Assessment of Dam Safety
Coal Combustion Surface Impoundments (Task 3)
Draft Report

Big Rivers Electric Cooperative

Coleman Generating Station

Hawesville, Kentucky

Prepared for

Lockheed Martin

2890 Woodridge Ave #209
Edison, New Jersey 08837

December 23, 2009

CHA Project No. 20085.2050.1510

CHA

I acknowledge that the management units referenced herein:

- Active Ash Pond A
- Inactive Ash Pond C

Have been assessed on November 17, 2009.

Signature: _____

Malcolm D. Hargraves, P.E.
Senior Geotechnical Engineer

Signature: _____

John Sobiech, P.E.
Senior Geotechnical Engineer
Registered in the State of Kentucky

Reviewer: _____

Warren A. Harris, P.E.
Reviewer

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1.0 INTRODUCTION & PROJECT DESCRIPTION

1.1 Introduction

CHA was contracted by Lockheed Martin (a contractor to the United States Environmental Protection Agency) to perform site assessments of selected coal combustion surface impoundments (Project #0-381 Coal Combustion Surface Impoundments/Dam Safety Inspections). As part of this contract, CHA was assigned to perform a site assessment of Big Rivers Electric Cooperative's Coleman Generating Station, which is located in Hawesville, Kentucky as shown on Figure 1 – Project Location Map. Big Rivers Electric Cooperative (BREC) resumed operational control of the Coleman Generating Station from Western Kentucky Energy Corporation, an E.On US subsidiary, in July 2009.

CHA made a site visit on November 17, 2009 to inventory coal combustion surface impoundments at the Coleman facility, to perform visual observations of the containment dikes, and to collect relevant information regarding the site assessment.

CHA Engineers John Sobiech, P.E. and Malcolm Hargraves, P.E. were accompanied by the following individuals:

Company or Organization Name	**Name**
KY DEP – Division of Water/Dam Safety	Scott Phelps, P.E., Supervisor
US EPA	Jim Kohler, P.E., Environmental Engineer
Associated Engineers, Inc.	David Lamb, P.E. President
Big Rivers Electric Cooperative	Tom Shaw, Manager – Environmental Services
Big Rivers Electric Cooperative	Daryl Citimn, Manager - Maintenance
Big Rivers Electric Cooperative	Mike Jones, Material Handling Supervisor
Big Rivers Electric Cooperative	Wayne O'Bryan, Manager – Production Services

1.2 Project Background

A total of four separate ponds have been present at one time or another at the Coleman Generation Station. Three of these ponds have been on the immediate property of the steam generation facility, and another one is on separate property acquired within about a mile downstream of the present facility along the Ohio River for the purpose of constructing the new pond. Active Ash Pond A, also referred to in some documents as the Active Recirculation Ash Pond, a reclaimed pond formerly known as the North Ash Pond, and Inactive Ash Pond C, also referred to in some documents as the South Ash Pond, are located on the immediate grounds of the generation facility. The New Ash Pond, also referred to as the Wastewater Treatment Facility, is the pond located remotely on the downstream property. It has not been completed and construction on the impoundment has been suspended since late 2008. Only two of the four ponds, Active Ash Pond A (hereafter called Ash Pond A) and Inactive Ash Pond C (hereafter called Ash Pond C) receive sluiced ash or dredged sluiced ash for dewatering purposes. The reclaimed pond cannot receive a waste product because it has been converted into an exterior storage and parking area and an approval to impound has not been issued for the New Ash Pond. Only Ash Pond A is under Kentucky Department of Environmental Protection (DEP) – Division of Water regulation. It has been given ID No. 0842 in the Kentucky State Dam inventory system and has been given a moderate hazard rating in the Kentucky DEP system on the basis of significant damage to property and facility operation should the impoundment fail.

1.2.1 State Issued Permits

Commonwealth of Kentucky Permit No. KY0001937 has been issued to Kentucky Utilities authorizing discharge under the National Pollutant Discharge Elimination System (NPDES) to the Ohio River in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit. The permit became effective on February 26, 2001 and was set to expire on February 28, 2005. According to BREC personnel, the renewal application was submitted in a timely fashion and is currently under review. It is unknown when a new permit

will be issued, so BREC continues to operate under the conditions of the expired permit until KY DEP issues an updated permit.

1.3 Site Description and Location

Figure 2 – Photo Site Plan shows the location of the three management units that have at one time or another received sluiced ash or dredged ash for dewatering for the Coleman Generating Station. Ash Pond A is located immediately north of the coal pile and generation plant. The reclaimed North Ash Pond area is located to the west of the generation plant. Its north dike is the southern half of the dike forming the south dike forming the adjacent Ash Pond A. Ash Pond C positioned at the southern extremity of the main plant facility and shares part of its north dike with the reclaimed North Ash Pond. River Road bounds the western extremity of the facility and the Ohio River bounds the eastern edge of Ash Pond A and generation facility.

Ash Pond A was completed in 1980. Figures 4, 5, 6A and 6B show the design plan area and typical dike cross sections when it was completed. Ash Pond A covers an area of about 48 acres with a maximum height of 30 feet. Based upon the plans, the dikes forming this pond were constructed with 2.5 horizontal (H):1 vertical (V) inboard and outboard slopes, with rock toe armoring along the east dike facing the Ohio River and rock slope facing in the area of an emergency spillway on its north dike. Steeper 2H:1V outboard slopes were constructed in the western portion of the south dike built as a raising of an existing dike of an older basin. It currently receives sluiced fly ash and bottom ash. One important item not shown explicitly on the aforementioned site plan is the recirculation pump structure, though a plan note does indicate the area on the impoundment dike where this structure is to be constructed.

Ash Pond C was completed when the plant was originally constructed in 1971. Figures 7 and 8 show the plan area from a 1990 survey of this pond and typical cross sections of the dikes as they were designed in 1967. It presently covers an area of roughly 90 acres, has a maximum height of 15 feet and stores bottom ash and fly ash. Based upon the plans, the dikes forming this pond

were constructed with 2H:1V inboard and outboard slopes. Ash Pond C is currently inactive and no longer receives sluiced ash. It is generally dry and has a stand of grass and weedy vegetation over most of its area, but is still maintained as a pond receiving dredged ash removed from Ash Pond A for dewatering and eventual reuse or landfilling

The North Pond was constructed when Ash Pond C and the present facility was completed in 1971. Based upon the available plans, this pond has a surface area of approximately 21 acres and was about 17 to 18 feet in height. In 2002, a Registered Permit-by-Rule for Beneficial Reuse of Special Waste No. 046-00022 was accepted to close, regrade, and reclaim the pond to use initially as a construction lay down area during the scrubber construction, then convert the area to external storage and parking. Figure 9 shows the plan area of the North Pond when it was constructed, prior to the time the pond was reclaimed.

An aerial photograph of the region indicating the location of the Coleman Generating Plant facilities and identifying schools, hospitals, or other critical infrastructure located within approximately five miles down gradient of Ash Pond A and Ash Pond C. is provided as Figure 3.

1.3.1 Other Impoundments

There is one other impoundment called the New Ash Pond, also referred to as the Wastewater Treatment Facility, located remotely on property BREC had obtained downstream of the present facility. Construction on this pond began in 2007 and has been temporarily suspended since late 2008, leaving the dikes approximately 12 feet below their design crest elevation. According to Kentucky DEP personnel and CREC personnel, a permit to impound, which would allow the sluicing of Coal Combustion Byproducts (CCB) to commence, has not been issued for this basin. Consequentially, the basin has not been used to store sluiced ash. During previous inspections at this basin, severe erosion as a result of poorly established grass cover on the slopes during the construction shut down period was observed. In order to preserve the slopes and save the

embankment soil, BREC has started placing compacted gypsum and ash on the inboard slopes. This activity was occurring at the time CHA visited the site

1.4 Previously Identified Safety Issues

Based on our review of the information provided to CHA and as reported by BREC, there have been no identified safety issues at Ash Pond A or Ash Pond C in the last 10 years.

1.5 Site Geology

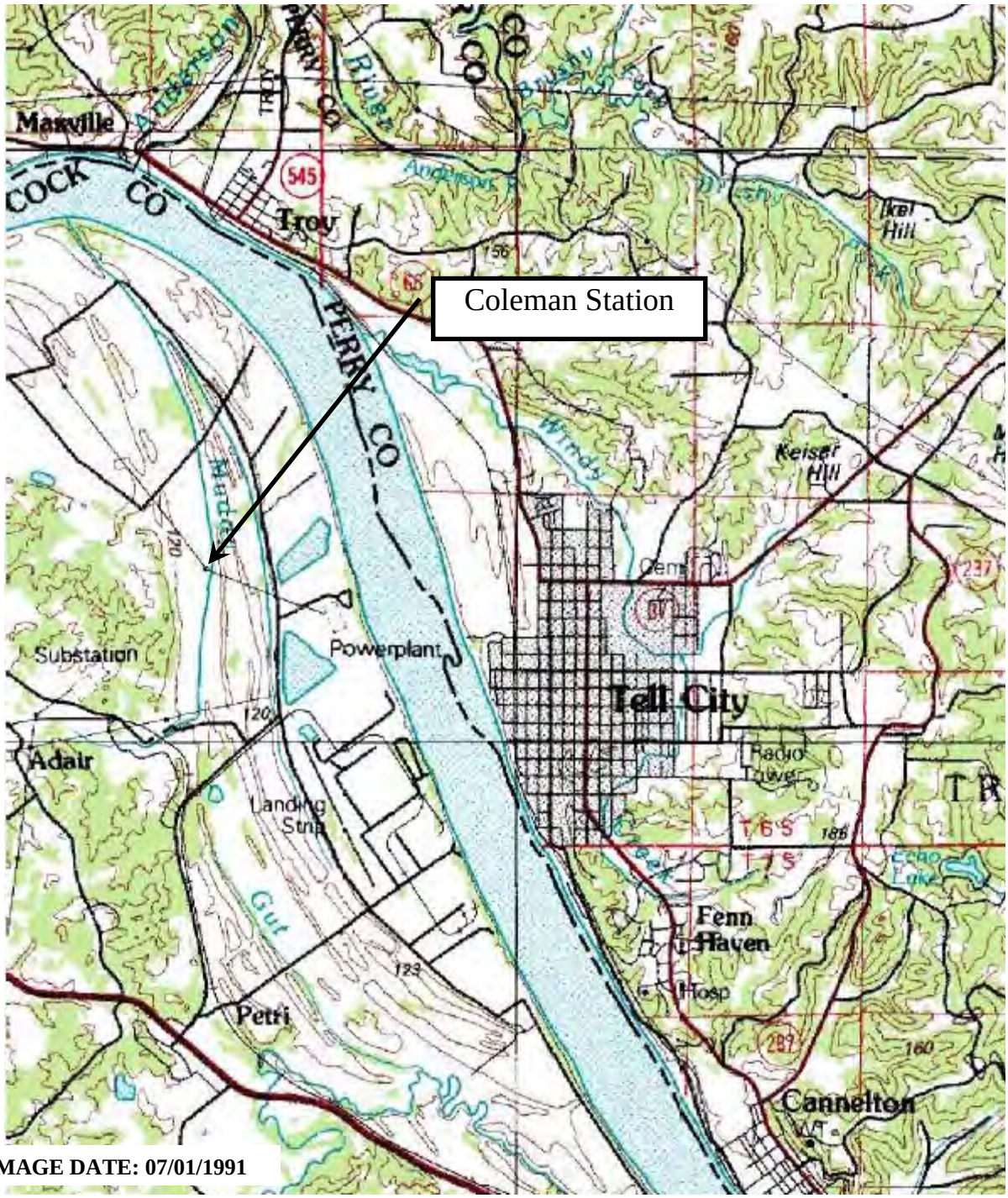
The *Geologic map of Kentucky*, prepared by R.C. McDowell et al. in 1981 for the U.S. Geological Survey, indicates that the ash ponds and generation facility lie above Holocene aged Ohio River deposited alluvium of the Quarternary period. This alluvium most likely lies above bedrock of the Pennsylvanian period comprising interbedded siltstone and sandstone, with tertiary amounts of limestone and coal mapped as the Tradewater formation.

1.6 Bibliography

CHA reviewed the following documents provided by BREC in preparing this report:

- *Big Rivers RECC KY. 62 – Big Rivers Kenneth C. Coleman Power Plant Site Plan*, February 12, 1971, with Revisions, Parson-Jurden Corporation Engineers and Constructors
- *Big Rivers Electric Corporation Site Coleman Power Plant Selected Record Drawings*, May 31, 979 with Revisions, Burns and Roe, Inc. Engineers and Constructors
- *Certificate of Inspection for Dam and Appurtenant Works*, Various Reports dated October 2004, April 2006, and April 2009, Kentucky Department for Environmental Protection – Division of Water.

- *Dam Inspection Reports,* Reports from May 2008 and February 2009, Big Rivers Electrical Cooperative
- *Impoundment Inspection Report,* Monthly Reports from May through October 2009, Big Rivers Electrical Cooperative
- *Coleman Impoundment Inspection Report,* April 2009, Associated Engineers, Inc.
- *Impoundment Inspection Report,* June 2009, Associated Engineers, Inc.
- *Meeting on Dam Inspection Action Items,* November Meeting Minutes, Big Rivers Electrical Cooperative



N

CHA

Figure 1
Project Location Map

Scale: 1" = 1 mile	Project No.: 20085.2050.1510	Western Kentucky Energy Coleman Station Hawesville, KY

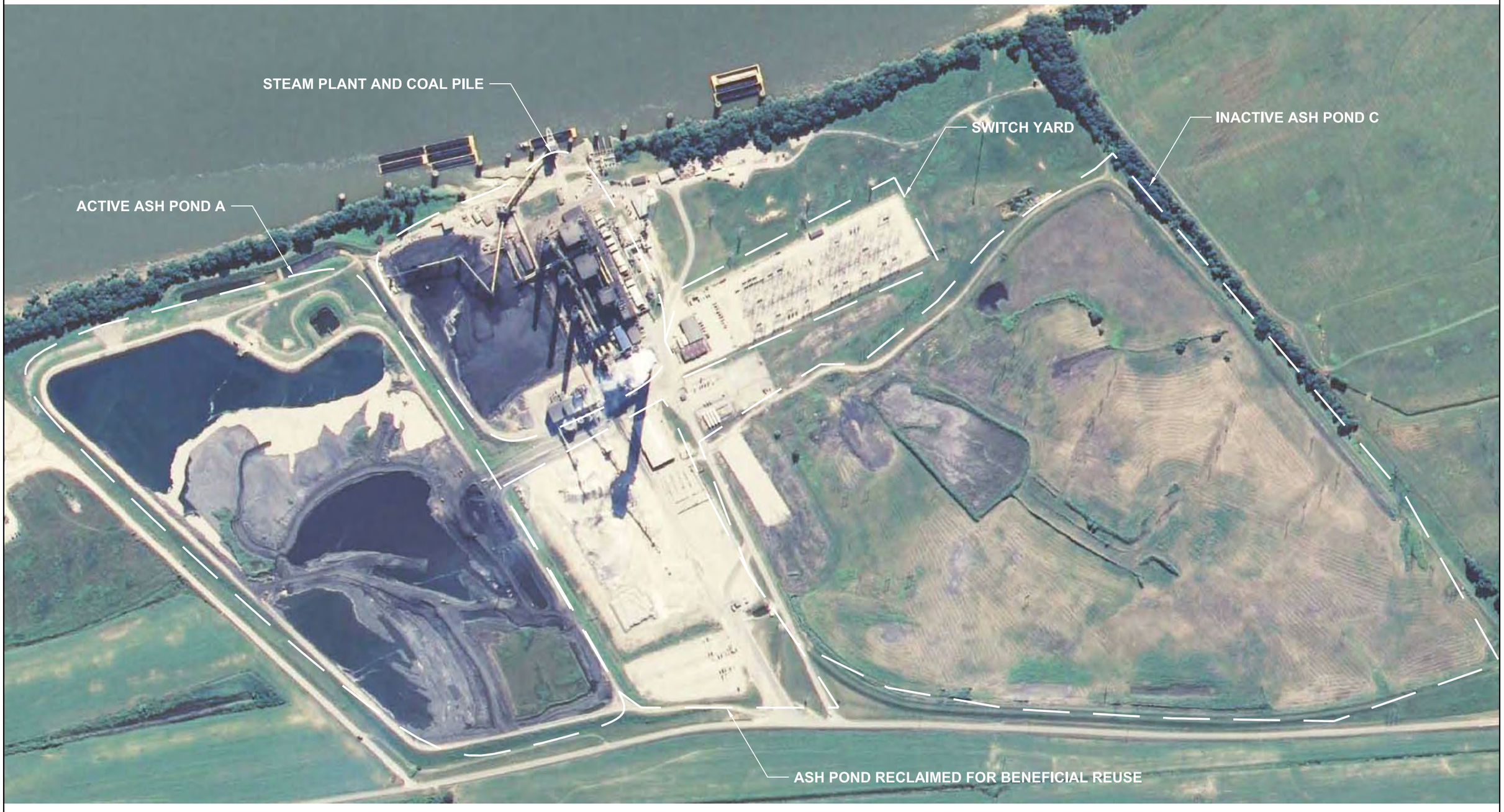


IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 17, 2006.

0 100 200
Scale in feet

LEGEND

23 STREET, HIGHWAY

FIRE DEPARTMENT

SCHOOL

CHURCH

CHA
III Winners Circle, PO Box 5269 - Albany, NY 12205-0269
Main: (518) 453-4500 · www.chacompanies.com

PHOTO SITE MAP

COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

FIGURE 2

IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 20, 2004.

LEGEND

545 STREET, HIGHWAY

FIRE DEPARTMENT

CHURCH

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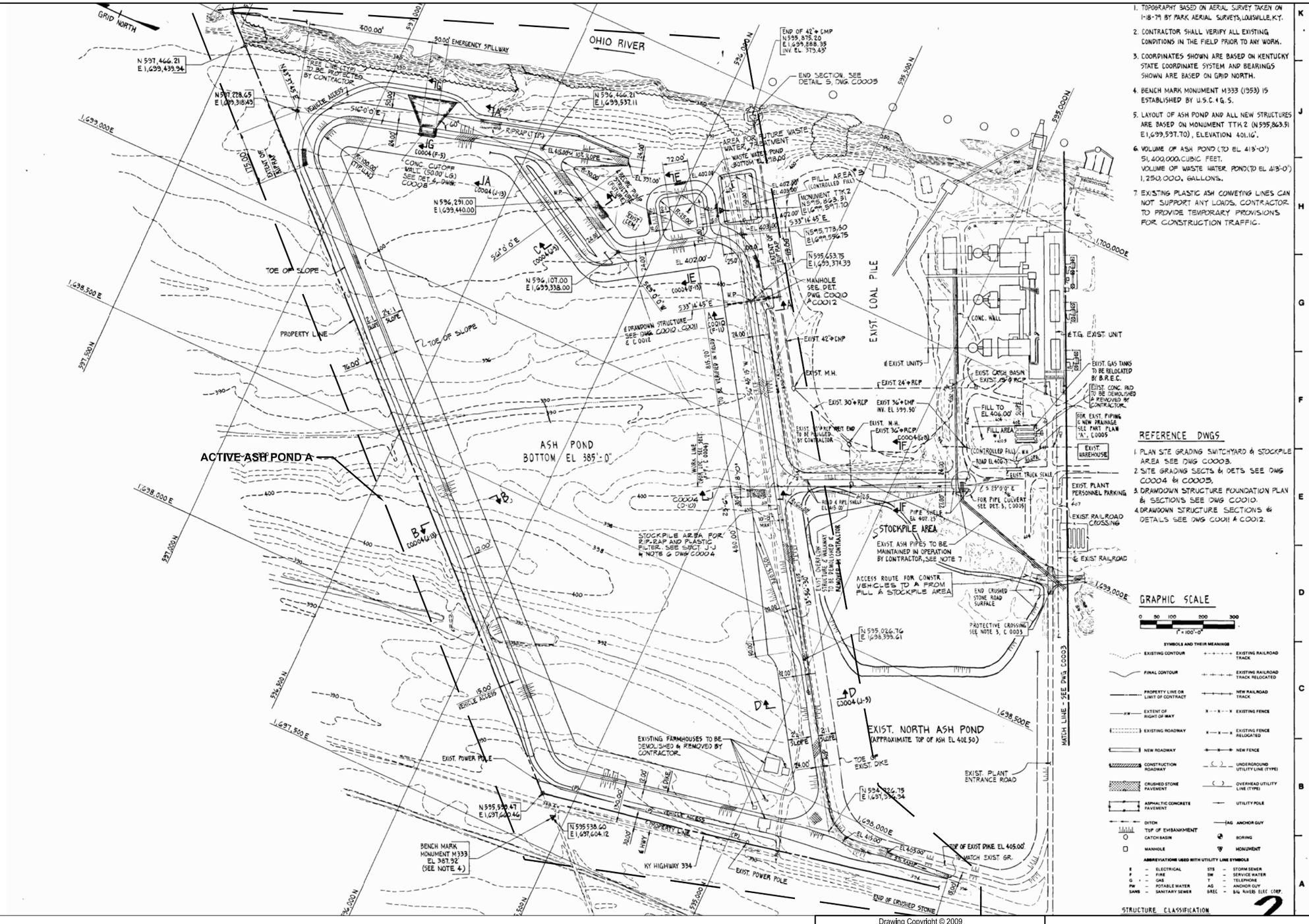
CRITICAL INFRASTRUCTURE MAP

COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

FIGURE 3



1. TOPOGRAPHY BASED ON AERIAL SURVEY TAKEN ON 1-18-79 BY PARK AERIAL SURVEYS, LOUISVILLE, KY.
2. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS IN THE FIELD PRIOR TO ANY WORK.
3. COORDINATES SHOWN ARE BASED ON KENTUCKY STATE COORDINATE SYSTEM AND BEARINGS SHOWN ARE BASED ON GRID NORTH.
4. BENCH MARK MONUMENT M333 (1953) IS ESTABLISHED BY U.S.C. & G.S.
5. LAYOUT OF ASH POND AND ALL NEW STRUCTURES ARE BASED ON MONUMENT TTK 2 (N 595,863.51 E 1,699,597.70), ELEVATION 401.16'.
6. VOLUME OF ASH POND (TO EL 413'-0') 51,400,000 CUBIC FEET. VOLUME OF WASTE WATER POND (TO EL 413'-0') 1,250,000 GALLONS.
7. EXISTING PLASTIC ASH CONVEYING LINES CAN NOT SUPPORT ANY LOADS. CONTRACTOR TO PROVIDE TEMPORARY PROVISIONS FOR CONSTRUCTION TRAFFIC.

REFERENCE DWGS

1. PLAN SITE GRADING SWITCHYARD & STOCKPILE AREA SEE DWG C0003.
2. SITE GRADING SECTS & DETS SEE DWG C0004 & C0005.
3. DRAWDOWN STRUCTURE FOUNDATION PLAN & SECTIONS SEE DWG C0010.
4. DRAWDOWN STRUCTURE SECTIONS & DETAILS SEE DWG C0011 & C0012.

IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN POWER PLAN, PLAN SITE GRADING, ASH POND AREA, BY BURNS AND ROE, INC., MAY 24, 1979

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ACTIVE ASH POND A PLAN VIEW

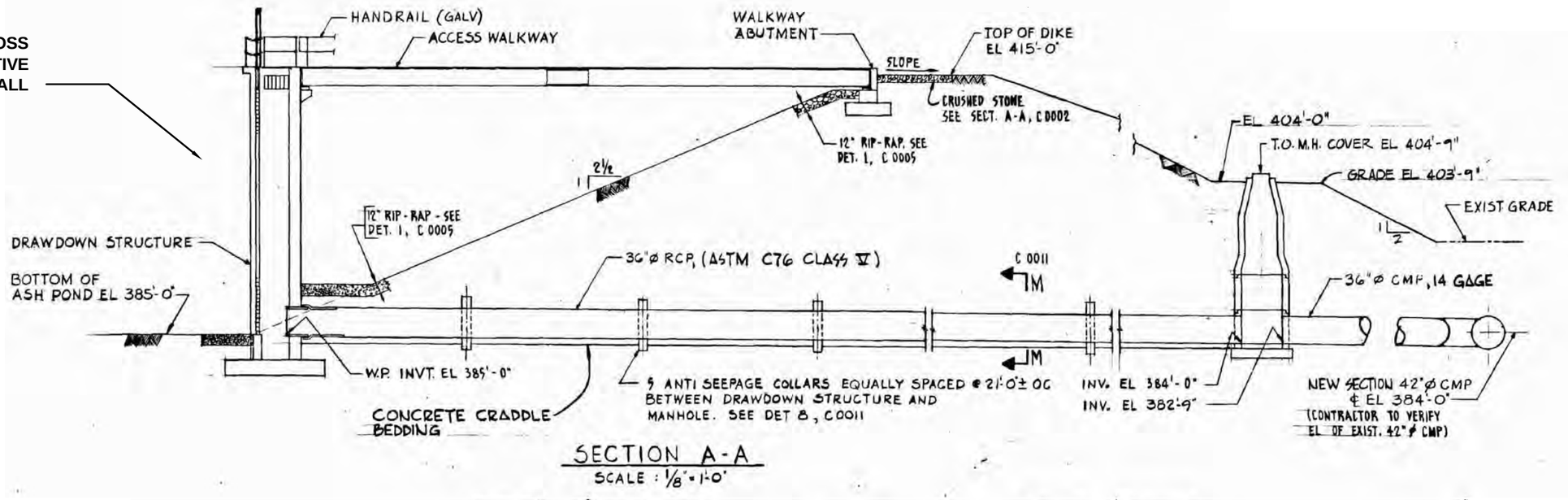
COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

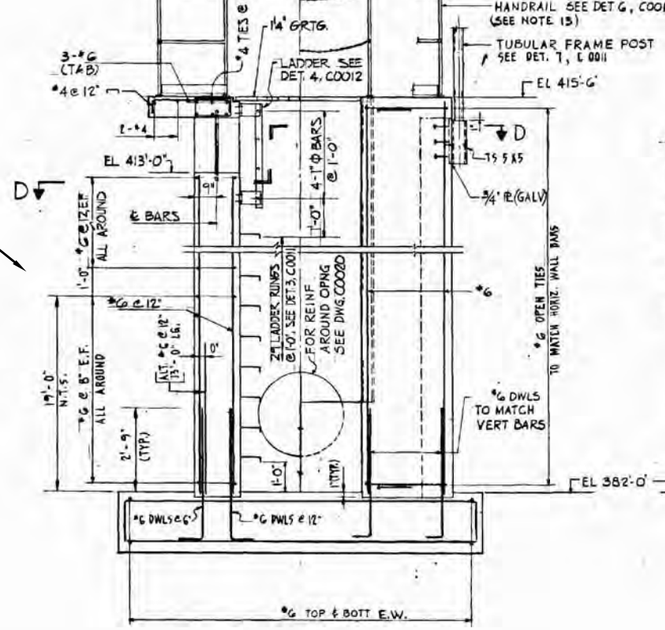
FIGURE 4

EMBANKMENT CROSS SECTION AT ACTIVE POND A OUTFALL

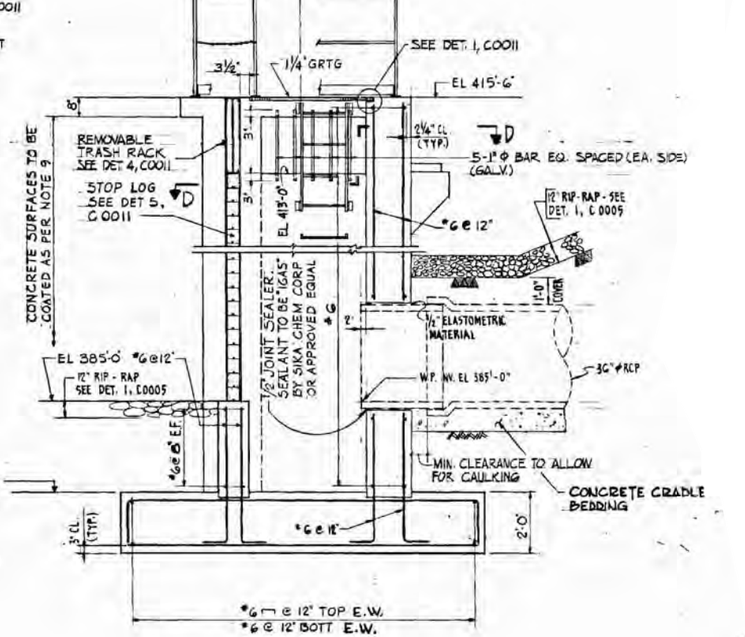


SECTION A-A
SCALE : 1/8" = 1'-0"

OUTFALL ELEVATION FOR ACTIVE POND A



SECTION C-C
SCALE : ½" = 1'-0"



SECTION B-B
SCALE : ½" = 1'-0"

IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN POWER PLAN, DRAWDOWN STRUCTURE FOUNDATION PLAN AND SECTIONS, DRAWING C0010 BY BURNS AND ROE, INC., MAY 31, 1979

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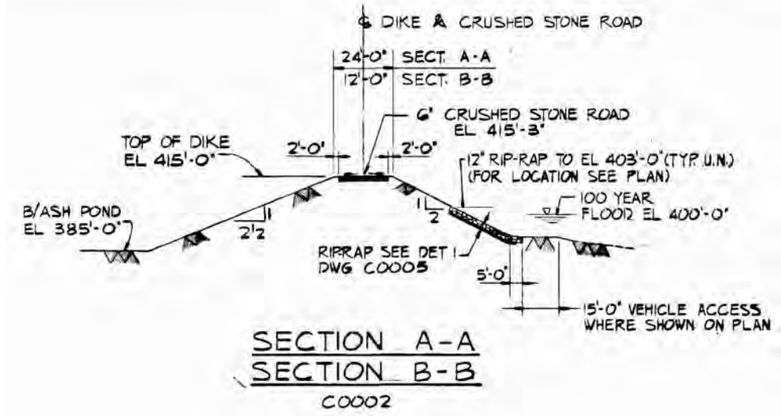
ACTIVE ASH POND A DIKE SECTION

COLEMAN STATION
HAWESVILLE, KENTUCKY

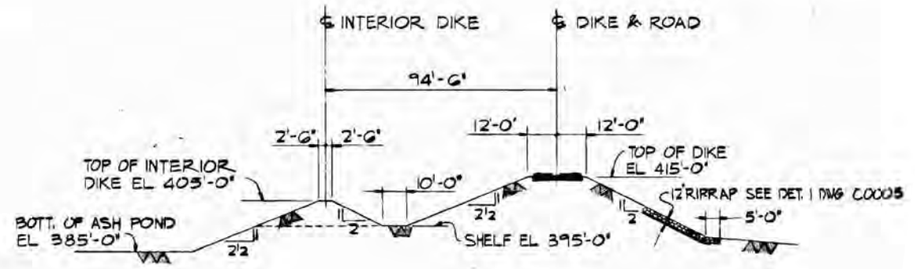
PROJECT NO. 20085.2050

DATE: 12/2009

FIGURE 5

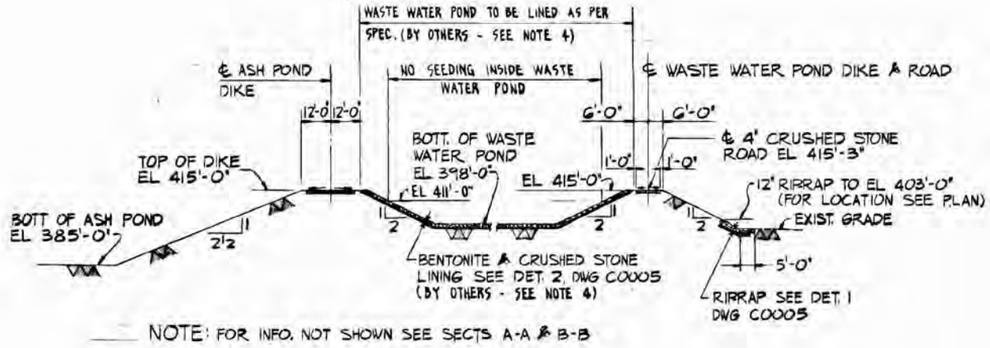


SECTION A-A
SECTION B-B
C0002



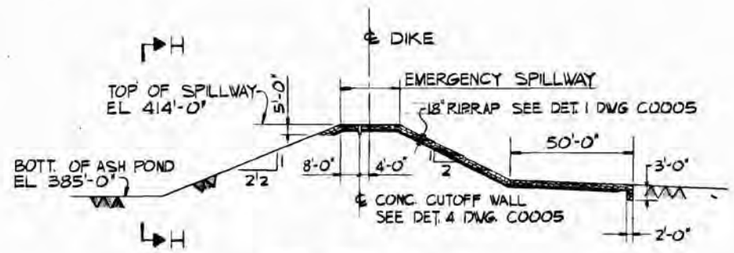
NOTE: FOR INFO. NOT SHOWN SEE SECT A-A & B-B

SECTION C-C
C0002



NOTE: FOR INFO. NOT SHOWN SEE SECTS A-A & B-B

SECTION E-E
C0002



SECTION G-G
C0002

IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN POWER PLAN, SITE GRADING SECTIONS AND DETAILS, DRAWING C0004 BY BURNS AND ROE, INC., MAY 31, 1979

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ACTIVE ASH POND A
TYPICAL DIKE SECTIONS
COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050
DATE: 12/2009
FIGURE 6

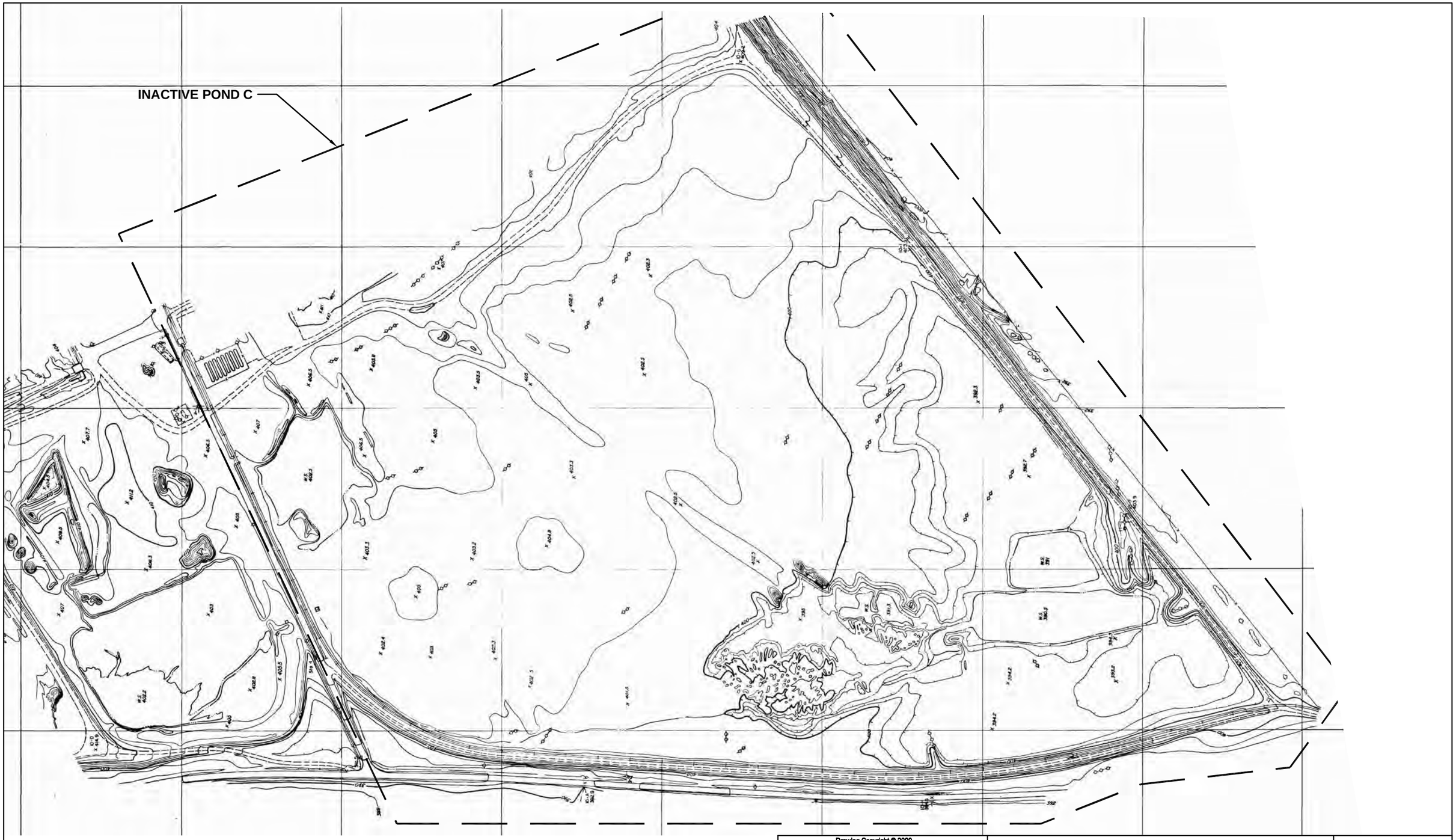

IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN STATION, OLD ASH POND CONTOURS, DRAWING 5-3820C-18, BY PARK AERIAL SURVEYS, INC., AUGUST 30, 1990

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INACTIVE ASH POND C PLAN VIEW

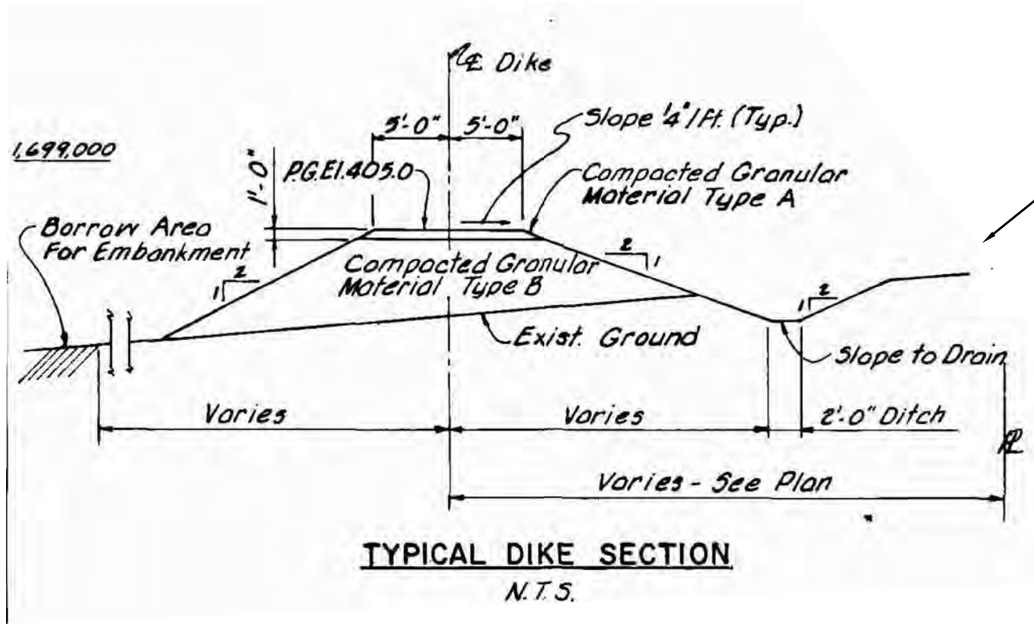
COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

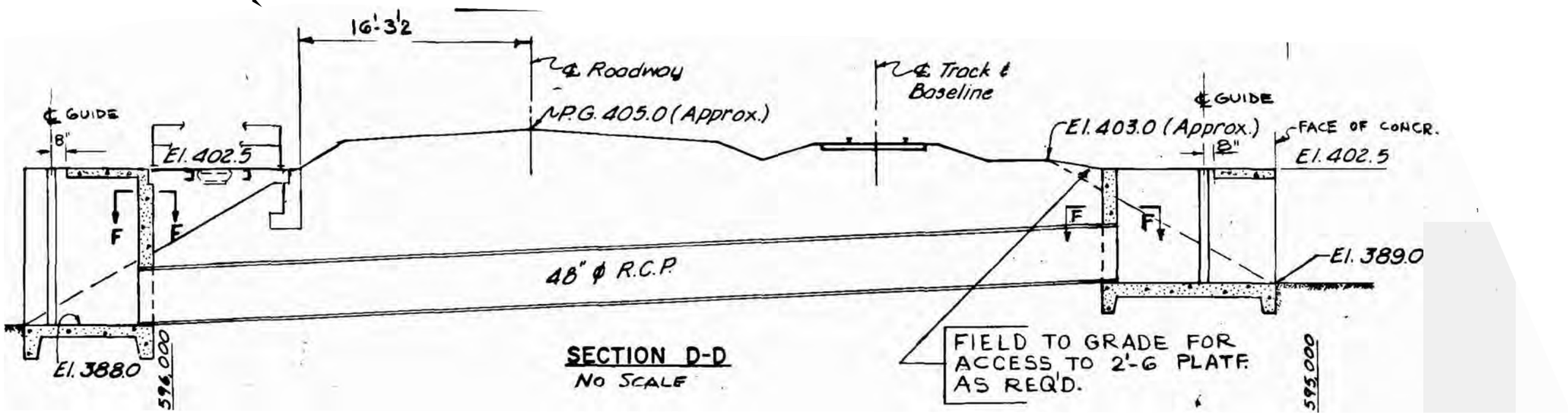
FIGURE 7

CROSS SECTION AT INACTIVE POND C



TYPICAL DIKE SECTION
N.T.S.

NORTH DIKE CROSS SECTION AT INACTIVE POND C



SECTION D-D
NO SCALE

IMAGE REFERENCE: BIG RIVERS RECC, SITE PLAN SHOWING ASH DISPOSAL DYKES DRAINAGE STRUCTURES & DITCHES, DRAWING NO. 3820-C1-3 REV. 6 – FINAL AS BUILT, FEBRUARY 12, 1971.

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INACTIVE ASH POND C
TYPICAL DIKE SECTIONS
COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050
DATE: 12/2009
FIGURE 8

FORMER POND RECLAIMED FOR CONSTRUCTION REUSE

STOP LOG GUIDE
Scale: 1/2" = 1'-0"

TYPICAL DIKE SECTION
N.T.S.

SECTION X-X
N.T.S.
SEE DWG 3820-C1-4

PLAN
48" PIPE CULVERT & HEADWALLS
NO SCALE

SECTION B-B
N.T.S.

SECT. H-H
N.T.S.

SECT. J-J
N.T.S.

SECT P-P (AS SHOWN & NOTED)
SECT Q-Q (" " ")

NOTE: Concrete work is to be by Contract No. 130.
Construction of dyke is to be by Contract No. 128.

NOTE: ALL STEEL WORK SHOWN ON THIS DWG. TO BE HOT DIP GALVANIZED

APPROVED
(FOR CONSTRUCTION)

IMAGE REFERENCE: BIG RIVERS RECC, SITE PLAN SHOWING ASH DISPOSAL DYKES DRAINAGE STRUCTURES & DITCHES, DRAWING NO. 3820-C1-3 REV. 6 – FINAL AS BUILT, FEBRUARY 12, 1971.

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ASH POND RECLAIMED FOR BENEFICIAL REUSE PLAN VIEW
COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050
DATE: 12/2009
FIGURE 9

2.0 FIELD ASSESSMENT

2.1 Visual Observations

CHA performed visual observations of the Ash Pond A and Ash Pond C dikes following the general procedures and considerations contained in Federal Emergency Management Agency's (FEMA's) *Federal Guidelines for Dam Safety* (April 2004), and Federal Energy Regulatory Commission (FERC) Part 12 Subpart D to make observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, prepared by the US Environmental Protection Agency, were completed on-site during the site visit. Copies of the completed forms were submitted via email to a Lockheed Martin representative approximately three days following the site visit to the Coleman Generating Station. Copies of these completed forms are included in Appendix A. A photo log and Site Photo Location Maps (Figures 10A and 10B) are also located at the end of Section 2.5.3.

CHA's visual observations were made on November 17, 2009. The weather was cloudy and rainy with temperatures between 41 and 54 degrees Fahrenheit. Prior to the days we made our visual observations the following approximate rainfall amounts occurred (as reported by www.weather.com). It should be noted that 0.16 inches of rain was recorded on the day of the site visit.

Table 1 - Approximate Precipitation Prior to Site Visit

Date of Site Visit – November 17, 2009		
Day	**Date**	**Precipitation (inches)**
Tuesday	11/10/09	0.00
Wednesday	11/11/09	0.00
Thursday	11/12/09	0.00
Friday	11/13/09	0.00
Saturday	11/14/09	0.00
Sunday	11/15/09	0.00
Monday	11/16/09	0.81
Total	**Week Prior to Site Visit**	**0.81**
Total	**Month of November up to Site Visit**	**0.81**

2.2 Visual Observation – Ash Pond A

CHA performed visual observations of the primary dike, which is about 5,900 feet long and about 30 feet high.

2.2.1 Ash Pond A - Crests

In general, the Ash Pond A dikes do not show signs of changes in horizontal alignment from the designed alignment (Photos 2, 8, 13, 14) The crest areas supported a granular surfaced access drive to service the impoundment. Theses appeared stable and free from any abrupt gross vertical deformation or cracking. In some areas the embankment crest areas were overbuilt due to ash handling processes, and a build-up of ash could be observed, making the crest area wider than initially designed (Photo 14). This was particularly evident along the western and central portions of the south dike, and to a somewhat lesser extent along the west dike and the western portion of the north dike. Isolated areas of softened surface gravel and bird baths were also observed on the south dike crest as well.(Photo 16).

2.2.2 Ash Pond A – Embankment Slopes

The outboard slopes were uniformly graded and generally covered with grassy vegetation from the crest to the toe elevation (Photos 6, 11, and 15). These areas generally appeared to be well maintained and stable with no readily observable sloughs, scarps, bulges, or other large deformations that would indicate global instability.

A rock armored toe to approximately ¼ of the slope height was evident on the east dike (Photo 1). This rock toe armoring appeared to be reasonably maintained, with sporadic fouling vegetative growth (Photo 5). It appears as if this armoring was designed and placed at this location as a measure of protecting the toe should a major flood event occur on the Ohio River that runs parallel to the dike. The east dike also has a portion of its length upon which rock

armoring was observed from the crest to the toe. This is the area of the emergency spillway (Photo 3).

An access ramp for ash processing equipment and pond maintenance was observed on the south dike outboard slope. Ash sluicing lines and other waste water pipelines emptying into the pond were also noted on this ramp. In the portion of the dike north of this access ramp, standing water was observed at the dike toe in a drainage swale. This appeared to be due to precipitation before and during the site visit in addition to possible poor drainage (Photo 19).

Standing water was also observed at the toe area of the north dike. In this area however, in addition to the recent precipitation, the standing water was the consequence of a drainage culvert beneath an access drive being crushed and completely covered (Photo 7). This has blocked the culvert and apparently allowed standing water to build up in this area for a period of time. In this area the soil at the base of the drainage swale had begun to soften, allowing a probe to penetrate approximately 1 foot.

Other observations of note on the outboard slope areas were isolated rodent burrows on the east and north dike slopes and grassed shallow ruts on the west and north slopes. One of the encountered rodent burrows had been rigged with a wire loop trap, indicating that the facility is actively attempting rodent control (Photo 21). The shallow grassed ruts are most likely related to mowing activities in steeper areas of the slope with tractor machinery when the slopes may have been wet (Photo 12).

Inboard slope areas of the impoundment were generally rock or ash covered (Photos 4, 9, 13, 14, and 17). As a result of grading activities, looser materials had been pushed out on these slopes, making them susceptible to erosion rills in locations where surface runoff has become concentrated (Photos 10 and 18). These areas were also susceptible to beaching erosion, particularly in the western portion of pond. Available freeboard appears to be on the order 1.5 to

2 feet on the western end of the north dike and about 2 to 3 feet on the east dike, potentially enhancing the effect of beaching erosion and other wave action from the open pond area.

2.2.3 Ash Pond A – Outlet Structures

The primary outlet structure is a recycle pump house at the east end of the pond (Photo 22). At this structure, decanted water is conveyed from the pond back through the generation plant and reused to sluice waste ash into the pond.

The original outlet structure, referred to in the design drawings as a drawdown structure, is an approximately 8-foot by 10-foot reinforced concrete spillway riser approximately 33.5 feet in height, located at the east end of the south dike. It is configured to utilize stop logs to control the pond elevation and releases water via a 36 inch diameter reinforced concrete pipe. This pipe has an outfall at the Ohio River. Presently, this spillway is inactive (Photo 20). At the time of the site visit, the pond level was approximately 3.5 below the top of the riser. Based upon the design plans that show a top elevation at 415.5, the pond surface was stable at approximately elevation 412.

The emergency spillway is located near the north end of the east dike (Photo 3). It is approximately 50 feet wide at the crest, with an invert set 1 foot below the crest at elevation 414. This spillway area was generally clear of any fouling debris or vegetation at the dike crest. Based upon a pond elevation at 412, there was about 2 feet of freeboard at the spillway. Very little difference between the dike crest elevation and spillway crest elevation was discernable in the field, despite the fact that plans note that there should be a 1 foot difference in the elevations.

2.3 Visual Observations – Ash Pond C

CHA performed visual observations of the Ash Pond C impoundment. It is roughly 8,000 feet around its perimeter, with a dike length on the order of about 6,300 feet and a maximum height

of approximately 15 feet. At the time of the site assessment, this pond area was dry. CHA understands that this pond is utilized primarily to dewater combustion ash when it is dredged from Ash Pond A. Otherwise it is maintained as an open dry surface with a grassy and weedy field (Photo 25).

2.3.1 Ash Pond C Crest

The crest areas of the Ash Pond C dikes carry a gravel access drive for maintenance activities, an abandoned railway spur along the west and north dikes, and a portion of the main entrance drive on the north dike (Photos 31, 34, and 44). A grass cover had overtaken the gravel surface of the access drive and most of the abandoned railroad spur, leaving only the rails exposed on the west dike. On the eastern rim of the pond area, the impoundment is essentially at grade or slightly incised, with 2 to 3 foot berms pushed up along the access drive and drainage swale areas to provide freeboard when the pond is in use (Photos 23, 24, and 26). In general, these crest areas of Ash Pond C did not exhibit signs of any abrupt lateral translation, vertical deformation or cracking that might indicate instability.

2.3.2 Ash Pond C Embankment Slopes

The inboard and outboard embankment slopes were uniformly graded and generally covered with grassy vegetation from the crest to the toe elevation (Photos 30, 32, 33, 35, 36, 38, 40 and 41). An exception was noted on the south dike, where heavier vegetation including weeds, brush, and trees were observed on the outboard slope along the eastern half of the dike (Photo 27). This portion of the dike is adjacent to a natural drainage feature that eventually outlets into the Ohio River roughly 750 to 800 feet east of the pond. Due to the nature of the vegetation in this area and the incised nature of the pond in the eastern extremity of the south dike, the transition from this natural drainage feature to the dike slope was obscured.

In general, the inboard and outboard embankment slopes were stable with no readily observable sloughs, scarps, bulges, or other large deformations that would indicate global instability. Isolated erosion rills as well as isolated grass cover loss or thinning and slope surface deformation was observed along the west dike (Photo 39). The erosion rills were generally grassed over, implying a long, slow development period, while the thinning grass cover and surface deformation appear to be the result of mowing in previously existing ruts on steeper portions of the slope. It is likely that previous mowing activities when the slope has been softened after precipitation events exacerbated the deformation and rutting.

2.3.3 Ash Pond C Outlet Structures

The primary outlet structure is a 24-inch diameter PVC riser connected to a 24-inch diameter PVC pipe located along the south dike (Photo 28). This pipe conveys water beyond the dike toe to the upper portions of the drainage feature running parallel to the south dike, eventually emptying into the Ohio River. At the time of the site assessment, the pond was dry and the outlet was inactive. It appeared to be open and unobstructed, with rip rap outlet protection. Sporadic dead or dying vegetation was observed in the outlet protection (Photo 29).

A secondary outlet is a roughly 9-foot by 12-foot reinforced concrete spillway riser located on the north dike (Photo 42). This structure is connected to a 48-inch diameter reinforced pipe and conveys water to a sump pit in the area where the old North Ash Pond was reclaimed (Photo 43). Effluent collected in this sump is pumped to Ash Pond A. This structure is configured to accept stop logs to control the pond level; however this structure is longer actively controlling a water level. During the site visit, the ash level and dried ground surface was generally observed to be above this structure. Furthermore, this area had been graded so that drainage swales from the pond area could convey water to this location when dredged ash was being dewatered and promote positive drainage for stormwater runoff. Water was noted pooling against this structure and dead or dying weedy vegetation was encountered at the structure opening. This vegetation did not appear to be impeding the structure in its present function.

2.4 Monitoring Instrumentation

CHA is not aware of any installed embankment performance instrumentation at Ash Pond A or Ash Pond C.

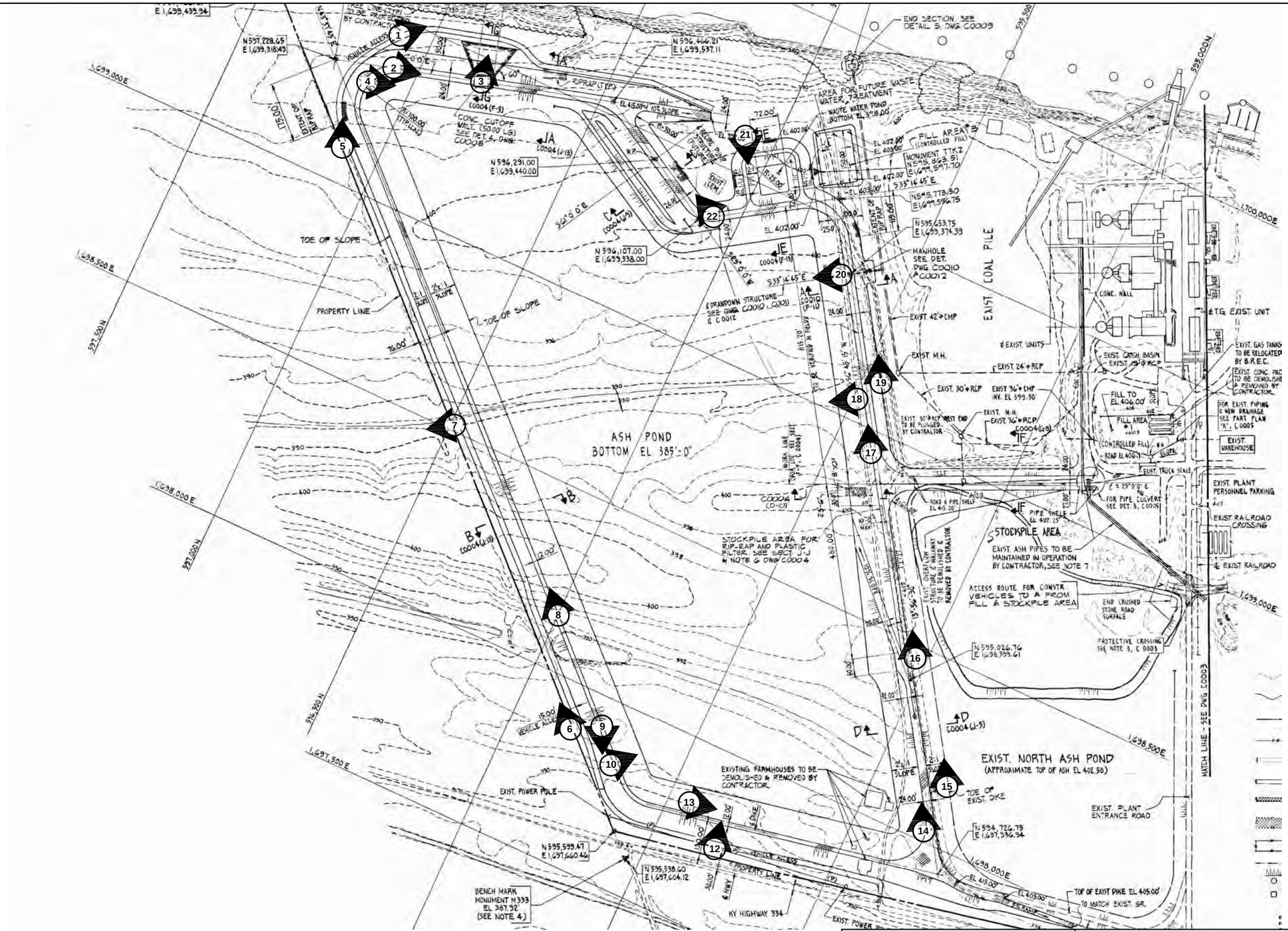


IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN POWER PLAN, PLAN SITE GRADING, ASH POND AREA, BY BURNS AND ROE, INC., MAY 24, 1979

CHA
III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
Main: (518) 453-4500 · www.chacompanies.com

PHOTO LOCATION PLAN

COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

FIGURE 10A

IMAGE REFERENCE: BIG RIVERS ELECTRIC CORPORATION COLEMAN STATION, OLD ASH POND CONTOURS, DRAWING 5-3820C-18, BY PARK AERIAL SURVEYS, INC., AUGUST 30, 1990

CHA
III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
Main: (518) 453-4500 · www.chacompanies.com

PHOTO LOCATION PLAN

COLEMAN STATION
HAWESVILLE, KENTUCKY

PROJECT NO. 20085.2050

DATE: 12/2009

FIGURE 10B

1

East dike outboard slope, looking south. Note rock toe drain.

2

East dike crest, looking south. Note gravel crest surface.

3

East dike emergency spillway, looking east toward the Ohio River. Note isolated dying woody vegetation.

4

East dike inboard slope with rock surface, looking south. Note isolated woody vegetation.

5

Rock toe drain at northeast corner of Ash Pond A, outboard slope.

6

North dike outboard slope, looking east.

7

Poor drainage at toe of north dike where culvert under road has been blocked.

8

North dike crest looking east. Note wet area at toe of dike to left of photo.

9

North dike inboard slope. Note beaching erosion and erosion rills.

10

Close up of slight beaching on inboard slope of north dike.

11

West dike outboard slope, looking south.

12

Mowing ruts on west dike outboard slope.

13

West dike inboard slope and crest, looking south.

14

South dike inboard slope and crest at ash processing area, looking east.
Note buildup of ash on inboard slope that widens crest area.

15

South dike outboard slope, looking east.

16

South dike crest looking east. Note standing water in puddles.

17

South dike, inboard slope looking east at open pond beyond ash processing area.

18

Erosion rills on inboard slope of south dike.

19

Standing water in drainage swale at toe of south dike.

20

Concrete outfall structure.

21

Rodent burrow with trap.

22

Recycle pump structure dam.

23

Access drive along east incised edge of pond, looking south.
Interior berm built up to provide free board when pond is in use can be seen at right of photo.

24

East dike crest, looking south. Note gravel crest surface.

25

East edge of pond area, looking north.

26

Looking west along south edge of pond from top of freeboard berm.

27

South dike outboard slope, looking east.
Note trees and brush vegetation on slope and at slope toe.

28

Outlet riser in pond area.

29

Outlet pipe on south dike.

30

South dike outboard slope, looking east.

31

South dike crest area, looking west. Note standing water near toe area.

32

South dike inboard slope, looking east.

33

South dike outboard slope from west corner, looking east.

34

West dike crest, looking south along abandoned railroad spur.

35

West dike outboard slope, looking south.

36

West dike outboard slope, looking north.

37

West dike crest, looking north.

38

West dike inboard slope, looking north.

39

Mowing ruts in surface on west dike outboard slope.

40

North dike outboard slope near facility driveway, looking east.

41

North dike inboard slope, looking east.

42

Old outlet structure to closed and reclaimed North Pond.

43

Looking north from north dike to reclaimed North Pond area.

44

North dike crest area, looking east.

3.0 DATA EVALUATION

3.1 Design Assumptions

CHA has reviewed the design assumptions related to the design and analysis of the stability and hydraulic adequacy of the Ash Ponds A and C available at the time of our site visits and provided to us by BREC and KDEP. The design assumptions are listed in the following sections.

The Commonwealth of Kentucky regulates Ash Pond A as a "Moderate" hazard impoundment. Kentucky does not regulate Ash Pond C.

3.2 Hydrologic and Hydraulic Design

The Kentucky regulations regarding hydrologic and hydraulic design requirements are found in DNR&EP Engineering Memorandum 5 pertaining to KRS 151.250. The regulations are based upon P_{100} which refers to the 6-hour, 100-year precipitation and the PMP which represents the 6-hour Probable Maximum Precipitation. From the National Weather Service *Technical Paper No. 40 – Rainfall Frequency Atlas of the Eastern United States for Duration from 30 minutes to 24 hours and Return Periods from 1 to 100 years*, for Hawesville, Kentucky, the P_{100} is about 4.6 inches and the PMP is about 27 inches. The reported 50-year, 6-hour rainfall is about 4.3 inches

3.2.1 Ash Pond A – Hydrologic and Hydraulic Design

As a Moderate (Class B) hazard structure, Kentucky regulations require Ash Pond A to safely store or pass a flow equivalent to the P_{100} plus 40 percent of the difference between the PMP and the P_{100} storms [P100 + 0.40(PMP-P100)]. Therefore, the design precipitation for Ash Pond A is 13.5 inches. CHA was not provided with a hydraulic analysis showing the ability of the Ash Pond A to safely store or pass the design storm.

Because Ash Pond A is a fully diked (i.e., above original grade) structure, inflow from a storm is limited only to the rainfall runoff that lands on the pond surface and the crest and upstream slopes of the dikes. Therefore, the rise in water surface elevation is not anticipated to be significantly more than the 13.5 inches of the design storm. However, this should be verified.

3.2.2 Ash Pond C – Hydrologic and Hydraulic Design

Ash Pond C is not regulated by KYDEP therefore there are no specific H&H guidelines for its design. CHA suggests the impoundment be evaluated for susceptibility to overtopping during a reasonable design storm.

3.3 Structural Adequacy & Stability

The Kentucky regulations and guidelines for dam safety do not provide specific factors of safety for slope stability. Therefore, CHA recommends following industry guidelines such as those found in the US Army Corps of Engineers Engineering Manual (EM) 1110-2-1902. Table 2 below summarizes the guidance values for minimum factors of safety for earthen embankment dams.

Table 2 - Minimum Safety Factors Recommended by US Army Corps of Engineers

Load Case	Required Minimum Factor of Safety
Steady State Seepage at Normal Pool	1.5
Maximum Surcharge Pool (Flood) Condition	1.4
Rapid Drawdown Condition	1.3
Seismic Conditions from Present Pool Elevation	1.0

Based on recent probabilistic hazard analyses performed by the United States Geological Society (USGS) accelerations of about 0.0704g and 0.1895g are representative of seismic accelerations with a 10 and 2 percent probability of exceedance in 50 years, respectively (about 500-year and 2,500-year events, respectively).

CHA was not provided with information regarding stability analyses performed for the ash ponds. Without having received site specific subsurface information, CHA was unable to perform a preliminary stability analyses for dikes. Our recommendation that subsurface investigations and stability analyses be performed for the ash ponds is discussed in Section 4.2.

3.4 Foundation Conditions

CHA has not been provided with geotechnical subsurface information for Ash Ponds A or C. CHA was provided with several record drawings related to construction of the Ash Pond A. The western half of the south dike was constructed by raising and widening a berm for the "North Ash Pond" to the downstream side. We understand from plant personnel that the North Ash Pond no longer exists and drawings for Ash Pond A indicate in areas of access ramps and pipe benches that were constructed within the former North Ash Pond that ash was to be removed.

3.5 Inspections

3.5.1 State Inspections

CHA was provided with KDEP inspection reports for Ash Pond A from 2004, 2006, and 2009. KDEP does not inspect Ash Pond C. The Table 2 summarizes items noted by KDEP related to Ash Pond A:

Table 2 – Summary of KDEP Inspections of Ash Pond A

2009 KDEP Inspection of Ash Pond A
• Erosion rills forming in the crest and travelling down the slope. KDEP indicated that upstream slope gravel cover needs to be recovered.
• Potholes in the crest. KDEP indicated that these need to be filled.
2006 KDEP Inspection of Ash Pond A
• Small trees/brush were noted on the downstream slope. KDEP indicated the brush should be sprayed or mowed frequently enough to stop the tree growth.
2004 KDEP Inspection of Ash Pond A
• Animal burrows, and some brush were encountered. KDEP indicated that the brush must be removed and animal burrows filled.
• Crest roadway disturbed due to ongoing ash removal operations. KDEP indicated the roadway must be graveled when construction is complete.

3.5.2 Inspections by Engineering Consultants

BREC (operating as Western Kentucky Energy at the time) hired Associated Engineers, Inc., to perform inspections of Ash Ponds A and C and to provide training to BREC (Western Kentucky Energy) personnel on dam safety issues so they can better make inspections in between those by the state or consultant. CHA was provided with inspection reports by Associated Engineers for inspections made on March 24, 2009 and June 5, 2009.

During the March inspection at Ash Pond A, Associated Engineers noted erosion on the North Dike, and a possible scarp and bulge on the South Dike, as well as significant rodent activity on the slope facing the Ohio River. The June report indicates that recommended repairs are in progress and no mention of scarps, bulges or erosion is reported. A new comment on the June report indicates that ash deposits are resulting in water being impounded within the pond above the crest elevation of the dam.

Associated Engineers did not note changes in condition between the March and June inspections at Ash Pond C, although the June inspection was partially hampered by vegetation which had not been recently mowed. The report suggests that mowing was occurring at the time of the inspection.

3.5.3 Inspections by Plant Personnel

Plant personnel have been making roughly monthly inspections. CHA was provided with copies of their inspection reports. Table 3 summaries the findings of the inspections.

Table 3 – Summary of BREC Monthly Inspections

BREC Monthly Inspections of Ash Pond A
05/14/08 – Dam was mowed in 2007, slopes covered with grass and light brush.
02/13/09 – Dam was mowed in 2008 as scheduled. Slopes are covered in grass and light brush.
05/28/09 – Possible scarp at toe of dam on northeast corner under rip rap, will discuss with Associated in June during their inspection. Working on rodent problem. Scheduling improvement work.
06/30/09 – Inside dike erosion repaired, potholes in road repaired. Work proceeding on catch basins to lower level below dike.
07/31/09 – No maintenance items recorded. Checklist still notes cracks, scarps, sloughing or bulging on the slope.
08/31/09 – No maintenance items recorded. Checklist still notes cracks, scarps, sloughing or bulging on the slope.
09/29/09 – No maintenance items recorded. Checklist still notes cracks, scarps, sloughing or bulging on the slope. Notes hump towards coal pile.
10/23/09 – No maintenance items recorded. Checklist still notes cracks, scarps, sloughing or bulging on the slope. Notes hump towards coal pile. West side of pond has less free board than the east. Personnel notified.
BREC Monthly Inspection of Ash Pond C
05/28/09 – No maintenance items recorded. New discharge stand pipe drain tile through dike.
06/30/09 – No maintenance items recorded. Reported new discharge stand pipe below dam level, drain tile through dike is plugged with concrete. Dirt storage area repair scheduled for July and dredge area scheduled for August.
07/31/09 – No maintenance items recorded.
08/31/09 – No maintenance items recorded.
09/29/09 – No maintenance items recorded.
10/23/09 – No maintenance items recorded.

4.0 CONCLUSIONS/RECOMMENDATIONS

4.1 Acknowledgement of Management Unit Condition

I acknowledge that the management units referenced herein were personally inspected by me and was found to be in the following condition: **Fair.** This indicates acceptable performance is expected under required loading conditions in accordance with applicable safety regulatory criteria, however some additional analyses should be performed and documented to verify that these criteria are met.

Evidence was observed indicating that BREC attempts and maintains a proactive maintenance program at these facilities. These efforts should be continued.

CHA presents recommendations for maintenance, monitoring and further studies where applicable to bring these facilities into a satisfactory rating in the following sections.

4.2 Ash Pond A and Ash Pond C- Stability Analyses

Presently there is no quantitative measurement of the dike stability. Therefore CHA recommends that detailed stability analyses be performed for the Ash Ponds. CHA was not provided with information regarding stability analyses performed prior to or following construction of the ponds nor was information regarding properties of the embankment and foundation soils provided.

The stability analyses for each pond should include a subsurface investigation to determine existing soil parameters in the embankments and foundation soils and the installation of piezometers to determine the current pheratic surface. Loading conditions that should be modeled should include those listed in Table 2 in Section 3.3.

4.3 Ash Pond A and Ash Pond C- Hydrologic and Hydraulic Analysis

Ash Pond A is classified as a Moderate (Class B) hazard structure according to Kentucky regulations. BREC has not provided CHA with a hydraulic analysis showing the ability of Ash Pond A to safely store or pass a flow equivalent to the P_{100} plus 40 percent of the difference between the PMP and the P_{100} storms [P100 + 0.40(PMP-P100)] as established in the Kentucky regulations . CHA recommends that evaluations be prepared for the pond to determine the ability of the Ash Pond A to safely store or pass the design storm event. Though Kentucky does not actively regulate Ash Pond C and has not established standards for unregulated dams, a similar analysis should be prepared for Ash Pond C to determine that it does not overtop in the event of a probable heavy storm event.

4.4 Ash Pond A – Freeboard

Kentucky regulations presently do not have a minimum freeboard requirement; only that the impoundment contain or safely pass the design event without overtopping. The available freeboard on the dikes at this pond appeared to vary from approximately 1.5 to 3 feet. This would seem to allow little room to account for wave action during a strong storm event. CHA recommends that the crest areas be graded and the pond level established so the freeboard is consistent around the pond on the dikes. Consideration should also be given to lowering the pond level to allow for a margin of error for wave run-up should the design storm event occur. Wave action on the dikes can of particular concern in light of the potential for erosion on some areas of the dike crests.

4.5 Ash Pond A – Crest Area and Inboard Slope Maintenance

Intermittent erosion rills and beaching erosion was observed on the dikes adjacent to the open water pond areas. This should not cause an immediate safety concern as long as a sufficient freeboard and dike crest width is maintained. Based upon the conditions encountered, this

erosion is most likely due to poorly compacted material pushed to the edge of the dike on the inboard side. At present the most probable concerns is incremental loss of capacity over time as the erosion rills transport material into the pond area. CHA recommends that the crest and slope areas be dressed to remove loose materials and appropriately compacted to increase their erosion resistance. An alternative may be to place heavier crushed rock and stone on the crest and inboard slope. These steps can also be taken to repair softened areas and depressions or ruts holding water in the crest access road, such as those noted along the south dike.

4.6 Ash Pond A – Instrumentation and Monitoring

Presently the dikes do not have instrumentation that permits tracking of embankment performance such as seepage weirs, piezometers, deformation monuments, or inclinometers. Such instrumentation and routine measurements obtained from these devices permit the monitoring of water levels, volumetric flow, and deformations over time that are not readily observable and aid in assessing the embankment. Once a trend has been established for the embankment, abrupt changes in these measurements can be used to guide a course of action and ideally stop a failure or breach before it occurs. CHA recommends that some manner of monitoring the dike performance be installed and that at a minimum it include piezometers at the crest and toe of the dike.

4.7 Ash Pond A and Ash Pond C- Grass Slope Maintenance

In general, a good, stable grass cover was observed on the outboard slope areas. Routine mowing and reseeding should continue as needed. In some areas, surficial slope deformation (rutting) due to these mowing activities were observed. It is likely that this rutting is the result of repeated passes of large riding equipment in these areas or attempting to mow too soon after a rain event. CHA recommends that mowing activities not commence on the slopes until the areas are fairly dry and the surface soils have stiffened.

A related grass slope maintenance item is erosion. Erosion rills, most of them grass and weed covered, occurring along the embankment slopes should be filled with compacted soil and seeded to stabilize the repaired area. This should also help with reducing the slope softening and subsequent mower rutting that can occur in these areas.

4.8 Ash Pond C – Heavy Vegetation and Tree Control on the South Dike

The heavy vegetation and trees established along the south dike adjacent to the drainage feature need to be removed. This should be done at least to the toe of the constructed dike and to the eastern extent of the dike where it ties in to the natural grade at the incised portion of the pond. According to an excerpt from the meeting minutes of a meeting held November 9, 2009, this tree removal activity was on an action item list, so it appears if this was recommended previously. To aid in determining the extent of tree removal, it is also suggested that a detailed survey be obtained in the area so that vegetation along the natural swale can be retained.

4.9 Ash Pond A – Rodent Control

Isolated rodent burrows were observed along the outboard slopes of Ash Pond A. At one location a trap was observed indicating that BREC is actively moving to control these animals. This rodent control measure and others should continue to be utilized as needed.

4.10 Ash Pond A and Ash Pond C – Rock Armament Vegetation Control

Ash Pond A has rock toe and rock slope protection on its east dike facing the Ohio River and Ash Pond C has rock outlet protection for its spillway. Woody and weedy vegetation should not be allowed to establish itself in this armament. Hand removal or a herbicide (applied in accordance with applicable laws/rules) can be employed to control this growth.

5.0 CLOSING

The information presented in this report is based on visual field observations, review of reports by others and this limited knowledge of the history of the Coleman Generating Station surface impoundments. The recommendations presented are based, in part, on project information available at the time of this report. No other warranty, expressed or implied is made. Should additional information or changes in field conditions occur the conclusions and recommendations provided in this report should be re-evaluated by an experienced engineer.

APPENDIX A

Completed EPA Coal Combustion Dam Inspection Checklist Forms

&

Completed EPA Coal Combustion Waste (CCW) Impoundment Inspection Forms

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Coleman Station	Date: November 17, 2009
Unit Name: Active Ash Pond A	Operator's Name: Big Rivers Electric Cooperative
Unit I.D.: 0842	Hazard Potential Classification: High **Significant** Low
Inspector's Name: John Sobiech P.E./Malcolm D. Hargraves	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	see note		18. Sloughing or bulging on slopes?		x
2. Pool elevation (operator records)?	411.5		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	412		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	414		Is water entering inlet, but not exiting outlet?	see	note
5. Lowest dam crest elevation (operator records)?	415		Is water exiting outlet, but not entering inlet?	see	note
6. If instrumentation is present, are readings recorded (operator records)?	n/a		Is water exiting outlet flowing clear?	see	note
7. Is the embankment currently under construction?		x	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	n/a		From underdrain?	n/a	
9. Trees growing on embankment? (If so, indicate largest diameter below)		x	At isolated points on embankment slopes?	see	note
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?	n/a	
11. Is there significant settlement along the crest?		x	Over widespread areas?	see	note
12. Are decant trashracks clear and in place?	x		From downstream foundation area?	see	note
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		x	"Boils" beneath stream or ponded water?		x
14. Clogged spillways, groin or diversion ditches?		x	Around the outside of the decant pipe?	see	note
15. Are spillway or ditch linings deteriorated?		x	22. Surface movements in valley bottom or on hillside?		x
16. Are outlets of decant or underdrains blocked?	see	note	23. Water against downstream toe?		x
17. Cracks or scarps on slopes?		x	24. Were Photos taken during the dam inspection?	x	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1	Outside consultant inspects quarterly; plant inspects monthly
3	Decant elevation is set above pond elevation. Water is recycled through plant to sluice ash.
4	Pond has an emergency open channel spillway.
16	Spillway/decant riser outlet is buried and opens to the Ohio River but does not convey water.
20	Spillway inlet below decant riser is submerged; not directly observed. Outlet is in Ohio River.
21	Seeps cannot be readily observed. Rain during site assessment would have obscured seep areas unless they were severe. Outlet pipe is buried up to Ohio River - not observed.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # KY0001937 INSPECTOR Sobiech/Hargraves

Date November 19, 2009

Impoundment Name Active Ash Pond A

Impoundment Company Big Rivers Electric Cooperative (Western Kentucky Electric)

EPA Region 4

State Agency (Field Office) Addresss Owensboro Regional EPA Office
3032 Alvey Park Drive W.; Ste.700; Owensboro, ky 42303

Name of Impoundment Active Ash Pond A

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update x

	Yes	No
Is impoundment currently under construction?	_____	x
Is water or ccw currently being pumped into the impoundment?	x	_____

IMPOUNDMENT FUNCTION: Fly ash and bottom ash disposal

Nearest Downstream Town : Name Troy, IN

Distance from the impoundment 1.6 miles

Impoundment Location:
Longitude 86 Degrees 47 Minutes 44.9 Seconds
Latitude 37 Degrees 58 Minutes 0.0 Seconds
State Kentucky County Hancock

Does a state agency regulate this impoundment? YES x NO _____

If So Which State Agency? DEP-Div. of Water, Dam Safety & Flood Plain Compliance

HAZARD POTENTIAL (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.

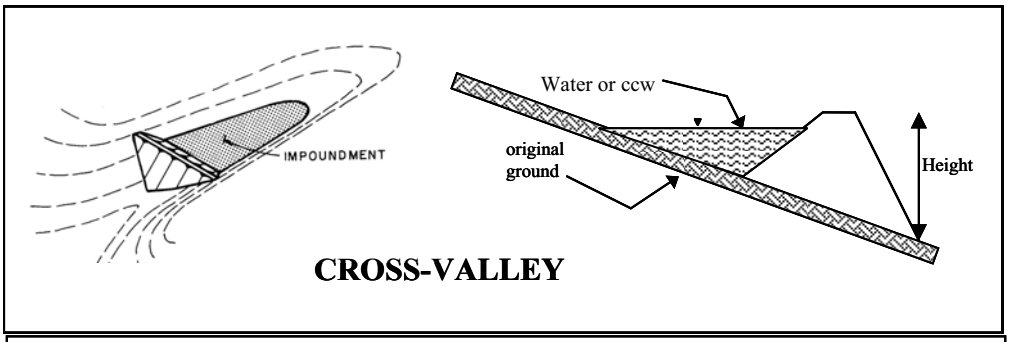
x_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

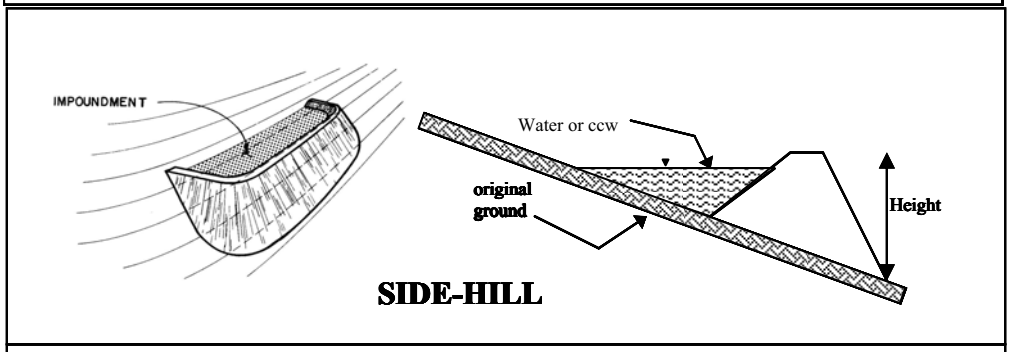
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

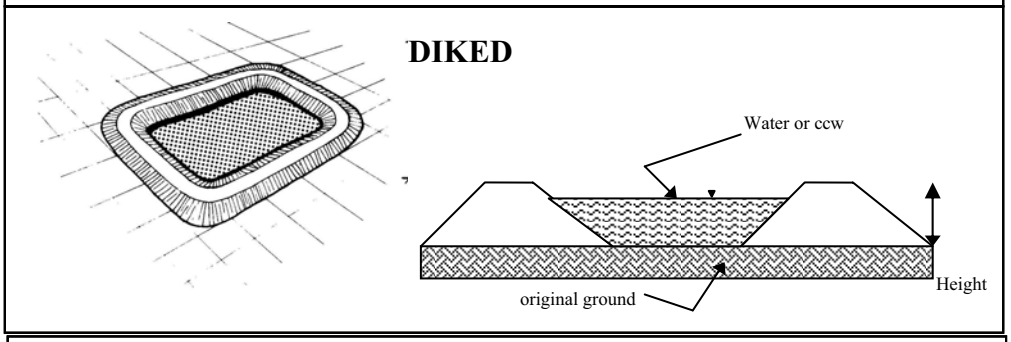
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

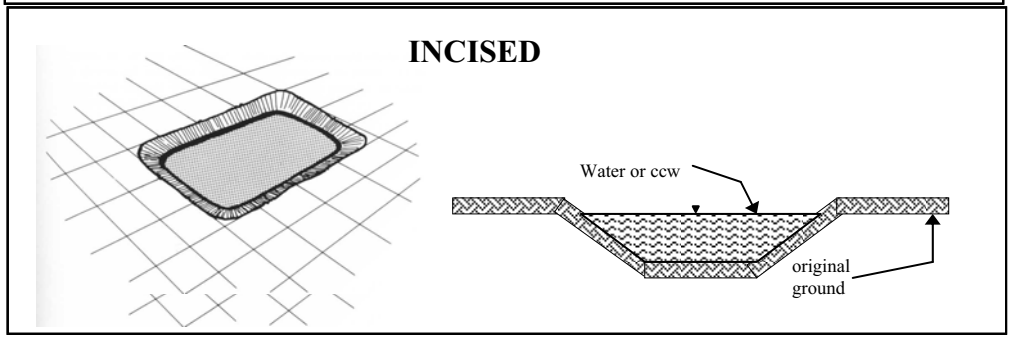
Failure of dike would impact the Ohio River and plant facilities.

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
X_____ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 30 feet
Pool Area 23 acres
Current Freeboard 1.5 to 3.5 feet

Embankment Material Earth fill
Liner none
Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

(Emergency Spillway)

x **Open Channel Spillway**

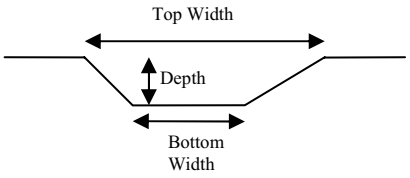
x Trapezoidal

_____ Triangular

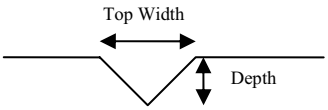
_____ Rectangular

_____ Irregular

TRAPEZOIDAL



TRIANGULAR

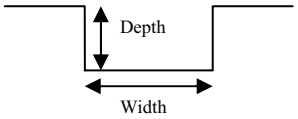


1' depth

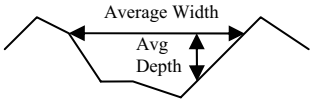
40' bottom (or average) width

50' top width

RECTANGULAR

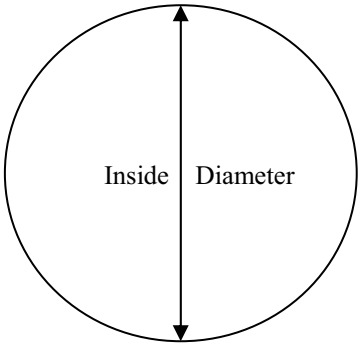


IRREGULAR



x **Outlet** (to recycle water back to the plant)

36" inside diameter



Material

_____ corrugated metal

_____ welded steel

x concrete

_____ plastic (hdpe, pvc, etc.)

_____ other (specify) _____

Is water flowing through the outlet? YES _____ NO x

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By Burns and Roe Engineers and Constructors, Inc.

Has there ever been a failure at this site? YES _____ NO x_____

If So When? _____

If So Please Describe :

Has there ever been significant seepages at this site? YES _____ NO x_____

If So When? _____

IF So Please Describe:

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____NO x_____

If so, which method (e.g., piezometers, gw pumping,...)? _____

If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Coleman Station	Date: November 17, 2009
Unit Name: Inactive Ash Pond C	Operator's Name: Big Rivers Electric Cooperative
Unit I.D.:	Hazard Potential Classification: High **Significant** Low
Inspector's Name: John Sobiech P.E./Malcolm D. Hargraves	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	see note		18. Sloughing or bulging on slopes?		x
2. Pool elevation (operator records)?	n/a		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	approx. 403		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?	n/a	
5. Lowest dam crest elevation (operator records)?	approx. 404		Is water exiting outlet, but not entering inlet?	n/a	
6. If instrumentation is present, are readings recorded (operator records)?	n/a		Is water exiting outlet flowing clear?	n/a	
7. Is the embankment currently under construction?		x	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	n/a		From underdrain?	n/a	
9. Trees growing on embankment? (If so, indicate largest diameter below)	x		At isolated points on embankment slopes?	see	note
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?	n/a	
11. Is there significant settlement along the crest?		x	Over widespread areas?	see	note
12. Are decant trashracks clear and in place?	n/a		From downstream foundation area?	see	note
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		x	"Boils" beneath stream or ponded water?	n/a	
14. Clogged spillways, groin or diversion ditches?		x	Around the outside of the decant pipe?		x
15. Are spillway or ditch linings deteriorated?		x	22. Surface movements in valley bottom or on hillside?		x
16. Are outlets of decant or underdrains blocked?		x	23. Water against downstream toe?		x
17. Cracks or scarps on slopes?		x	24. Were Photos taken during the dam inspection?	x	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1	Outside consultant inspects quarterly; plant inspects monthly.
2	Pond does not impound water currently; ash surface is grassed and dry.
3, 5	Elevations estimated from 1990 topographic survey and present observations.
9	Trees up to roughly 12" in diameter were noted on segment of south dike toward eastern extent of pond area adjacent to a drainage swale. Appears to also be a part of the swale bank. Area identified for vegetation removal.
21	Seeps cannot be readily observed. Rain during site assessment would have obscured seep areas unless they were severe. Such seepage not likely due to dry condition of pond area.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # KY0001937 INSPECTOR Sobiech/Hargraves

Date November 17, 2009

Impoundment Name Inactive Ash Pond C

Impoundment Company Big Rivers Electric Cooperative (Western Kentucky Electric)

EPA Region 4

State Agency (Field Office) Addresss Owensboro Regional EPA Office
3032 Alvey Park Drive W.; Ste.700; Owensboro, ky 42303

Name of Impoundment Inactive Ash Pond C

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update x

	Yes	No
Is impoundment currently under construction?	_____	x
Is water or ccw currently being pumped into the impoundment?	_____	x

IMPOUNDMENT FUNCTION: Ash dewatering area when Active Ash Pond A is dredged

Nearest Downstream Town : Name Troy, IN

Distance from the impoundment 1.9 miles

Impoundment Location:
Longitude 86 Degrees 47 Minutes 41.6 Seconds
Latitude 37 Degrees 57 Minutes 23.8 Seconds
State Kentucky County Hancock

Does a state agency regulate this impoundment? YES _____ NO x

If So Which State Agency?_____

HAZARD POTENTIAL (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.

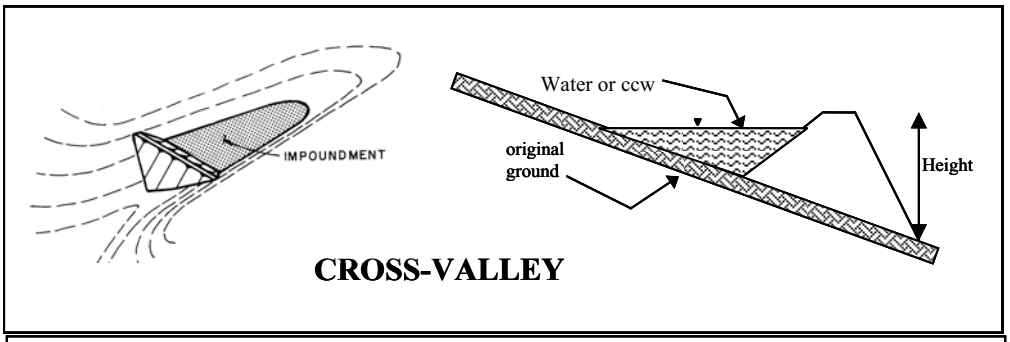
x_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

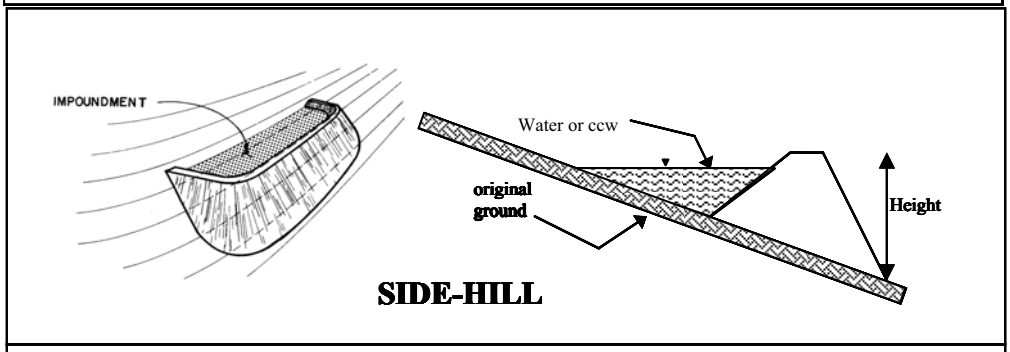
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

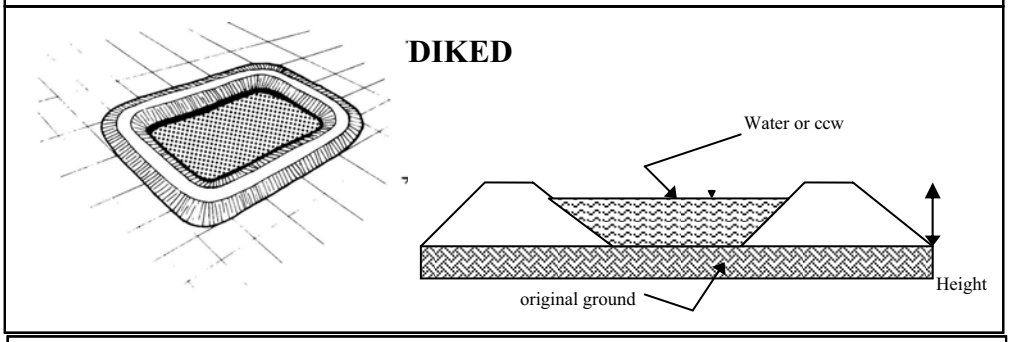
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

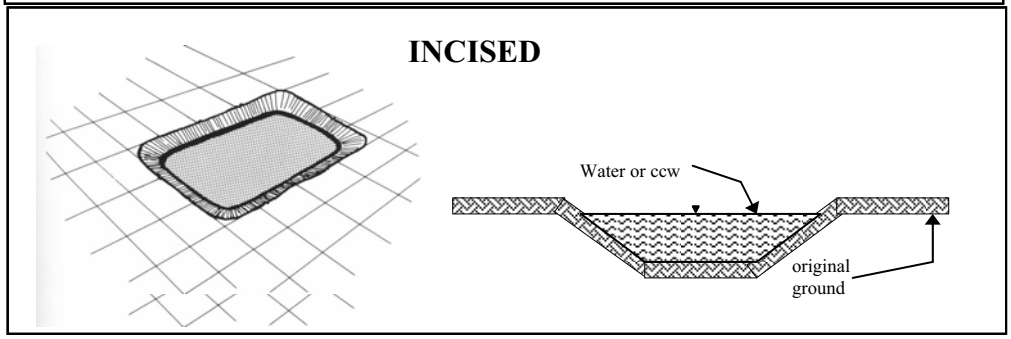
Failure of the south dike would impact drainage swale leading to the Ohio River.

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
x____ Combination Incised/Diked

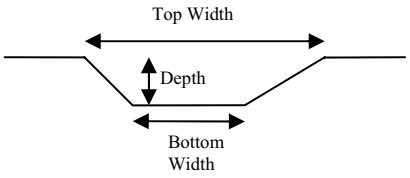
Embankment Height 15 feet
Pool Area 19.5 acres
Current Freeboard approx. 2 to 3 feet

Embankment Material Earth fill
Liner none
Liner Permeability n/a

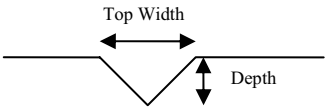
TYPE OF OUTLET (Mark all that apply)

n/a **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

TRAPEZOIDAL

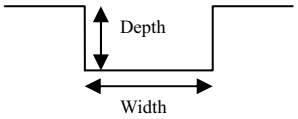


TRIANGULAR

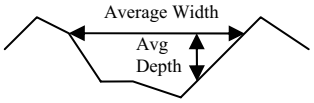


_____ depth
_____ bottom (or average) width
_____ top width
_____

RECTANGULAR

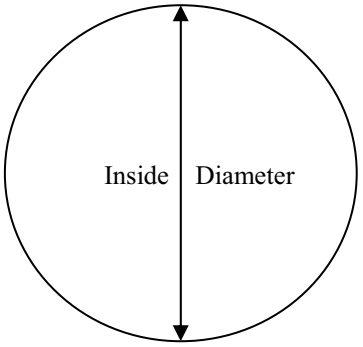


IRREGULAR



x **Outlet**

24" inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
x plastic (hdpe, pvc, etc.)
_____ other (specify) _____

_____

Is water flowing through the outlet? YES _____ NO x

_____ **No Outlet**

_____

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By Parsons-Jurden Corporation.
_____

Has there ever been a failure at this site? YES _____ NO x_____

If So When? _____

If So Please Describe :

Has there ever been significant seepages at this site? YES _____ NO x_____

If So When? _____

IF So Please Describe:

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____NO x_____

If so, which method (e.g., piezometers, gw pumping,...)? _____

If so Please Describe :