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

MEMORANDUM

16 October 2016
File No. 128064-013

SUBJECT: History of Construction – Cell 001
Associated Electric Cooperative, Inc.
Thomas Hill Energy Center
Clifton Hill, MO

Haley & Aldrich, Inc. (Haley & Aldrich) has assisted Associated Electric Cooperative, Inc. (AECI). with compiling the history of construction in accordance with §257.73(c)(1) for the existing coal combustion residuals (CCR) surface impoundment known as Slag Pond 001 - Cell 001 (Cell 001) at the Thomas Hill Energy Center (THEC). This document addresses the requirements of the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (CCR Rule) effective 19 October 2015. To the extent feasible, AECI has provided documentation supporting the history of construction. Information on the history of construction of Cell 001 is presented in the following sections.

§257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Owner: Associated Electric Cooperative, Inc.
2814 South Golden Avenue
P.O. Box 754
Springfield, Missouri 65807

Name of CCR Unit: Cell 001 (current naming convention, historically referred to as Slag Dewatering Basin)

§257.73(c)(1)(ii): The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7 ½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

Latitude: 39°32'50"
Longitude: 92°38'12"
The general location of the facility is provided in Appendix A.

<u>§257.73(c)(1)(iii):</u> A statement of the purpose for which the CCR unit is being used.

Cell 01 receives sluiced bottom ash and boiler slag and process water.

<u>§257.73(c)(1)(iv):</u> The name and size in acres of the watershed within which the CCR unit is located.

USGS Watershed Name: Little Chariton Watershed 10280203
Unit-specific Watershed Area: 14 acres

The watershed area was referenced from page 10 of "Specific Site Assessment of Coal Combustion Waste Impoundments at Thomas Hill Energy Center" by GEI Consultants dated June 2011, and the excerpt is provided as Appendix B-2. It should be noted that updated drainage area is being revised and determined as part of the Inflow Flood Control System Plan required by §257.83 of the CCR Rule which will be provided under separate cover.

<u>§257.73(c)(1)(v)</u>: A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

The description of the physical and engineering properties of the foundation and abutment materials on which Cell 001 was constructed was discussed on page 4 of "Slope Stability and Seepage Analysis Slag Dewatering Basin" by Geotechnology,Inc. dated 3 February 2012, and the excerpt is provided as Appendix C. AECI was not able to locate original construction design documents related to this criterion.

<u>§257.73(c)(1)(vi)</u>: A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

The type, size, range, and physical engineering properties of the materials of each zone of the impoundment were discussed on page 4 of "Slope Stability and Seepage Analysis Slag Dewatering Basin" by Geotechnology,Inc. dated February 2012, and the excerpt is provided as Appendix C. AECI was not able to locate original construction design documents related to this criterion.

Information on the method of site preparation and construction of Cell 001 is not available. Further information is provided on the site and grading plan Y1 and Y2 by Burns and McDonnell dated June 4, 1984 included in Appendix D.

Cell 001 was constructed circa 1984.

<u>§257.73(c)(1)(vii)</u>: At a scale that details engineering structures and appurtenances relevant to the design, construction, operation and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Drawings providing information listed above, as available have been provided in Appendix D. Revisions to grading on top of and adjacent to the southern berm were performed in 2015, a figure showing those general grading revisions is also included in Appendix D.

<u>§257.73(c)(1)(viii)</u>: a description of the type, purpose, and location of existing instrumentation.

Cell 001 does not have existing instrumentation.

<u>§257.73(c)(1)(ix)</u>: area-capacity curves for the CCR unit.

Original design area-capacity curves for Cell 001 are not available. It should be noted that updated area-capacity curves for the impoundment is being developed as part of the Inflow Flood Control System Plan required by §257.83 of the CCR Rule which will be provided under separate cover.

<u>§257.73(c)(1)(x):</u> a description of each spillway and diversion design features and capacities and calculations used in their determination.

Decant water discharges Cell 001 through a 30-inch RCP pipe from a concrete outlet structure in the northwest corner of the impoundment. Cell 001 does not utilize an emergency spillway. Original design drawings and calculations for the outlet structure for Cell 001 were not located. A discussion regarding understanding of the outlet structure is provided on pages 4 and 5 of "Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center" by GEI Consultants dated June 2011, and the excerpts are provided as Appendix B-1. It should be noted that updated calculations for the outlet structure is being developed as part of the Inflow Flood Control System Plan required by §257.83 of the CCR Rule which will be provided under separate cover.

§257.73(c)(1)(xi): The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

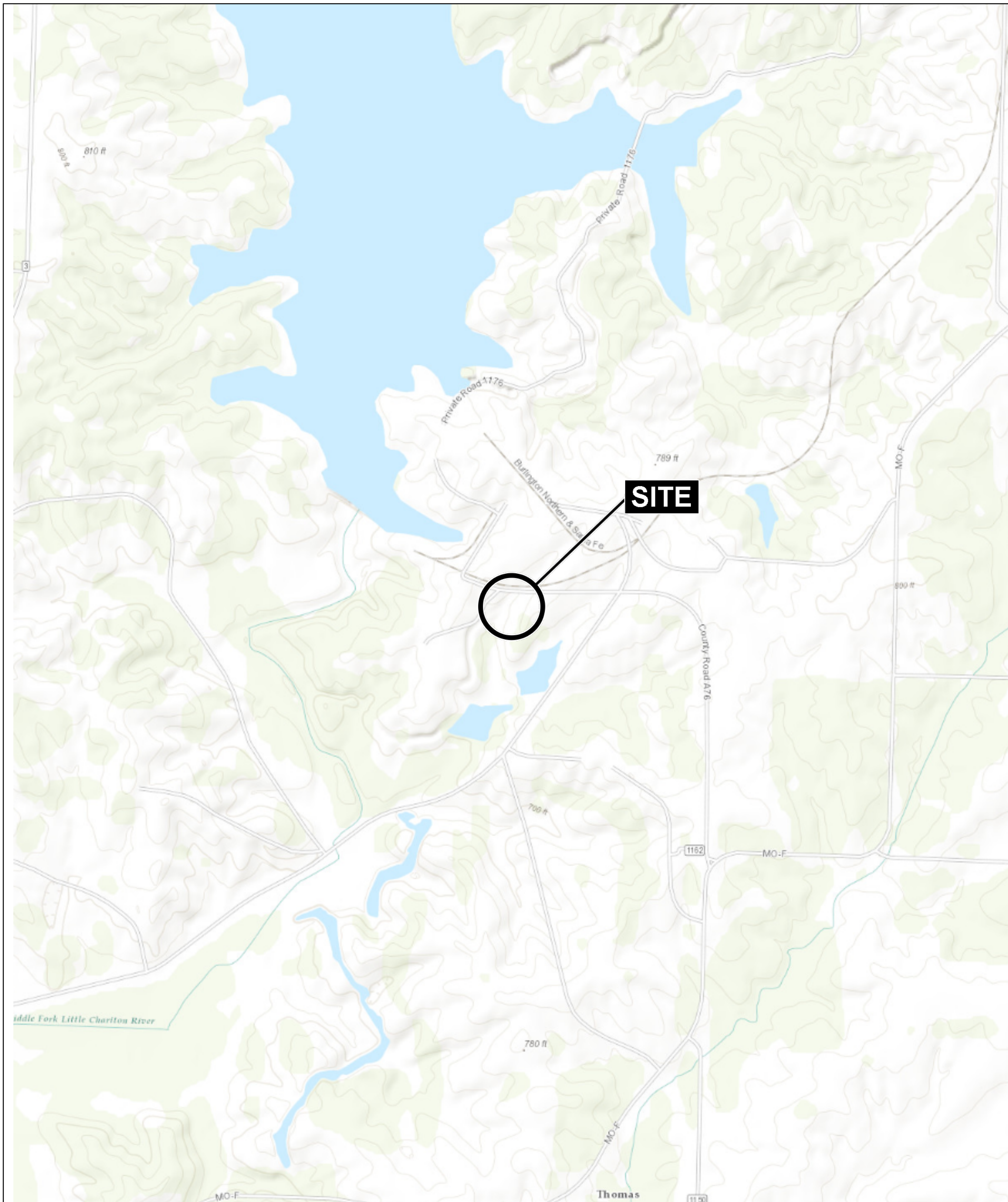
The construction specifications and provisions for surveillance, maintenance, and repair of the Cell 001 are discussed in the "Pond 001, The Ash Pond Series Operating and Management Plan" by AECI, provided as Appendix E.

§257.73(c)(1)(xii): any record or knowledge of structural instability of the CCR unit.

There are no records or knowledge of structural instability associated with Cell 001.

Cc: Kim Dickerson-AECI;
Steve Putrich/Jason Pokorny-Haley & Aldrich

APPENDIX A
Site Locus



MAP SOURCE: ESRI

SITE COORDINATES: 39°32'51"N, 92°38'10"W

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER
, MISSOURI

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
SEPTEMBER 2016

FIGURE 1

40616_1_LOCUS.PDF

APPENDIX B
Excerpts from:
Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center
By GEI Consultants, Dated June 2011

APPENDIX B-1

Pgs. 4-5 from:

Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center

By GEI Consultants, Dated June 2011

Geotechnical
Environmental
Resources
Ecological

Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center

Clifton Hill, Missouri

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
5304P
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted by:
GEI Consultants, Inc.
4601 DTC Blvd, Suite 900
Denver, CO 80237

June 2011
Project Number: 092884

Steven R. Townsley, P.E.
Senior Project Engineer

The materials stored in each of the CCW impoundment dikes are summarized below:

- Slag Dewatering Basin – This basin is a wet storage area that is used to contain both bottom ash and boiler slag. The ash and slag is continuously dredged and is sold to a private contractor who uses the material as roofing granules.
- Ash Pond – Cell No. 2 – This cell is a wet storage that is used to contain fly ash, bottom ash, boiler slag, and sediments from the coal pile runoff. The fly ash is collected and used as part of the mine reclamation activities on the power plant property.

Based on our observation and the soil boring information presented in the Global Stability Evaluation report prepared by Geotechnology, Inc. in May of 2010, the CCW impoundment dikes appear to have homogeneous construction using silty clayey fill soils. The dikes were designed without internal drains from the collection of seepage.

The dike for the Slag Dewatering Basin has an approximate crest width of 10 feet and design upstream and downstream side slopes of 3H:1V and 2H:1V, respectively. The perimeter dike for Ash Pond – Cell No. 2 has an approximate crest width of 18 feet and design upstream and downstream side slopes of 3H:1V.

The basic dimensions and geometry of each impoundment is summarized in Table 2-1.

Table 2-1: Summary Information for Impoundment Dike Parameters

Parameter	Value	
Dam	Slag Dewatering Basin	Ash Pond – Cell No. 2
Maximum Height (ft)	Approximately 10	25
Approximate Length (ft)	1,500	830
Approximate Crest Width (ft)	15	18
Lowest Crest Elevation (ft)	735	717
Design Side Slopes (H:V)	3:1 US/2:1 DS	3:1 US/3:1 DS
Estimated Freeboard (ft) at time of site visit	2.7	4
Total Storage Capacity (cubic yards)*	16,000	50,000
Approximate Surface Area (acres)*	3	12

*Storage capacity and area values provided by Associated Electric Cooperative, Inc.

2.3 Spillways

The Ash Pond – Cell No. 2 Impoundment has an emergency spillway (Photo 16) which, if utilized, would flow into Ash Pond – Cell No. 3. The emergency spillway is an Open Channel Spillway, trapezoidal in shape, with a top width of approximately 18 feet, an average bottom width of 12 feet, and a depth of 2 feet below the top of the dike crest. The emergency spillway crest is lined with 3- to 6-inch crushed rock.

The Slag Dewatering Pond does not have a spillway associated with the impoundment.

2.4 Intakes and Outlet Works

2.4.1 Slag Dewatering Basin

The coal ash slurry line at the Slag Dewatering Basin consists of an 18-inch steel pipe from the power plant. Photos 1 and 2 in Appendix B show the inlet structure to the Slag Dewatering Basin.

The outlet structure (Photos 3 and 7) consists of a 30-inch diameter concrete outlet pipe from the concrete decant tower with 60-inch wide, 6-inch square concrete stop logs. The outlet structure releases the decant water into a bypass channel (Photo 4) which bypasses Ash Pond – Cell No. 1 and discharges into the Ash Pond – Cell No. 2 (Photos 8 and 9). At the time of our visit to the site, there was active flow through the outlet structure.

2.4.2 Ash Pond – Cell No. 2

Decant water is received from the Slag Dewatering Basin through a bypass channel (Photos 8 and 9) and from a concrete decant tower with 60-inch wide, 6-inch square concrete stop logs in the Ash Pond – Cell No. 1. This decant water is collected from natural runoff around Ash Pond – Cell No. 1.

The outlet structure (Photo 12) consists of a 36-inch diameter concrete outlet pipe from the concrete decant tower with 72-inch wide, 6-inch square concrete stop logs. At the time of our visit to the site, there was active flow through the outlet structure into Ash Pond – Cell No. 3. Ash Pond – Cell No. 3 contains only decant water prior to its release to the Middle Fork of the Little Chariton River.

2.5 Vicinity Map

Thomas Hill Energy Center is located in the town of Clifton Hill in Randolph County, Missouri, as shown on Figure 1. The specific latitude and longitude of the ponds is provided below:

Longitude: 92 Degrees, 38 Minutes, 17 Seconds
Latitude: 39 Degrees, 32 Minutes, 34 Seconds

2.6 Plan and Sectional Drawings

GEI was provided with two partial sets of design documents for this project and a geotechnical engineering report. These documents included:

- Engineering drawings for the "Ash Pond Facilities" project in 1978-79. These plans were prepared by Burns and McDonnell dated December 1, 1978 and March 23, 1979.

APPENDIX B-2
Pg 10 from:
Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center
By GEI Consultants, Dated June 2011

GEI Consultants

Geotechnical
Environmental
Resources
Ecological

Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center

Clifton Hill, Missouri

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
5304P
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted by:
GEI Consultants, Inc.
4601 DTC Blvd, Suite 900
Denver, CO 80237

June 2011
Project Number: 092884

Steven R. Townsley, P.E.
Senior Project Engineer

5.0 Hydrology and Hydraulics

5.1 Floods of Record

Floods of record have not been evaluated and documented for the impoundments at the Thomas Hill Energy Center. Based on Intellicast Data Records, the average monthly rainfall for Clifton Hill, Missouri ranges from 1.56 inches in January to 5.16 inches in May. According to the National Climatic Data Center, which holds data for daily rainfall recorded for the period between 1946 and 2010, the maximum 24-hour rainfall event in Salisbury, Missouri occurred on September 13, 1961 with a rainfall amount of 6.12 inches.

These rainfall events are not expected to result in overtopping of the dams under the current normal operating conditions. No documentation has been provided to verify the storm results.

5.2 Inflow Design Floods

Currently there is no hazard classification for the CCW impoundments at the Thomas Hill Energy Center. Based on observations during the field inspection, we recommend the Slag Dewatering Basin and Ash Pond – Cell No. 2 be rated "Low" hazard dams (see Section 4.0). Based on the recommended "Low" hazard classification, the Missouri Dam Safety Laws and Regulations specifies conventional environmental Class III dams be capable of passing the 100-year flood event without overtopping the dam. The USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 recommends a small "Low" hazard dam be capable of passing the 50-year to 100-year storm event without overtopping the dam. Considering the "Low" hazard rating, the scale of the economic and environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, it is reasonable to select the 100-year design storm for the Slag Dewatering Basin and Ash Pond – Cell No. 2. Accordingly, the 100-year 24-hour storm precipitation at the Thomas Hill Energy Center is about 7.2 inches based on Technical Paper No 40, Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 Years Report Number 51 6-hour PMP data.

5.2.1 Slag Dewatering Basin

The contributing drainage area to the Slag Dewatering Basin includes the impoundment's surface area (Table 2-1) and a small portion of surface drainage located east of the basin, for a total contributing area of about 14 acres. The water surface in Slag Dewatering Basin is regulated by a decant structure located in the northwestern portion of the pond that discharges to the drainage ditch and eventually to Ash Pond – Cell No. 2. Currently, the Slag Dewatering Basin water level is maintained at about elevation (El.) 732.3 feet, providing about 2.7 feet of freeboard. Under the current configuration, the decant structure

APPENDIX C
Excerpt from:
Slope Stability and Seepage Analysis Slag Dewatering Basin
By Geotechnology, Inc., dated February 3, 2012
Pg. 4

SLOPE STABILITY AND SEEPAGE ANALYSIS
SLAG DEWATERING BASIN
THOMAS HILL ENERGY CENTER
CLIFTON HILL, MISSOURI

Prepared for:

ASSOCIATED ELECTRIC COOPERATIVE, INC.
Springfield, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Geotechnology Project No. J011309.02

February 3, 2012

Multi-point, consolidated-undrained, triaxial compression tests with pore pressure measurements (R-bar tests) were performed on selected Shelby tube samples. Summary results of these tests are provided in Appendix C.

SECTION IV - SUBSURFACE CONDITIONS

STRATIGRAPHY

The embankments at the basin consist of clay fill with variable amounts of sand, gravel, and slag. The underlying soils consist generally of clay and silty clay till underlain by shaley to sandy clay. Auger refusal on shale bedrock occurred at an approximate depth of 16 feet in Boring B-2.

The embankment fill extends to approximate depths of 3 to 12 feet in the borings. The embankments consist generally of brown to tan and gray clay with variable amounts of sand, gravel, and slag. The clay is high plasticity based on Atterberg limits test results. SPT N-values in the fill range from 5 to 8 blows per foot (bpf). Dry unit weights of 110 to 115 pounds per cubic foot (pcf) were obtained from Shelby tube samples of the fill. Moisture contents range from 15 to 34 percent.

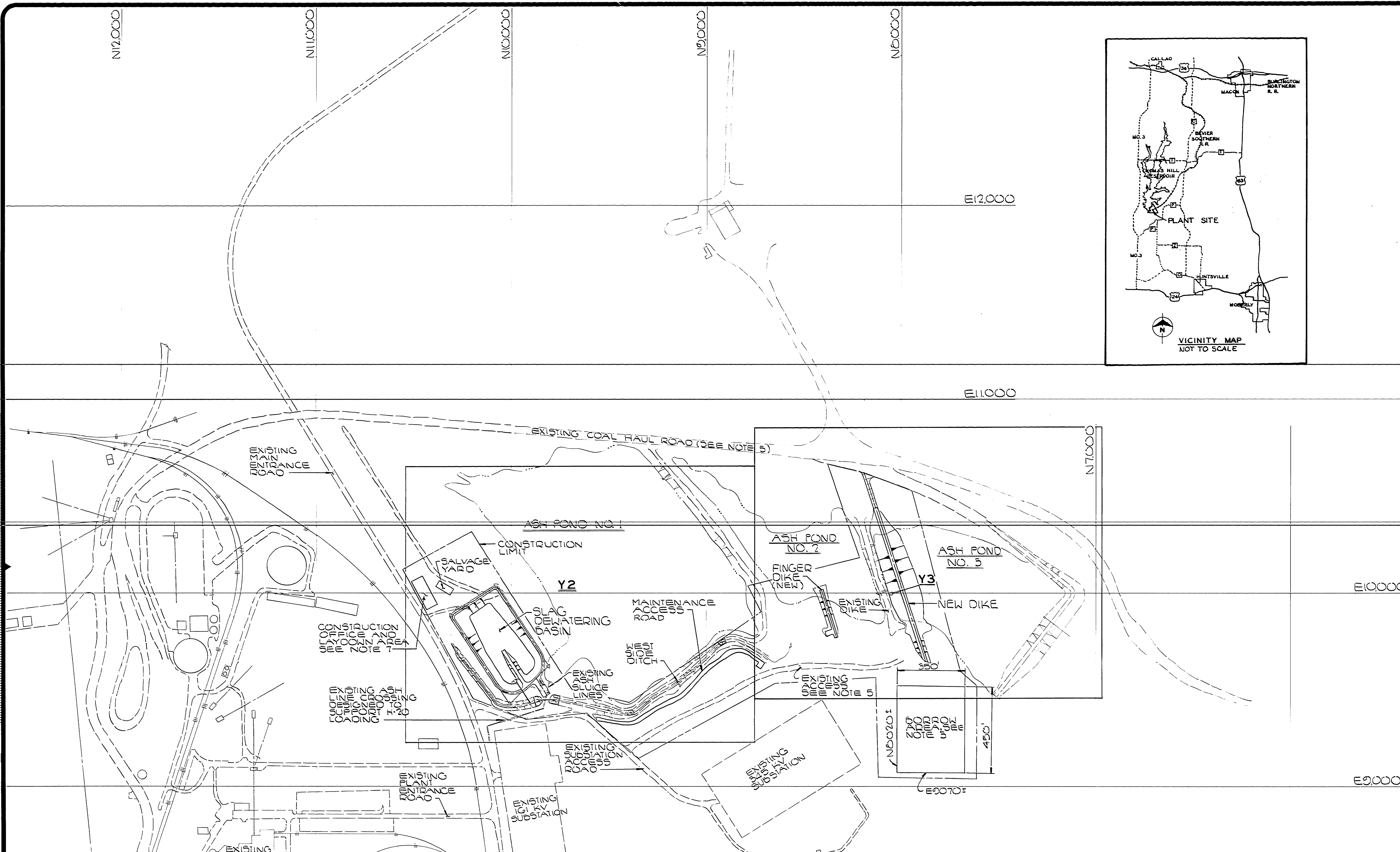
The fill embankments are underlain by glacial till consisting of stiff, brown and gray to tan clay and silty clay with trace amounts of sand and gravel. Dry unit weights of 99 to 108 pcf were obtained from Shelby tube samples of the till. The till has a shear strength of 1,700 pounds per square foot (psf) based on an unconfined compressive strength test. Moisture contents in the till range from 17 to 24 percent. The till is high to low plasticity based on Atterberg limits test results.

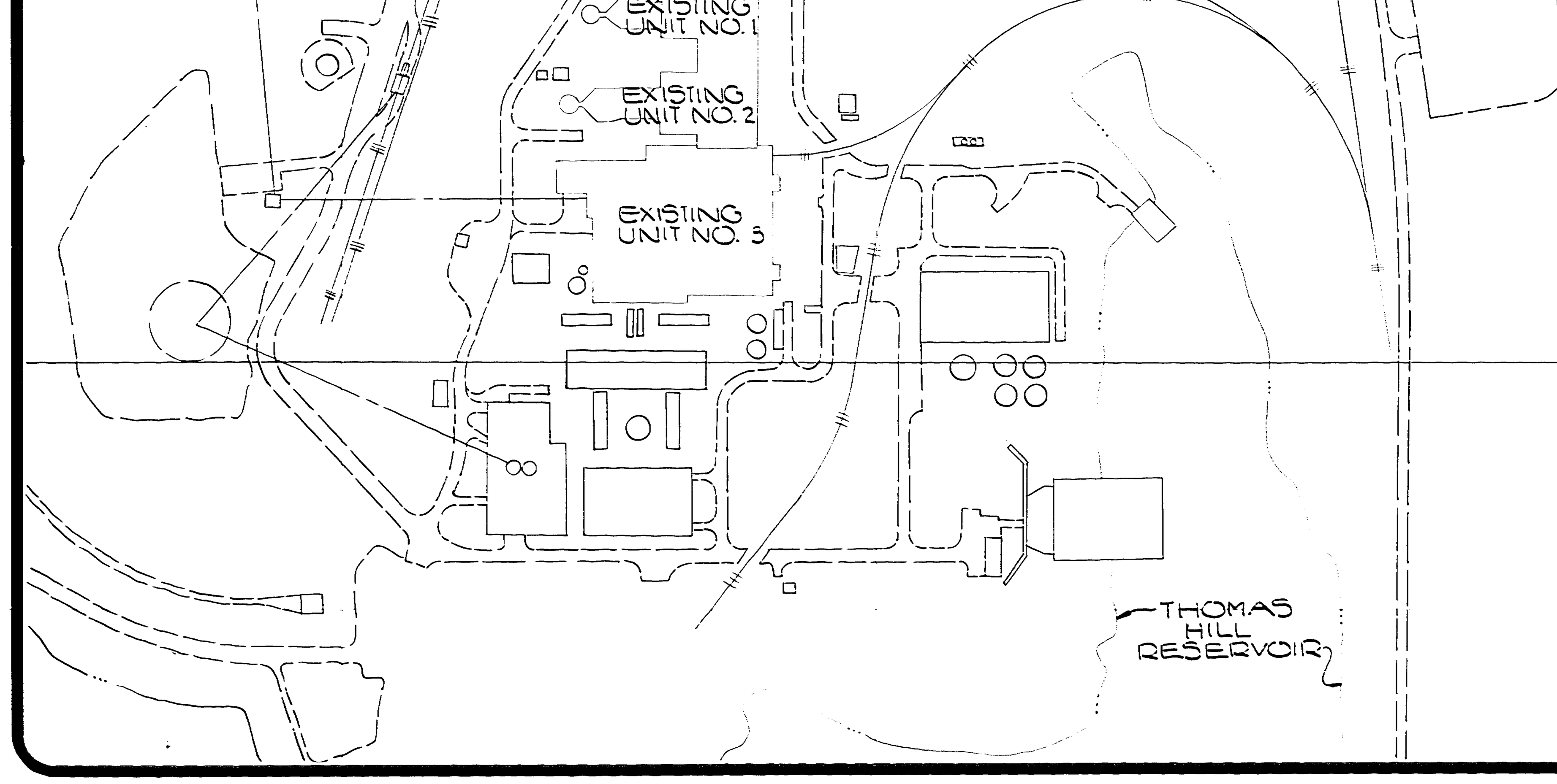
Orange, green, and gray, shaley clay occurs in Borings B-1 and -2 at respective, approximate depths of 17 and 12 feet. The shaley clay is medium stiff to stiff based on N-values. Moisture contents range from 41 to 47 percent. Soft, orange shale was recovered in a split-spoon sample collected upon auger refusal in Boring B-2.

GROUNDWATER

Groundwater was observed during drilling in Borings B-1 and -2 at approximate depths of 9.5 and 5.5 feet, respectively. Groundwater was not observed during drilling in Boring B-3. Groundwater levels shown on the logs might not have stabilized before backfilling, which is typical in less permeable cohesive soil. Consequently, the indicated or lack of observed groundwater levels in a particular boring might not represent present or future levels. Groundwater levels could vary significantly over time due to the effects of seasonal variation in precipitation, recharge from nearby ponds and creeks, or other factors not evident at the time of exploration.

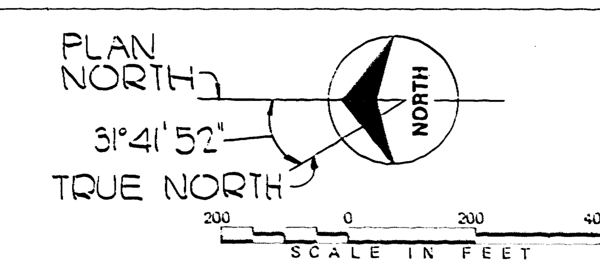
APPENDIX D
Drawings Y1 and Y2:
Ash Pond Modifications
By Burns and McDonnell, Dated June 4, 1984
South Berm Addition and Pad 2015





GENERAL NOTES:

1. ALL CONTOURS & ELEVATIONS SHOWN ON PLANS ARE TOP OF SUBGRADE UNLESS OTHERWISE NOTED.
2. CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY HIS OPERATIONS TO ORIGINAL CONDITION. TOPSOIL, SEED, MULCH AND FERTILIZE PREVIOUSLY SEEDED AREAS.
3. LOCATION OF BORROW AREA INDICATED IS APPROXIMATE. BEFORE BORROWING MATERIAL FROM THIS AREA CONTACT RESIDENT PROJECT REPRESENTATIVE. CONTRACTOR SHALL NOT REMOVE BORROW MATERIAL BEYOND THE INDICATED LIMITS & BELOW ELEVATION 725.00. FINISHED BORROW AREA SHALL BE GRADED TO DRAIN WITH 2:1 CUT SLOPE (SIDE SLOPES) & 0.50% CROSS SLOPE. TOPSOIL, SEED, MULCH, & FERTILIZE FINISHED BORROW AREA.
4. CLEARING & GRUBBING SHALL BE WITHIN THE "CONSTRUCTION LIMITS"
5. EXISTING COAL HAUL ROAD SHALL NOT BE AVAILABLE FOR USE BY THIS CONTRACT DURING THE CONSTRUCTION. EXISTING ACCESS OFF SUBSTATION ACCESS ROAD IS NOT GRADED & HAS NO SURFACING. CONTRACTOR SHALL PROVIDE NECESSARY ALL WEATHER ACCESS OFF SUBSTATION ACCESS ROAD FOR HIS USE DURING CONSTRUCTION.
6. BEFORE BEGINING CONSTRUCTION VERIFY LOCATIONS OF ELECTRIAL & TRANSMISSION LINE POLES.
7. CONTRACTOR SHALL CONTACT MACON ELECTRIC COOPERATIVE @ BUSINESS HIGWAY 36E - P.O. BOX 157 - MACON, MO. 63552 PHONE NO. (816) 385-3158 FOR ARRANGEMENTS OF CONSTRUCTION POWER CONNECTION TO CONTRACTOR'S CONSTRUCTION OFFICES.



no.	date	by	revision
	8-6-84	UAK	ISSUED FOR CONSTRUCTION
	10-17-85	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI H. L. WONDERLY NUMBER E-20896 REGISTERED PROFESSIONAL ENGINEER

date JUNE 4, 1984
designed KUMTHEKAR
detailed MADDOCK
checked

Burns & McDonnell
Engineers • Architects • Consultants
Kansas City, Missouri

THOMAS HILL POWER PLANT
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73

ASH POND MODIFICATIONS

SITE PLAN

project 83-210-1
contract EP. TO. 8301
drawing Y1
rev. –

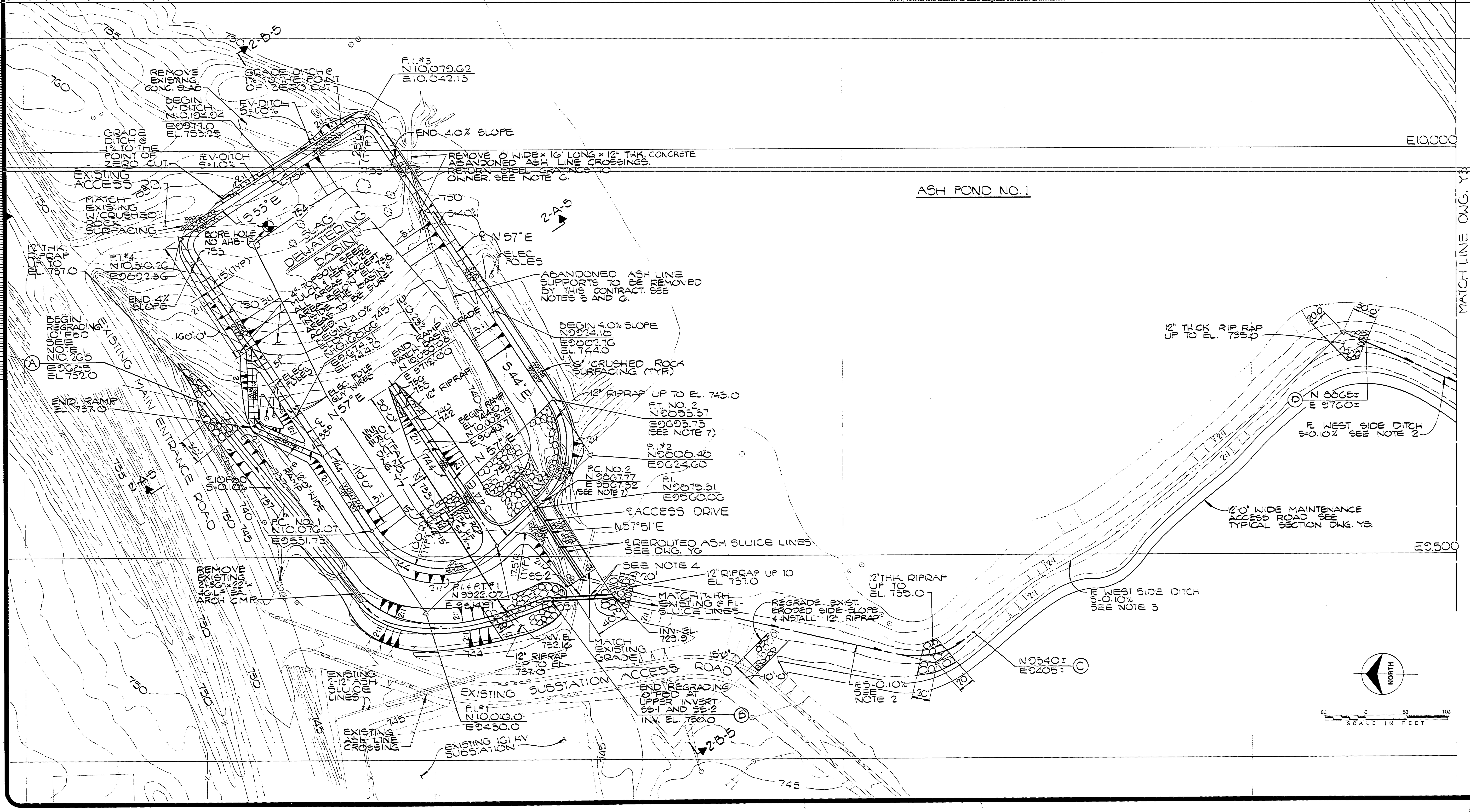
LEGEND

NEW (THIS CONTRACT)		EXISTING
	* TOP OF SLOPE	
	* TOE OF SLOPE	
—750—	CONTOURS	—750—
	FLOW LINE INDICATOR	
	CRUSHED ROCK	
	RIPRAP WITH 6" FILTER BLANKET	
	CULVERT WITH END SECTIONS	
SS	CULVERT WITHOUT END SECTIONS	
	STRUCTURES	
	POWER POLE	
	RAILROAD	
	ROADS	
	TREES	

* TOP OR TOE OF SLOPE TO MATCH EXISTING GRADE UNLESS AN ELEVATION OR SLOPE IS INDICATED.

NOTES:

1. Clean and regrade existing ditch as indicated between Point A and Point B. See Detail No. 2 Dwg. Y5.
2. Clean and reshape existing west side ditch between Points B and C and Points D and E. See Detail No. 1 Dwg. Y5.
3. Clean existing west side 10' FBD. Remove vegetation and sediments between Point C and D.
4. A. Remove existing 58" x 36" - 70LF Arch CMP and install SS-1 and SS-2.
   B. SS-1 and SS-2 shall be 36" - 76LF each, 14 gage, Type A CMP conforming to AASHTO M-190.
5. Prior to the submission of the proposal, the Bidder shall verify type, location and number of abandoned ash line supports and crossing to be removed by this contract.
6. Remove abandoned ash line supports (total 28 - see Dwg. Y6) and reinstall seven (7) supports as indicated on Dwg. Y6. Abandoned ash line supports are set in concrete at 18' C/C.
7. Excavate existing stockpile of ash between P.C. No. 2 and P.T. No. 2 down to El. 723.00 and backfill to basin subgrade elevation as indicated.



no.	date / by	revision
	6-6-84 UAK	ISSUED FOR CONSTRUCTION
	10-17-85 DLM	

H. L. WONDERLY NUMBER E-20896 — STATE OF MISSOURI — REGISTERED PROFESSIONAL ENGINEER

date: 6-4-84
designed: KUMTHEKAR
detailed: MADDOCK
checked:

Burns & McDonnell
Engineers • Architects • Consultants
Kansas City, Missouri

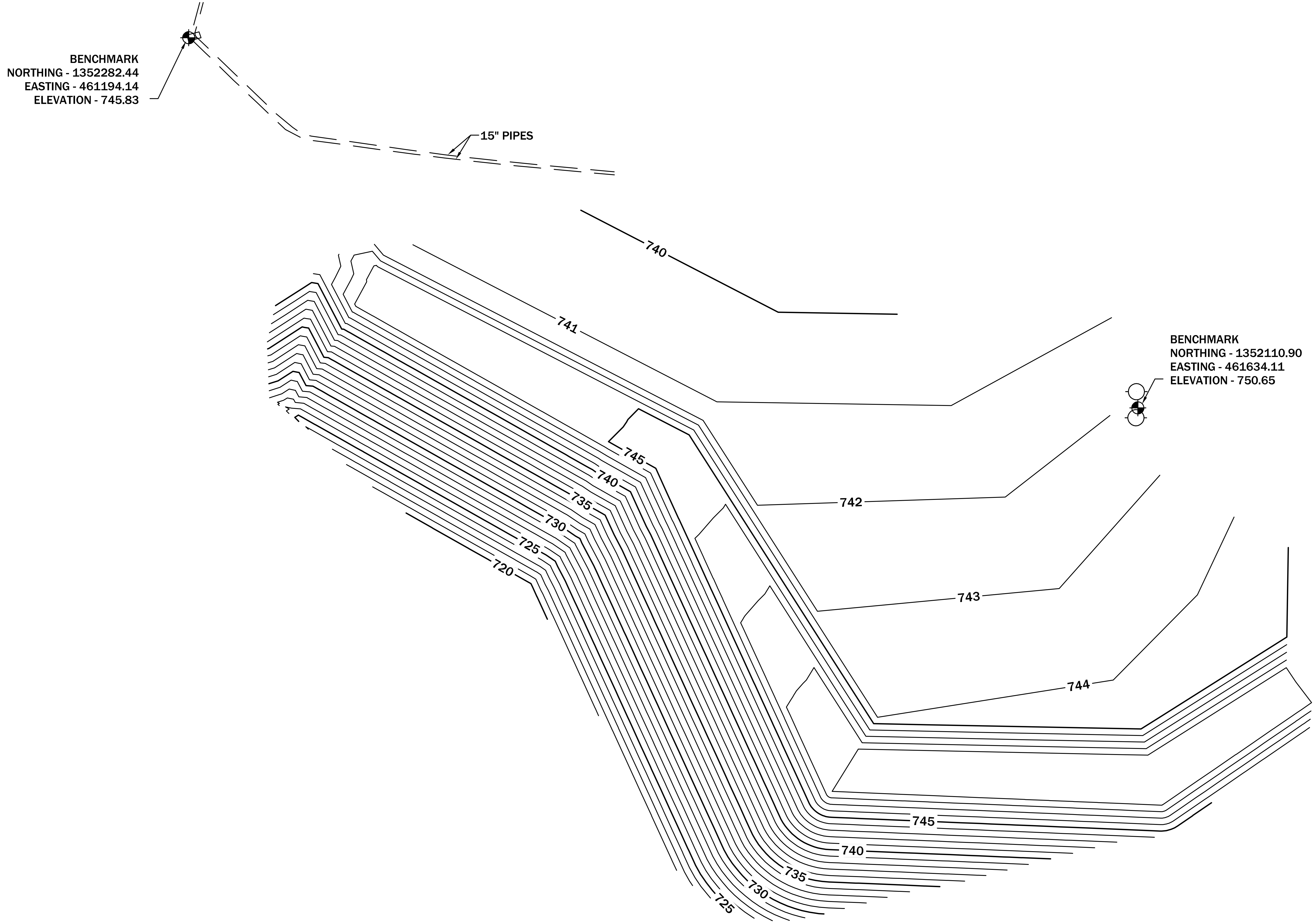
THOMAS HILL POWER PLANT
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73

ASH POND MODIFICATIONS

GRADING PLAN AREA NO. 1

project: 83-210-1
contract: EP. TO. 8301
drawing: Y2
rev.: —

EP. TO. 8301   TO. 8301



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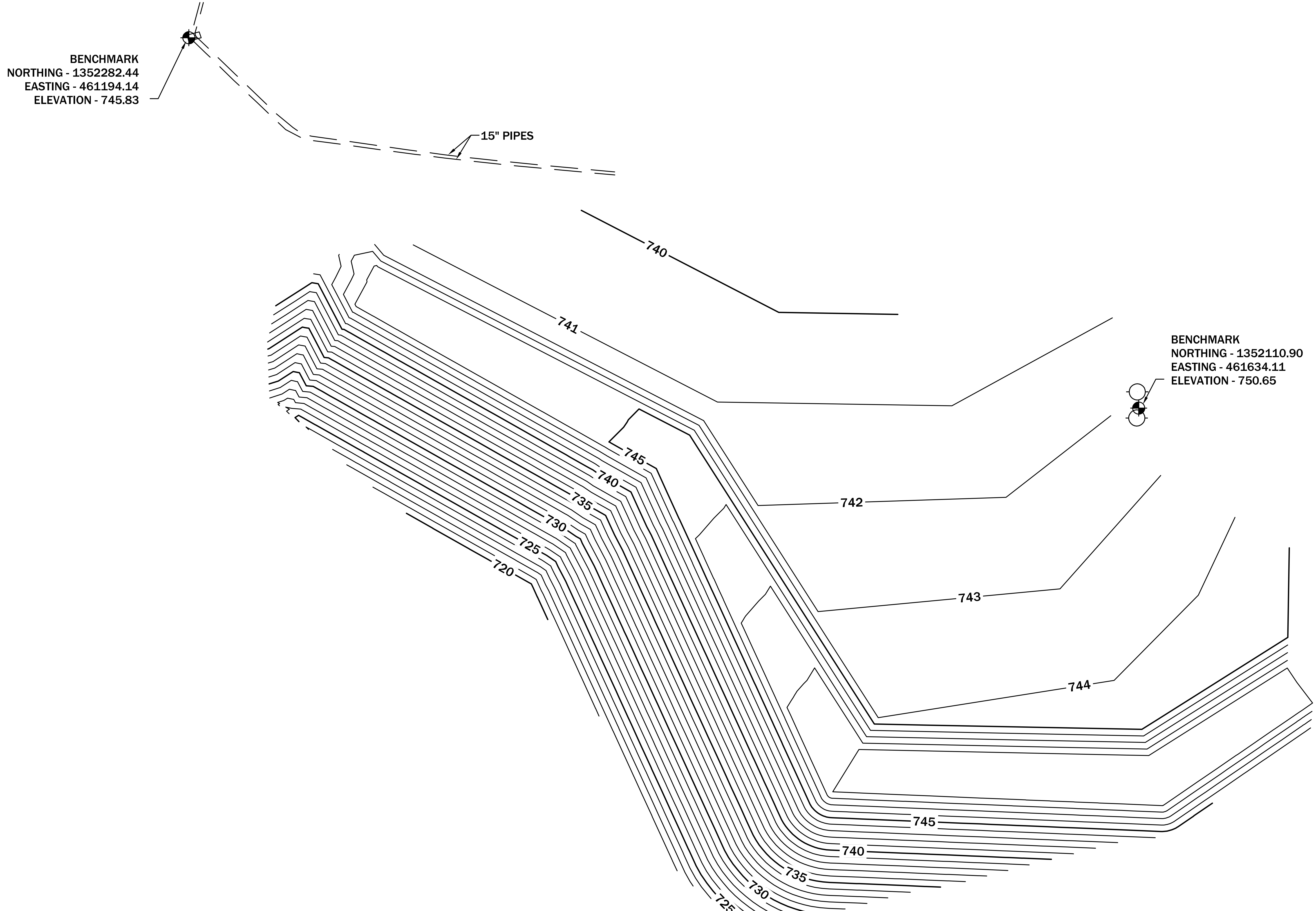

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APPENDIX E
Pond #001,The Ash Pond Series
Operating Management Plan
Dated 1/3/2012

Pond #001, the Ash Pond Series

Operating and Management Plan

1/3/2012 (Revised 12/14/2012)

Overview -

The ash pond series consists of 4 cells, each of which performs a vital function in separating ash and sediment from the clean discharge water.

At the head of the series are Cells 1 and 2. Cell 1 sits inside Cell 2 and collects the pipe-discharged, slag slurry sluiced from the power plant. Cell 2 receives some runoff from the plant's coal yard as well as the slag solids, which are mechanically moved with heavy machinery from Cell 1 to Cell 2.

The purpose of Cell 2 is to collect the slag generated by the power plant. As such, an ash recycling contractor stages a slag recovery and sizing operation on this cell. The waste solids are removed to the plant's permitted utility waste landfill. The water discharge from Cell 2 flows into Cell 3 through the principal spillway discharge weir located on the eastern side of the Cell 2 dam. Similarly, the water discharge from Cell 1 flows to Cell 3. The path differs, however, with flow entering Cell 3 from the western side, through a stream-like channel that also carries the majority of the coal yard runoff, be it storm water, wash water, or pumped discharges.

The sediments carried into Cell 3 drop out in this pool. Cell 3 is managed to capture the particles separating the water through gravitational settling. The water then discharges through the principal spillway weir in the Cell 3 dam into the pool of Cell 4.

Cell 4 is a polishing pond, collecting the finest of sediments before allowing flow from the plant's NPDES permitted discharge point, #001, located at the outlet of the Cell 4 principal spillway weir. The final discharge water joins the Middle Fork of the Little Chariton River after flowing overland for about one quarter mile. Please see the diagram below for a visual depiction:

Operation –

Water pumped from the Thomas Hill Reservoir transports the slag, primarily from Thomas Hill Units 1 and 2, through an abrasion resistant, ceramic lined (Abersist) pipeline to Cell 1 of the Ash Pond Series. A small flow from the Thomas Hill Unit 3 economizer screens also joins the pipeline discharge. Slurry flow usually is continuous, but a water conservation mode can be implemented, if needed, to help reduce the amount of water removed from the Thomas Hill Reservoir, or to support low flow needs within the pond system for maintenance work or for water quality consideration. (The Operations Department manages sluice line operation when low flow conditions warrant.)

Sluice Pumps * -			Continuously Pumped	+	Sluiced	=	Total from Sluice Pumps
	(GPM)		(gallons / year)		(gallons / year)		(gallons / year)
Unit 1	1,500		721,440,000		90,180,000		811,620,000
Unit 2	2,700		1,318,032,000		164,754,000		1,482,786,000
Unit 3	20		10,512,000		0		10,512,000
Total							2,304,918,000
* Calculation basis: Unit 1&2 - One pump on each unit runs continuously. Sluice every 4 hours, 30 minutes per unit. Sluicing requires 2 pumps.							
	2011 - No water conservation measures were in place.						
	Unit 3 - A continuous flow, measured by Operations as 5 gallons every 15 seconds, is pumped from U3 and joins U2 sluice line discharge.						
	Unit 3 source of flow - spray nozzles in the economizer ash tanks on the 6th floor.						
	Water source is circulating water pumps at the intakes and the discharge follows the sluice lines to discharge through #001 into the Middle Fork of the Little Chariton River.						

During periods when the Thomas Hill Reservoir water levels are below the permanent pool elevation of 712 feet, the ash pond discharge provides the primary flow to the Middle Fork of the Little Chariton River. In an agreement with the Missouri Department of Conservation (MDC), the plant is obligated to provide a 5 cubic feet per second (cfs) flow to the river, either through the hole in the reservoir principal spillway, or through the ash pond. During non-drought conditions, discharge flow is more than sufficient to support the MDC obligation. Ash pond discharges average 15 cubic feet per second, continuously (NPDES weekly monitoring records).

Maintenance –

Cell 1 - The pipeline, which receives a daily visual inspection for leaks (Operations Department, Daily Environmental Report) discharges into Cell 1. Solids build up and are pushed out with heavy equipment. The Materials Handling Department moves the slag from Cell 1 to Cell 2 as needed, but usually on a weekly or bi-weekly (every other week) basis.

Water flows around the horse shoe shaped pond, maximizing retention time to allow the majority of the slag particles to settle within the pond. Water discharge typically is not controlled or manipulated, but simply is allowed to discharge through the principal spillway weir.

Cell 2 – The recycling contractor, currently the Harsco Company operates on Cell 2, under their own direction. Routinely the plant Environmental staff, Material Handling Department, and Harsco discuss operations and sediment control techniques on the cell. Material Handling supervisors observe the operation daily and coordinate waste removal with the Harsco crew. Quarterly, the Environmental staff inspects the operation regarding spill prevention, control and countermeasures.

The Materials Handling Department manages the principal spillway weir. Pool is maintained at the agreed upon level. After consultation with the Environmental staff and Harsco, if affected, weir boards are removed or added as needed. The weir stop logs allow water level adjustments in 6-inch increments and may be used to facilitate the operation, such as lowering water level during annual channel cleanout. A channel without ash is maintained adjacent to the dam. Sediments are removed annually. Water level is dropped to allow settling before discharging.

Cell 3 – The pond is the workhorse of the system, treating sediment laden water by promoting settling. A baffle (dike) extends out from the western shore, downstream from the overland flow channel that brings water into the pond from Cell 1 and from the Coal Yard. Similarly, on the eastern side, the principal spillway weir discharges flow from Cell 2 that travels toward the west before entering the main body of the pond. Both arrangements ensure that the flow slows, since it takes a longer distance to travel through the pond before discharging, thus prompting the sediment load to drop out. Accumulation is heavy on the north end, along the toe of the Cell 2 embankment, which is one of the pond's challenges.

The Cell 2 embankment toe is inundated with the pool water of Cell 3, and subsequently with the sediment as well. Care must be taken when removing sediment, to insure the integrity of the upstream dam. Also complicating management of the cell are two large transmission power lines that bisect the pond, a 161Kv and a 345Kv line. A 20 foot buffer zone must be maintained around the lines to avoid arcing, and the lines sag with increasing weather temperatures, limiting the use of equipment under the lines. The third challenge in Cell 3 is an underwater embankment that parallels the controlling structure. It can be seen on the design drawings. The ash pond capacity was increased in the early 1980s, with construction of an independent dam downstream, flooding the old dam in place. When the water level is lowered in Cell 3, the old dam can become exposed, allowing an increased sediment load as water cuts into the old clay dam surface. Sediment loading must be watched when 2 or more stop logs are removed below permanent pool.

Management of the pond centers on making it function as a sediment collection basin, maximizing its shape to support sedimentation, and working through the challenges. Cleaning the pond is essential to assuring adequate capacity, thus the need for a distinct dredging plan to insure timely removal of the sediment.

Dredging Plan – A contracted dredge is used routinely to clean Cell 3 of the Ash Pond. The waste is pumped through a semi-permanent pipeline to the AECI-owned, Utility Waste Landfill # 717502. Past dredging has occurred roughly every seven years, but with the 2011 completion of the pipeline construction, more frequent dredging becomes economical. The pipeline is a 12-inch, high density polyethylene, welded pipe. It follows the terrain, so increasing elevation toward the landfill cell prompts the need for a booster pump. The pipe is flanged at the low point in the line, with the site being located at a point where a concrete pad sits inside a spill containment area. The contractor is able to set his booster pump on the pad and quickly hook up to the pipeline. The slurry discharges into the western end of Ash Cell #3 in the landfill.

About 18,000 cubic yards were dredged from the southern half of Ash Pond Cell 3 in 2011. Removal is needed in the northern half and is planned for 2013. Since this area is full above current pool elevation, dry removal is being discussed for 2013. Operational support would involve lowering, rather than raising the water level to accommodate the operation. Once capacity is reestablished, dredging will proceed at two year intervals, as follows: Dredge southern half of pond in 2015. Dredge northern half of pond in 2017. Dredge southern half in 2019, northern in 2021, with this recurrence interval continuing into the future.

Operationally, the plant will support the contracted dredging projects, primarily through water level fluctuation. The Materials Handling Department will add water depth as needed to float the dredge. Depth requirements may vary with the type of dredge deployed. Weir boards, or stop logs are added for short durations to increase pool depth in 6-inch intervals. When 3 boards have been added, it becomes necessary to seal the emergency spillway (ES). Clay is placed over the rock surface of the ES. One more stop log may be added to achieve maximum pool depth. At this level, the dam still has 2 feet of freeboard. Weather conditions are monitored to assure removal of the clay ES plug should a potential arise for a storm flow level increase. The Environmental staff and the Materials Handling Department coordinate to remove the boards if storm flow warrants. Operational measures also can help to influence water level, such as implementing water conservation measures to decrease inflow, or by doing the reverse. Wash water in the coal yard also can be managed to help establish the desired pool elevation. Significantly slowing Cell 3 discharge or raising the pool above the old submerged dam are the best ways to control sediment load leaving the pond.

Cell 4 – The final discharge point from the Ash Pond Series, Cell 4 functions as a settling basin. Permanent pool, design elevation is maintained in this pond. If a change is needed to facilitate a non-routine maintenance activity, the departments coordinate to assess risks and to develop an individual plan for the specific task.

Plant chemical lab technicians check water quality weekly at the discharge from Cell 4. The location is marked with a labeled, red post. If trouble shooting, control points (identified with white stakes) may be used for sampling. Though rare, quality problems are reported to the assistant plant chemists and to the environmental staff. Appropriate responses are coordinated with the Materials Handling Department.

Parameters of concern include total suspended solids and oil and grease. For instance, if an increasing suspended solids trend is developing, upstream sediment sources are evaluated and cleaned up if possible. If not possible, control alternatives within the cells exist: Incoming water flow can be reduced, a weir board may be added to the Cell 3 principal spillway, or to the Cell 2 principal spillway if the source is in that cell, thus allowing additional settling time. The pool area of each cell is observed daily for the presence of an oil sheen. Oil absorbent booms are in place at each discharge structure. The Materials Handling Department responds to an oil sighting, using spill control and clean up products to contain and remove the sheen. If discharge manipulation is needed, it is coordinated between the departments, again with the options of reducing incoming water flow from plant operations, a weir board may be added to the Cell 3 principal spillway, or to the Cell 2 principal spillway if the source is in that cell. A portable pump also may be placed to run pump-back operations geared at reducing or stopping flow while cleanup is started.

Documents -

Structural stability reports are available for each cell, and design drawings are available for Cells 1, 3 and 4. They are accessible in plant environmental files or in RX Index.

Ash Pond #001 Specs -											
Cell Description	**Cell Number**	**Top of Dam (TOD)**	**Down stream Toe**	**Normal Pool**	**Emergency Spillway (ES) Dimensions**			**Principal spillway (PS) Dimensions (elev. Ft.)**			
		Elevation (ft)	**Elevation (ft)**	**Elevation (ft)**	**Crest Elevation (ft)**	**Control Section**	**Side Slopes (perpendicular to flow)**	**crest (normal pool)**	**Stop log extent**	**pipe invert elevation**	**Stop log height (in)**
Dewater pond	1	740		731	na			731			6
Slag Pond, supporting slag recycling operation	2	726.5	692-695 *	723.4	724						6
(Submerged Dam in pool of Cell 3)		710.3	692	-	702.5						
Coal Yard Sediment Control Basin	3	717	690	713 **	715	10'x10'	6:1				6
Polishing Pond; final discharge water	4	705.2 - 705.7	681	700	703	10'x10'	6:1	700	682.2	680.6	6

* Underwater and covered with sediment

** Estimated relative to TOD and ES. (2005 elevation discrepancy should be resolved the next time a land survey crew performs work on the Ash Pond Series)

Actions Upcoming:

Project # 1301020 is planned for execution in 2013: Removal of Waste Ash From Cell 2. The project involves removal of 352,000 cubic yards of waste fly ash, and slag from the eastern side of Cell 2. The waste will be hauled to Landfill Cells 2 and 3 for final disposal, leaving the ash pond cell as solely a slag recycling operation.

Survey drop log spillway structures to determine heights, and confirm structure elevations to establish relationship between PS, ES and TOD and to resolve discrepancy with 2005 flown topography. *(complete when surveying for waste ash removal project, Spring 2013)*

Project # 1300380 is planned for execution in 2013: Dredging of sediments from Cell 3. Discussed in the dredging plan, this effort needs to focus on removal of the sediments deposited in the northern part of the cell.

Tentative, possibly in the future: Draft NPDES permit, under negotiation discusses a ground water monitoring program around the Ash Pond Series.