Report of Dam Safety Assessment of Coal Combustion Surface Impoundments
Hoosier Energy
Frank E. Ratts Generating Station
Petersburg, IN

AMEC Project No. 3-2106-0177.0005

Prepared By:

AMEC Earth & Environmental, Inc.
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, KY 40299

Prepared For:

Mr. Stephen Hoffman
U.S. EPA
Emergency Response Service Center
1200 Pennsylvania Ave., NW
Washington, DC 20460

September 2010

I certify that the management units referenced herein:

Hoosier Energy, Frank E. Ratts Generating Station: Pond 1, Pond 2, Pond 3, and Pond 4 were assessed on August 19, 2010.

Signature ____
Don Dotson, PE
Senior Geotechnical Engineer

List of AMEC Participants who have participated in the assessment of the management units and in preparation of the report:

- Shea Carr, PE
  Project Engineer

- Dan Conn
  GIS Specialist

- Chris Eger
  CADD Technician

- Mary Sawitzki, PE
  Civil/Environmental Engineer

- Mary Swiderski, EIT
  Staff Engineer

TABLE OF CONTENTS

SECTION **PAGE NO.**

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

AMEC Earth and Environmental, Inc. (AMEC) was contracted by the United States Environmental Protection Agency (EPA), via contract BPA EP09W001702, to perform site assessments of selected coal combustion byproducts surface impoundments. As part of this contract with EPA, AMEC was assigned to perform a site assessment of Hoosier Energy Frank E. Ratts Generating Station. Ratts Generating Station is located approximately 2 miles north of Petersburg, Indiana as shown on Figure 1, the Project Location Map.

A site visit to Ratts Generating Station was made by AMEC on August 19, 2010. The purpose of the visit was to perform visual observations, to inventory coal combustion waste (CCW) surface impoundments, assess the containment dikes, and to collect relevant historical impoundment documentation.

AMEC engineers, Don Dotson, PE and Mary Swiderski, EIT were accompanied during the site visit by the following individuals:

Table 1. Site Visit Attendees

Company or Organization	Name and Title
Hoosier Energy Rural Electric Cooperative, Inc.	L. Todd Davis, Operations Manager
Hoosier Energy Rural Electric Cooperative, Inc.	Bob Douglas, Senior Chemist
Hoosier Energy Rural Electric Cooperative, Inc.	Lon M. Petts, Environmental Team Leader
Hoosier Energy Rural Electric Cooperative, Inc.	Michalene Reilly, Manager, Environmental Services
Hoosier Energy Rural Electric Cooperative, Inc.	William Thomas Teague, Chemist

1.2 Project Background

CCW results from the power production processes at coal fired power plants. Impoundments (dams) are designed and constructed to provide storage and disposal for the CCW that are produced. Hoosier Energy refers to the four CCW impoundments at the Ratts Generating Station as “Pond 1”, “Pond 2”, “Pond 3” and “Pond 4;” Pond 4 is also known as “The Bottom Ash Pond.”.

The Ratts Generating Station was built in the late 1960’s and the units began commercial operation in 1970. The station is composed of two 125 MW coal burning units. In this process, two types of CCW ash are generated: bottom ash and flyash. Typically, power plants like Ratts discharge CCW by wet sluicing it into large impoundments designed to hold the CCW solids as well as the liquid added for sluicing. In addition to the flyash and bottom ash transport water, the ponds also receive wastewater from several sources including: wastes from floor drains and periodically generated metal cleaning wastes. Currently only Ponds 1 and 4 are active.

The Indiana Department of Natural Resources (IDNR) Division of Water defines the term *dam*, as well as regulates dam design, construction, and repair. According to IDNR 312 IAC 10.5-2-3, a dam is defined as “"an artificial manmade barrier, including appurtenant works, that meets the conditions as given in Indiana Cod (IC) 14-27-7.5-1.” IDNR evaluates the probable loss of life and property damage downstream from a dam to determine and assign a dam hazard classification to each structure. The dams are classified as a low, significant, or high hazard.

The following definitions of hazard classification currently apply to dams in Indiana:

1. **High hazard dam**: a structure the failure of which may cause the loss of life and serious damage to homes, industrial and commercial buildings, public utilities, major highways, or railroads.

2. **Significant hazard dam**: a structure the failure of which may damage isolated homes and highways, or cause the temporary interruption of public utility services.

3. **Low hazard dam**: a structure the failure of which may damage farm buildings, agricultural land, or local roads.

According to the *Indiana Dam Safety Inspection Manual* 312 IAC 10.5-3-1 the dam classifications are described as follows:

Table 2. Summary of Dam Classifications

Damage To:	Area Affected by Dam Breach		
	Low	**Significant**	**High**
Location	***Rural or Agricultural*** Damage would be minimal and would mostly occur on dam owner’s property. No building, road, railroad, utility, or individual significantly affected. Damage is limited to farm buildings, agricultural land, and local roads.	***Predominantly Rural or Agricultural*** but roads, buildings, utilities or railroads may be damaged.	***Developing or Urban*** Where individuals could be seriously injured or killed. Buildings, roads, railroads or utilities seriously damaged.
Potential of Loss of Life Flood depths greater than 1 foot in occupied quarters. Potential of loss of human life may occur.	No	No	Yes
Roads County roads, state two-lane highways. or U.S. highways Serving as the only access to a community. Multilane divided state or US highway, including an interstate highway.	***No Damage***	***May Damage*** Interruption of service for not more than 1 day.	***Serious Damage*** Interruption
Railroads Operating Railroads	***No Damage***	***May Damage*** Interruption of service for not more than 1 day.	***Serious Damage*** Interruption
Occupied Quarters	***No Damage***	***May Damage*** Damage that would not	***Serious Damage*** Damage where the flow velocity at

Damage To:	Area Affected by Dam Breach		
	Low	**Significant**	**High**
Homes-Single family residences, apartments, nursing homes, motels and hospitals		render the structure unusable	the building compromises the integrity of the structure for human occupation.
Utilities	***No Damage***	***May Damage*** Damage may occur to important utilities where service would not be interrupted for more than 1 day but either of the following may occur: 1) buried lines can be exposed by erosion, or 2) towers, poles and above ground lines can be damaged by undermining or debris loading.	***Serious Damage*** Interruption of service to interstate and intrastate utility, power or communication lines serving towns, communities or significant military and commercial facilities in which disruption of power and communication would adversely affect the economy, safety, and general well-being of the area for more than 1 day.

According to IDNR Rule IC 14-27-7.5-9, the owner of a high hazard structure shall have a professional engineer make a technical inspection of the structure and prepare or revise the emergency action plan at least once every two years. If the engineer recommends maintenance or repairs, the owner must comply. IDNR may make technical inspections to insure compliance with this rule. In regard to a low or significant hazard structures IDNR rule IC 14-27-7.5-10 states that IDNR will perform an inspection once every three years for a significant hazard structure, and once every five years for a low hazard structure, or more often if deemed necessary.

IDNR currently regulates all dams that meet any one of the following criteria:

1. the drainage area above the dam is greater than 1 square mile
2. the dam embankment is greater than 20 feet high
3. the dam impounds more than 100 acre-feet

All dams that meet any one of the three criteria listed above will be regulated by IDNR under IC 14-27-7.5, "Regulation of Dams." IC 14-27-7.5 presents the legal requirements for operating, maintaining, and inspecting regulatory dams in Indiana. Ratts Generating Station embankments do not meet the criteria listed above, and therefore, are not regulated by the state.

The National Inventory of Dams (NID), administered by the U.S. Army Corps of Engineers (USACE), provides a list of many dams within the United States, as well as hazard potentials related to the listed dams. The information is provided to the USACE for inclusion in the NID database primarily by the states. The ash ponds at the Ratts Generating Station are not included within the NID database.

As part of the observations and evaluations performed at Ratts Generating Station, AMEC completed EPA's Coal Combustion Dam Inspection Checklists and Coal Combustion Waste (CCW) Impoundment Inspection Forms. Copies of the forms are provided in Appendix A. The Impoundment Inspection Forms include a section that assigns a "Hazard Potential" that is used to indicate what would occur following failure of an impoundment. "Hazard Potential" choices include "Less than Low," "Low," "Significant," and "High." Based on the site visit evaluation of the impoundments, AMEC engineers assigned a “Low Hazard Potential” to Ponds 1, 2, and 3. As defined on the Inspection Form, dams assigned a “Low Hazard Potential” are those dams 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. Pond 4 was assigned a “Significant Hazard Potential” classification which is defined as a dam 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. AMEC assigned the “Significant Hazard Potential” classification to Pond 4 based on its proximity to the White River.

1.2.1 State Issued Permits

The State of Indiana Department of Environmental Management has issued National Pollutant Discharge Elimination System Permit No. IN0004391 to Hoosier Energy Frank E. Ratts Electric Generating Station. The permit provided by IDNR authorizes Hoosier Energy to discharge to the White River. The permit became effective on September 1, 2005 and will expire on August 31, 2010.

IDNR issues a Certificate of Approval of Construction in a Floodway for Hoosier Energy Rural Electric Corporation, Inc. dated March 16, 1984. The permit is for “ash pond addition to existing power plant along White River near Petersburg in Section 14, T. 1 N., R. 8 W. Pike County, Indiana.” The Hydrology section of the attached engineers report indicates the March 1913 flood discharge at the site was elevation 432 feet, which is estimated to by IDNR be in the order of magnitude of the 100-year frequency flood.

1.3 Site Description and Location

Hoosier Energy Ratts Generating Station is located approximately two miles north of Petersburg, Indiana. The area surrounding the plant boundary is primarily rural. The Site Location and Vicinity Map, included as Figure 1, illustrates the location of Ratts Generating Station relative to Petersburg. The White River is located to the north of the plant facilities. The distance between the closest point of the ash ponds and the White River is approximately 150 feet. The Photo Site Plan, included as Figure 2, shows the location of the Ash Ponds and their proximity to the White River.

An aerial photograph of the region showing the location of Ratts Generating Station ash ponds in relation to schools, hospitals, and other critical infrastructure located within approximately five miles downstream of the structures is included as Figure 3, the Critical Infrastructure Map. A table that provides names and coordinate data for the infrastructure is included on the map.

1.4 Process Ponds

1.4.1 Ash Handling and Flow Summary

Ratts Generating Station disposes of bottom ash (the heavier of the two types) through pipelines as wet slurry to Pond 1. After settling, waste water will flow by gravity from Pond 1 along a drainage ditch to discharge at the White River. Pond 1 is periodically dredged and the removed ash is taken offsite to Prides Creek Mine. Pond 4, which receives flyash as wet slurry, discharges to a settling basin. The decanted water from the basin combines with flow from Pond 1 and is discharged to the White River via NPDES permitted outfalls. The remaining two ponds (Ponds 2 and 3) previously received flyash, however, at the time of the site visit, were full and inactive.

1.4.2 Ash Ponds

Ash Management

In September 1997, Hoosier Energy retained Burns & McDonnell to complete a ten-year ash management plan for the Ratts Generating Station. That a report, *Ash Management Plan for Pond Closure, Ash Management Plan Report*, , dated April 22, 1998, was provided to AMEC. The report states that the most cost effective method for accommodating 10 years of ash production is to create additional ash storage capacity within the existing ponds by building interior dikes. The dikes were to be constructed from the deposited ash within the existing ash ponds. According to conversations with site personnel, Hoosier Energy followed Burns & McDonnell's recommendations resulting in the current pond configuration around Ponds 1, 2, and 3. A plan view and cross sections of the ponds are included as Figures 4, 5, 6, and 7.

1.4.2.1 Pond 1

Pond 1 is located to the east of Ratts Generating Station. Hoosier Energy's March 30, 2009 response to the EPA indicates that Pond 1 was commissioned in 1970 and has a total storage capacity of 6 acres. The pond primarily contains bottom ash; however flyash was placed in the pond between 1970 and 1977. Hoosier Energy believes the majority of the flyash has been removed by dredging "throughout the years." The pond also receives waste from floor drains and periodically generated metal cleaning wastes.

Pond 1 Ash Disposal

1994

An Interoffice memo titled *Frank E. Ratts Generating Station Bottom Ash Pond* (Pond #1) dated May 11, 1994 discusses future disposal options for Pond 1. The memo states that the pond was commissioned in 1970 and was active until 1976. In 1970, Pond 1 was the only pond in service and was used for both bottom and flyash disposal. At that time, the pond was 20 acres in surface area. In 1976, Pond 2 was constructed and placed in service, and began receiving bottom ash. In 1980, the bottom ash pipeline was diverted back into Pond 1, where it currently discharges. The memo estimates that as of 1994, approximately 300,000 tons of ash had accumulated in the pond; approximately two-thirds of the quantity was flyash, and the remaining third was bottom ash. The estimated capacity of the pond at the 434 foot contour was 230,000 cubic yards, or approximately 217,400 tons of ash.

The memo states that much of the original 20 acres of Pond 1 was no longer in service or useful. Approximately one-fourth of the area appeared to have surface elevation below the minimum berm height of the original pond (434 foot contour level). This area of the pond was stagnant and prolonged inactivity resulted in a marshy area. It was noted that within a significant portion of the pond footprint, ash has been accumulated and stacked at heights considerably higher than the pipe discharge elevation, creating a dry disposal environment. Only a small portion of the pond was truly active. To preserve the volumetric capacity of this small area, periodic dredging was considered to be necessary, but would only be considered a short term ash disposal solution.

Three alternatives were proposed for long-term planning and improvement in coal ash management:

- Dredge ponded ash and remove off-site for dry disposal. Possible locations would be a surface coal mine, Merom Station landfill, or a local landfill;
- In connection with off-site removal, the bottom ash pond could be evaluated to determine the feasibility of constructing a new, on-site pond embankment out of bottom ash and creating a larger pond with an increased volumetric capacity;
- Modify bottom ash discharge piping so it is capable of discharging to the inactive areas of the original pond. This can also be in conjunction with a rebuild of the ash pond.

<u>1995</u>
An Interoffice memo entitled *Ratts Station Ash Management* dated December 18. 1995 summarizes renovation work at Pond 1. According to the memo, by December 15, 1995, Solar (contractor) hauled off a total of 82,500 tons of ash. A comparison summary attached to the memo, indicates the ash is hauled "back to mine", which is assumed by AMEC to be Prides Creek Mine.

1.4.2.3 Pond 2

Hoosier Energy's March 30, 2009 response to the EPA indicates that Pond 2 was commissioned in 1975 and has a total storage capacity of 10 acres. The pond is filled to capacity with flyash only.

1.4.2.4 Pond 3

Hoosier Energy's March 30, 2009 response to the EPA indicates that Pond 3 was commissioned in 1982 and has a total storage capacity of 16 acres. The pond is filled to capacity with flyash only.

<u>Previous Pond Issues</u>

On September 15, 2006 employees at Hoosier Energy discovered that a portion of the inside dike of Pond 3 had breached. In response to the breach, the Indiana Department of Environmental Management (IDEM) issued an Agreed Order Case No. 2007-16900-W. The Findings of Facts state that "on September 15, 2006, Respondent (Hoosier Energy) discharged ash water into the Main Stem of White River and surrounding ditches, of a nature and from a location not authorized by the Permit." Hoosier Energy was found to be in violation of 327 IAC 5-2-2, 327 IAC 2-1-6(a) and Part I. B. of the Permit, IC 13-18-4-5, and IC 13-30-2-1.

IDEM required, within 30 days of the Effective Date (September 31, 2007), that Hoosier Energy develop and submit a Compliance Plan which identifies the proposed actions to assure the integrity of the ash ponds. Specifically, the Compliance Plan was to include:

- A description of the steps Hoosier Energy has taken or plans to take to properly repair the ash pond(s) that were damaged in the September 15, 2006 incident;
- Plans for a study into the nature and adequacy of ash pond construction techniques employed by Hoosier Energy system-wide;
- Plans for routine inspection of ash ponds system-wide;
- Plans for responding to identified needs for improvements to the ash ponds that may be identified by any of the above actions;
- A process to notify IDEM within ten days of completion of each milestone; and

- An implementation and completion schedule, including specific milestone dates.

Hoosier Energy provided a Compliance Plan on October 31, 2007. The plan states that on September 15, 2006, employees discovered that a portion of an inside dike on the south side of the Frank E. Ratts coal ash pond had breached. Following the observation of the breach, a temporary fix was put into place on September 15th. The sluicing trench was redirected into Pond 4 and the dike was temporarily repaired by bulldozing surface material from adjoining dike sections into the breached area. Hoosier Energy contacted FMSM to establish a permanent method for repairing the breach and determine the safety of the other dikes in the Ratts pond system.

A memo prepared by FMSM dated September 22, 2006, describes the breach, repair options, and probable cause. The report states that the breach occurred on Tuesday, September 12, 2006, approximately two months after the pond was reactivated. In an attempt to maximize on-site storage, the sluicing trench was redirected to the middle pond (Pond 3) where a borrow pit had been recently excavated. A trench was constructed south toward the pond discharge point located at the southwest corner. Significant precipitation the week of September 11th, coupled with the ash slurry water, resulted in water collecting against the southwest dike, followed by a breach. From a review of photographs, observations, and descriptions of the failed area, FMSM believed the breach likely occurred due to piping through the dike.

FMSM recommended the following for the breach area, assuming that Pond 3 would be reverted back into an inactive pond and a new outlet control would be installed at a lower elevation to drain surface dike side slope:

- Remove temporary material, extending downward as deep as practicable, and laterally by excavating small benches into undisturbed portions of the dikes.
- Reform the dike by placing durable limestone shot rock (12-inch maximum size rock) in minimum two-feet lifts tracked in with a bulldozer. Shape slopes to match existing dike slopes.

While on site, FMSM also reviewed the taller dikes that form the active ash pond (Pond 4). During the review, areas of toe erosion were noted. The most pronounced erosion was located at the northwest portion where several deep gullies had formed. FMSM concluded that the erosion was most likely caused by perimeter ditch flows between the outer clay dike and the new flyash dike. FMSM further noted that no other signs of erosion or instability were noted, but due to heavy vegetation, the dikes were difficult to evaluate.

In regard to the toe erosion, FMSM made the following recommendations:

- Place INDOT class 1 or Class 2 riprap along eroded toe areas to reform the side slopes;
- Construct small rock check dams along the perimeter ditch between the two dikes to reduce flow velocities and provide additional sediment retention;
- Cut vegetation to allow for closer dike evaluation and provide similar erosion protection as needed;
- Monitor the dike areas to check for further erosion of dike deterioration.

In addition to the above recommendations, FMSM proposed to perform a geotechnical evaluation of the active pond perimeter dikes. This would include field reconnaissance, soil test borings, laboratory testing, slope stability evaluation, and recommendations for improvements.

On January 31, 2007, FMSM issued *Report of Slope Stability Evaluation Perimeter Dikes for Ash Pond 003 Ratts Generating Station Pike County*. The report included a geotechnical exploration and slope stability evaluation for the active pond (Pond 4) perimeter dikes. FMSM made the following recommendations (Further details regarding the geotechnical exploration and slope stability analysis are presented in Section 3.3.4.)

1. The outer clay dikes exhibit adequate factors of safety, no improvements for slope stability are deemed necessary. However, the elevation of the dike crest is 432 feet, which is 3 feet below the reported 100-year flood elevation of the White River. Increasing the height of the dikes to provide additional flood protection should be considered.
2. Adequate factors of safety do not exist for the inner ash dikes. FMSM recommended the dike slopes be regraded to 3H:1V and the dike crest be lowered to elevation 440 feet. A drainage berm (top elevation 435 feet) should be placed on the outer slope face to force water deeper into the slopes and to add to support. The width of the drainage berm should be a minimum of 10 feet along the west and south dikes and a minimum of 27 feet along the north dike.

FMSM provided 13 recommendation items concerning dike regrading.

According to the Compliance Plan, Rode & Sons performed corrective action of the dikes between July 25th and September 20th of 2007. FMSM was on site to observe the contractor activities which included regrading the crest to a uniform height and flattening the outer slopes in several areas for increased stability. Also, as part of the corrective action plan, berm inspection was be done on a monthly basis, as opposed to a quarterly basis prior to the breach. Additionally, to preclude woody vegetation growth on the slopes, vegetation would be cut twice a year.

1.4.2.5 Pond 4

Hoosier Energy's March 30, 2009 response to the EPA indicates that Pond 4 was commissioned in 1982 and has a total storage capacity of 25 acres. The pond is currently active and contains flyash only. The pond also receives waste from floor drains and periodically generated metal cleaning wastes. In addition, an eight-acre polishing pond "settling basin" receives water from the active area for final solids removal prior to NPDES permitted discharge .

Previous Pond Issues

1997

An undated ATC Associates Inc. report titled "Site Observation Trip, Coal Ash Storage Pond" describes seepage observed at Pond 4. According to ATC, several seeps were noted during a routine inspection discharging from the exterior face of the southern end of the western embankment of Pond 4.

Following the discovery of the seep, the water level within the pond was lowered by approximately 10 to 15 feet. During ATC's site visit (August 6, 1997), the pond was 10 feet below normal pool level. No seepage was noted in the problem areas; however the soil was moist relative to the surrounding areas. On-site personnel noted that no soils particles were noted in the seeps while they were flowing. ATC believes the seeps were contributed to by the following: a high percentage of sand within the soil embankment, recent repair work that may have disturbed a low permeability layer, and animal burrows along the interior slope which may have created a seepage path.

ATC made the following recommendation:

- When Hoosier Energy allowed the water level in Pond 4 to return to normal pool that personnel take water level readings and seepage observations on a regular schedule and record the results;
- Unless seepage worsens as the pond is refilled, it does not appear that it will be necessary to make immediate repairs;
- The long term stability of the exterior slope of the western embankment of Pond 4 should be evaluated with emphasis given to analysis of the stability of the slope following rapid drawdown during the recession of an extended flood event.

ATC refers to a "Koester proposal", this document dated August 17, 1997 was provided by Hoosier Energy, and provides three options for "repairing the levee leaks in ash pond number four." The three options include:

1. Excavate a slurry wall and fill with a soil bentonite mixture;
2. Use a vibrated beam injection system to inject bentonite solution into the levee; and
3. Form a clay bentonite seal on the outside of the levee with a toe drain.

No documentation was provided by Hoosier Energy to indicate which of the three alternatives, if any, was selected to repair Pond 4.

<u>1998</u>
An April 22, 1998 report by Burns & McDonnell titled *Frank E. Ratts Generating Station Ash Management Plan for Pond Closure Ash Management Plan Report* notes that water seepage areas have been discovered on the exterior slopes of the west and north embankments of Pond 4. The seepage areas on the west embankment occur on the south half of Pond 4 and are located on the lower ten feet of the exterior embankment slope and adjacent to the outlet structure for Pond 4. The report notes the seepage areas for both the west and north embankments were initially discovered in 1997, and the seepage became "noticeably worse" when the water level was raised to 427 to allow for additional settling and retention capacity.

In addition, the Burns & McDonnell report states

> *The open fields located south, east, and north of Pond 4, periodically flood when the White River overflows. It is our understanding that wave action during past flood events eroded the exterior slope of the west dike. In an effort to repair the eroded areas a few years ago, soil material was removed from the interior dike slope and placed on top of the dike and exterior slope. Also, as part of this repair work, the exterior slope was reshaped by excavating a twelve foot wide bench ad backfilling to the approximate original slope, 2H:1V. In addition to the soil removed from the interior dike slope, alluvium material existing along the dike toe was borrowed for the exterior dike slope repairs. Prior to this repair work, there is no record of seepage occurring along the dike.*

In order to investigate the seepage areas, Burns & McDonnell performed a limited subsurface exploration consisting of four borings located on the south and west embankment of Pond 4. Two of the four borings, PZ-1 and PZ-2, were located in documented seepage area along the west embankment of Pond 4. The third boring, PZ-3, was installed in the south embankment in an areas that has no known documentation of seepage. The fourth boring, PZ-4, was located approximately 100 feet from the toe of the west embankment adjacent to documented seepage areas.

Based on the Burns & McDonnell report, the seepage areas along the west and north embankments show no sign of soil piping (i.e., soil loss) or slope instability at the seep locations. Burns & McDonnell noted during their site visit on October 14, 1997 the exposed subgrade along the west embankment seepage area appeared saturated and "showed signs of active water flow;" however, the seepage area located on the north embankment was not "noticeable" saturated/wet during their site visit. Consequently, Burns & McDonnell did not install a piezometer along the north embankment; however, Burns & McDonnell noted the seeps were observed along the north embankment during their site visit approximately 4 months later (February 18, 1998). In addition, animal burrows approximately 1 inch in diameter were noted on the upper section of the north embankment. Animal burrows were "not as prominent" on the west embankment"; however recent re-grading and repair work may have covered the burrows.

Burns & McDonnell summarized the piezometer and seepage areas as follows:

> *Periodic water level measurements taken in PZ-1 and PZ-2 confirm the west pond dike is not saturated in the seep areas. Piezometers PZ-1 and PZ-2 have remained essentially dry several months after being installed. Most likely, the seeps occurring along the southern portion of the Pond 4 west dike are a result of isolated seepage paths in the dike system. Water moves through these paths in the original dike section and disperses as it flows through the fill material subsequently placed on the outer dike slope. These seepage paths may be a result of animal burrows, seams through soil layers, or zones of more permeable soil material. Past dike erosion repair activity may have exposed these seepage paths resulting in water movement through the dike.*
>
> *Since the west dike of Pond 4 is not saturated and appears to be relatively stable, immediate repair of the dike leaks is not recommended. The north dike also appears stable; however, a piezometer was not installed in this area to determine the type and condition of dike soil materials. The water seeping from the dikes appears to be relatively clear indicating the loss of soil fines (piping) is not occurring. Based on this, the dike seepage areas do not appear to be an immediate concern.*

Burns & McDonnell recommend the water levels for Pond 4 be "maintained as low as possible to reduce the seepage potential through the embankments", and a quarterly inspection program should be implemented to monitor the seepage areas. Should the existing conditions change, the report provides several alternatives that could be implemented to stop the potential leakage through the embankment. These alternatives included: pressure injection grouting, lining the interior slope of the embankment with a synthetic bentonite mat, or installing a bentonite slurry trench. No documentation was provided by Hoosier Energy to indicate if any of these operations were pursued.

<u>*Pond 4 Embankment Erosion*</u>
Burns & McDonnell noted possible erosion of the interior and exterior slopes of Pond 4. The report stated that the water level in Pond 4 was at the top of the riprap on the interior slope and wave action within the pond had caused erosion of the embankment above the riprap surface. Burns & McDonnell recommended that the riprap be extended to the top of the embankment if water levels remained at this elevation.

As noted previously, during periods of flooding of the White River, the exterior slopes of the south, west, and north embankments of Pond 4 have experienced erosion due to wave action and river flow. Burns & McDonnell recommended placement of riprap to the top of the dike or to an elevation of three feet over the 100-year flood stage for the White River, whichever is less.

Burns & McDonnell noted that during periods of flooding, the exterior dike is susceptible to instability (rapid draw-down) if flood water recedes quickly. To determine the likelihood of dam failure due to rapid draw-down, river stage data should be reviewed to determine how quickly river levels fluctuate. If rapid draw-down is likely to occur, a dike stability analysis is recommended.

<u>*2009*</u>
A report entitled “Ash Pond Dike Improvements” prepared by Stantec (formerly FMSM), dated January 15, 2009 was provided by Hoosier Energy. Following regrading efforts in the fall of 2007 (as discussed in Section 1.4.2.4) grass cover had not been established before heavy rains in the winter of 2007 and spring of 2008 caused several erosion washouts and channels to form on the downstream slopes. To provide additional measures against further erosion issues, and possible failure, Stantec completed the *Ash Pond Erosion Repair Plants and Specifications* in July 2008. AMEC was not provided with a copy of these plans. Construction work on the ash ponds was completed in October 2008.

Stantec prepared a report dated April 2, 2009, entitled *2007 Ash Pond Dike Improvements* to summarize the periodic construction monitoring efforts performed during the summer and fall of 2007. Following the January 2007 slope stability analyses (described in Section 1.4.2.4) regrading recommendations; Stantec was on-site to conduct periodic observations of construction activities. The report states that construction was completed in late fall 2007.

1.5 Previously Identified Safety Issues

Discussions with plant personnel and review of provided documentation indicate that there are no current or previously identified safety issues at the Ratts Generating Station impoundments.

1.6 Site Geology

A report prepared by Fuller Mossbarger Scott & May Engineers (FMSM) entitled *Report of Slope Stability Evaluation Perimeter Dikes for Ash Pond 003 Ratts Generating Station Pike County*, Indiana dated January 31, 2007 describes local site geology.

The report states:

> *Available geologic mapping (Regional geologic Map NO. 3 of the Vincennes Quadrangle: parts A and B, Indiana Geologic Survey, 1970) shows that the near surface material at the site consists of recent alluvial deposits composed of interbedded silt, sand and*

gravel. The thickness of these unconsolidated deposits may be approximately 50 feet on the south portion of the site to over 100 feet near the White River.

In terms of bedrock the report states that:

> *The underlying bedrock reported on the mapping is the Carbondale Group of the Pennsylvanian Period. The Carbondale Group is made up of three formations, two of which are present in the vicinity of the project site, the Dugger and Petersburg Formations. The Dugger Formation is the upper member of the Carbondale Group and is found above the Petersburg Formation. Te lowest unit of the Dugger Formation is the Alum Cave Limestone, a medium-to-blue-gray fine grained, argillaceous and fossiliferous limestone that can be used as a marker bed for the base of the Dugger Formation. The Petersburg Formation is composed of the Houchin Creek Coal, Stendal Limestone, Folsomville and Springfield Coal units, as well as unnamed beds of shale, siltstone, sandstone, and underclay. The Stendal Limestone is a black, dense, argillaceous, sometimes fossiliferous limestone that can be used as a marker unit for the Petersburg Formation. The upper unit of the Petersburg Formation is the Springfield Coal unit.*

1.7 Inventory of Provided Materials

Hoosier Energy provided AMEC with numerous documents pertaining to the design and operation of Ratts Generating Station. These documents were used in the preparation of this report and are listed in Appendix C, Inventory of Provided Materials.

2.0 FIELD ASSESSMENT

2.1 Visual Observations

AMEC performed visual assessments of the Ratts Generating Station ash ponds on August 19, 2010. Assessment of the ash ponds were completed in general accordance with *FEMA's Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams, April 2004*. The EPA Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Forms were completed for the ash ponds during the site visit. The completed forms were provided to the EPA via email five business days following the site visit. Copies of the completed checklists are included in Appendix A. In addition to completing the checklist and assessment forms, photographs were taken of the impoundment during the site visit. A photo site location map and descriptive photos are included in Appendix B. Rainfall data for the Oakland City, Indiana area was collected for the 30 days prior to the site visit. Table 2, below, summarizes the rainfall data for the days immediately preceding AMEC's site visit.

Table 3. Ratts Generating Station Rainfall Data

Rainfall Prior to Site Visit	
Date	**Rainfall (in.)**
August 11, 2010	0.00
August 12, 2010	0.04
August 13, 2010	0.00
August 14, 2010	0.00
August 15, 2010	0.00
August 16, 2010	0.00
August 17, 2010	0.00
August 18, 2010	0.00
Total (7 days prior to visit)	**0.04**
Total (30 days prior to visit)	**1.21**

Source: Weather Underground (wunderground.com) for "1 Block West of Oakland City University."

2.2 Pond 1 - Visual Observations

Pond 1 primarily contains bottom ash. At the time of AMEC's field inspection, the pond was receiving CCW. The inlet from the plant is located at the along the western portion of the pond. The plants coal pile is located along the northern edge of the pond (photo 1-5). Railroad tracks were located along the western dike (photo 1-3).

2.2.1 Pond 1 - Embankments and Crest

Pond 1 has an incised configuration. Because survey data was not available and gauges are not located within the pond, freeboard was not able to be determined. The northern, eastern, and western crest and dikes of the dam are primarily surfaced with grass (photos 1-1 and 1-2). The southern interior dike is surfaced with tall grasses and heavy vegetation (photos 1-3, 1-7, 1-

8, and 1-9). Heavy vegetation included grasses, brush, and trees greater than 12 inches in diameter. Major erosion or slope deterioration along the southern interior dike could not be commented upon due to the presence of vegetation.

2.2.2 Pond 1 - Outlet Control Structure

The primary outlet is located within the south-western portion of the pond. This inlet is a submerged 12-inch diameter plastic pipe. Because the pipe was submerged, AMEC could not determine if the outlet was blocked. Flow from the 12-inch pipe discharges into a manhole (photo 1-6), which directs the decanted water through a 24-inch reinforced concrete pipe (RCP) that outlets along the southern toe of Pond 2 (photos 3-4 and 3-5). From this discharge point the flow travels down gradient in a drainage swale along the southern toe of the outer clay dike of Ponds 3 and 4, along the eastern downstream toe of Pond 4, then to the northern downstream toe of Pond 4 where it combines with discharge from the Settling Pond (Pond 4) (photo 4-4). The combined flows travel in a drainage ditch and discharge per NPDES permitted outfalls to the White River.

2.3 Pond 2 - Visual Observations

Pond 2 contains flyash, at the time of AMEC's field inspection; the pond was full and inactive. The western inner dike of the ash pond is a shared dike shared with Pond 3. Railroad tracks are located along the south portion of the eastern dike. The ponds northern, eastern, and southern dikes are contained within two perimeter dikes. The inner, larger, dike is constructed of flyash, and the outer, smaller dike is constructed of clay. The dikes are divided by a 10feet wide ditch.

2.3.1 Pond 2 - Embankments and Crest

Pond 2 has a diked configuration. Because survey data was not available and gauges are not located within the pond, freeboard was not able to be determined. The northern, southern, and western dikes are covered with grass. The south portion of the eastern dike along the railroad is primarily surfaced with grass and heavy vegetation. Heavy vegetation included grasses, brush, and trees up to 12 inches in diameter. Major erosion or slope deterioration could not be commented upon due to the presence of vegetation.

2.3.2 Pond 2 - Outlet Control Structure

Pond 2 has no outlet structure.

2.4 Pond 3 - Visual Observations

At the time of AMEC's field inspection, the pond was full of flyash and inactive. Approximately half of the eastern inner dike of the ash pond is shared with Pond 2 and the western dike is shared with Pond 4. The ponds northern and southern dikes are contained within two perimeter dikes. The inner, larger, dike is constructed of flyash, and the outer, smaller dike is constructed of clay. The dikes are divided by an approximately 10-feet wide ditch. At the time of the site visit, portions of the southwestern dike were under construction (photo 3-1). Discharge from Pond 1 flows into a drainage ditch along the southern downstream toe (photos 3-4 and 3-6).

2.4.1 Pond 3 - Embankments and Crest

Pond 3 has a diked configuration. Because survey data was not available and gauges are not located within the pond, freeboard was not able to be determined. Monitoring wells were observed along the northern and southern dikes (photos 3-8 and 3-9). Site personnel stated the wells are read semi-annually.

2.4.2 Pond 3 - Outlet Control Structure

Pond 3 has no outlet structure.

2.5 Pond 4 - Visual Observations

Pond 4 primarily contains flyash. At the time of AMEC's field inspection, the pond was receiving CCW. The inlet from the plant is located in the northeastern corner of the pond (photo 4-7). The eastern inner dike of the ash pond is shared with Pond 3. The northwestern portion of the pond is referred to as the "Settling Pond", and is separated from the remainder of Pond 4 by an interior dividing dike. The ponds northern, western, and southern dikes are contained within two perimeter dikes. The inner, larger dike is constructed of flyash, and the outer, smaller dike is constructed of clay. The dikes are divided by an approximately 10-feet wide ditch.

2.5.1 Pond 4 - Embankments and Crest

Pond 4 has a diked configuration. Freeboard in the settling pond was measured to be approximately 14-feet. The ponds northern, western, southern outer dikes are primarily surfaced with grass and vegetation (photos 4-11 and 4-13). Three monitoring wells were present along the crest, upstream toe, and downstream toe of the dividing dike between the Settling Pond and Pond 4 (photos 4-8, 4-9, and 4-12).

2.5.2 Pond 4 - Outlet Control Structure

The Pond 4 primary outlet is located within the western dike of the pond. The outlet is a 12-inch diameter plastic pipe (photo 4-14) which discharges into the dividing ditch between the inner ash dike, and outer clay dike. Flow travels along the dividing ditch to the Settling Pond. The settling pond contains a concrete structure which outlets into a 24-inch diameter galvanized steel pipe (photos 4-1 and 4-2). The decanted water outlets along the northern downstream toe (photo 4-3) and combines with discharge from Pond 1 (photo 4-4). The combined flow travels in a drainage ditch and discharges at NPDES permitted outfalls to the White River (photo 4-6).

2.6 Monitoring Instrumentation

During AMEC's site visit, six monitoring wells were observed at Ratts Generating Station. Monitoring well 7 was located along the northwestern downstream dike of Pond 2, (photo 2-1). Monitoring wells 4 and 6 were present at the southwest and northwest downstream toe of Pond 3 (photos 3-8 and 3-9). Three wells were located along the dividing dike between Pond 4 and the settling pond. One of the three wells was located along the crest, and the remaining two were along the upstream and downstream toe (photos 4-8, 4-9, and 4-12). Site personnel indicated the monitoring wells are read semi-annually.

3.0 DATA EVALUATION

3.1 Design Assumptions

This section provides a summary of accepted minimum design criteria for dams and impoundments with respect to hydrologic, hydraulic and stability design of those structures. Information, (methodology, design criteria, data, and analyses) provided to AMEC concerning hydrology and hydraulics, as well as structural adequacy and stability is then presented and compared to the accepted minimum industry criteria.

3.2 Hydrologic and Hydraulic Design

<u>IDNR</u>
Section 4, Hydrology and Hydraulics of *The General Guidelines for New Dams & Improvements to Existing Dams in Indiana* published on the IDNR website was referenced for hydrologic and hydraulic design parameters. The website states that "The intent of these guidelines is to provide direction to experienced dam design professionals so that the final product, the dam, is safe and the owner's investment in professional engineering is maximized."

The guidelines state that a spillway system is required which is capable of safely passing the runoff from the design storm event without the dam overtopping or failing. Typically, a dam will have a primary and emergency spillway. The combined capacities of the two spillways should be sufficient to pass runoff from the design storm without overtopping the dam. The magnitude of the design storm is determined by the hazard classification of the dam, which is determined by evaluating the areas which would be affected by inundation in the event of a dam failure.

In regard to design storm, section 4.2.3 Design Storm Events, states:

> *If the time of concentration (Tc) is less than 6 hours, the 6-hour Probable Maximum Precipitation (PMP) should be used to analyze the spillway system. If the Tc exceeds 6 hours, the design storm duration is increased to a time equal to or greater than the Tc. This increases the PMP depth to account for the longer storm duration. All season 6-hour, 10 square mile PMP isohyetals and 24-hour, 10 square mile PMP isohyetals for the state can be found in Appendix D and in the latest edition of the Indiana Department of Natural Resources (IDNR)- Division of Water Publication "Rainfall Frequency for Indiana." The definition of the PMP rainfall event and its computation are discussed in the Department of Commerce Hydrometerological Report (HMR) No. 52. If the watershed is greater than 10 square miles, the PMP depth may be reduced using procedures outlined in Hydrometerological Report (HMR) No. 51.*

Minimum Design Flood as defined by IDNR includes the following, listed in Table ##:

Table 4. Minimum Design Flood Criteria

Dams' Hazard Classification	Design Storm Event	Remarks
High	100% PMP	For existing dams, a smaller design storm between 50% and 100% PMP may be justified through an elaborate Incremental Hazard Evaluation procedure described in TADS module "Evaluation of Hydrologic Adequacy".[1]
Significant	50% PMP	
Low	100-Year to 50% PMP	The spillway design storm requirements may vary from the 100-Year storm (for in-channel, low head dams which will be completely inundated by the 100-Year storm event) to the 50% PMP (for normal situations, where the downstream hazard is likely to increase from low to significant in the future). A smaller percentage of PMP may be accepted by the Division of Water on a case by case basis, if the consequences dam failure can be demonstrated to be negligible or assurance in the form of a deed restriction , covenant, etc. is provided to the Division of Water prohibiting new development within the dam breach inundation zone.

Note 1: Information regarding this publication may be obtained from the Division of Water. The owner and engineer should recognize that dam construction typically results in higher risks. If an Incremental Hazard Evaluation procedure is utilized, the owner should periodically evaluate the downstream area to determine if this evaluation is accurate as new development takes place. The owner may eventually be required to modify the dam and spillway to pass the runoff of the 100% PMP, if such analysis indicates that the earlier results are no longer valid due to new development occurring downstream.

In regard to freeboard, section 4.5 of the Guidelines, IDNR states that the spillway system should be capable of passing the design storm without overtopping the dam. The engineer should evaluate the characteristics of the reservoir to determine if freeboard is required. When appropriate the effects of wave action should be analyzed. On rare occasions, the dam may be allowed to overtop during the design storm.

Mine Safety and Health Administration

Chapter 8 - "Impoundment Design Guidelines" of the Mining Safety and Health Administration (MSHA) *Coal Mine Impoundment Inspection and Plan Review Handbook* (Number PH07-01) published by the U.S. Department of Labor, Mine Safety and Health Administration, Coal Mine Safety and Health, October 2007 provides another source for minimum hydrologic design criteria.

When detailing impoundment design storm criteria, MSHA states that dams need "to be able to safely accommodate the inflow from a storm event that is appropriate for the size of the impoundment and the hazard potential in the event of failure of the dam." Additionally, MSHA notes that sufficient freeboard, adequate factors of safety for embankment stability, and the prevention of significant erosion to discharge facilities, are all design elements that are required for dam structures under their review. Additional impoundment and design storm criteria are as shown in Table 3, MSHA Minimum Long Term Hydrologic Design Criteria.

Table 5. MSHA* Minimum Long Term Hydrologic Design Criteria

Hazard Potential	Impoundment Size	
	< 1000 acre-feet < 40 feet deep	**≥ 1000 acre-feet ≥ 40 feet deep**
Low - Impoundments located where failure of the dam would result in no probable loss of human life and low economic and/or environmental losses.	100 - year rainfall**	½ PMF
Significant/Moderate - Impoundments located where failure of the dam would result in no probably loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities.	½ PMF	PMF
High - Facilities located where failure of the dam will probably cause loss of human life.	PMF	PMF

*Mining Safety and Health Administration (MSHA) Coal Mine Impoundment Inspection and Plan Review Handbook (Number PH07-01) published by the U.S. Department of Labor, Mine Safety and Health Administration, Coal Mine Safety and Health, October 2007
**Per MSHA, the 24-hour duration shall be used with the 100-year frequency rainfall.

Probable maximum flood (PMF) is, per MSHA, "the maximum runoff condition resulting from the most severe combination of hydrologic and meteorological conditions that are considered reasonably possible for the drainage area." Additionally, MSHA notes the designer should consider several components of the PMF that are site specific. These components include: "antecedent storm; principal storm; subsequent storm; time and spatial distribution of the rainfall and snowmelt; and runoff conditions." Basic agreement, it was noted, exists between dam safety authorities regarding "combinations of conditions and events that comprise the PMF;" however, there are "differences in the individual components that are used." MSHA provided the following as a "reasonable set of conditions for the PMF:

- Antecedent Storm: 100-year frequency, 24 hour duration, with antecedent moisture condition II (AMC II), occurring 5 days prior to the principal storm.
- Principal Storm: Probable maximum precipitation (PMP), with AMC III. The principal storm rainfall must be distributed spatially and temporally to produce the most sever conditions with respect to impoundment freeboard and spillway discharge.
- Subsequent Storm: A subsequent storm is considered to be handled by meeting the "storm inflow drawdown criteria," as described subsequently in the document.

With regard to subsequent storms, MSHA Impoundment Design Guidelines noted that:

> *Impoundments must be capable of handling the design storms that occur in close succession. To accomplish this, the discharge facilities must be able to discharge, within 10 days, at least 90 percent of the volume of water stored during the design storm above the allowable*

normal operating water level. The 10-day drawdown criterion begins at the time the water surface reaches the maximum elevation attainable for the design storm. Alternatively, plans can provide for sufficient reservoir capacity to store the runoff from two design storms, while specifying means to evacuate the storage from both storms in a reasonable period of time – generally taken to be at a discharge rate that removes at least 90% of the second storm inflow volume within 30 days . . . . When storms are stored, the potential for an elevated saturation level to affect the stability of the embankment needs to be taken into account.

In Mineral Resources Department of Labor Mine Safety and Health Administration Title *30 CFR § 77.216-2 Water, sediment, or slurry impoundments and impounding structures; minimum plan requirements; changes or modifications, certification*, information relevant to the duration of the probable maximum precipitation is given. Sub-section *(10)* of *77.216-2* states that a "statement of the runoff attributable to the probable maximum precipitation of 6-hour duration and the calculations used in determining such runoff" shall be provided at minimum in submitted plans for water, sediment, or slurry impoundments and impounding structures.

The definition of design freeboard, according to the MSHA Guidelines, is "the vertical distance between the lowest point on the crest of the embankment and the maximum water surface elevation resulting from the design storm." Additionally, the Handbook states that "sufficient documentation should be provided in impoundment plans to verify the adequacy of the freeboard." Recommended items to consider when determining freeboard include "potential wave run-up on the upstream slope, ability of the embankment to resist erosion, and potential for embankment foundation settlement." Lastly, the Handbook states, "without documentation, and absent unusual conditions, a minimum freeboard of 3 feet is generally accepted for impoundments with a fetch of less than 1 mile."

3.2.1 Pond 1 - Hydrologic and Hydraulic Design

Pond 1 is not classified by IDNR, therefore, Hoosier Energy is not required by the state of Indiana to provide a hydrologic and hydraulic design for the ash pond that meets regulatory criteria.

Based on size, Pond 1 qualifies for the first, smaller category as defined by MSHA. The Handbook states that a low hazard potential dam (as assigned by AMEC) that is sized such that it falls within the ranges of the smaller category shall use precipitation from the 100-year storm for hydrologic and hydraulic design purposes.

Hoosier Energy provided a Water Mass Balance Diagram to illustrate the flows entering Pond 1. The diagram indicates 193 x 10^3 gallons per day (GPD) and 2,020 x 10^3 GPD of bottom ash sluice enters the pond, as average and peak daily flows, respectively.

3.2.2 Pond 2 - Hydrologic and Hydraulic Design

Pond 2 is not classified by IDNR, therefore, Hoosier Energy is not required by the state of Indiana to provide a hydrologic and hydraulic design for the ash pond that meets regulatory criteria.

Based on size, Pond 2 qualifies for the first, smaller category as defined by MSHA. The Handbook states that a low hazard potential dam (as assigned by AMEC) that is sized such that it falls within the ranges of the smaller category shall use precipitation from the 100-year storm for hydrologic and hydraulic design purposes.

No hydrologic or hydraulic data was provided for Pond 2.

3.2.3 Pond 3 - Hydrologic and Hydraulic Design

Pond 3 is not classified by IDNR, therefore, Hoosier Energy is not required by the state of Indiana to provide a hydrologic and hydraulic design for the ash pond that meets regulatory criteria.

Based on size Pond 3qualifies for the first, smaller category as defined by MSHA. The Handbook states that a low hazard potential dam (as assigned by AMEC) that is sized such that it falls within the ranges of the smaller category shall use precipitation from the 100-year storm for hydrologic and hydraulic design purposes.

No hydrologic or hydraulic data was provided for Pond 2.

3.2.4 Pond 4 - Hydrologic and Hydraulic Design

Pond 4 is not classified by IDNR, therefore, Hoosier Energy is not required by the state of Indiana to provide a hydrologic and hydraulic design for the ash pond that meets regulatory criteria.

Based on size Pond 4qualifies for the first, smaller category as defined by MSHA. The Handbook states that a significant hazard potential dam (as assigned by AMEC) that is sized such that it falls within the ranges of the smaller category shall use precipitation from the ½ PMF storm for hydrologic and hydraulic design purposes.

Hoosier Energy provided a Water Mass Balance Diagram to illustrate the flows entering Pond 4. The diagram indicates average and peak daily flows of 1710 x 10^3 GPD and 3030 x 10^3 GPD, respectively. The flow includes flyash sluice, waste from floor drains, and periodically generated metal cleaning wastes.

3.3 Structural Adequacy & Stability

The *Indiana Dam Safety Inspection Manual*, updated in 2007 and developed for the Indiana's Department of Natural Resources (IDNR), provides valuable information regarding all aspects of dam planning, design, construction, and management. *Indiana Code (IC) 14-27-7.5* provides information regarding Regulation of Dams that are located in the state. Acceptable factors of safety are not identified by Indiana safe dam laws; however, *IC 14-27-7.5-7*, requires that "the owner of a structure (dam) shall maintain and keep the structure in the state of repair and operating condition required by the following: (1) the exercise of prudence, (2) due regard for life and property, and (3) the application of sound and accepted technical principles."

Two well regarded sources for embankment design and evaluation criteria include The United States Army Corps of Engineers (USACE) and the United States Mine Safety and Health Administration (MHSA). Minimum recommended factors of safety for different loading conditions can be found in those agency publications, as shown in Table __ shown below.

Table 6. Minimum Stability Factors of Safety

Loading Condition	MSHA[1]	USACE[2]
Rapid Drawdown	1.3	1.1[3] – 1.3[4]
Long-Term Steady Seepage	1.5	1.5
Earthquake Loading	1.2	---[5]

1 Coal Mine Impoundment Inspection and Plan Review Handbook, 2007, US Mine Safety and Health Administration
2 Slope Stability Publication, EM1110-2-1902, 2003, US Army Corps of Engineers, Table 3-1: New Earth and Rock-Fill Dams
3 Applies to drawdown from maximum surcharge pool
4 Applies to drawdown from maximum storage pool
5 Referred to USACE Engineer Circular "Dynamic Analysis of Embankment Dams" document that is still in preparation

To analyze the structural adequacy and stability of the ash ponds at Ratts Generating Station, AMEC reviewed stability analysis material provided by Hoosier Energy with respect to the load cases shown in Table 6. Factors of safety documented in the provided material were compared with those factors outlined in the table to help determine whether the impoundments meet the requirements for acceptable stability.

3.3.1 Pond 1 - Structural Adequacy & Stability

No stability analyses were provided for Ratts Generating Station Pond 1.

3.3.2 Pond 2 - Structural Adequacy & Stability

No stability analyses were provided for Ratts Generating Station Pond 2.

3.3.3 Pond 3 - Structural Adequacy & Stability

No stability analyses were provided for Ratts Generating Station Pond 3.

3.3.4 Pond 4 - Structural Adequacy & Stability

FMSM Engineers completed a study entitled *Report of Slope Stability Evaluation Perimeter Dikes for Ash Pond 003, Ratts Generating Station*, dated January 31, 2007. This report provided results of a geotechnical exploration and slope stability evaluation for Ash Pond 4, which includes the active ash pond and the adjacent settling pond.

The report determined that the slopes on Pond 4 did not meet minimum criteria. The slopes were regraded and the recalculated factors of safety were determined. The recalculated factors of safety are shown in the Table 7.

Table 7. Slope Stability Analysis Results - Regrading Concept with Drainage Berm for Inner Ash Dike (Pool Raised to Elevation 432 feet)

Cross Section	Loading Condition	Circle ID[1]	Regraded Factor of Safety	Target Factor of Safety[2]
A-A' Downstream Slope Face	Long Term	A	1.5	1.5
	Rapid Drawdown	B	1.4	1.1
	Post-Earthquake	C	1.1	1.1
A-A' Upstream Slope Face	Long Term	D	1.5	1.5
B-B' Downstream Slope Face	Long Term	A	1.6	1.5
	Rapid Drawdown	B	1.4	1.1
	Post-Earthquake	C	1.3	1.1
B-B' Upstream Slope Face	Long Term	D	1.5	1.5

1 Circle ID refers to stability analyses failure surfaces, as shown on cross section A-A' and B-B' included in Appendix D.
2 Target factors of safety selected based on discussions between FMSM and Indiana Department of Natural Resources regarding minimum acceptable values.

We note, however, that ½ of the PMP flood elevation was not used in the stability analyses, and we, therefore, recommend that the analyses be updated with the appropriate flood elevation. Furthermore, we recommend that the analysis methodology be thoroughly documented along with references and procedures for any soil strength reduction.

2009 Stability Model Update
A report dated January 15, 2009, entitled *Ash Pond Dike Improvements* prepared by Stantec Consulting Services, Inc. references a stability model update. Although not referenced in the report, AMEC assumes Stantec is referring to the January 2007 slope stability analyses. The report states that Hoosier Energy requested Stantec review the stability of the dikes to determine if a pool level in the pond could be increased to elevation 432 feet. AMEC notes that according to provided documentation from Hoosier Energy, the January 2007 Stantec report evaluated this condition.

Stantec performed a bathometric survey and determined the pond was already operating at elevation 432 feet. To reduce the potential for a potential slope stability failure at this elevation, a rock blanket was recommended along the downstream face. Additionally, to obtain more accurate results from the slope stability model, Stantec installed five piezometers along two critical sections in the active ash pond dike. Stantec states, "The stability model update indicated increased long term factors of safety than previously calculated using the assumed phreatic levels." No calculations or water level readings were provided to document this conclusion.

3.4 Foundation Conditions

The 2007 FMSF report describes the foundation conditions. The report states that beneath both dikes all but two (D-1 and D-2) of the nine borings native clays grading into sands were encountered. In borings D-1 and D-2, native sands were encountered immediately below the dike materials.

3.5 Operations and Maintenance

Hoosier Energy states that on-site personnel perform safety and surveillance inspections for the ash ponds on a monthly basis. According to the October 31, 2007 Compliance Plan provided by Hoosier Energy pertaining to a breach of Ash Pond 3, "Prior to the breach, property walk-downs were done on a quarterly basis. As part of our corrective ash pond system, property inspections will be one on a monthly basis." Hoosier Energy's March 2009 response to EPA's information request states that inspections and monitoring of the ash ponds is completed on a quarterly basis.

Property inspections for the ash ponds dated from March 10, 2005 to August 5, 2010 were provided for review. The inspection forms include a one-page work order, and a three-page property inspection checklist. The "Property Inspection" checklist includes several areas of the plant for the inspector to observe. The areas include, property marking signs, Ash Pond 004, Flyash Pond & Annex, Ash Pond 003, and Levee. Beneath each inspection area individual line items are listed, the inspector is to check a column for either "present" or "absent". In terms of the ash ponds, line items partially include "perimeter erosion," "obstructions in ash water flow", "noxious weeds," and "obstructions in drainage ditch." Four completed inspection forms were provided for the years 2005, 2006, and 2007. Provided records indicate in 2008 three inspections were completed, two inspections were completed in 2009, and as of August 2010, six inspections were performed. In many cases, only partial documentation of the inspection was provided, this included the work order without the corresponding checklist, or a partial checklist without the work order.

3.5.1 Instrumentation

An April 2008 report entitled Ash *Management Plan for Pond Closure, Ash Management Report*, completed by Burns & McDonnell discusses a limited geotechnical study including four borings along the south and west dikes of Pond 4. As part of the study ATC Associates Inc. was contracted to install four piezometers. Piezometers (PZ-1 and PZ-2) were installed in areas of known seeps along the west dike of Pond 4. PZ-3 was located in the south dike where no seepage has been observed. PZ-4 was installed approximately 100 feet from the outside toe of the west dike in an area of known seepage. The report references an "Exhibit 1A" for piezometer locations, however this was not provided to AMEC. Burns & McDonnell state only four piezometers were installed during the geotechnical study; however provided well logs indicate five piezometers were installed. Well logs indicate a bentonite seal, sand pack, and 10-foot pvc slotted screen was included in each borehole. Table ##, references piezometer water levels.

Table 8. Burns McDonnell 1998 Study Ash Pond 4 Piezometer Data

Piezometer	Date Installed	Screen Depth (ft, BSG)	November 26, 1997	December 12, 1997	February 2, 1998
			Depth (ft)	Depth (ft)	Depth (ft)
PZ-1	11/13/97	15-27	NA	NA	26' 10"
PZ-2	11/13/97	15-27	NA	NA	27' 4"
PZ-3	11/13/97	15-27	13	12' 9"	12' 10"
PZ-4	11/13/97	7-19	13	12' 4"	9' 8"
PZ-5	11/13/97	0.5-11	13	11' 4"	10

BSG - Below Subgrade

A report dated January 15, 2009, entitled Ash Pond Dike Improvements" prepared by Stantec Consulting Services, Inc. states that:

To obtain more accurate results from the slope stability model, Stantec installed five piezometers along two critical sections in the active ash pond dike. No drawings were provided to indicate piezometer locations. The piezometers were installed to an elevation ten feet below the level where water was initially encountered (AMEC assumes this is referring to borings completed in 2007) in each boring. Over a three week period, additional piezometer readings were taken, generally indicating phreatic surfaces lower than previously assumed.

3.5.2 Inspections

State Inspections
Ratts Generating Station is not regulated by IDNR, therefore no inspections of the ash ponds have been completed by the state.

2009 Inspection
Hoosier Energy's March 2009 response to EPA's Request for information indicates that "A full inspection of the ash pond dikes was conducted by an outside engineering firm with results presented to Hoosier Energy on January 31, 2007 . . . . The work was performed by professional engineers from the Fuller, Mossbarger, Scott and May Engineers, Inc (now Stantec)".

FMSM's 2007 report states that the "dikes evaluated for this study form the westernmost ash pond" or Pond 4. During the site visit, FMSM engineers noted signs of instability along both the inner and outer ash dike slopes. This primarily consisted of shallow surface sloughing along the slope faces, where the slopes appeared steeper, or where groundwater was present near the embankment toe. Observed groundwater levels were consistent with pool levels within the pond. Some signs of erosion were noted along the ash dike. No signs or erosion of surface sloughing was noted along the outer clay dike.

4.0 COMMENTS AND RECOMMENDATIONS

Condition assessment definitions, as accepted by the National Dam Safety Review Board, are as follows:

<u>SATISFACTORY</u>

No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.

<u>FAIR</u>

No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.

<u>POOR</u>

A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

<u>UNSATISFACTORY</u>

A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

<u>NOT RATED</u>

The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

4.1 Acknowledgement of Management Unit Conditions

I certify that the management units referenced herein (Pond 1, Pond 2, Pond 3, and Pond 4) were personally assessed by me and were found to be in the following condition: **<u>Poor</u>**

Pond 1, Pond 2, Pond 3, and Pond 4 are rated poor due to lack of critical analyses which would verify the units would be stable under required loading conditions. At Pond 4, ½ of the PMP should be used in the analyses.

4.2.1 Hydrologic and Hydraulic Recommendations

AMEC recommends that an appropriate design storm rainfall and freeboard depth in accordance with MSHA guidelines be applied to the impoundment„s watershed to assess whether the dams and decant systems can safely store, control, and discharge the design flow. Based on the size and rating for the Ponds 1, 2, and 3, the MSHA design storm would be the 100-year storm. Based on the size and rating for Pond 4, the MSHA design storm would be the

½ PMF. Hydraulic calculations should also be completed to determine the rate at which the discharge structure and associated piping could pass the design storm, if necessary, or draw down elevated water surfaces following such an event. The analysis should consider all critical stages over the life of the pond including full pond conditions.

4.2.2 Geotechnical and Stability Recommendations

AMEC recommends that a stability analyses be completed for Pond 1, 2, 3, and 4 that includes the maximum design water levels and appropriate steady-state phreatic surfaces. Likewise, the stability analyses should consider all critical stages during the life of the facility, such as maximum pool area and any potential surcharges, as well as likely loading combinations. AMEC recommends that the slope stability analyses include slip surface optimization to allow for noncircular failure surfaces.

4.2.3 Monitoring and Instrumentation Recommendations

AMEC recommends additional instrumentation to monitor slope stability and landslide conditions. In order to monitor these parameters, Hoosier Energy should install combination slope inclinometers and additional piezometers in the river side dike of each ash pond. These instruments may be installed within the same borehole. Routine monitoring should be established with corresponding elevations within the ash ponds at the time of the measurement in order to establish an understanding of the embankment behavior.

In order to monitor change of water surface, a gauge should be added to Ponds 1 and 4. Routine monitoring should be established and read in conjunction with slope inclinometer and piezometer readings.

4.2.4 Inspection Recommendations

Hoosier Energy plant personnel state they currently perform quarterly inspections of the ash ponds. Although inspections by Hoosier Energy is commendable, a more detailed and documented record would be appropriate. AMEC recommends that the current inspection program by the plant be expanded to include inspections which identify potential problems, areas inspected, instrumentation monitoring (when installed), and pond and river levels. Inspections of the ponds should be performed after significant rainfall events.

AMEC understands a Professional Engineer performed an inspection in 2007. We recommend this type of inspection program and report by a Professional Engineer be continued at least annually, in addition to the recommended monthly inspections by facility personnel.

4.2.5 Vegetation Removal

Due to heavy vegetation including tall grasses, brush, and trees, AMEC could not readily evaluate the embankments. AMEC recommends the trees and brush be removed from the interior and exterior embankment slopes. Additionally, any animal burrows should be located and filled.

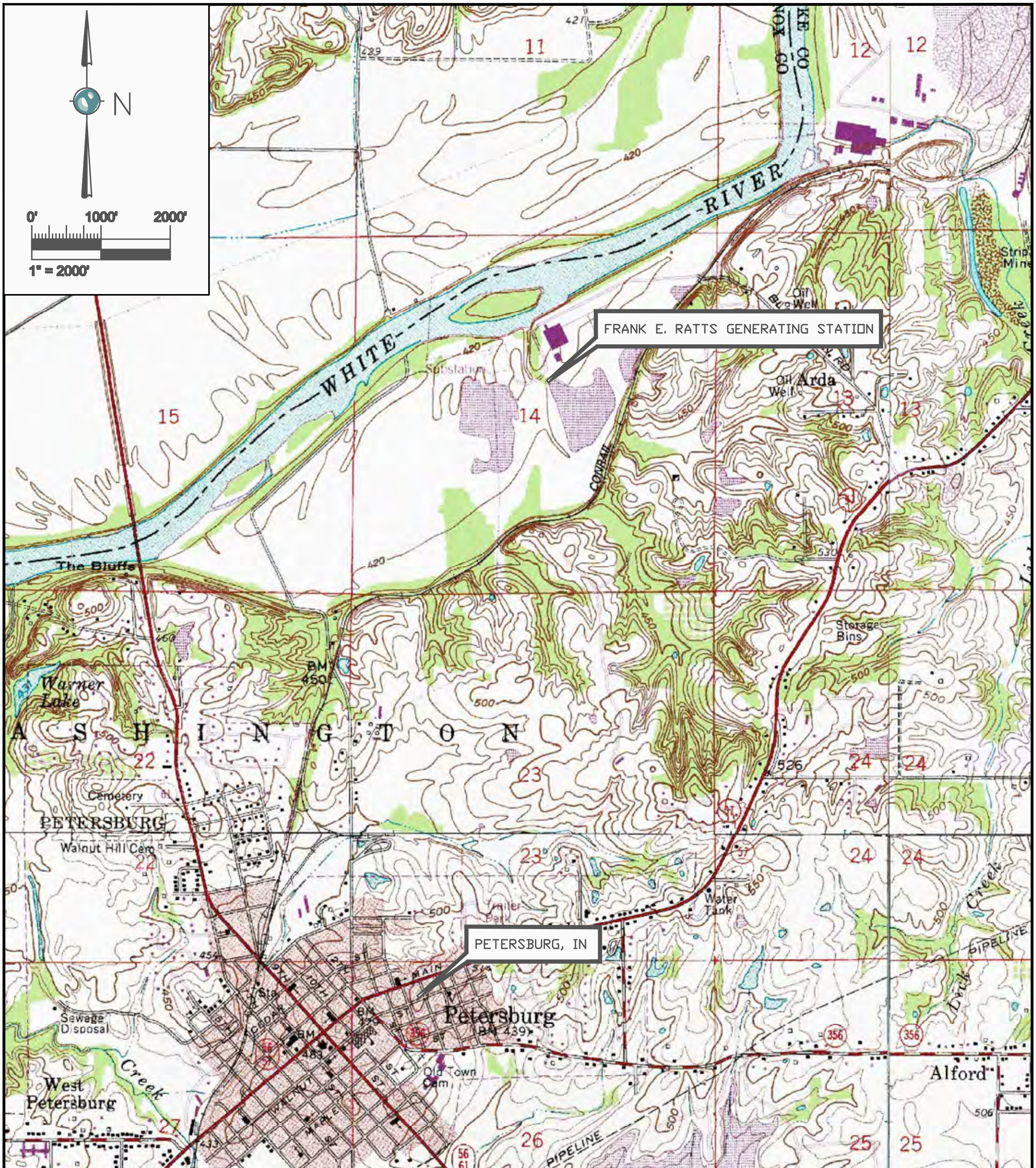
5.0 CLOSING

This report is prepared for the exclusive use of the Environmental Protection Agency for the site and criteria stipulated herein. This report does not address regulatory issues associated with storm water runoff, the identification and modification of regulated wetlands, or ground water recharge areas. Further, this report does not include review or analysis of environmental or regional geo-hydrologic aspects of the site, except as noted herein. Questions or interpretation regarding any portion of the report should be addressed directly by the geotechnical engineer.

Any use, reliance on, or decisions to be made based on this report by a third party are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions and recommendations given in this report are based on visual observations, our partial knowledge of the history of Ratts Generating Station impoundments, and information provided to us by others. This report has been prepared in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

FIGURES



AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 9/20/10
TITLE HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN SITE LOCATION & VICINITY MAP	CHK'D BY: MSC	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE: AS SHOWN	FIGURE No. 1

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

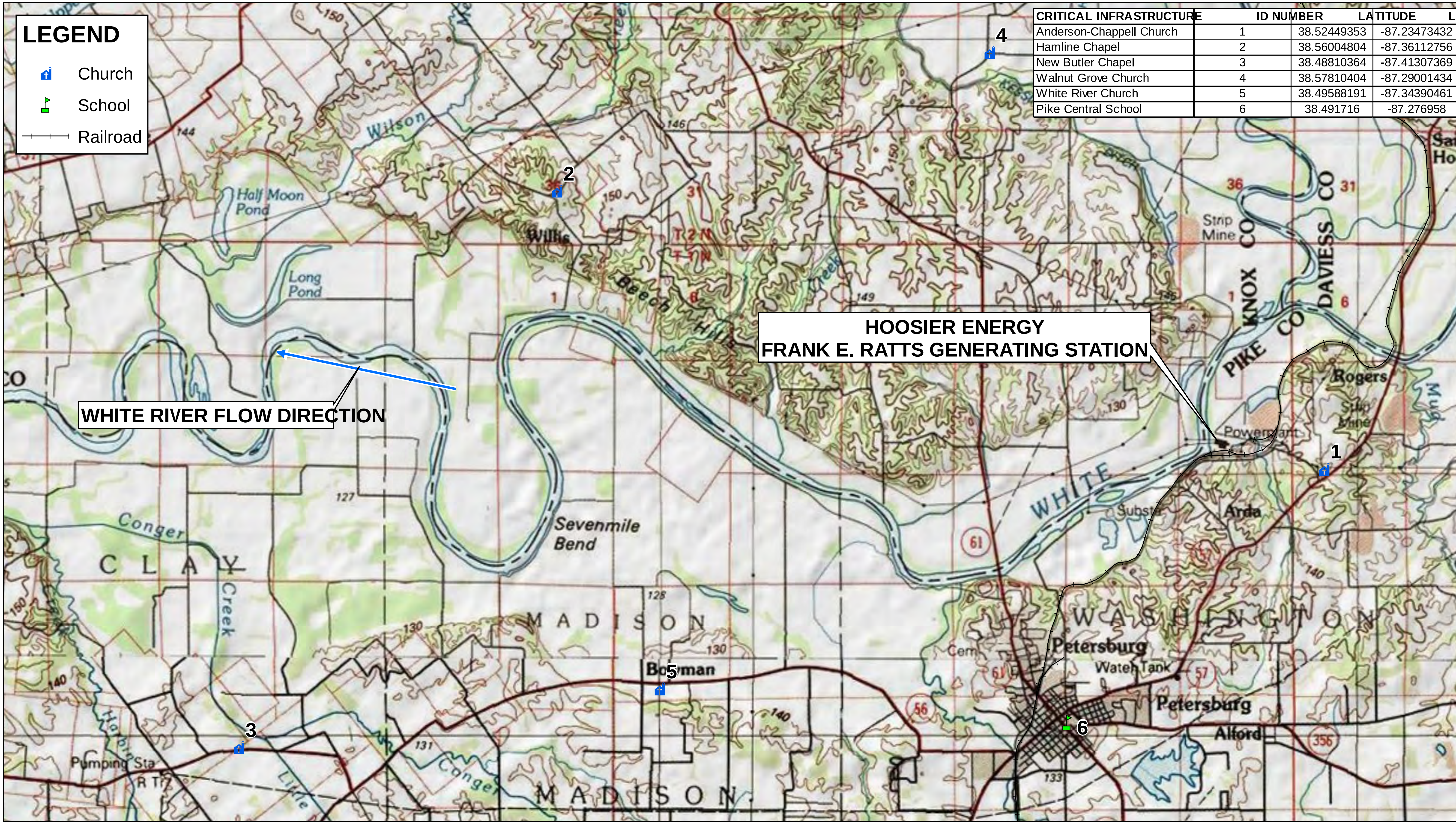
AMEC Earth & Environmental
690 Commonwealth Business Center
11003 Bluegrass Parkway
Louisville, KY 40299

DWN BY:	DJC
CKD BY:	MS
Datum:	NAD 83
Projection:	IN SPC W
Scale:	As Shown

ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

HOOSIER ENERGY
FRANK E. RATTS GENERATING STATION,
PETERSBURG, IN
SITE PLAN

REV. No.:	A
Date:	9-15-10
Project No:	3-2106-0177-0005
Figure No:	2



CRITICAL INFRASTRUCTURE	ID NUMBER	LATITUDE	LONGITUDE
Anderson-Chappell Church	1	38.52449353	-87.23473432
Hamline Chapel	2	38.56004804	-87.36112756
New Butler Chapel	3	38.48810364	-87.41307369
Walnut Grove Church	4	38.57810404	-87.29001434
White River Church	5	38.49588191	-87.34390461
Pike Central School	6	38.491716	-87.276958

amec

AMEC Earth & Environmental
690 Commonwealth Business Center
11003 Bluegrass Parkway
Louisville, KY 40299

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

DRAWN BY: DJC
CHK'D BY: MS
DATUM: NAD83
PROJECTION: Albers
SCALE: AS SHOWN
DATE: 8/19/2010

ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

HOOSIER ENERGY
FRANK E. RATTS GENERATING STATION, PETERSBURG, IN
CRITICAL INFRASTRUCTURE

N

0 1 Miles

0 1 Kilometers

Notes: Critical infrastructure data provided by ESRI

FIGURE
3

SOURCE: "SITE PLAN-BORING LAYOUT" HOOSIER ENERGY RATTS GENERATING STATION - DIKE EVALUATION PETERSBURG, PIKE COUNTY, INDIANA" PREPARED BY FMSM ENGINEERS, DATED JANUARY 2007

NOTE: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE AMEC EARTH & ENVIRONMENTAL REPORT

CLIENT LOGO

CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

amec

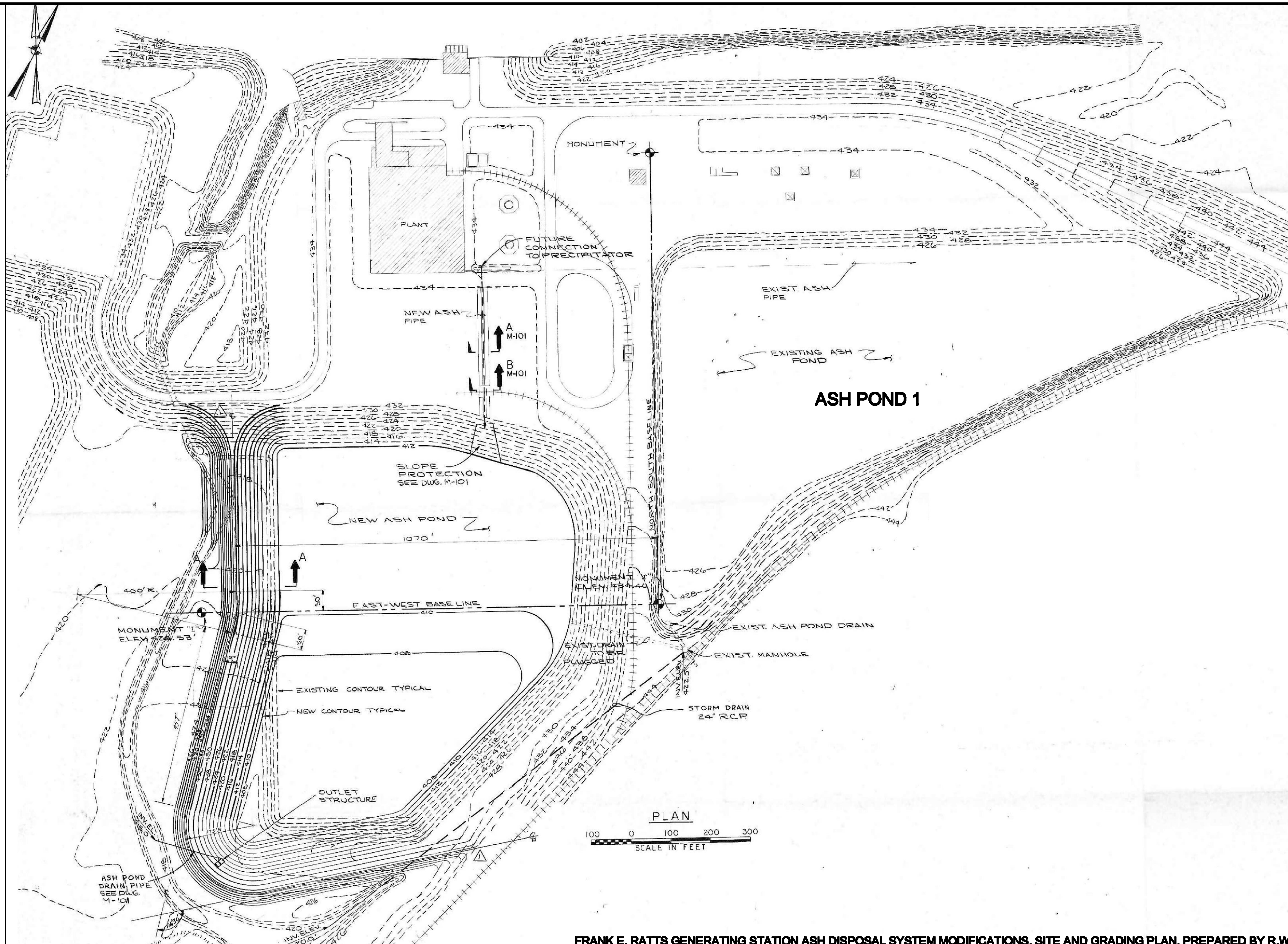
DWN BY: CAE
CHK'D BY: MGS
DATUM:
PROJECTION:
SCALE: AS SHOWN

PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE: HOOSIER ENERGY
FRANK E. RATTS GENERATING STATION, PETERSBURG, IN
PLAN VIEW OF PONDS 2,3 AND 4, 2007 SLOPE STABILITY CROSS-SECTIONS AND BORING LOCATIONS

DATE: 9/17/10
PROJECT NO: 3-2106-0177-0005
REV. NO.:
FIGURE No. 4

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\EPA CCW June Round 6\Hoosier – Ratts\CAD GIS Files\rattsFIG4.dwg – Layout1 – Sep. 17, 2010 1:58pm – chris.eger



FRANK E. RATTS GENERATING STATION ASH DISPOSAL SYSTEM MODIFICATIONS, SITE AND GRADING PLAN, PREPARED BY R.W. BECK AND ASSOCIATES, DATED MARCH 19, 1975

NOTE: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE AMEC EARTH & ENVIRONMENTAL REPORT

CLIENT LOGO

CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

amec

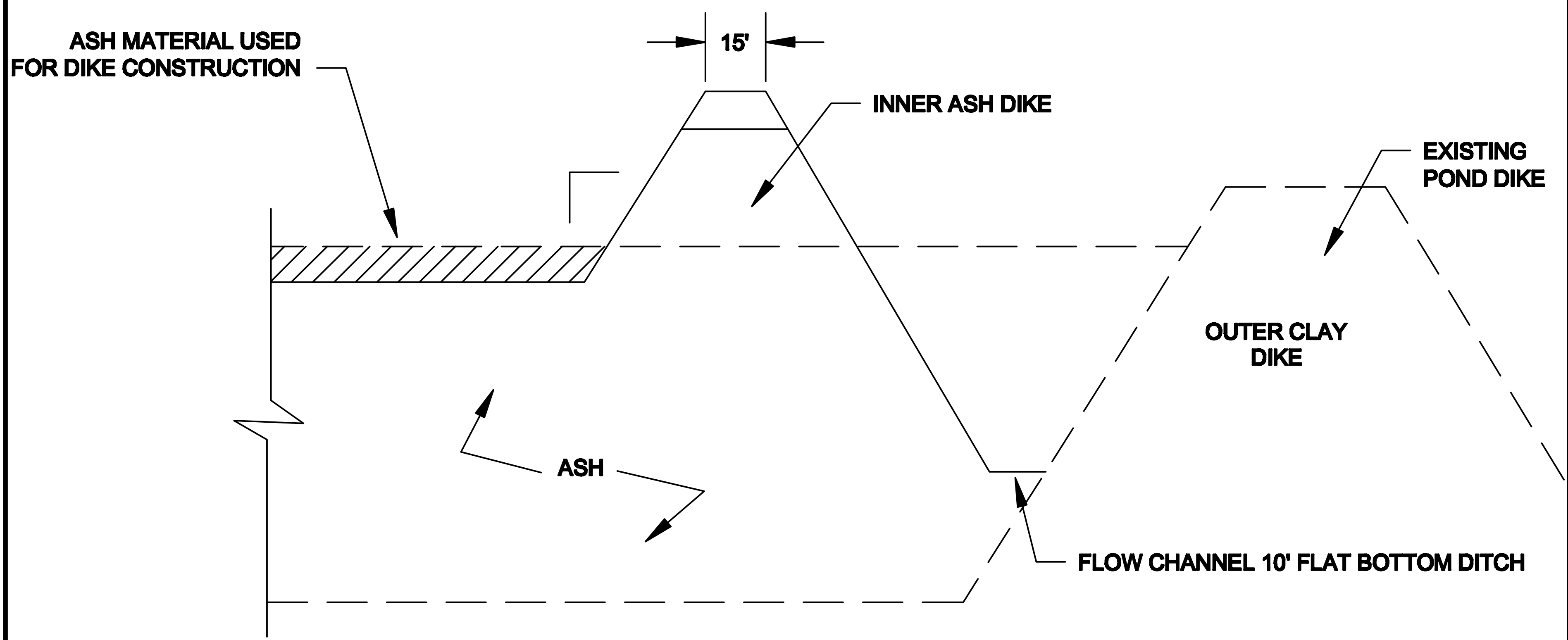
DWN BY:	CAE
CHK'D BY:	MGS
DATUM:	
PROJECTION:	
SCALE:	AS SHOWN

PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE: HOOSIER ENERGY
FRANK E. RATTS GENERATING STATION, PETERSBURG, IN
PLAN VIEW OF POND 1

DATE:	9/17/10
PROJECT NO:	3-2106-0177-0005
REV. NO.:	
FIGURE No.	5

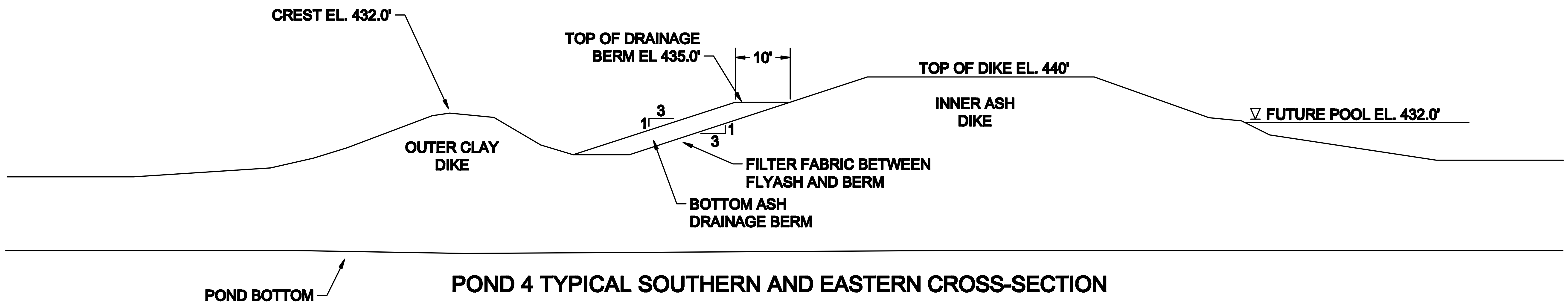
S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\EPA CCW June Round 6\Hoosier – Ratts\CAD GIS Files\rattsFIG5.dwg – Layout1 – Sep. 20, 2010 2:01pm – chris.eger



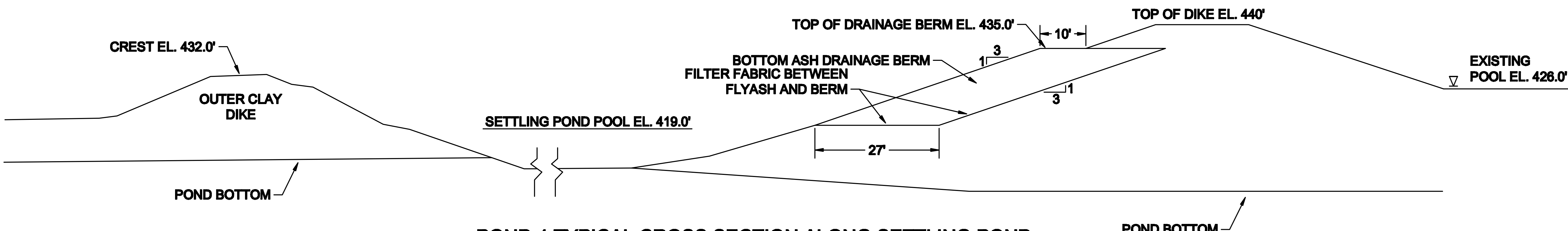
SOURCE: "ASH POND SECTIONS EXHIBIT 3" PREPARED BY BURNS & McDONNELL, DATED JANUARY 28, 1997

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	DWN BY: CAE CHK'D BY: XXX	PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	REV. NO.: A DATE: 9/20/10
AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	DATUM: PROJECTION: SCALE: NOT TO SCALE	TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN TYPICAL OUTER DIKE CROSS SECTION FOR POND 2 AND 3	PROJECT NO: 3-2106-0177-0005 FIGURE No. 6

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\EPA CCW June Round 6\Hoosier – Ratts\CAD GIS Files\rattsFIG6.dwg – Layout2 – Sep. 20, 2010 1:29pm – chris.eger



POND 4 TYPICAL SOUTHERN AND EASTERN CROSS-SECTION



POND 4 TYPICAL CROSS SECTION ALONG SETTLING POND

SOURCE: "STABILITY SECTION B-B` AND C-C` FOR HOOSIER ENERGY RATTS GENERATING STATION - DIKE EVALUATION PETERSBURG, PIKE COUNTY, INDIANA" PREPARED BY FMSM ENGINEERS, DATED JANUARY 2007

NOTE: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE AMEC EARTH & ENVIRONMENTAL REPORT

CLIENT LOGO

CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

DWN BY:	CAE
CHK'D BY:	MGS
DATUM:	
PROJECTION:	
SCALE:	AS SHOWN

PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE: HOOSIER ENERGY
FRANK E. RATTS GENERATING STATION, PETERSBURG, IN
POND 4 - TYPICAL CROSS SECTIONS

DATE:	9/17/10
PROJECT NO:	3-2106-0177-0005
REV. NO.:	
FIGURE No.	7

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\EPA CCW June Round 6\Hoosier – Ratts\CAD GIS Files\rattsFIG7.dwg – Layout1 – Sep. 20, 2010 1:38pm – chris.eger

APPENDICES

APPENDIX A
Waste Impoundment Inspection Forms

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Ratts Generating Station | Date: August 19, 2010

Unit Name: Pond 1 | Operator's Name: Hoosier Energy

Unit I.D.: | Hazard Potential Classification: High Significant **Low**

Inspector's Name: Don Dotson, P.E., Mary Swiderski, EIT

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?	Monthly		18. Sloughing or bulging on slopes?	unknown	
2. Pool elevation (operator records)?	430.2		19. Major erosion or slope deterioration?	unknown	
3. Decant inlet elevation (operator records)?	429.2		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?	undetermined	
5. Lowest dam crest elevation (operator records)?	433.0		Is water exiting outlet, but not entering inlet?	undetermined	
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
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)?	unknown		From underdrain?	unknown	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?	unknown	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	unknown	
11. Is there significant settlement along the crest?		X	Over widespread areas?	unknown	
12. Are decant trashracks clear and in place?		X	From downstream foundation area?	unknown	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?	unknown	
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?	unknown	
15. Are spillway or ditch linings deteriorated?	unknown		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	unknown		23. Water against downstream toe?		X
17. Cracks or scarps on slopes?	unknown		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
8	No records available.
9	Maximum tree size – greater than 12 inch diameter.
15, 17, 18, 19, 21	Not visible due to heavy vegetation
16, 20	Outlet from pond is submerged, not visible.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # IN0004391

Date August 19, 2010

INSPECTOR Don Dotson P.E/ Mary Swiderski

Impoundment Name Pond 1

Impoundment Company Hoosier Energy Ratts Generating Station

EPA Region 5

State Agency (Field Office) Address

100 North Senate Avenue
Indianapolis, IN 46204

Name of Impoundment Pond 1

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

New x Update ______

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

IMPOUNDMENT FUNCTION: Bottom ash settling pond

Nearest Downstream Town : Name Petersburg, IN

Distance from the impoundment 1.5 miles

Impoundment

Location: Longitude -87 Degrees 15 Minutes 48.5 Seconds

Latitude 38 Degrees 31 Minutes 10.4 Seconds

State IN County Pike

Does a state agency regulate this impoundment? YES ______ NO X

If So Which State Agency? -

<u>HAZARD POTENTIAL</u> (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.

__X__**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.

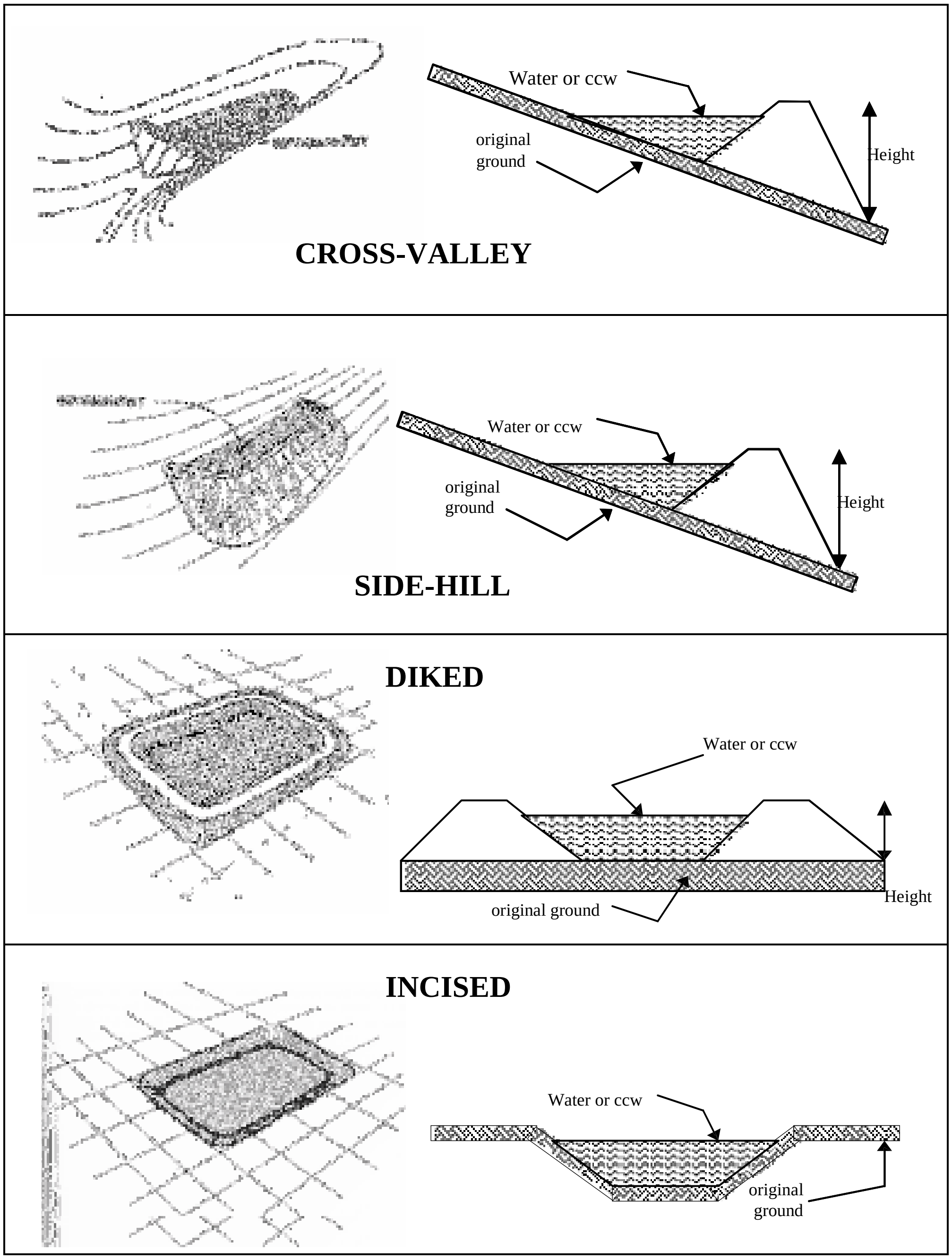
______**SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

- Significant Distance from the White River, reduces likelihood of contamination.
- Incised configuration reduces probability of failure, and limits extent of environmental impact.

CONFIGURATION:



______Cross-Valley
______Side-Hill
______Diked
__X__Incised (form completion optional)
______Combination Incised/Diked

Embankment Height __unknown__feet   Embankment Material_ Earthern Mtls.___
Pool Area ____Approx. 6_______ acres   Liner -_____________________________
Current Freeboard unknown* feet   Liner Permeability -_________________

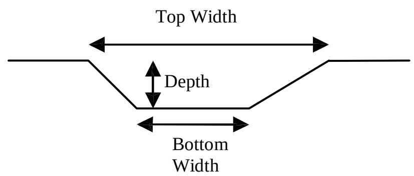
*Pond has no gauges/recent surveys to indicate water elevation.

TYPE OF OUTLET (Mark all that apply)

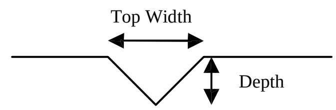
_n/a__Open Channel Spillway
______Trapezoidal
______Triangular
______Rectangular
______Irregular

______depth
______bottom (or average) width
_____top width

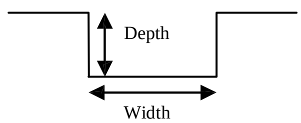
TRAPEZOIDAL



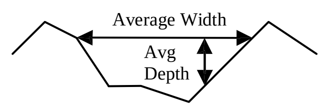
TRIANGULAR



RECTANGULAR

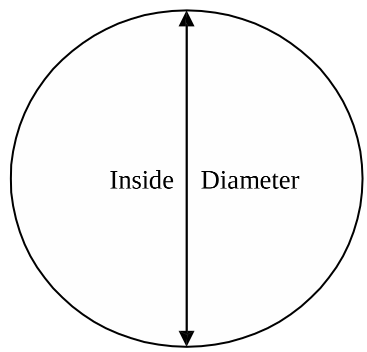


IRREGULAR



__x__Outlet

__12"_inside diameter



Material
______corrugated metal
______welded steel
______concrete
__X___plastic (hdpe, pvc, etc.)
______other (specify) ______________________

Is water flowing through the outlet? YES __X___ NO _______

_____No Outlet

_____Other Type of Outlet (specify) ____________________________________

The Impoundment was Designed By R.W. Beck and Associates
____

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: Ratts Generating Station	Date: August 19, 2010
Unit Name: Pond 2	Operator's Name: Hoosier Energy
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name: Don Dotson, P.E., Mary Swiderski, EIT	

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?	Monthly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	Dry		19. Major erosion or slope deterioration?	unknown	
3. Decant inlet elevation (operator records)?	n/a		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)?	441.2		Is water exiting outlet, but not entering inlet?	n/a	
6. If instrumentation is present, are readings recorded (operator records)?	X		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)?	unknown		From underdrain?	unknown	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?	unknown	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	unknown	
11. Is there significant settlement along the crest?		X	Over widespread areas?	unknown	
12. Are decant trashracks clear and in place?		X	From downstream foundation area?	unknown	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?	unknown	
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?	unknown	
15. Are spillway or ditch linings deteriorated?	X		22. Surface movements in valley bottom or on hillside?	unknown	
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
2	Pond currently filled with ash.
3,4,12,16,20	No outlet work structure.
6	Monitoring wells, semi-annual readings.
8	No records available.
9	Maximum tree diameter – greater than 12 inch diameter.
7, 15	Area under construction.
19, 21	Not visible due to heavy vegetation.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IN0004391

INSPECTOR Don Dotson P.E/ Mary Swiderski

Date August 19, 2010

Impoundment Name Pond 2
Impoundment Company Hoosier Energy Ratts Generating Station
EPA Region 5
State Agency (Field Office) Address
100 North Senate Avenue
Indianapolis, IN 46204

Name of Impoundment Pond 2
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update ____

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

IMPOUNDMENT FUNCTION: Fly ash settling pond

Nearest Downstream Town : Name Petersburg, IN
Distance from the impoundment 1.5 miles
Impoundment
Location: Longitude -87 Degrees 15 Minutes 52.4 Seconds
Latitude 38 Degrees 31 Minutes 1.8 Seconds
State IN County Pike

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):

__x__ **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.

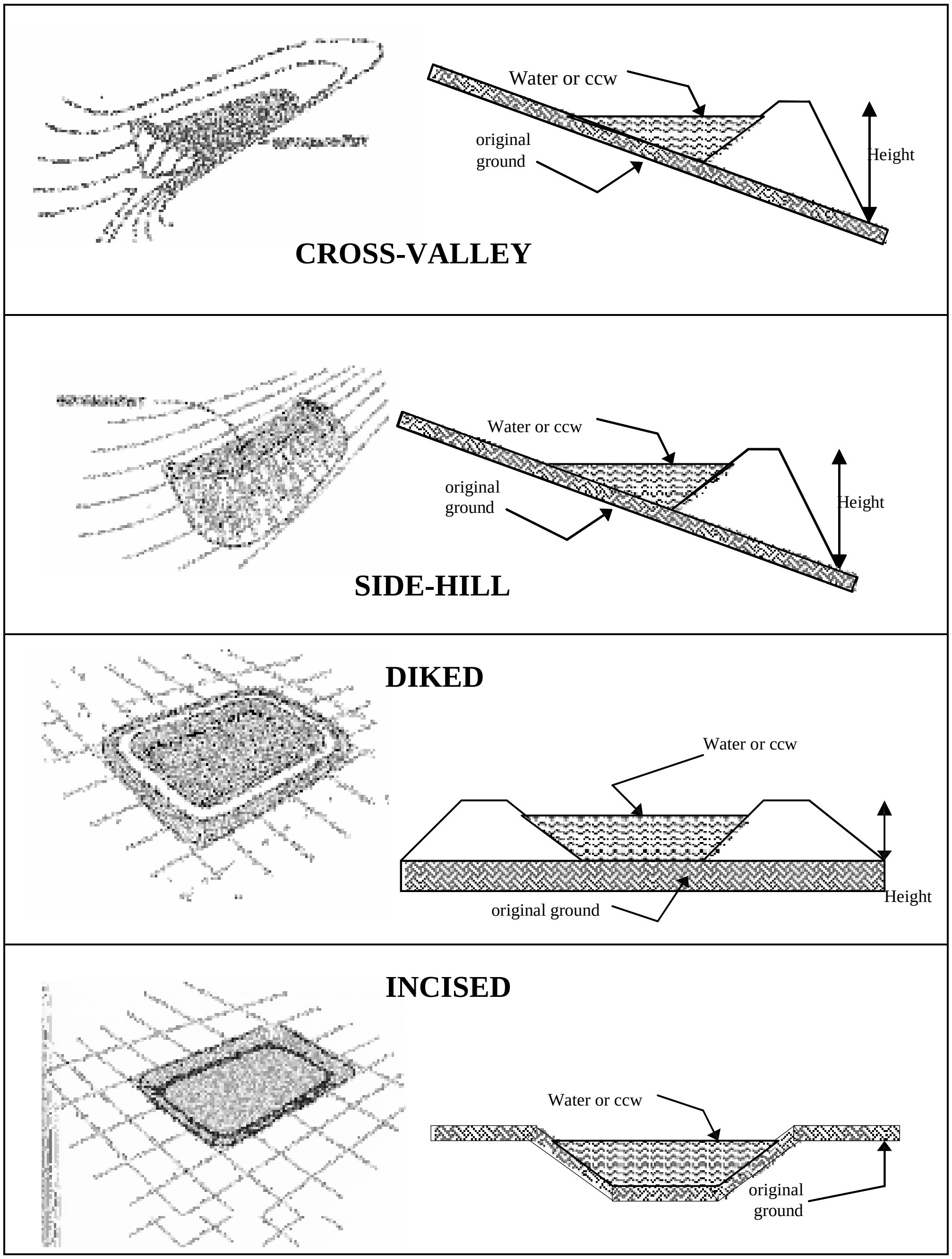
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

- Significant Distance from the White River reduces likelihood of contamination.
- Due to location of pond, in the event of a failure, fly ash would have to flow uphill to reach the White River.

CONFIGURATION:



______Cross-Valley
______Side-Hill
__X__Diked
______Incised (form completion optional)
______Combination Incised/Diked

Embankment Height __10-15'____feet   Embankment Material__Earthern Mtls.___
Pool Area ____Approx. 10______ acres   Liner -______________________________
Current Freeboard unknown*   feet   Liner Permeability -________________

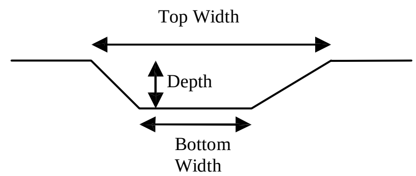
*Pond currently filled with ash, no gauges/recent surveys to indicate ash elevation.

<u>TYPE OF OUTLET</u> (Mark all that apply)

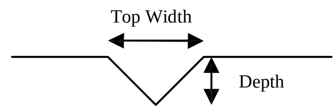
_n/a__Open Channel Spillway
______Trapezoidal
______Triangular
______Rectangular
______Irregular

______depth
______bottom (or average) width
_____top width

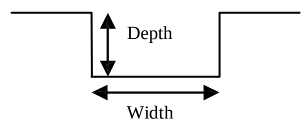
TRAPEZOIDAL



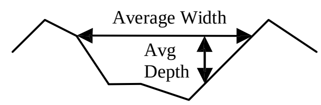
TRIANGULAR



RECTANGULAR

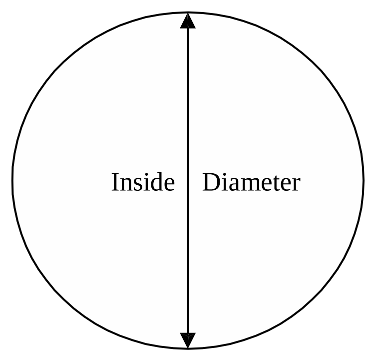


IRREGULAR



__n/a_Outlet

______inside diameter



Material
______corrugated metal
______welded steel
______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 <u>R.W. Beck and Associates</u>_________________

____

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: Ratts Generating Station	Date: August 19, 2010
Unit Name: Pond 3	Operator's Name: Hoosier Energy
Unit I.D.:	Hazard Potential Classification: High Significant **Low**
Inspector's Name: Don Dotson, P.E., Mary Swiderski, EIT	

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?	Monthly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	Dry		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	n/a		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)?	432.5		Is water exiting outlet, but not entering inlet?	n/a	
6. If instrumentation is present, are readings recorded (operator records)?	X		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)?	unknown		From underdrain?	unknown	
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?	unknown	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	unknown	
11. Is there significant settlement along the crest?		X	Over widespread areas?	unknown	
12. Are decant trashracks clear and in place?		X	From downstream foundation area?	unknown	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?	unknown	
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?	unknown	
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	unknown	
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
2	Pond currently filled with ash.
3,4,12,16,20	No outlet work structure.
6	Monitoring wells, semi-annual readings.
7	Southeast dike currently under construction.
8	No records available.
21	Heavy vegetation obstructing view.

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # IN0004391

INSPECTOR Don Dotson P.E/ Mary Swiderski

Date August 19, 2010

Impoundment Name Pond 3

Impoundment Company Hoosier Energy Ratts Generating Station

EPA Region 5

State Agency (Field Office) Address

100 North Senate Avenue
Indianapolis, IN 46204

Name of Impoundment Pond 3

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

New x Update ______

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

IMPOUNDMENT FUNCTION: Fly ash settling pond

Nearest Downstream Town : Name Petersburg, IN

Distance from the impoundment 1.5 miles

Impoundment

Location: Longitude -87 Degrees 16 Minutes 0.58 Seconds

Latitude 38 Degrees 30 Minutes 58.9 Seconds

State IN County Pike

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):

__x___ **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.

______ **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.

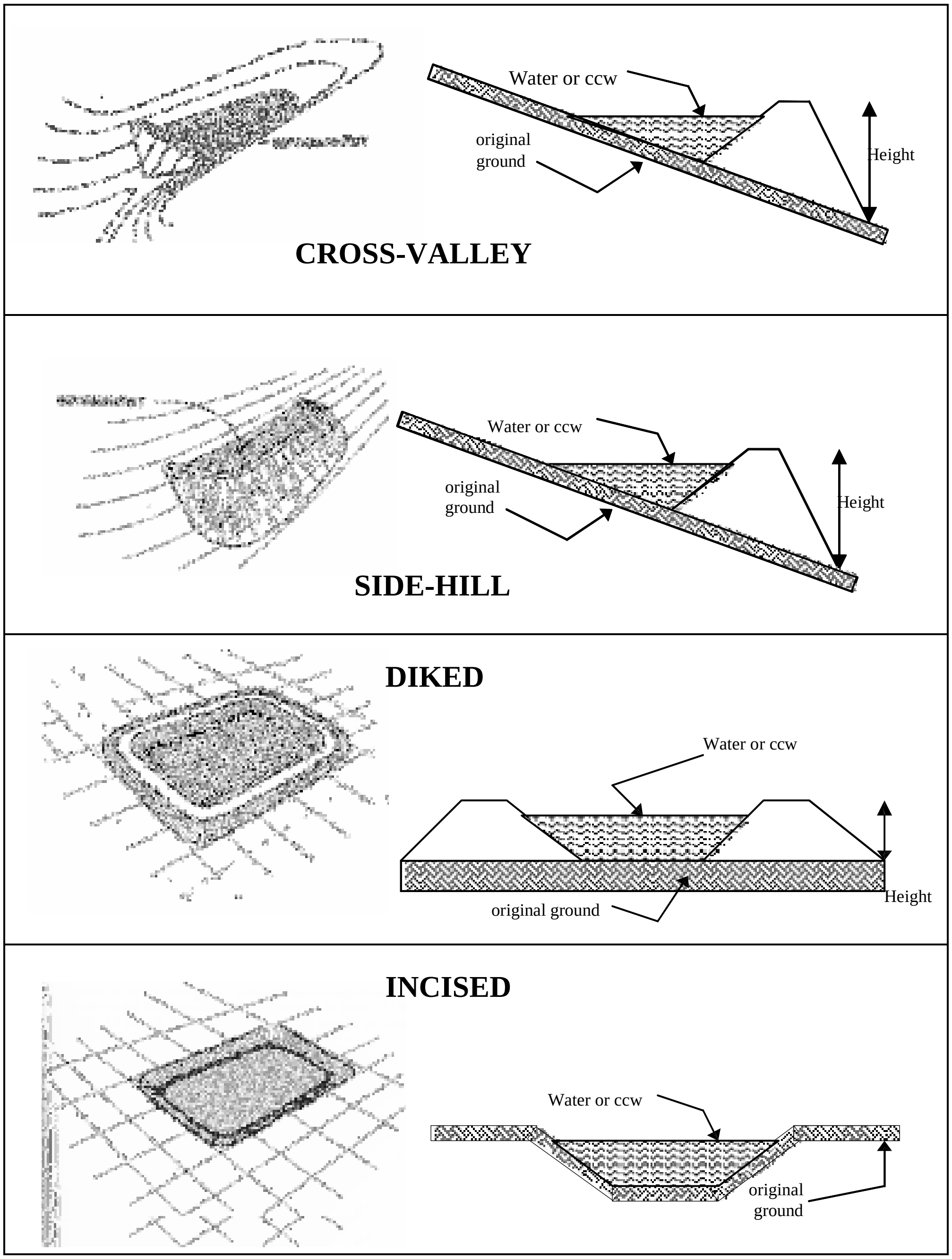
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

- Significant Distance from the White River reduces likelihood of contamination.

- Due to location of pond, in the event of a failure, fly ash would have to flow uphill to reach the White River.

CONFIGURATION:



______Cross-Valley
______Side-Hill
__X__Diked
______Incised (form completion optional)
______Combination Incised/Diked

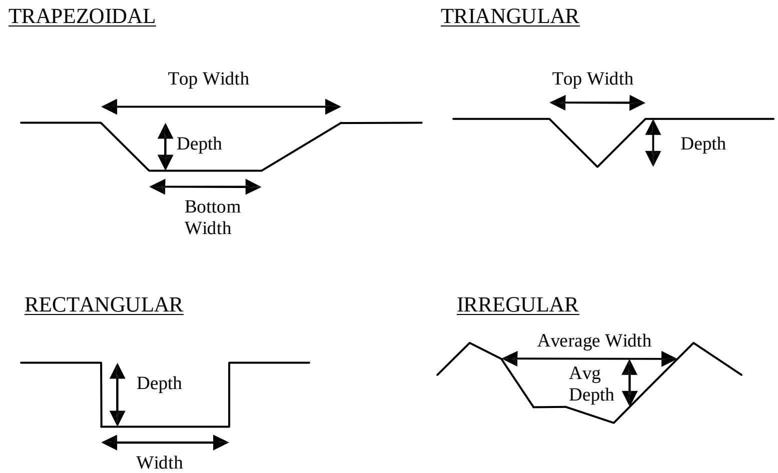
Embankment Height __10-15’____feet   Embankment Material_ Earthern Mtls.___
Pool Area ____Approx. 10______ acres   Liner -_____________________________
Current Freeboard unknown*   feet   Liner Permeability -________________

*Pond currently filled with ash, no gauges/recent surveys to indicate ash elevation.

TYPE OF OUTLET (Mark all that apply)

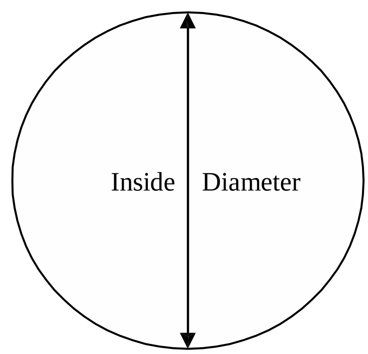
__n/a__ **Open Channel Spillway**
______Trapezoidal
______Triangular
______Rectangular
______Irregular

______depth
______bottom (or average) width
______top width



__n/a__ **Outlet**

______inside diameter



Material
______corrugated metal
______welded steel
______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 Unknown ________________________________

Has there ever been a failure at this site? YES ____X______NO ___________

If So When? September 12, 2006___________

If So Please Describe :

According to a report by Fuller, Mossbarger, Scott and May (FMSM) Engineers dated September 22, 2006 significant precipitation during the week of September 11th, coupled with the ash slurry water, resulted in water collecting against the southeast dike causing the breach. Two months prior to the breach, the pond was reactivated, and in an attempt to maximize on-site storage capacity, the sluicing trench was redirected to a borrow pit that was recently excavated. From the borrow pit excavation, a trench was formed south toward the pond discharge point located at the southwest corner. Once the breach was noticed by plant personnel the sluice trench was redirected to the westernmost ash pond (Pond 4), and the dike was temporarily repaired by bulldozing surface material from the adjoining dike sections into the breached area. Photographs, observations and descriptions of the failed area indicate the breach likely occurred due to piping through the dike.

FMSM recommended the temporary repair material be removed as deep as practical, and laterally by excavating small benches into undisturbed portions of the dike. The breached area was to be reformed by placing durable limestone shot rock in minimum two-foot lifts tracked in with a bulldozer, shaping the slopes to match the existing dike side slopes. Additionally FMSM completed a slope stability evaluation with recommendations for improving the stability of the ash pond.

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: Ratts Generating Station — Date: August 19, 2010

Unit Name: Pond 4 — Operator's Name: Hoosier Energy

Unit I.D.: — Hazard Potential Classification: High Significant Low

Inspector's Name: Don Dotson, P.E., Mary Swiderski, EIT

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?	Monthly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	417.3		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	unknown		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	432		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
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)?	unknown		From underdrain?	unknown	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?	unknown	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	unknown	
11. Is there significant settlement along the crest?		X	Over widespread areas?	unknown	
12. Are decant trashracks clear and in place?	X		From downstream foundation area?	unknown	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?	unknown	
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?	unknown	
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	unknown	
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
3, 8	No records available.
9	Maximum tree diameter – approximately 2 inches.
21	Heavy vegetation obstructing view.
24	White River along northern toe, ponded water located along the western downstream toe.

EPA FORM -XXXX

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # IN0004391

INSPECTOR Don Dotson P.E/ Mary Swiderski

Date August 19, 2010

Impoundment Name Pond 4
Impoundment Company Hoosier Energy Ratts Generating Station
EPA Region 5
State Agency (Field Office) Address
100 North Senate Avenue
Indianapolis, IN 46204

Name of Impoundment Pond 4
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update ____

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

IMPOUNDMENT FUNCTION: Fly ash settling pond

Nearest Downstream Town : Name Petersburg, IN
Distance from the impoundment 1.5 miles
Impoundment
Location: Longitude -87 Degrees 16 Minutes 12.0 Seconds
Latitude 38 Degrees 30 Minutes 58.7 Seconds
State IN County Pike

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.

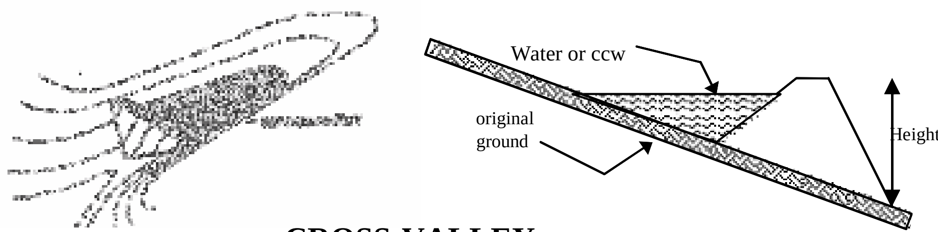
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

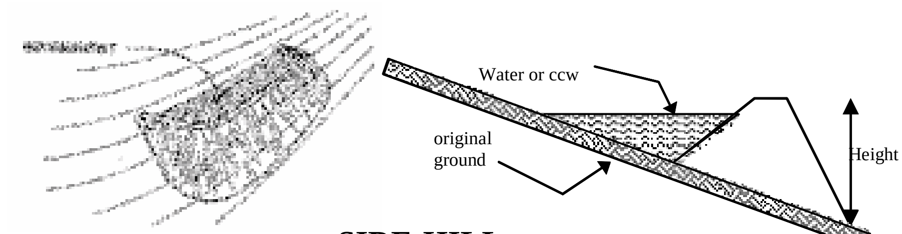
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

- Close proximity to the White River increased likelihood of contamination in the event of a failure.

<u>CONFIGURATION</u>:

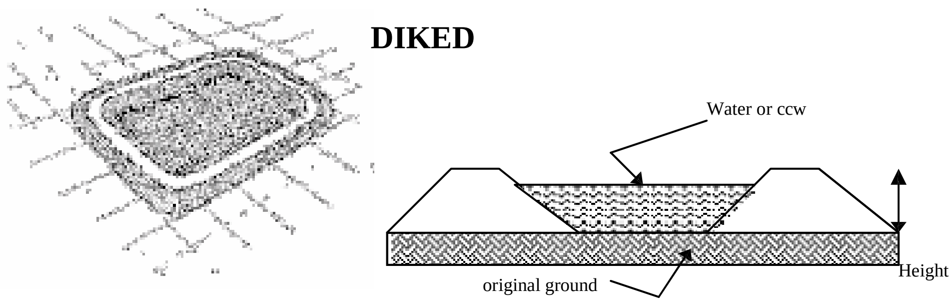


CROSS-VALLEY

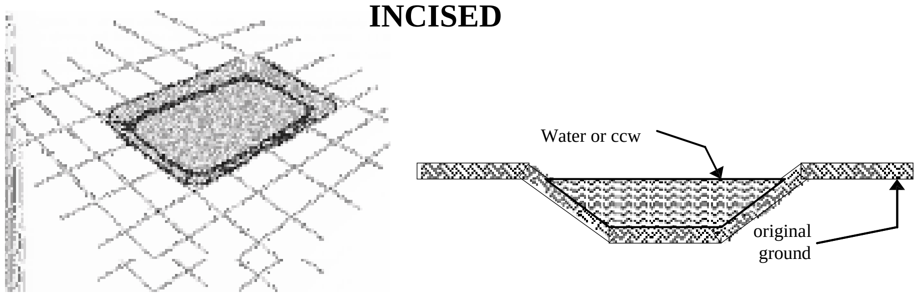


SIDE-HILL

DIKED



INCISED



______Cross-Valley
______Side-Hill
__X__Diked
______Incised (form completion optional)
______Combination Incised/Diked

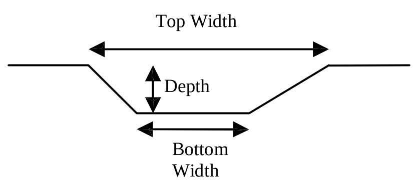
Embankment Height _10-15’____feet   Embankment Material_Earthern Mtls.___
Pool Area ____Approx. 25_______ acres   Liner -____________________________
Current Freeboard 14.7   feet   Liner Permeability -________________

TYPE OF OUTLET (Mark all that apply)

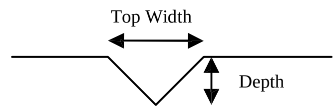
_n/a_ Open Channel Spillway
______Trapezoidal
______Triangular
______Rectangular
______Irregular

______depth
______bottom (or average) width
______top width

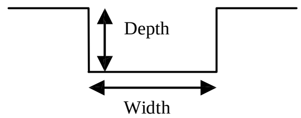
TRAPEZOIDAL



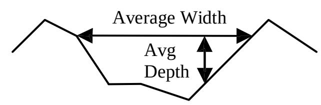
TRIANGULAR



RECTANGULAR

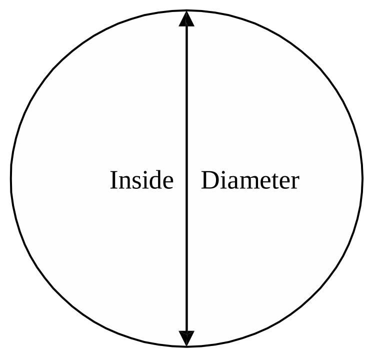


IRREGULAR



_X_ Outlet

_24”_ inside diameter



Material
______corrugated metal
______welded steel
______concrete
______plastic (hdpe, pvc, etc.)
_X_ other (specify) _Galvanized Steel_

Is water flowing through the outlet? YES _X_ NO _______

______No Outlet

______Other Type of Outlet (specify) ________________________________

The Impoundment was Designed By _Unknown_________________________
____

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 __X____ NO _______

If So When? Spring/Summer 1997

IF So Please Describe:

An undated ATC Associates Inc. report titled "Site Observation Trip, Coal Ash Storage Pond" describes the seepage observed at Pond 4. According to ATC, several seeps were noted during a routine inspection discharging from the exterior face of the southern end of the western embankment of Pond 4. Prior to the seeps, repair work was completed along the eroded exterior slope of the western embankment. The repair consisted of excavating an approximately twelve foot wide bench in the exterior slope and then backfilling the excavation with soils obtained from the recent alluvium deposited at the toe of the slope and from an excavation made along the interior face, thus creating a steeper interior slope. No specific compaction or material requirements were made relative to the backfilling operations. No signs of seepage had been noted along the ash pond embankments prior to the referenced repair work.

Following the discovery of the seep, the water level within the pond was lowered by approximately 10 to 15 feet. During ATC's site visit, the pond was 10 feet below normal pool level. No seepage was noted in the problem areas; however the soil was clearly moist relative to the surrounding areas. On site personnel noted that no soils particles in the seeps were noted while they were flowing. ATC believes the seeps were contributed to based on the following: a high percentage of sand within the soil embankment, recent repair work that may have disturbed a low permeability layer, and animal burrows along the interior slope which may have created a seepage path.

ATC recommended that when Hoosier Energy allowed the water level in Pond 4 to return to normal pool that personnel take water level readings and seepage observations on a regular schedule and record the results.

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES __X__ NO __

If so, which method (e.g., piezometers, gw pumping,...)? Opened Discharge Structure to reduce pool level

If so Please Describe : Please see page 6 for details.

APPENDIX B
Site Photo Log Map and Site Photos

	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	DWN BY: DJC	ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	REV. No.: A
		CKD BY: MS		Date: 9-15-10
AMEC Earth & Environmental 690 Commonwealth Business Center 11003 Bluegrass Parkway Louisville, KY 40299	amec	Datum: NAD 83	HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN ASH POND PHOTO LOCATION MAP	Project No: 3-2106-0177-0005
		Projection: IN SPC W		
		Scale: As Shown		Figure No: B-1

SITE PHOTOS

POND 1
SITE PHOTOS

1-1

VIEW FROM WITHIN POND 1 LOOKING TOWARDS EAST DIKE

1-2

VIEW FROM WITHIN POND 1 LOOKING SOUTHEAST CORNER OF POND

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS		DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 1 SITE PHOTOS		CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
		PROJECTION:	SCALE:	PAGE NO.. B-2

1-3

VIEW FROM WITHIN POND 1 LOOKING SOUTH TOWARDS SOUTHERN EMBANKMENT

1-4

VIEW FROM WITHIN POND 1 LOOKING WEST TOWARDS RATTS GENERATING STATION

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE **HOOSIER ENERGY** **FRANK E. RATTS GENERATING STATION, PETERSBURG, IN** **POND 1 SITE PHOTOS**	CHK'D BY: MGS PROJECTION:	REV. NO.: SCALE:	PROJECT NO: 3-2106-0177-0005 PAGE NO.. B-3

1-5

VIEW FROM WITHIN POND 1 LOOKING NORTH TOWARDS COAL PILE

1-6

SAMPLING POINT FROM POND 1 (OUTFALL 004)

1-7

VIEW FROM SOUTHERN DIKE LOOKING NORTH TOWARDS COAL PILE, NOTE VEGETATION

1-8

VIEW FROM SOUTHERN DIKE LOOKING NORTH TOWARDS COAL PILE, NOTE VEGETATION

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: **HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 1 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-5

1-9

VIEW FROM SOUTHERN DIKE LOOKING SOUTHWEST. EMBANKMENT ON RIGHT HAND SIDE, NOTE VEGETATION

1-10

VIEW FROM SOUTHERN BANK LOOKING SOUTH TOWARDS OLD WASH PLANT (NOT PROPERTY OF HOOSIER ENERGY)

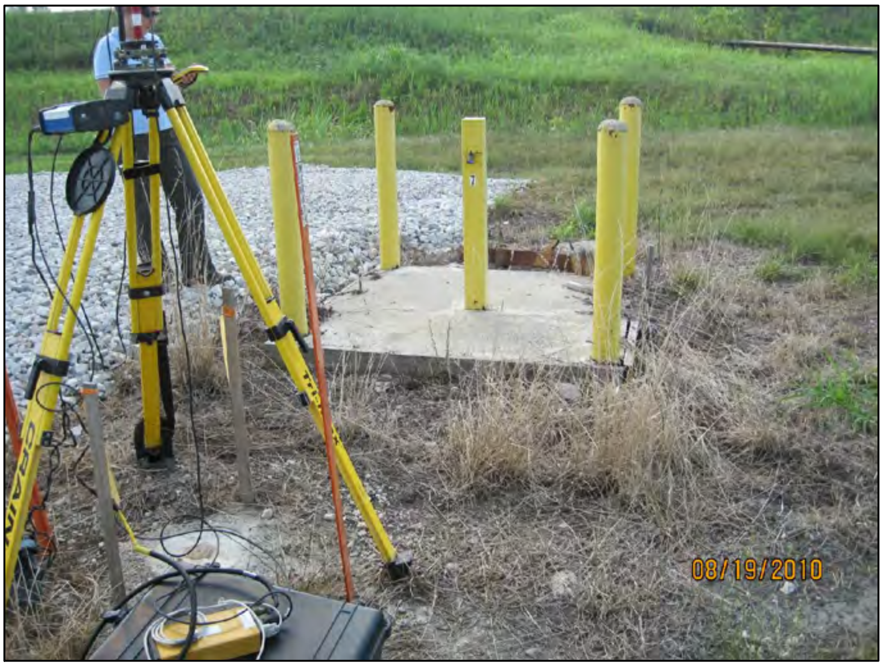
AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: **HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 1 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-6

1-11

LOOKING EAST ALONG SOUTHERN CREST, POND LOCATED ON LEFT-HAND SIDE

POND 2
SITE PHOTOS



2-1

MONITORING WELL 7

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS		DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 2 SITE PHOTOS		CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
		PROJECTION:	SCALE:	PAGE NO.. B-8

POND 3
SITE PHOTOS

3-1

CONSTRUCTION ALONG POND 3 SOUTHEASTERN DOWNSTREAM SLOPE

3-2

SOUTHEASTERN DOWNSTREAM SLOPE

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 3 SITE PHOTOS	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-9

3-3

DRAINAGE DITCH ALONG EASTERN DOWNSTREAM TOET

3-4

OUTLET FROM POND 1

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700		CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS		DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE **HOOSIER ENERGY** **FRANK E. RATTS GENERATING STATION, PETERSBURG, IN** **POND 3 SITE PHOTOS**		CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
		PROJECTION:	SCALE:	PAGE NO.. B-10

3-5

OUTLET FROM POND 1

3-6

CONSTRUCTION ALONG POND 3 SOUTHEASTERN DOWNSTREAM SLOPE

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 3 SITE PHOTOS	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-11

3-7

FROM SOUTHEAST CORNER OF POND 3 LOOKING WEST AT DRAINAGE DITCH BETWEEN POND 3 AND OUTER DIKE

3-8

MONITORING WELL 4

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: **HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 3 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-12

3-9

MONITORING WELL 6

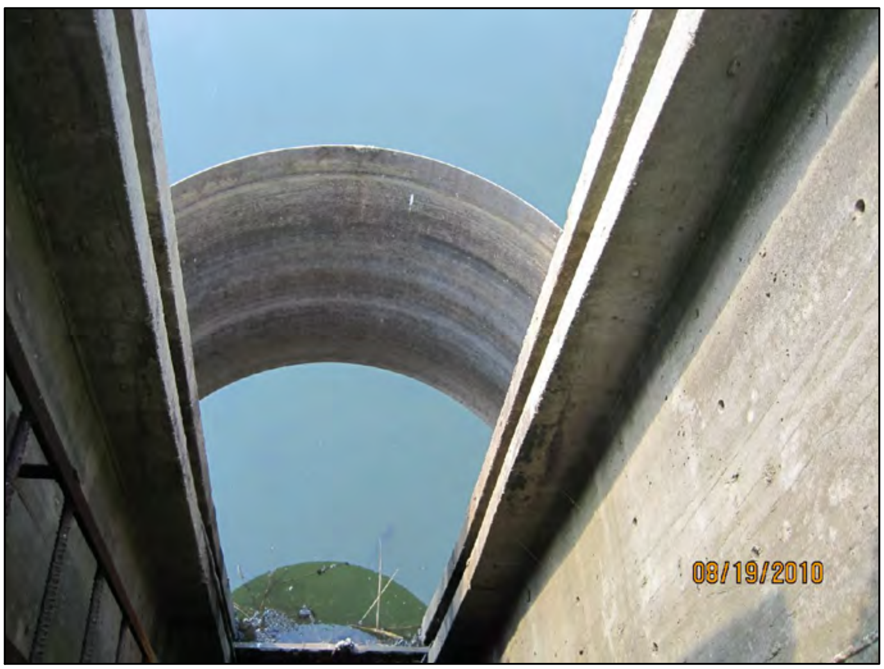
AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 3 SITE PHOTOS	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-13

POND 4
SITE PHOTOS

4-1

OUTLET STRUCTURE FOR SETTLING POND



4-2

OUTLET STRUCTURE FOR SETTLING POND

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE **HOOSIER ENERGY** **FRANK E. RATTS GENERATING STATION, PETERSBURG, IN** **POND 4 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-14

4-3

DISCHARGE POINT FOR OUTLET STRUCTURE FROM SETTLING POND (OUTFALL 003)

4-4

OUTLET POINT FROM BOTTOM ASH POND AND DRAINAGE DITCH LOCATED AROUND PERIMETER OF POND 3 AND POND 4

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS		DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE **HOOSIER ENERGY** **FRANK E. RATTS GENERATING STATION, PETERSBURG, IN** **POND 4 SITE PHOTOS**		CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
		PROJECTION:	SCALE:	PAGE NO.. B-15

4-5

NEW FLAP GATE FOR OUTFALL 003

4-6

OUTLET TO WHITE RIVER

AMEC Earth & Environmental 690 Commonwealth Center 11003 Bluegrass Parkway Louisville, Ky 40299 (502) 267-0700	amec	CLIENT LOGO	CLIENT UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE **HOOSIER ENERGY** **FRANK E. RATTS GENERATING STATION, PETERSBURG, IN** **POND 4 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-16

4-7

INLET TO POND 4 FROM UNITS 1 AND 2

4-8

PIEZOMETER LOCATED ALONG SOUTHERN DIKE OF SETTLING POND/NORTHERN DIKE OF POND 4

AMEC Earth & Environmental

690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: **HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 4 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-17

4-9

MONITORING WELL LOCATED ALONG SOUTHERN DIKE OF SETTLING POND/NORTHERN DIKE OF POND 4

4-10

LOOKING SOUTH TOWARDS POND 4 FROM NORTHERN DIKE/SOUTHERN DIKE OF SETTLING POND

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: **HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 4 SITE PHOTOS**	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-18

4-11

LOOKING EAST TOWARDS RATTS GENERATING STATION

4-12

MONITORING WELL LOCATED ALONG SOUTHERN DIKE OF SETTLING POND/NORTHERN DIKE OF POND 4

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 4 SITE PHOTOS	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-19

4-13

FROM WESTERN DIKE OF POND 4 LOOKING SOUTH

4-14

OUTLET FROM POND 4 TO DRAINAGE DITCH

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO	CLIENT: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY		
PROJECT: ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 8/24/10
TITLE: HOOSIER ENERGY FRANK E. RATTS GENERATING STATION, PETERSBURG, IN POND 4 SITE PHOTOS	CHK'D BY: MGS	REV. NO.:	PROJECT NO: 3-2106-0177-0005
	PROJECTION:	SCALE:	PAGE NO.. B-20

APPENDIX C
Inventory of Provided Materials

Hoosier Energy Provided Documents

1. Interoffice memorandum Frank E. Ratts Generating Station Bottom Ash Pond (Pond #1), dated May 11, 1994;
2. Interoffice memorandum Ash Pond Maintenance 1996, dated December 27, 1996;
3. Levee Repair Petersburg Generating Station, prepared by Koester Contracting Corp, dated August 17, 1997;
4. Application for Approval of Construction in a Floodway, dated March 16, 1984;
5. Frank E. Ratts Generating Station Ash Disposal System Modifications, Site and Grading Plan, prepared by R.W. Beck and Associates dated March 19, 1975;
6. Interoffice memorandum Ash Pond Survey, dated September 14, 1995;
7. Construction Permit New Settling Pond (Pond 3), dated February 7, 1983;
8. Fly Ash Pond Closure Plan, prepared by Burns & McDonnell, dated January 28, 1997;
9. Frank E. Ratts Generating Station Ash Management Plan for Pond Closure, prepared by Burns &McDonnell, dated April 22, 1998;
10. Site Observation Trip Coal Ash Storage Pond, prepared by ATC Associates Inc., site inspection performed on August 6, 1997.
11. Frank E. Ratts Generating Station Ash Disposal System Modifications, Site and Grading Plan, prepared by R.W. Beck and Associates dated March 19, 1975. Same as item 5, with notes pertaining to active/inactive areas in Bottom Ash Pond and Pond 1.
12. Compliance Plan for the Frank E. Ratts ash pond system, dated October 31, 2007;
13. Certificate for Approval of Construction in a Floodway, dated July 2, 1984;
14. Floodplain Analysis and Regulatory Assessment, dated October 15, 2007;
15. Interoffice memorandum Ratts Subsurface Investigation, dated October 31, 1997;
16. EPA Information Request under Section 104(e) of the Comprehensive Response, Compensation, and Liability Act, dated March 9, 2009;
17. Pictures of 1997 seepage;
18. Attachment 2, Piezometer Water Level Measurements;
19. Floodplain Analysis and Regulatory Assessment, dated October 15, 2007 (same as item 14);
20. Construction Permit Application (Pond 3) ,dated September 14, 1982;
21. Approved Construction Permit (Pond 4), dated May 11, 1984;
22. Construction Permit Application (Pond 4) ,dated March 16, 1984;
23. Property Land Descriptions (Ponds 2 and 3);
24. Property Descriptions;
25. Site Aerial;
26. Ratts Generating station dike Evaluation, prepared by Fuller Mossbarger Scott & May Engineers, dated September 22, 2006;
27. Record of Well Water, Indiana Department of Natural Resources, dated July 13, 1988;
28. Request for 100-Year Flood Elevation Determination, dated March 5, 2007;
29. From Indiana Department of Environmental Management, signed agreed order issued to Hoosier Energy concerning the ash pond failure, dated September 18, 2007
30. 2007 Ash Pond Dike Improvements, Ratts Generating Station, Pike County, Indiana, prepared by Stantec Consulting Services Inc., dated April 2, 2009;
31. Ash Pond Dike Improvements, Ratts Generating Station, Pike County, Indiana, prepared by Stantec Consulting Services Inc., dated January 15, 2009;
32. Attachment 1 Subsurface Investigation Test Results, includes piezometer logs and lab test results, provided by ATC Associates Inc. dated January 7, 1998;
33. Report of Slope Stability Evaluation, Permiter Dikes for Ash Pond 003 Ratts Generating Station, Pike County, Inidana, prepared by Fuller Mossbarger Scott & May Engineers, dated January 31, 2007;

34. Interoffice memorandum Ratts Station Ash Management, dated December 18, 1995;
35. Technical Specification for Ash Pit Dike Upgrade Ratts Generating Station Hoosier Energy Rec, Inc. Petersburg, IN. dated June 30, 1998;
36. Hoosier Energy, various work orders and property inspection forms;
37. Monroe City Quadrangle, preapared by the United Sates Department of the Interior Geological Survey;
38. Hoosier Energy Ratts Generating Station Ash Pond and Dike Cross-Sections, prepared by Bernardin Lochmueller & Assoc., Inc, dated December 22, 1997;
39. Bottom Ash Pond Closure Plan, Exhibit 1B, prepared by Burns & McDonnell, dated March 26, 1998;
40. Phase I & Phase II Dike Plan, Exhibit 2A, prepared by Burns & McDonnell, dated January 28, 1997;
41. Partial Development of Phase I Cell, Exhibit 2B, Burns & McDonnell, dated April 9, 1998;
42. Ash Pond Sections, Exhibit 3, prepared by Burns & McDonnell, dated January 28, 1997;
43. The Hoosier Energy Division, Indiana Statewide R.E.C Inc Units No. 1&2 – Petersburg, Indiana, Proposed Ash Pit #4, prepared by Laramore, Douglass and Popham Engineers – Constructors, date illegible;
44. New Settling Pond for Ratts Station, prepared by Hoosier Energy, dated September 14, 1982;
45. Hoosier Energy – Frank E. Ratts Generating Station, 10 Year Ash Management Plan, prepared by Time Goad, dated May 13, 1998;
46. Flue Gas Desulfurization Retrofit Conceptual Design Report;
47. Letter from the Department of the Army Operations and Readiness Division Regulatory Branch, indicating the plant is not within a floodplain, dated August 1, 1994;
48. Specifications and Contract Documents Contract I, Ash Pond, The Hoosier Energy Division Indiana Statewide R.E.C., Inc. Bloomington, Indiana;
49. Addendum to Report of Slope Stability Evaluation, Perimeter Dikes for Ash Pond 003, prepared by FMSM Engineers, dated March 2, 2007;
50. Addendum to Report of Slope Stability Evaluation, Perimeter Dikes for Ash Pond 003 Drawings 1 through 3, prepared by FMSM Engineers, dated February, 2007;

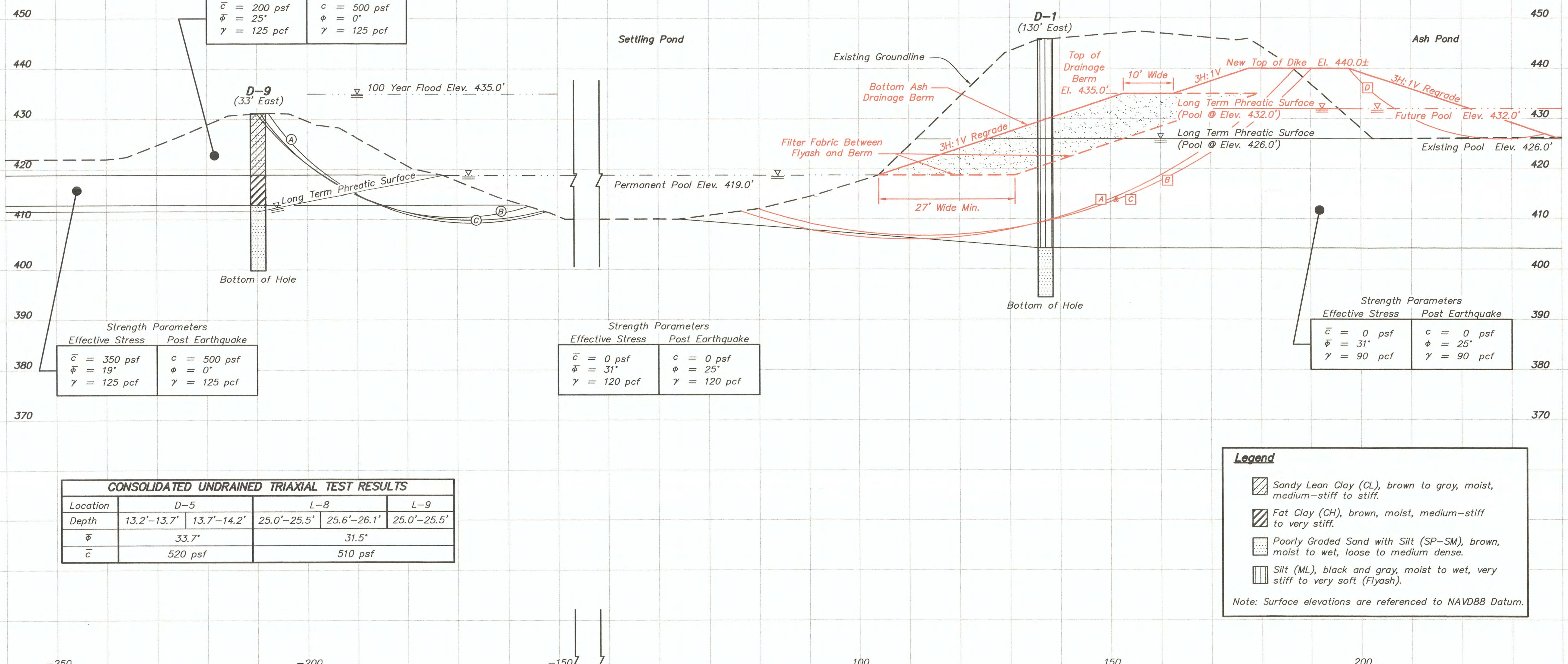
APPENDIX D
JANUARY 2007 SLOPE STABILITY CROSS SECTIONS

CLAY PERIMETER DIKE FACTORS OF SAFETY

Ⓐ Long Term (Inner Face)	1.8
Ⓑ Rapid Drawdown (Inner Face)	1.3
Ⓒ Post Earthquake (Inner Face)	1.5

ASH DIKE 3H:1V REGRADE WITH DRAINAGE BERM – FACTORS OF SAFETY

A Long Term (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.5
B Rapid Drawdown (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.4
C Post Earthquake (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.1
D Long Term (Inner Face 3H:1V Regrade)	1.5



Strength Parameters

Effective Stress	Post Earthquake
$\bar{c}$ = 200 psf	c = 500 psf
$\bar{\phi}$ = 25°	ϕ = 0°
γ = 125 pcf	γ = 125 pcf

Strength Parameters

Effective Stress	Post Earthquake
$\bar{c}$ = 350 psf	c = 500 psf
$\bar{\phi}$ = 19°	ϕ = 0°
γ = 125 pcf	γ = 125 pcf

Strength Parameters

Effective Stress	Post Earthquake
$\bar{c}$ = 0 psf	c = 0 psf
$\bar{\phi}$ = 31°	ϕ = 25°
γ = 120 pcf	γ = 120 pcf

Strength Parameters

Effective Stress	Post Earthquake
$\bar{c}$ = 0 psf	c = 0 psf
$\bar{\phi}$ = 31°	ϕ = 25°
γ = 90 pcf	γ = 90 pcf

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	D-5		L-8		L-9
Depth	13.2'-13.7'	13.7'-14.2'	25.0'-25.5'	25.6'-26.1'	25.0'-25.5'
$\bar{\phi}$	33.7°		31.5°		
$\bar{c}$	520 psf		510 psf		

Legend

- Sandy Lean Clay (CL), brown to gray, moist, medium-stiff to stiff.
- Fat Clay (CH), brown, moist, medium-stiff to very stiff.
- Poorly Graded Sand with Silt (SP-SM), brown, moist to wet, loose to medium dense.
- Silt (ML), black and gray, moist to wet, very stiff to very soft (Flyash).

Note: Surface elevations are referenced to NAVD88 Datum.

STABILITY SECTION A-A'
Scale: 1"=10'

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky 40223-2177
502-212-5000

FMSM ENGINEERS
LEXINGTON • ST. LOUIS • LOUISVILLE • JEFFERSONVILLE • CINCINNATI • ATLANTA • COLUMBUS

Fuller Mossbarger Scott & May

STABILITY SECTION A-A'
HOOSIER ENERGY
RATTS GENERATING STATION - DIKE EVALUATION
PETERSBURG, PIKE COUNTY, INDIANA

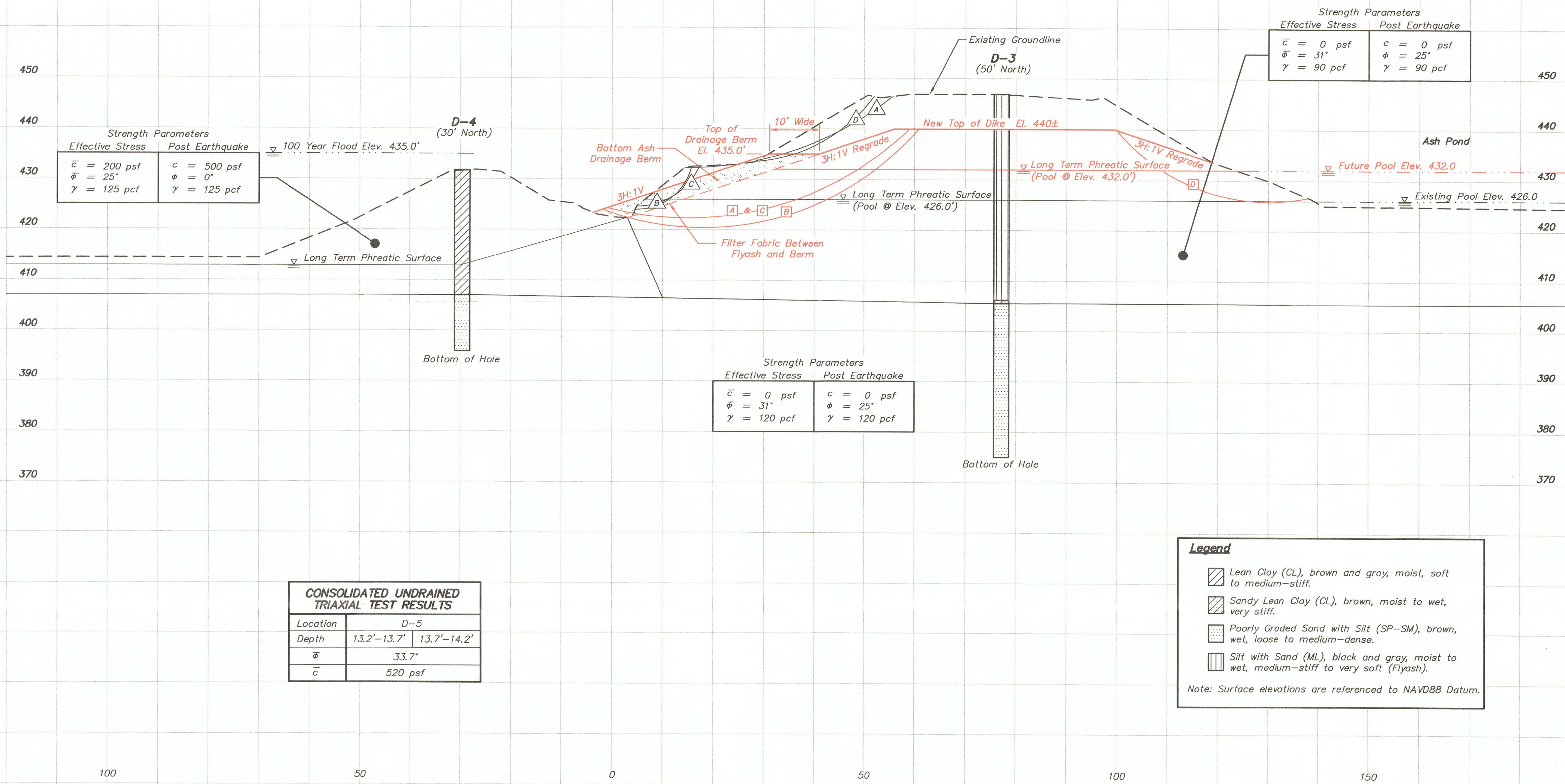
PROJECT NO.	LV2006108
DATE	January 2007
DRAWN BY	SLB/RRP
CHECKED BY	JRC
CHECKED BY	NAB
SCALE	1"=10'
REVISED	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

SHEET
2 of 4

LV2006108\LV06108StabXSAA.dwg

ASH DIKE 3H:1V REGRADE WITH DRAINAGE BERM – FACTORS OF SAFETY	
A Long Term (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.6
B Rapid Drawdown (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.4
C Post Earthquake (Outer Face 3H:1V Regrade with Drainage Berm @ El. 435')	1.3
D Long Term (Inner Face 3H:1V Regrade)	1.5

EXISTING ASH DIKE FACTORS OF SAFETY	
A Long Term (Outer Face with Pool @ El. 426')	1.3
B Long Term (Outer Face with Pool @ El. 426')	1.0
C Rapid Drawdown (Outer Face)	0.2
D Post Earthquake (Outer Face with Pool @ El. 426')	0.9



STABILITY SECTION B–B'
Scale: 1"=10'

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS		
Location	D–5	
Depth	13.2'–13.7'	13.7'–14.2'
$\bar{\phi}$	33.7°	
$\bar{c}$	520 psf	

Legend

- Lean Clay (CL), brown and gray, moist, soft to medium–stiff.
- Sandy Lean Clay (CL), brown, moist to wet, very stiff.
- Poorly Graded Sand with Silt (SP–SM), brown, wet, loose to medium–dense.
- Silt with Sand (ML), black and gray, moist to wet, medium–stiff to very soft (Flyash).

Note: Surface elevations are referenced to NAVD88 Datum.

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky 40223-2177
502-212-5000

FMSM ENGINEERS
LEXINGTON • ST. LOUIS • LOUISVILLE • JEFFERSONVILLE • CINCINNATI • ATLANTA • COLUMBUS

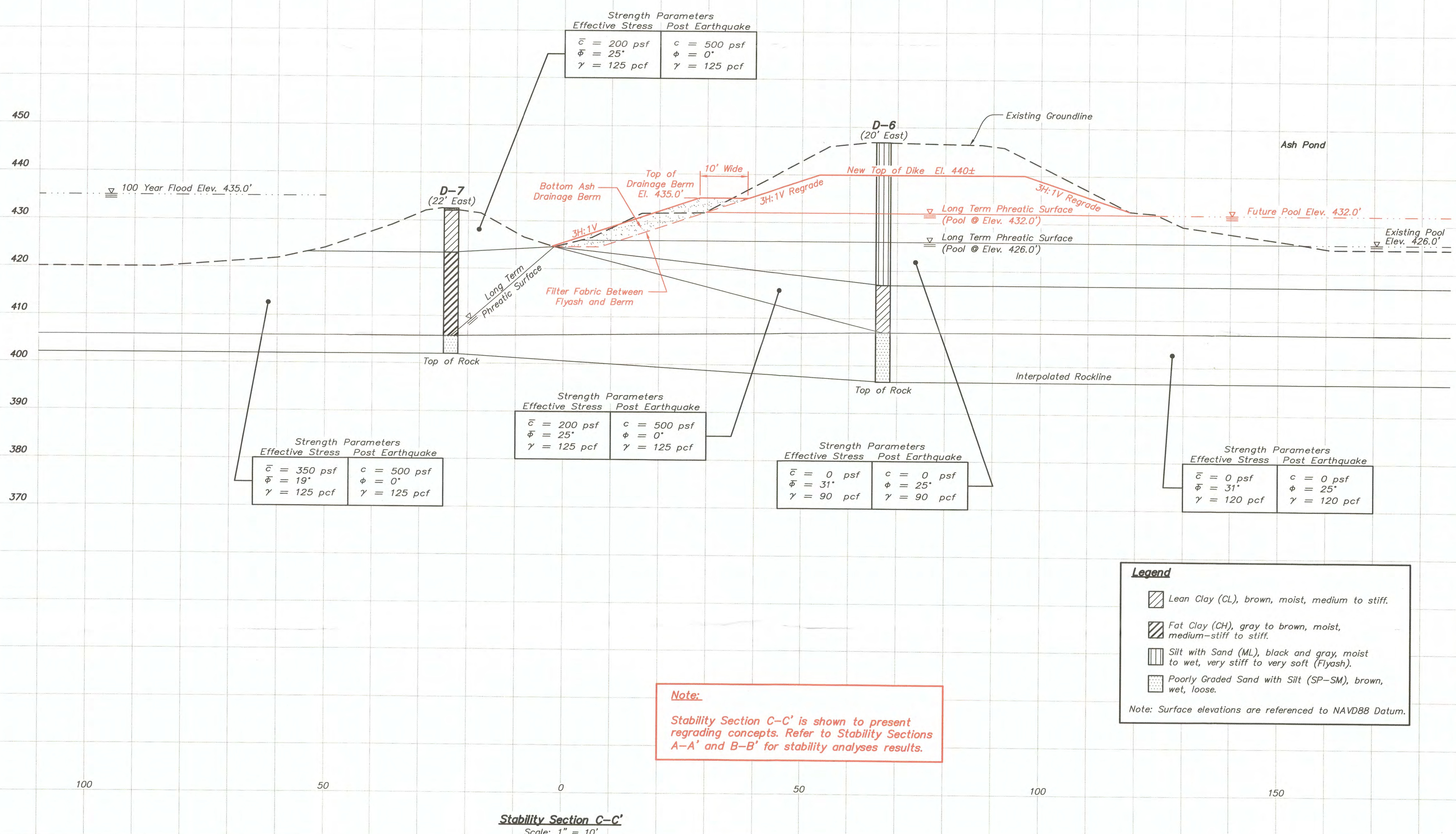
Fuller Mossbarger Scott & May

STABILITY SECTION B-B'
HOOSIER ENERGY
RATTS GENERATING STATION - DIKE EVALUATION
PETERSBURG, PIKE COUNTY, INDIANA

PROJECT NO.	LV2006108
DATE	January 2007
DRAWN BY	SLB/RRP
CHECKED BY	JRC
CHECKED BY	NAB
SCALE	1"=10'
REVISED	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

LV2006108\LV06108StabXSBB.dwg

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS					
Location	D-5		L-8		L-9
Depth	13.2'-13.7'	13.7'-14.2'	25.0'-25.5'	25.6'-26.1'	25.0'-25.5'
$\bar{\Phi}$	33.7°		31.5°		
$\bar{c}$	520 p.s.f.		510 p.s.f.		



Stability Section C-C'

Scale: 1" = 10'

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky 40223-2177
502-212-5000

FMSM ENGINEERS

LEXINGTON • ST. LOUIS • LOUISVILLE • JEFFERSONVILLE • CINCINNATI • ATLANTA • COLUMBUS

Fuller Mossbarger Scott & May

STABILITY SECTION C-C'

HOOSIER ENERGY

RATTS GENERATING STATION - DIKE EVALUATION

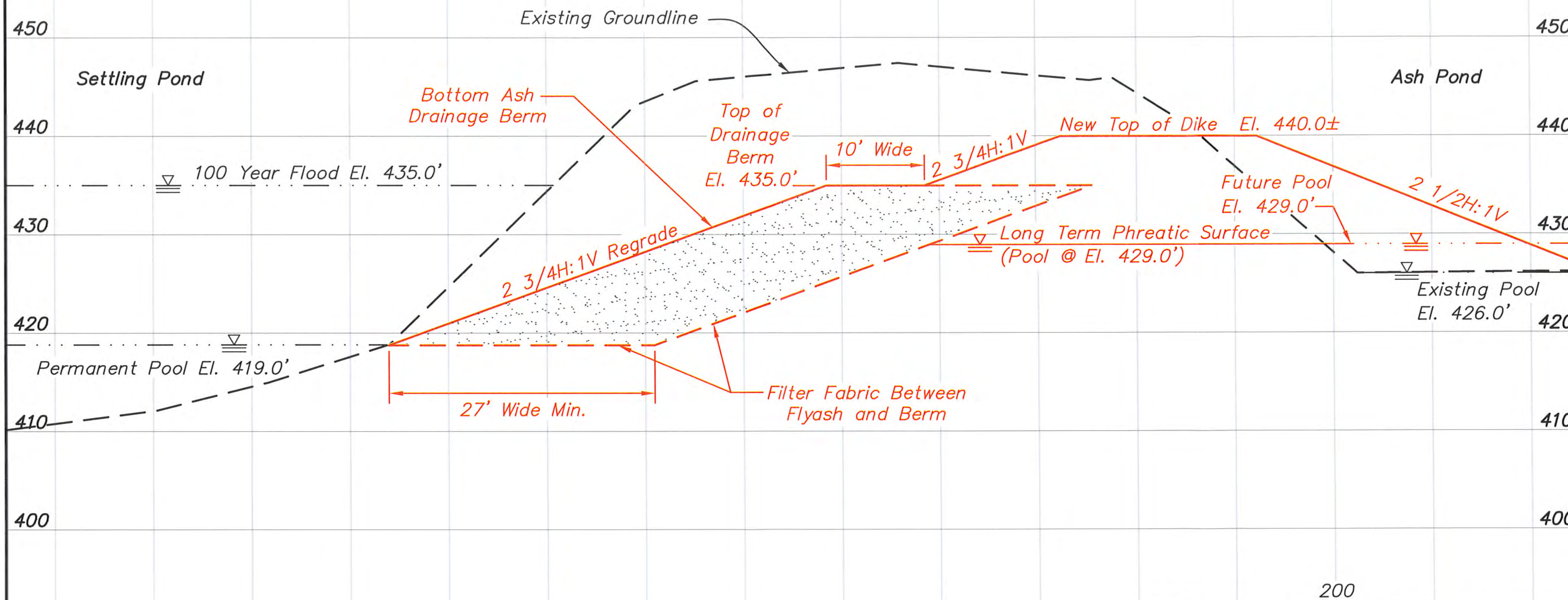
PETERSBURG, PIKE COUNTY, INDIANA

PROJECT NO.	LV2006108
DATE	January 2007
DRAWN BY	SLB/RRP
CHECKED BY	JRC
CHECKED BY	NAB
SCALE	1"=10'
REVISED	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

LV2006108\LV06108StabXSCC.dwg

SHEET

APPENDIX E
MARCH 2007 SLOPE STABILITY CROSS SECTIONS



REVISED SECTION A–A'

Scale: 1"=10'

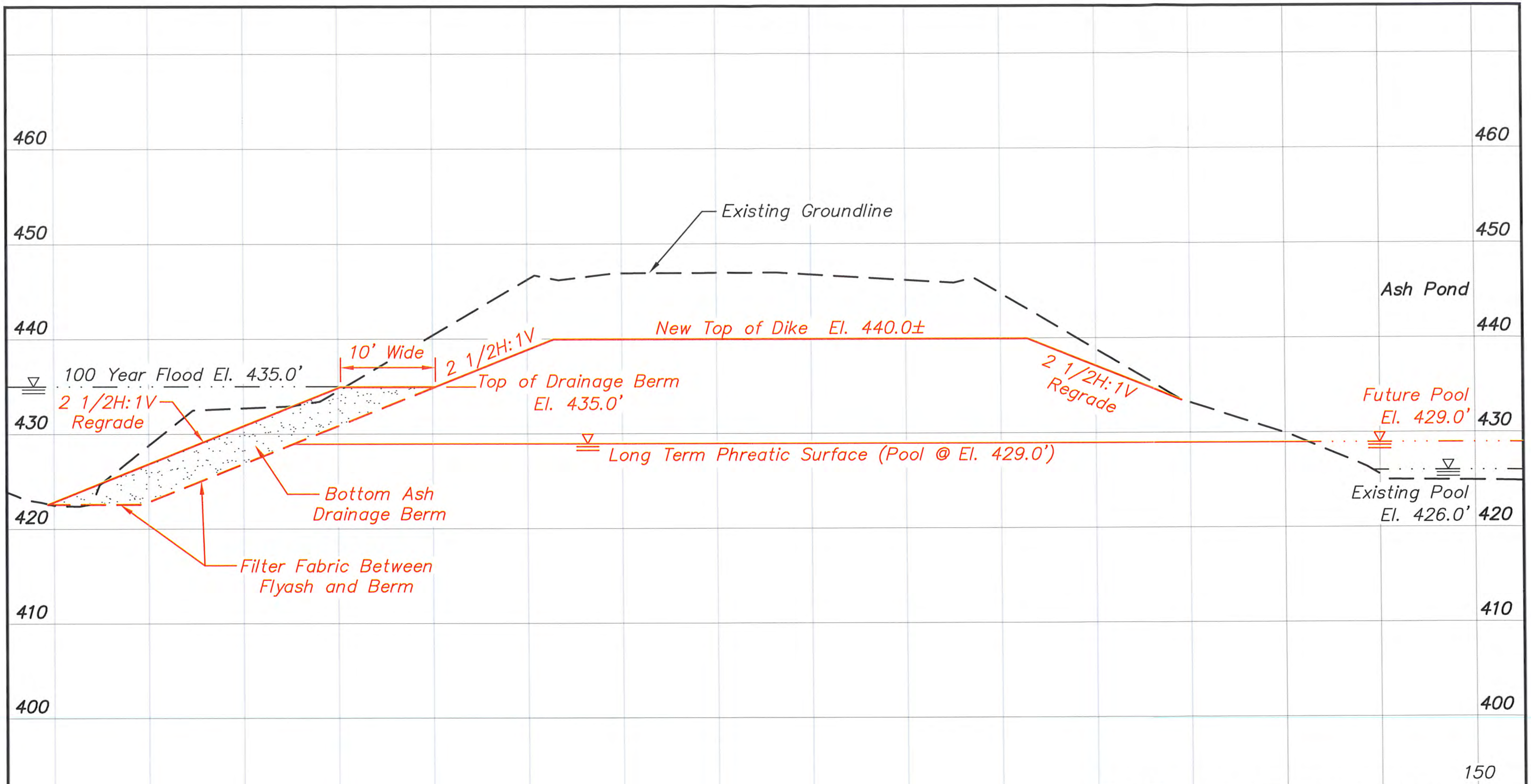
LV2006108\LV06108SectXSAA-11x17.Dwg

HOOSIER ENERGY – RATTS GENERATING STATION DIKE EVALUATION PETERSBURG, PIKE COUNTY, INDIANA

FMSM ENGINEERS
LEXINGTON • LOUISVILLE • CINCINNATI • COLUMBUS
ST. LOUIS • JEFFERSONVILLE • ATLANTA

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky
40223-2177
502-212-5000

DRAWN BY	RRP	DATE	February 2007	REVISED			SHEET
CHECKED BY	NAB	PROJ. NO.	LV2006108	1.	3.		1 of 3
CHECKED BY	–	SCALE	1" = 10'	2.	4.		



REVISED SECTION B-B'

Scale: 1"=10'

HOOSIER ENERGY - RATTS GENERATING STATION DIKE EVALUATION
PETERSBURG, PIKE COUNTY, INDIANA

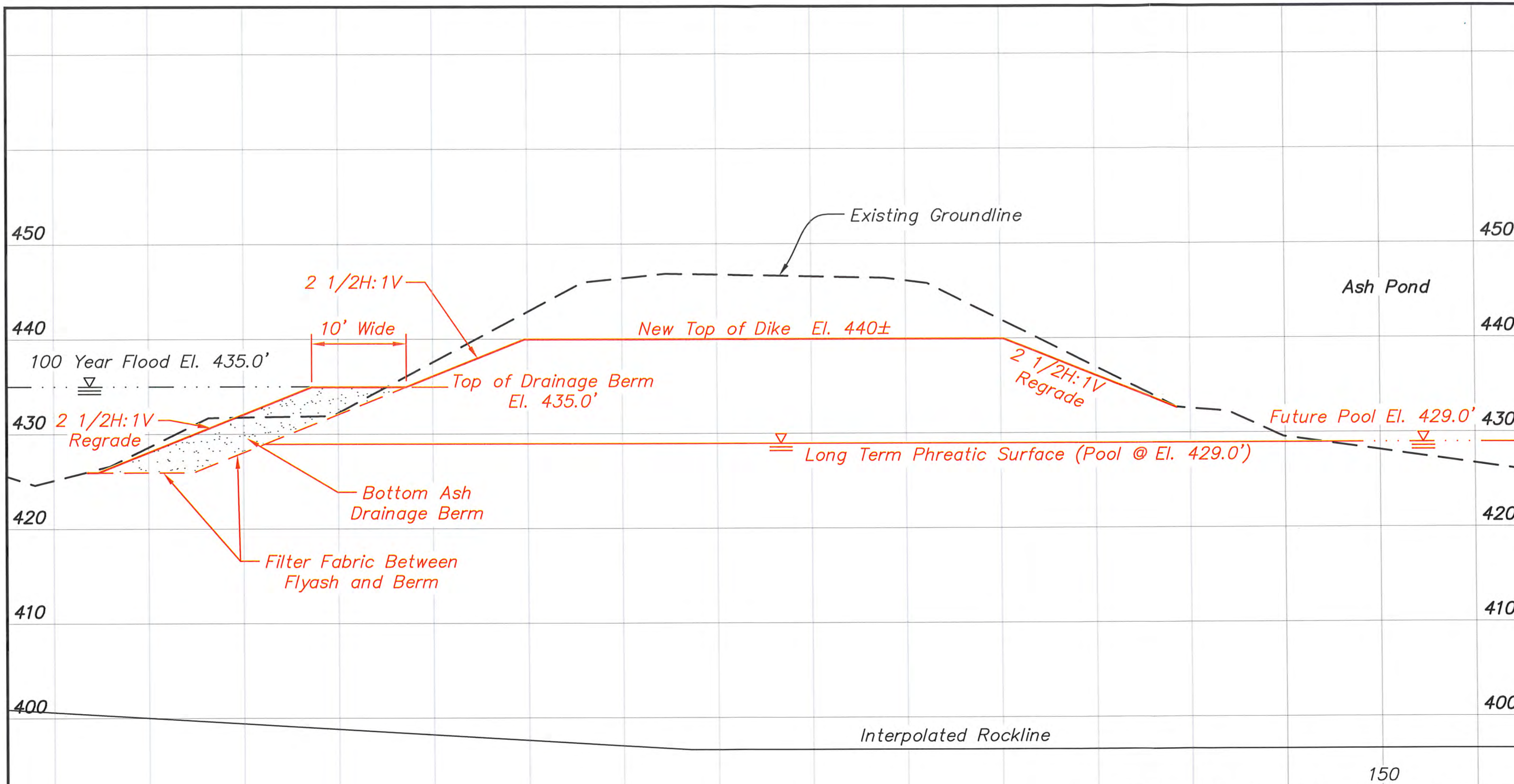
FMSM ENGINEERS

LEXINGTON • LOUISVILLE • CINCINNATI • COLUMBUS
ST. LOUIS • JEFFERSONVILLE • ATLANTA

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky
40223-2177
502-212-5000

LV2006108\LV06108StabXSBB-11x17.Dwg

				REVISED		SHEET
DRAWN BY	RRP	DATE	February 2007			2 of 3
CHECKED BY	NAB	PROJ. NO.	LV2006108	1.	3.	
CHECKED BY	–	SCALE	1" = 10'	2.	4.	



Revised Section C–C'

Scale: 1" = 10'

HOOSIER ENERGY - RATTS GENERATING STATION DIKE EVALUATION
PETERSBURG, PIKE COUNTY, INDIANA

FMSM ENGINEERS
LEXINGTON • LOUISVILLE • CINCINNATI • COLUMBUS
ST. LOUIS • JEFFERSONVILLE • ATLANTA

FULLER MOSSBARGER SCOTT AND MAY ENGINEERS, INC.
1901 Nelson Miller Parkway
Louisville, Kentucky
40223-2177
502-212-5000

DRAWN BY	RRP	DATE	February 2007	REVISED		SHEET
CHECKED BY	NAB	PROJ. NO.	LV2006108	1.	3.	3 of 3
CHECKED BY	–	SCALE	1" = 10'	2.	4.	

LV2006108\LV06108StabXSCC-11x17.Dwg