Final Report

Bottom Ash Pond – Trimble County Station Assessment Report

Lockheed Martin
Contractor for the USEPA

September 2009

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Lockheed Martin

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September 2009

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1. Introduction

1.1. General

In response to the coal combustion waste (CCW) impoundment failure at the TVA/Kingston coal-fired electric generating station in December of 2008, the Environmental Protection Agency has initiated a nationwide program of structural integrity and safety assessments of coal combustion waste impoundments or "management units". A CCW management unit is defined as a surface impoundment or similar diked or bermed management unit or management units designated as landfills that receive liquid-borne material and are used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Management units also include inactive impoundments that have not been formally closed in compliance with applicable federal or state closure/reclamation regulations. The administration of this program is being supported by Lockheed Martin, who has authorized O'Brien & Gere to provide actual site specific impoundment assessments at selected facilities. This project is being conducted in accordance with the terms of our Purchase Order No. 7100051854, dated May 29, 2009.

1.2. Project Purpose and Scope

As stated in the Request for Proposal, the purpose of this work is to provide Dam Safety Assessment of CCW management units, including the following:

- Identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures
- Note the extent of deterioration, status of maintenance, and/or need for immediate repair
- Evaluate conformity with current design and construction practices
- Determine the hazard potential classification for units not currently classified by the management unit owner or by state or federal agencies

O'Brien & Gere's scope of services for this project includes performing a site specific dam safety assessment of all CCW management units at the subject facility. Specifically, the scope includes the following tasks:

- Perform a review of pertinent records (prior inspections, engineering reports, drawings, etc.) made available at the time of the site visit to review previously documented conditions and safety issues and gain an understanding of the original design and modifications of the facility.
- Perform a site visit and visual inspection of each CCW management unit and complete the visual inspection checklist to document conditions observed.
- Perform an evaluation of the adequacy of the outlet works, structural stability, quality and adequacy of the management unit's inspection, maintenance, and operations procedures.
- Identify critical infrastructure within 5 miles downgradient of management units.
- Evaluate the risks and effects of potential overtopping and evaluate effects of flood loading on the management units.

- Immediate notification of conditions requiring emergency or urgent corrective action.
- Identify all environmental permits issued for the management units
- Identify all leaks, spills, or releases of any kind from the management units within the last 5 years.
- Prepare a report summarizing the findings of the assessment, conclusions regarding the safety and structural integrity, recommendations for maintenance and corrective action, and other action items as appropriate.

This report addresses the above issues for the Bottom Ash Pond (BAP) Management Unit at the Trimble County Generating Station in Bedford, Kentucky. The Louisville Gas & Electric (LG&E) BAP impoundment facility is owned and operated by LG&E. In the course of this assessment, we obtained information from representatives of LG&E and its parent company, E.ON U.S.

2. Project/Facility Description

2.1. Identification of Management Unit

The Louisville Gas & Electric (LG&E) power generation facility in Trimble County was placed in operation in 1990 and includes a coal fired electrical power generating facility with an approximate capacity of 547 megawatts (MW) gross generation capacity. The main generating power comes from the coal fired facility and is supplemented during peak times with six simple cycle natural gas operated units for peak loads. Phase II of this facility will be a second coal fired generating unit, with a capacity of approximately 810 MW gross capacity, and is currently under construction and scheduled to be completed by mid-2010.

The facility is located at approximately elevation (EL) 475 feet above mean sea level along the alluvial floodplain of the Ohio River. The approximate 100 year floodplain elevation is 458 feet to 459 feet in the area. The small community of Wises Landing, KY is located approximately a mile south of the facility and is inhabited by about 30 residential homes. The small community of Bethlehem, IN is located approximately five miles south of the facility and is inhabited by about 40 residential homes.

The coal is supplied to the facility via barges from the Ohio River, and is then conveyed by belt to the coal pile and the boiler. All coal combustion waste is managed as wet disposal. The facility has four impoundment areas; 1) a small storm water retention pond at the southern end of the site, which collects site runoff; 2) the Bottom Ash Pond (BAP) at the northern end of the site, which receives all the facility's CCW; 3) an Emergency Fly Ash Pond located immediately north of the Bottom Ash Pond; and 4) a small retention pond adjacent to the limestone grinding facility, which collects limestone process and coal pile run-off water and pumps it to the BAP. According to LG&E personnel, the Emergency Fly Ash Pond has never been used or received any CCW. The Emergency Fly Ash Pond will be converted to a Gypsum Storage Pond (GSP) to be placed in service in 2010.

Both the BAP and Emergency Fly Ash Pond (future GSP) are separated from the Ohio River by a meandering stream and wooded area, which has been designated a nature reserve.

2.2. Hazard Potential Classification

The Commonwealth of Kentucky classifies dams or embankments in accordance with the Kentucky Revised Statutes (KRS) and Kentucky Administrative Regulations (KAR). The regulations are administrated by the Kentucky Department for Environmental Protection (KDEP), Division of Water, Dam Safety and Floodplain Compliance Section of the Water Infrastructure Branch. The KRS defines a dam as any structure that is 25 feet in height, measured from the downstream toe to the crest of the dam, or has a minimum impounding capacity of 50 acre-feet or more at the top of the structure (KRS Chapter 151.100).

Dam and embankment hazard classifications are established by the 401 KAR 4:030 and provide standards regarding impoundment facility structure classification from the Division of Water Engineering Memorandum No. 5 (incorporated by reference in 401 KAR 4:030).

> *"In determining structure classification, a number of factors must be considered. Consideration must be given to the damage that might occur to existing and future developments downstream resulting from a sudden breach of the earth embankment and the structures themselves. The effect of failure on public confidence is an important factor. State and local regulations and the responsibility of the involved public agencies must be recognized. The stability of the spillway materials, the physical characteristics of the site and valley downstream, and the relationship of the site to industrial and residential areas all have a bearing on the amount of potential damage in the event of a failure."*

A moderate or significant hazard classification may be applied for structures located such that failure may cause significant damage to property and project operation, but loss of human life is not envisioned. Such structures will generally be located in predominantly rural agricultural areas where failures may damage isolated homes, main highways or major railroads, or cause interruption of use or service of relatively important public utilities.

KDEP has rated the hazard potential of this BAP structure as "moderate hazard" (significant) due to the importance of the structure to the operation of this facility in which a failure of the structure could render the facility as inoperable. A failure of the structure could cause significant environmental damage if the CCW was released into the Ohio River thereby damaging the surrounding area and wildlife habitat, potential damage to wildlife and "fish kills", and threatening the drinking water supplies of the downstream communities. With the proximity of the operation buildings and workers immediately downstream and the small communities of Wises Landing, KY and Bethlehem, IN, a failure could result in damage to isolated homes, main highways or major railroads, or cause interruption of use or service of relatively important public utilities.

2.3. Bottom Ash Pond Physical Configuration

The BAP is a zero discharge, combined incised/diked structure with a surface pool area of approximately 82 acres. The embankment dike is partially incised with the pond bottom at approximately EL 430. Considering an average ground surface at EL 475, the BAP bottom is approximately 45 feet below natural ground elevation. The eastern crest is the highest at EL 528, while the north, south, and west dike crests are at about EL 500. The north dike is common to the BAP and the Emergency Fly Ash Pond (future GSP) to the north. According to design and survey plans, the crest of the north dike is approximately 75 feet above the bottom of the emergency fly ash pond. At the maximum section, the crest of the western dike is about 40 feet above the downstream toe elevation. The height of the embankments vary slightly on the north, south, and west sides due to the minor variation in the toe elevations; however, the eastern dike height decreases significantly toward the south due to increasing downstream toe elevations toward the south.

The inboard and outboard embankment slopes of all dikes are relatively steep, at two horizontal to one vertical slope (2H:1V). All dikes are constructed of native silt, sand and gravel with a 3 foot thick clay liner placed along the upstream slope. The clay material was mined from within the incised portion of the dike as well as from an adjacent borrow area to the north. According to boring logs from the 2008 MACTEC geotechnical report, the embankment foundations consist of natural glacial outwash deposits consisting of mostly dense sand layers with interbedded layers of generally stiff lean clay.

During the construction of the facility, the north, south, and west dikes were not completed to the design crest elevation of 528 feet, due to lack of available fill material, and as-built crest elevations met engineering requirements. However, the east dike was completed to the design crest elevation due to its parallel alignment with Corn Creek Road (KY 1838), which required relocation during the construction of the impoundment and necessitated construction of the dike to the final elevation. The crest width of the east dike is approximately 45 feet. The other perimeter dikes have crest widths of about 100 feet or more, given that these dikes were not completed to their design crest elevations. With the construction of the Phase II project (the second coal fired generating unit) at the facility, the dikes along the north, west and south sides are being expanded vertically to EL 528, which raises the western embankment height to about 68 feet. While the inspection team was on site, the contractor was in the process of mobilizing for the embankment vertical extension project. This project will require the use of mechanically stabilized earth walls for a portion of the vertical extension to establish the final crest elevations without modifying the upstream or downsteam slope geometries (for the majority of cross-sections), while providing for a crest width of at least 45 feet.

Several groundwater monitoring wells were observed and originally placed around the BAP because the original intent was to have a landfill at the premises for the CCW in lieu of the "wet management unit". While the KDEP requires groundwater monitoring for landfills, they do not require monitoring wells for surface water impoundments. Several piezometers were observed along the east dike but were only installed for the analysis and design of the vertical extension project and are now mostly abandoned.

The BAP is an incised/dike impoundment that does not have any contributing drainage area. The structure does not have a spillway system. The BAP water levels are controlled by three vertical turbine pumps on a floating dock. These pumps recirculate the water back to the facilities' various processes of use. Level is added to the BAP via two vertical Service Water Pumps, which draw water from the Ohio River (there is no means of return from the BAP to the Ohio River). No other outlet works exist for this structure.

3. Records Review

3.1. General

A review of the available records related to design, construction, operation and inspection of the Bottom Ash Pond was performed as part of this assessment. The documents provided by E.ON U.S. are listed below:

Document	Author	Date
Geotechnical Investigation Reports (3)	ATEC Associates	1976/1977
Design Drawings (Plans and Sections)	Fluor-Pioneer	1981 to 1986
Geotechnical Engineering Study Completion Report	ATEC Associates	1984
State Inspection Reports and Related Correspondence	KDEP-Dam Safety	1992 to 2009
Original Topography and Plant Layout Plans (4 drawings)	Fluor-Pioneer (originals) LG&E (revisions)	2000 to 2008
Report of Geotechnical Exploration – Bottom Ash Pond Dike Improvement	MACTEC	2008
Visual Dam Assessment Report	ATC Associates, Inc.	2009
Response to EPA Request for Information	E.ON U.S.	2009

3.2. Design Documents

Review of the 1976/1977 geotechnical investigation reports, early 1980's impoundment design drawings, and the 1984 Geotechnical Engineering Study (BAP and EFAP Pond Completion Report) revealed several things, as follows:

- The geotechnical engineering recommendations for pond siting, design slope inclinations, embankment drainage provisions, and pond liner thicknesses were generally followed in the impoundment design.

- The 1984 Geotechnical Engineering Study (BAP and EFAP Pond Completion Report) indicated that the pond bottom had not been lined with clay due to lack of clay material available on-site, but the inside slopes had been lined with the exception of the northwest portion of the north embankment. The report recommended that the clay liner be completed to cover these areas, but no documentation was available to verify that this was done. The liner was recommended to minimize seepage and reduce the potential for groundwater contamination by leachate from the

pond. The report indicates a design permeability of 1 x 10^{-7} cm/sec for the clay liner; however, no documentation was reviewed that verified the design value during construction.

- The 1984 Geotechnical Engineering Study (BAP and EFAP Pond Completion Report) also revealed that the north, south, and west embankments were completed to EL 500, while the east embankment was completed to EL 528. This variance in embankment crest elevations was due to the lack of on-site fill to bring all embankments up to the design crest EL 528.

Review of the 2008 Report of Geotechnical Exploration (MACTEC) revealed the following:

- This geotechnical exploration report was conducted to support the proposed vertical embankment extension design for the BAP. This project is reportedly currently underway and will bring the north, south, and west embankment crests up to EL 528 consistent with the east embankment crest.

- The report stated that subsurface conditions revealed by the borings indicated that the embankments were well constructed and consistent with design drawings.

- The embankments will be raised to the proposed grades using a combination of compacted fill at 2.5H:1V slopes and near vertical Mechanically Stabilized Earth (MSE) walls ranging in height from 8 to 20 feet. The report indicates that the new embankment material will consist of a combination of bottom ash and clay from on-site. It is anticipated that the clay liner will be extended along with the embankment raising.

- The boring logs and the report text indicate that the existing embankments were founded on native soils consisting of glacial outwash deposits of stiff lean clay and generally dense to very dense sands. No indication or mention of ash, coal slimes, or other CCW by-products within the embankments or embankment foundations was noted in our review of this most recent report of geotechnical exploration.

3.2.1. Spillway Design Flood

The Bottom Ash Pond is diked above surrounding grades on all sides and does not receive storm water drainage other than precipitation that falls directly into the impoundment or incidental runoff directed into the pond from the embankment crest. In addition, the BAP was designed as a "zero-discharge" impoundment with all inflow and outflow controlled by pumps. The normal pool is maintained at EL 495 giving sufficient freeboard to collect direct precipitation from a Probable Maximum Precipitation (PMP) event, during a period of pump failure.

3.2.2. Stability Analyses

The 1976/1977 ATEC geotechnical reports presented the results of extensive embankment slope stability modeling for short-term (end-of-construction), long-term static and dynamic (seismic), and rapid drawdown loading conditions. Conservative soil strength parameters used in the analyses were derived from laboratory tests of the foundation and proposed embankment soils. The results of these analyses indicated safety factors that meet current criteria for slope stability embankment dams.

The 2008 MACTEC geotechnical report presented results of embankment slope stability modeling of the proposed vertical embankment expansion design. These recent analyses were based on the existing slope geometry, soil strength parameters derived from laboratory testing, or in-situ testing of existing embankment soils, and the final embankment geometries/configurations proposed for the vertical expansion project. The analyses conducted included multiple sections representing all embankments analyzed for long-term, seismic, and rapid drawdown loading conditions. All results indicated safety factors that meet current criteria for slope stability embankment dams.

3.2.3. Summary of Design Modifications

The only design modification noted in the available records since the original construction of the BAP is the closure of the 48-inch Corrugated Metal Pipe (CMP) equalization pipe between the Bottom Ash Pond and the Emergency Fly Ash Pond. Based on review of the design drawings and discussions with plant engineering personnel, this pipe was sealed with grout shortly after construction of the two impoundments. The Emergency Fly Ash Pond was never used to store CCW by-products.

The current embankment vertical extension project will be the first major modification of the BAP. As discussed previously, the embankments will be raised to the proposed grades using a combination of compacted fill at 2.5H:1V slopes and near vertical Mechanically Stabilized Earth (MSE) walls ranging in height from 8 to 20 feet. The walls are needed due to a minimum 45-foot crest width requirement, which could not be achieved by simply raising the embankment at the same upstream and downstream slope inclinations. The new embankment material will consist of a combination of bottom ash and clay from on-site. It is anticipated that the clay liner will be extended along with the embankment raising. The new embankments will be founded on previously placed soil embankments. None of the raised embankments will be founded on ash materials. The embankment extension project will bring the Emergency Fly Ash Pond into operation as a FGD repository and gypsum storage pond. Storage of water and FGD (Gypsum) materials in the EFAP should serve to improve the stability of the north dike, as the unbalanced load on the dike will decrease as water and FGD materials accumulate in the EFAP or future GSP.

3.2.4. Instrumentation

As part of the geotechnical study performed by MACTEC in 2008, four piezometers were installed to observe water levels within the BAP embankments. These piezometers indicated that seepage through the embankment was minimal with two of the four piezometers yielding no groundwater. The piezometer installed on the crest of the east dike indicated a water level at approximately EL 474 feet, which appears similar in elevation to the blanket drain at the native soil/embankment fill interface as shown in Section C-C of Figure 4. A piezometer installed on the south dike indicated a steady water level at approximately EL 481, which MACTEC attributed to a granular toe drain that was installed at this elevation during original construction. The seepage observed at the toe of south embankment is believed to be associated with discharge from this toe drain.

The piezometers were installed and monitored during the design development of the embankment vertical extension project. Based on our discussions with plant engineering personnel, the existing

temporary piezometers are not currently being monitored, as they fulfilled their purpose for the design of the BAP vertical extension.

3.3. Previous Inspections/Analyses

KDEP Dam Safety personnel have been performing regular dam safety inspections of the BAP since 1989. These state inspections are scheduled to be performed every two years. The two year inspection cycle was maintained through 2000. The next inspection was delayed until 2005, and the 2007 inspection was not performed due to state inspection personnel shortages. The most recent state inspection was performed concurrently with our site visit on June 1, 2009. Based on our review of the state inspection reports, the only issues or action items addressed in the reports included recommendations for clearing of small trees and woody vegetation growing on the embankments and mowing of the embankments, all of which have been completed.

In January of 2009, LG&E contracted ATC Associates, Inc. to perform an independent dam safety inspection of the BAP. The conclusion of this inspection indicated the BAP and associated dikes to be in "Satisfactory" condition overall with no urgent problems noted. This inspection report did recommend completion of several maintenance and monitoring items, which generally included the following:

- Mowing of slopes (completed)
- Removal of trees on northern dike downstream slope (completed)
- Repair of shallow scarps or sloughs (not completed)
- Repair erosion gullies (numerous locations; not completed)
- Grade crest toward pond to reduce erosion problems (not completed)
- Evaluate and repair upstream slope erosion (not completed)
- Monitor seepage at south toe (on-going)
- Monitor former scarps on east downstream slope (on-going)

3.4. Operator Interviews

LG&E engineering personnel accompanied the other members of the inspection team and provided answers to questions regarding the BAP structure and the CCW disposal process. Mr. Bob Waterman indicated that he was present during the original construction of the BAP and has been an employee at Trimble County Station since commissioning of the BAP in 1990. Mr. Waterman is serving as Project Manager of the vertical extension project currently underway. None of the plant personnel were aware of any former failures, releases, or other structural integrity problems occurring at the BAP.

4. Visual Inspection

4.1. General

On June 1, 2009, the following individuals were present to visually inspect the Bottom Ash Pond at the LG&E Trimble County Station in Bedford, Kentucky:

Thomas Crutcher – LG&E
David Millay – LG&E
Robert Waterman – LG&E
Roger Medina – LG&E
Marilyn Thomas – KDEP
Ray Prater – KDEP
Alexander Livnat – US EPA
Bryan Lovan – O'Brien & Gere
Dreher Whetstone – O'Brien & Gere

The weather on the date of inspection was clear and approximately 89 degrees. A field checklist was prepared by O'Brien & Gere to summarize the visual inspection and is included as Appendix A. Photographs were taken by both KDEP and O'Brien & Gere. Pertinent photos taken by O'Brien & Gere are included as Appendix B. In addition, an aerial photograph of the BAP is presented as Figure 2, which provides photograph locations and directions. This aerial photograph is believed to have been taken in 2006.

KDEP's Dam Safety and Floodplain Compliance Section/Water Resources Branch/Division of Water inspections of the unit have taken place in 1989, and from 1990, bi-annually until 2000. Due to reductions in staff, the last inspection prior to our visit took place only in September, 2005. Marilyn Thomas with the KDEP Dam Safety and Floodplain Compliance Section conducted an inspection concurrently and the report would be made available upon request.

4.2. Summary of Findings

LG&E had contracted with ATC Associates to conduct a site inspection of the BAP on January 20, 2009. A copy of this inspection is presented in Appendix C. Results of this inspection were reviewed by O'Brien & Gere, the high priority items recommended for completion in the ATC report had been addressed by LG&E prior to this visual inspection; however, the moderate and normal priority items had not been completed at the time of our site visit.

During the visual site inspection of the BAP, the perimeter of the impoundment was walked by two groups. One group walked the downstream slope, while the other group walked the crest and upstream slope. Representative features were observed by both groups. Sluiced CCW by-product discharge is concentrated within the northwest quadrant of the BAP, where CCW by-products have accumulated above the normal water line. Operations to load and export dewatered ash and other CCW by-products were on-going within the northwestern quadrant of the BAP at the time of our site visit. The BAP does not have a spillway or outlet works and the water level is maintained in the

pond by the recirculating pumps in conjunction with service water pumps, which draw water from the Ohio River. The pump raft is located within the southern portion of the BAP. The current water level is approximately five to seven feet below normal (EL 495) in preparation for construction of the vertical extension project.

Wave action erosion was observed on the unarmored upstream slopes of both the south and east embankment and was more noticeable with the lower pool elevation. This erosion and some minor gully erosion occurring near the influent/effluent piping were the only deficiencies found on the upstream slope.

The downstream slope had recently been mowed, which allowed for better observation of the slope. Several shallow sloughs were noticed along the downstream slopes, but it was evident that they were old occurrences due to the vegetative growth around the sloughs. No new sloughs or depressions were found during this inspection.

Several erosion gullies were observed on the downstream slopes of the west and north embankments. This erosion appears to be occurring due to concentrated storm water discharge due to rutting of the crest by equipment and irregular grading of the crest toward the downstream slope.

The deficiencies described above are considered minor issues that do not currently impact the structural integrity of the impoundment; however, these issues will require monitoring and repair in the future to avoid worsening conditions and prior to the construction of the vertical extension project. Counter to the situation during the last KDEP inspection, grasses were mowed shortly before our visit. It was observed that the equipment used to conduct the mowing was causing some rutting, which may be contributing to the minor sloughs, especially if the embankment was wet from recent rainfall. No seepage was observed, with the exception of the noted seepage along the toe of the south dike that has been in existence since the late 1980s. This was noted in the field checklist. As discussed previously, this seepage is believed to be associated with discharge from a granular toe drain that was installed during the original construction.

5. Conclusions

Based on the findings of the visual inspection and the records review conducted for this study, the Bottom Ash Pond at Trimble County Station located in Bedford, Kentucky appears to be in satisfactory condition and is well maintained. As described in the previous section, several minor maintenance items were observed, which do not currently impact the structural integrity of the BAP management unit, but should be addressed in the near future to avoid worsening conditions. These items include areas of erosion and shallow slope sloughing on both the upstream and downstream slopes. One small seepage location was noted on the toe of the south embankment.

Our interviews with plant engineering personnel responsible for the operation of the management unit indicate that a regular operations plan is in use at the Trimble County facility. The system of CCW and process water management in the BAP appears to be consistent with the original design intent. The regular operating procedures of the facility do not appear to be impacting the structural integrity of the impoundment structures.

In recent years, maintenance of the BAP has consisted of regular mowing and prevention of woody vegetation growth on the embankments. The plant engineering staff maintains all design documents and inspection reports in a well organized manner. The plant participates in and cooperates with regular state inspections. The Plant operations personnel make daily "drive-by" observations to monitor general conditions of the management unit. Based on these findings, we are of the opinion that the operations and maintenance procedures being practiced at the BAP management unit are adequate, although we recommend additional maintenance actions be implemented to correct some of the conditions observed.

6. Recommendations

Based on the findings of our visual inspection and review of the available historical documents for the Bottom Ash Pond Management Unit, O'Brien & Gere recommends that additional maintenance of the embankment be performed to correct the erosion, slope sloughing, and poor drainage conditions observed during the inspection. These recommendations are grouped into the following categories, based on the urgency and nature of the issue to be addressed.

6.1. Urgent Action Items

None of the recommendations are considered to be urgent, since the issues noted above do not appear to threaten the structural integrity of the dam in the near term. However, it is recommended that all of the maintenance items be undertaken during construction of the embankment extension project, given the need to correct these issues prior to placing additional fill on the embankments.

6.2. Long Term Improvement/Maintenance Items

All of the deficient conditions observed during the inspection are considered to be maintenance items that do not require immediate attention; however, we recommend that these issues be corrected prior to raising the embankments during the vertical extension project. This recommendation is made considering that it is the most logical time to complete the minor repairs during the course of a major earthwork project. Furthermore, access to the areas requiring repair will be difficult after the embankments are raised, and neglected erosion or slope sloughing conditions may eventually impact the stability of the newly modified embankments with increased loading. As such, the repairs should be treated as preparation measures for the new embankment extension. The needed repairs are listed below:

1. Upstream slope – repair eroded and sloughed areas near the top of the east and south embankments. Repairs should be completed in accordance with an engineered design. Consider armoring of upper portion of interior eastern and southern slopes to protect against wave action erosion.

2. Embankment Crest -- regrade crest to divert runoff into pond, fill low areas to establish a uniform crest elevation and to avoid concentrated channeling of runoff. Grade crest to promote sheet flow. Stabilize areas of crest where vehicle or equipment will travel or in material laydown areas to avoid rutting of soft surface soils and creation of poorly drained areas.

3. Downstream slopes – fill erosion gullies on the downstream slopes of the north, east, and west embankments. Repair sloughs, and re-grade irregular areas of slopes to avoid concentrated runoff channels or saturation of portions of slope. Repairs should be performed in accordance with an engineered design. Avoid mowing during wet conditions to reduce rutting by heavy tractor, which may be causing some minor slope sloughing. Place turf reinforcement erosion control matting over repaired areas to reduce the potential for future erosion gullies.

6.3. Monitoring and Future Inspection

O'Brien & Gere recommends continued participation in state bi-annual inspections. Consideration should also be given to independent inspections, such as the one conducted by ATC Associates, Inc., by licensed dam safety engineers on at least a bi-annual basis. Consideration should be given to development of an O&M Plan that would establish a firm schedule for operations, maintenance, and inspection activities.

Although the minor seepage/wetness at the downstream toe of the south embankment is believed to be the result of controlled discharge from an engineered toe drain, this seepage area should be monitored for increased seepage volume, transport of fine-grained soils, or other changed conditions that may indicate a potential problem. Installation of a small gravel blanket drain in the area with an outlet channel or pipe would help to alleviate the poor drainage conditions in the area and provide a means to measure seepage flow rate at a convenient discharge point.

Consideration should also be given to installing permanent piezometers at critical sections within each embankment. These piezometers can serve to monitor the phreatic surface and pore water pressure during and after the embankment extension project, and help to evaluate the performance of the clay liner under the higher hydraulic loading that will be applied with the raised normal pool elevation after completion of the embankment extension. Considering that the level of the phreatic surface, or pore water pressure, within the downstream embankment soils can have a significant effect on slope stability, the piezometers would help to ensure engineers that pore water pressures remain below the levels assumed in the design slope stability analyses. The engineer of record for the embankment extension project should be consulted regarding the location, depths, and types of piezometer instrumentation to be installed and the frequency of monitoring.

6.4 Certification Statement

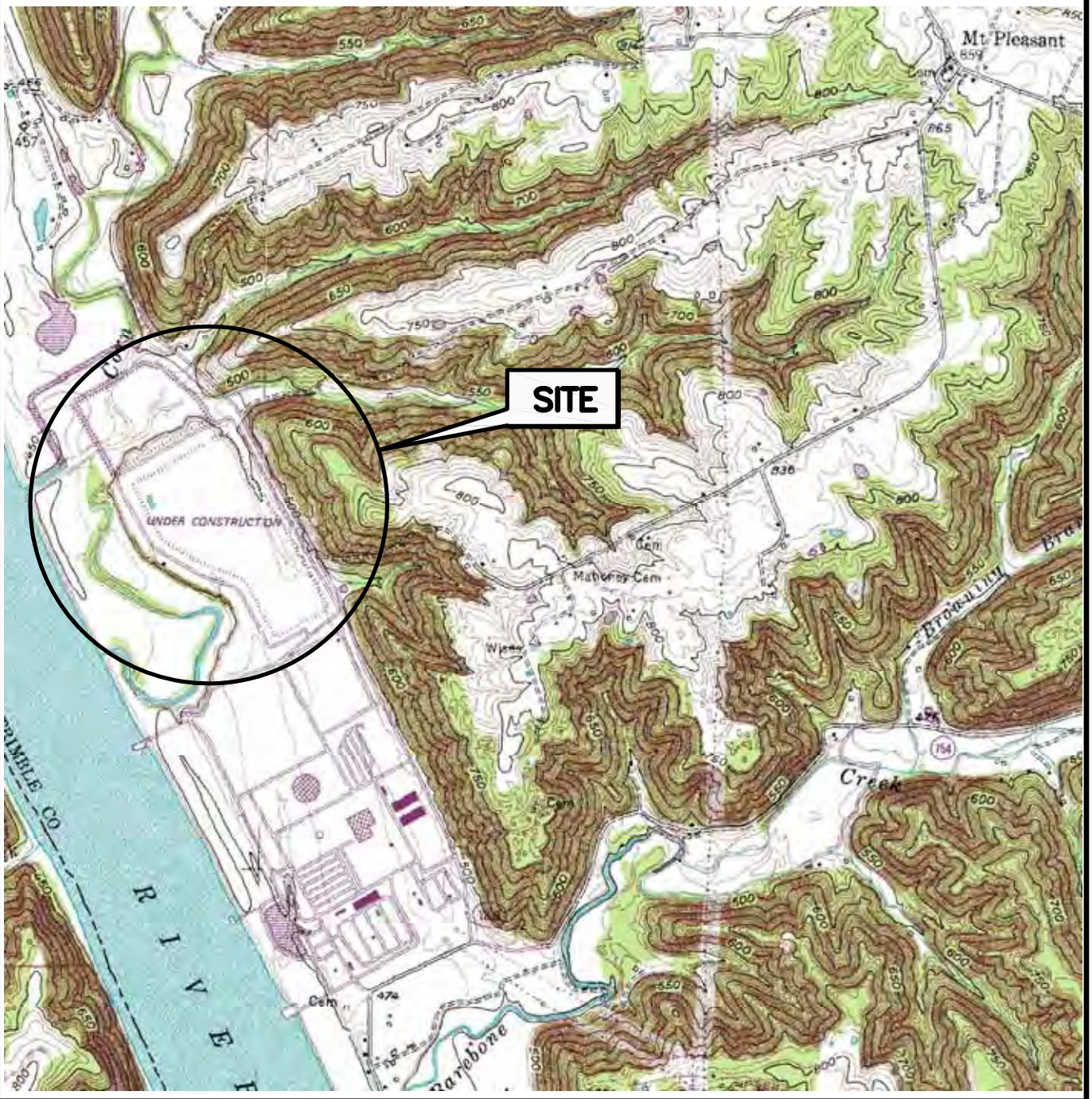
I acknowledge that the Bottom Ash Pond management unit referenced herein was personally inspected by me on June 1, 2009 and was found to be in the following condition:

(SATISFACTORY)
FAIR
POOR
UNSATISFACTORY

Signature: Bryan K. Lovan

Bryan K. Lovan, PE

FIGURE 1



ADAPTED FROM: BETHLEHEM QUADRANGLE, KENTUCKY U.S.G.S. 7.5 MIN. QUAD

KENTUCKY

TRIMBLE COUNTY POWER PLANT
BOTTOM ASH POND
TRIMBLE COUNTY, KENTUCKY

SITE LOCATION MAP

QUADRANGLE LOCATION

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

FILE NO. 5851.44642-001A.DWG SCALE: 1:24000

JULY 2009

O'BRIEN & GERE

I:\LOCKHEED-MAR-FS.5851\44642.COAL-ASH-IMPOUN\DOCS\DWG\SHEETS\44642-001A.DWG, 09/11/2009 3:14PM

FIGURE 2

LEGEND:

1 PHOTOGRAPH LOCATION/DIRECTION

US EPA &
LOCKHEED MARTIN

COAL COMBUSTION WASTE
IMPOUNDMENT INSPECTIONS

TRIMBLE COUNTY, KY

TRIMBLE COUNTY POWER PLANT BOTTOM ASH POND AERIAL PHOTOGRAPH

1"=400' 400 0 400

FILE NO. 5851/44642-002
JULY 2009

O'BRIEN & GERE

6/30/09

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6/30/09

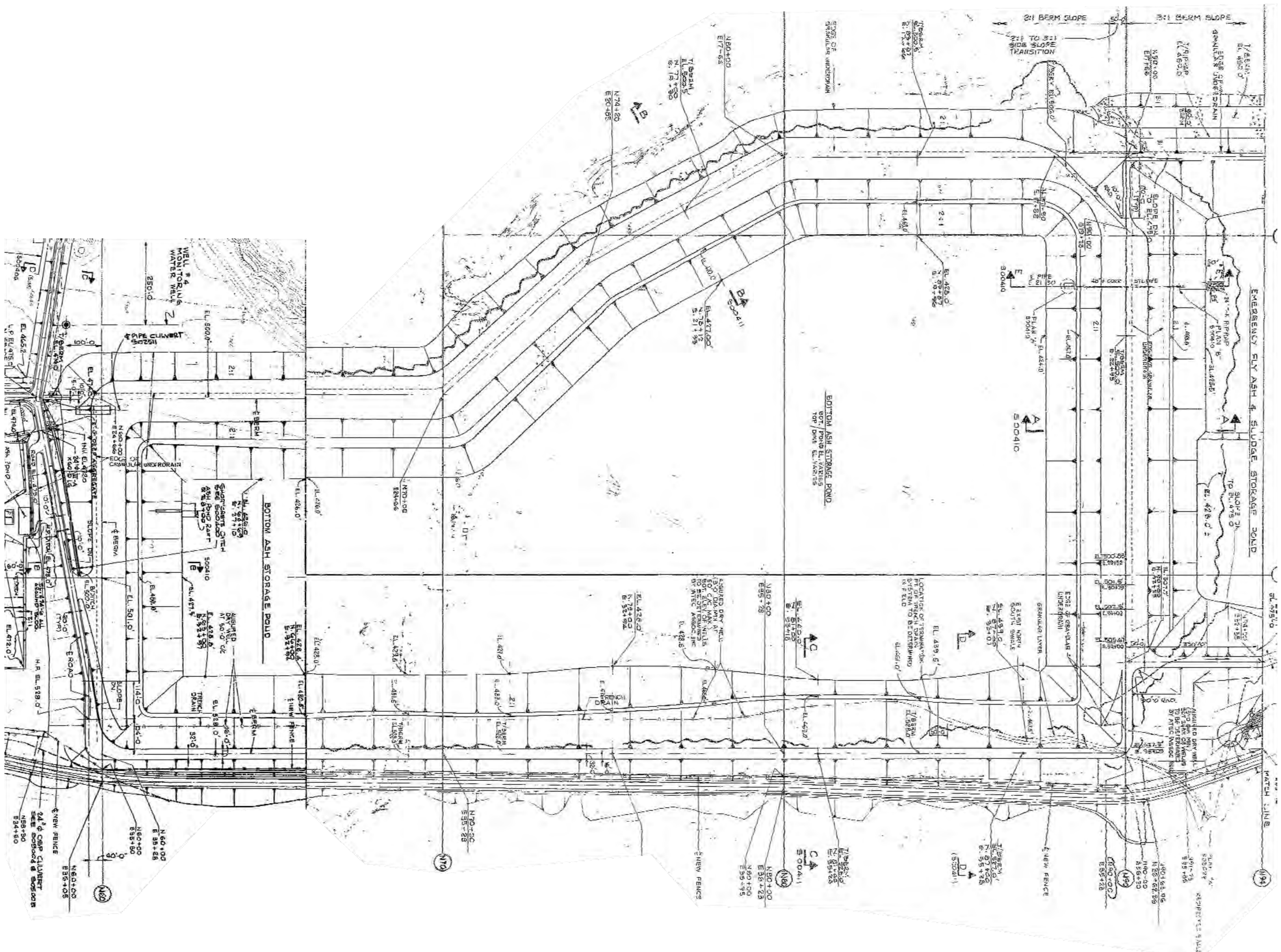


FIGURE 3

US EPA &
LOCKHEED MARTIN

COAL COMBUSTION WASTE
IMPOUNDMENT INSPECTIONS

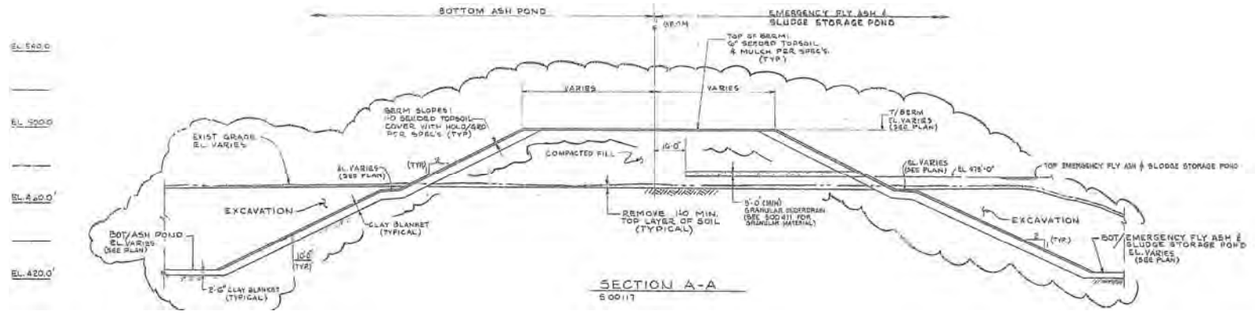
TRIMBLE COUNTY, KY

TRIMBLE COUNTY POWER PLANT BOTTOM ASH POND SITE PLAN

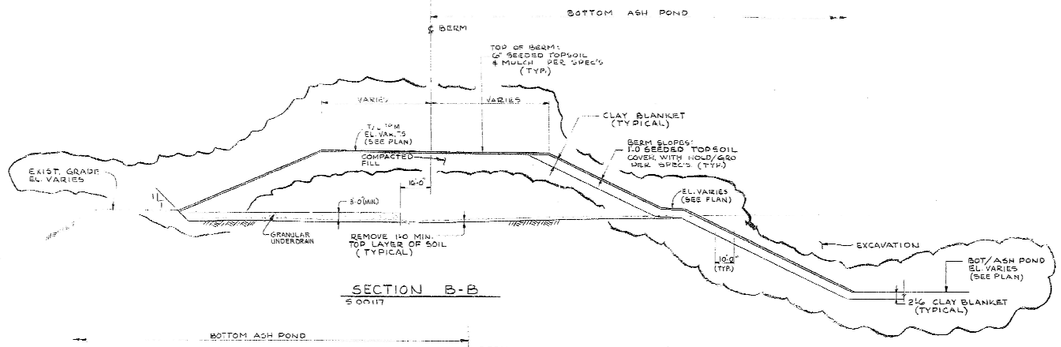
1"=300'   300   0   300

FILE NO. 5851/44642-003
JULY 2009

O'BRIEN & GERE



SECTION A-A
SCALE: 1"=80'



SECTION B-B
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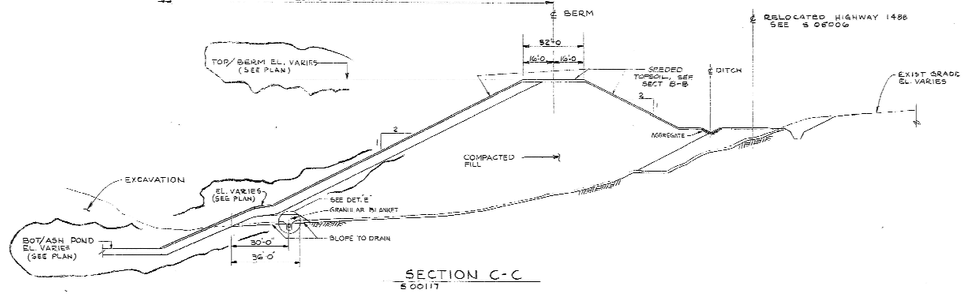

SECTION C-C
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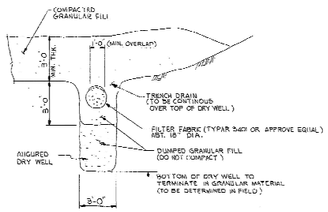
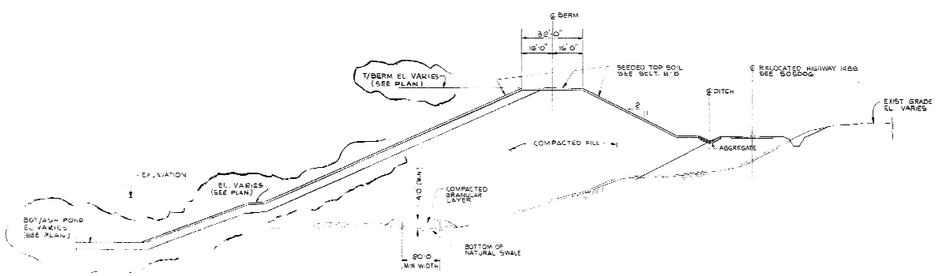


DETAIL E
SCALE: NONE



SECTION D-D
SCALE: 1"=80'

8/13/09

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US EPA & LOCKHEED MARTIN

COAL COMBUSTION WASTE IMPOUNDMENT INSPECTIONS

TRIMBLE COUNTY, KY

TRIMBLE COUNTY POWER PLANT BOTTOM ASH POND TYPICAL SECTIONS

1"=80' 80 0 80

FILE NO. 5851/44642-004
AUGUST 2009

O'BRIEN & GERE

APPENDIX A

Visual Inspection Checklist

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Trimble Co. Station Date: June 1, 2009

Unit Name: Coal Combustion Waste Pond Operator's Name: Louisville Gas & Electric

Unit I.D.: BAP - Bottom Ash Pond Hazard Potential Classification: High (Significant) Low

Inspector's Name: Dreher Whetstone, P.E./Bryan Lovan, P.E.

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?	Periodic		18. Sloughing or bulging on slopes?	X	
2. Pool elevation (operator records)?	EL 495+/-		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes: N/A		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		
5. Lowest dam crest elevation (operator records)?	EL 500+/-		Is water exiting outlet, but not entering inlet?		
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?		
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)?			From underdrain?	X	
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?	X	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Inspection Issue # Comments

1. Internal inspections performed at least quarterly; daily "drive-by" inspections by employees working ash pond operations; inspections by State Dam Safety Agency scheduled every 2 years (last state inspection in 2005)

3. Water in impoundment is recirculated back to plant via floating pumps on south end of impoundment.

6. Two piezometers are present on south and east crest, but not regularly monitored. These piezometers were installed as part of a design study for proposed embankment raising project.

Inspection Issue #	Comments
7.	Mobilization for embankment raising project commenced this week.
8.	Unknown at time of inspection. Will research in construction records and document in Final Report
12	Water removed by recirculation pumps.
18	Numerous erosion rills and shallow sloughs observed upstream and downstream embankment slopes. Conditions observed considered maintenance issues that do not currently impact embankment stability, but will require repair work in the near future to avoid worsening conditions. Upstream freeboard slope erosion due to wave action.
19.	A few significant erosion rills observed that require maintenance in the near future, during proposed embankment raising.
21	Minor seepage estimated at < 1 gallon/min was observed at mid-point of toe of south embankment. Seepage believed to be discharge from gravel blanket drain at toe. A few very minor wet areas were observed at isolated areas on downstream slopes. No observed flow from these wet areas. Not a safety concern
24	Photos were taken and will be presented in Final Report.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

B Lovan, P.E.

Impoundment NPDES Permit # KY0041971 INSPECTOR D. Whetstone, P.E.

Date 6/1/09

Impoundment Name CCW Pond - Trimble Co. Station, Kentucky

Impoundment Company Louisville Gas & Electric E. on US

EPA Region 4

State Agency (Field Office) Addresss Dept. of Env. Protection, Div. of Water
200 Fair Oak, 4th Fl, Frankfort, KY 40601-1189

Name of Impoundment Bottom Ash Pond

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

New _____ Update _____

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

IMPOUNDMENT FUNCTION: Containment/Management of Coal Combustion Process By Products

Nearest Downstream Town : Name Wises Landing

Distance from the impoundment 1 Mile South

Impoundment Location:

Longitude 38 Degrees 35 Minutes 36 Seconds

Latitude 85 Degrees 25 Minutes 04 Seconds

State KY County Trimble

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

If So Which State Agency? Dept. of Env. Protection, Div. of Water

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.

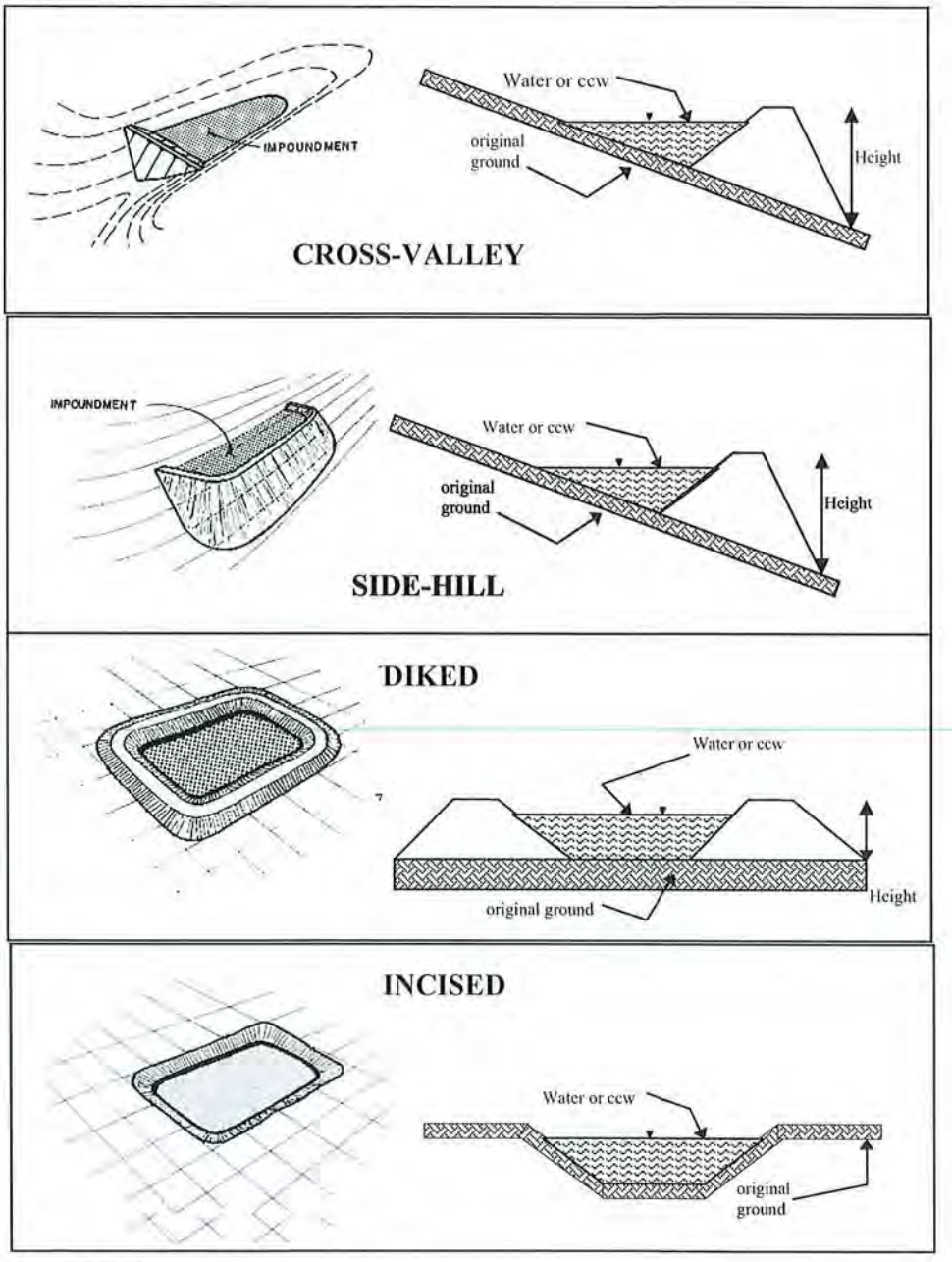
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

Predetermined based on state rating of "moderate hazard".

CONFIGURATION:



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

Embankment Height 40 feet
Pool Area 82 acres
Current Freeboard 5 feet

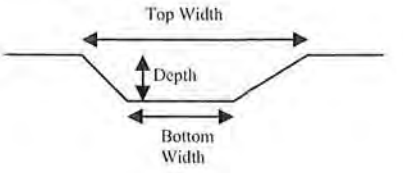
Embankment Material Sand, gravel, silt
Liner Compacted clay ~ 3 ft thick
Liner Permeability Design Value:
1×10^{-7} cm/sec

TYPE OF OUTLET (Mark all that apply) N/A

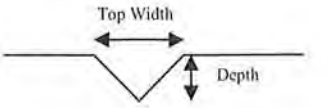
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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

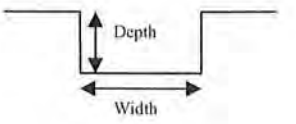
TRAPEZOIDAL



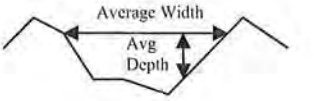
TRIANGULAR



RECTANGULAR

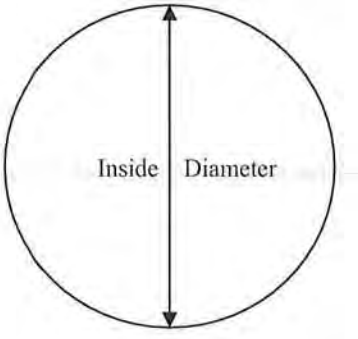


IRREGULAR



_____ **Outlet**

_____ inside diameter



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

_____

Is water flowing through the outlet? YES _____ NO _____

_____ **No Outlet**

_____

__X__ **Other Type of Outlet** (specify) Water levels in the pond are managed by large recirculation pumps situated on a floating raft.

The Impoundment was Designed By Fluor Pioneer, Inc.
Chicago, IL

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 : _____

APPENDIX B

Photographs

Photo 1 - View of Floating Dock with recirculating pumps and piping along South Dike

Photo 2 – View of South Dike with erosion and sloughing of upstream slope freeboard caused by wave action

Photo 3 - Typical overview of impoundment viewed from Floating Dock along South Dike

Photo 4 – View of typical erosion gullies in freeboard area along upstream slope near Floating Dock

Photo 5 – View of influent/effluent piping and vault along west embankment crest

Photo 6 – Overview of downstream slope of the west dike from crest of south dike

Photo 7 – Typical view of groundwater monitoring well (Not used for seepage or pore pressure monitoring)

Photo 8 – Typical erosion gullies along western downstream slope near inside curved slope of embankment

Photo 9 – Typical rutting and slope sloughing due to heavy mowing tractor, western downstream slope

Photo 10 – Old slough on western downstream slope

Photo 11 – View along toe of western downstream slope looking south

Photo 12 – View of Emergency Fly Ash Pond and northern slope of Bottom Ash Pond

Photo 13 – Old slough on eastern downstream slope

Photo 14 – View along crest and upstream slope of eastern embankment looking north

Photo 15 – Wet Area or minor seepage at toe of south embankment possibly due to discharge from gravel toe drain (View looking west)

APPENDIX C

Copy of January 2009 Inspection Report

DAM ASSESSMENT FORM

Name of Professional Conducting Inspection: Mark J. Schuhmann P.E.				KY Professional License No.: 12,500	
Company Name: ATC Associates, Inc.				Phone:502-722-1401	
Address: 132 Citizens Blvd. Simpsonville, KY 40067					
Inspection Preparation: Reviewed all pertinent technical documentation related to this dam and site in: the State's files Yes ☒ No ☐ ; and Owner's Files: Yes ☒ No ☐					
Comments: Due to weather conditions at time of Assessment in January of 2009 a follow-up assessment should be performed					
Dam/Pond Name: **Trimble County, BAP**		Hazard Rating: Moderate	Topographic Quad: Bethlehem	Date of Inspection: 1/20/09	
State Dam ID: 928	County: Trimble	Latitude: 38°35.6000'	Longitude: 85°25.0666' W	Last Inspection: 9/07/05	
Power Station Name: Trimble County					
Address: 487 Corn Creek Road, Bedford KY					
Site Contact: Tom Crutcher			Phone: 502-627-6201		
Drainage Area (AC): 64	Surface Area(AC): 64	Height (Ft): 40	Crest Length (Ft): 8850	Crest Width (Ft): 30	Crest Elevation (Ft): 500 to 528
Slope (Ft): Upstream: 2H:1V Downstream: 2H:1V	Principal Spillway Type: Intake from Process Water	Principal Spillway Size:	Spillway Control Elevation: 492	Freeboard(Ft): 8	
CCP placed in Pond: Bottom Ash, Fly Ash, pyrites. Gypsum	Emergency Spillway Type: None	Emergency Spillway Size: N/A	Spillway Control Elevation: N/A	Freeboard(Ft): N/A	

FIELD CONDITIONS OBSERVED

Ash Exposed: Yes: ☒ None: ☐	Location: west side	Max. Height above pool: Estimated at 8 Feet
Water Level (Below Dam Crest, Ft): 8		
Ground Moisture Condition: Dry ☐ Wet ☐ Snow cover ☒ Other:		
Monitoring: Yes ☐ None: ☐ (☐ Gage Rod ☒ Piezometers ☐ Seepage Weirs ☐ Survey Monuments ☐ Other)		
Comments: Regular observations by E.on staff who drive over the crest road at least once per shift.		

A UPSTREAM SLOPE GOOD ☐ ACCEPTABLE ☒ DEFICIENT ☐ POOR ☐	**Problems Noted**: ☐ None ☐ Riprap – Missing, Sparse ☒ Wave Erosion ☐ Cracks ☐ Sinkholes ☐ Appears Too Steep ☐ Depressions or Bulges ☐ Slides ☐ Animal Burrows ☐ Trees, Bushes, Briars ☒ Other **Comments**: Wave erosion has caused a 4 to 5 foot vertical scarp at waterline (492) on east side of impoundment as well as lateral bench extending out into the pond. No apparent instability of slope above scarp noted. Numerous ruts from mowing equipment observed running parallel to slope.
B CREST GOOD ☒ ACCEPTABLE ☐ DEFICIENT ☐ POOR ☐	**Problems Noted**: ☐ None ☐ Ruts or Puddles ☐ Erosion ☐ Cracks ☐ Sinkholes ☐ Not Wide Enough ☐ Low Areas ☐ Misalignment ☒ Inadequate Surface Drainage ☐ Trees, Bushes, Briars ☐ Other **Comments**: Previous grading of road on east side has concentrated runoff and generated some minor erosion of upstream face of slope. Grade slopes to downstream face on west side and has generated numerous erosion gullies on west slope face.

CCP: Coal Combustion Products;
Spillway Size: Pipe Dia. for drop inlet; open channel width (typically emergency or (auxiliary) spillway) at the control section, Ft;
Freeboard: vertical distance from the emergency spillway control section to the lowest point of the crest of the dam.

DAM ASSESSMENT FORM

C DOWNSTREAM SLOPE

GOOD ☐
ACCEPTABLE ☒
DEFICIENT ☐
POOR ☐

Problems Noted: ☐ None ☐ Livestock Damage ☒ Erosion, Gullies ☐ Cracks ☐ Sinkholes ☐ Appears Too Steep ☐ Depression or Bulges ☒ Slide ☐ Soft Areas ☒ Trees, Bushes, Briars ☒ Animal Burrows ☐ Other

Comments: West slope: Numerous erosion gullies on west embankment slope, needs mowing. North Slope: EFAB interior slope not well maintained. Numerous trees and brush observed , cutting currently in progress. Several small sloughs on the slope observed and some animal burrows near the bottom of the slope. Shared dike between basins is very wide in this area (>100').
East slope: 2 repaired surface sloughs noted near north half of embankment.

D SEEPAGE

GOOD ☒
ACCEPTABLE ☐
DEFICIENT ☐
POOR ☐

Problems Noted: ☐ None ☐ Saturated Embankment Area ☐ Seepage Exits on Embankment ☐ Seepage Exits at Point Source ☒ Seepage Area at Toe ☐ Flow Adjacent to Outlet

If Seepage: ☐ Clear ☐ Muddy

Drain Outfalls Seen: Yes ☐ No ☐ Flow: ☐ Clear ☐ Muddy ☐ Dry ☐ Obstructed

Comments: No known areas of seepage, however area below toe of south embankment slope, reported to be soft and wet but was frozen at time of assessment.

E PRINCIPAL SPILLWAY

GOOD ☒
ACCEPTABLE ☐
DEFICIENT ☐
POOR ☐

Description: Intake for process water.

Problems Noted: ☐ None ☐ Deterioration ☐ Separation ☐ Cracking ☐ Inlet, Outlet Deficiency ☐ Stilling Basin Inadequacies ☐ Trash Rack ☐ Other

Comments: Minor area of erosion

F AUXILIARY SPILLWAY

GOOD ☐
ACCEPTABLE ☐
DEFICIENT ☐
POOR ☐

Description: N/A

Problems Noted: ☐ None ☐ No Auxiliary Spillway Found ☐ Erosion with Backcutting ☐ Crack with Displacement ☐ Appears to be Structurally Inadequate ☐ Appears too Small ☐ Inadequate Freeboard ☐ Flow Obstructed ☐ Concreted Deteriorated/Undermined ☐ Other

Comments:

G MAINTENANCE AND REPAIRS

GOOD ☐
ACCEPTABLE ☒
DEFICIENT ☐
POOR ☐

Problems Noted: ☐ None ☐ Access Road Needs Maintenance ☐ Cattle Damage ☐ Spillway Obstruction ☒ Vegetation on Upstream Slope, Crest, Downstream Slope, Toe ☒ Trees on Upstream Slope, Crest, Downstream Slope, Toe ☒ Rodent Activity on Upstream Slope, Crest, Downstream Slope, Toe ☐ Deteriorated Concrete –Facing, Outlet, Spillway ☐ Gate and/or Drawdown Need Repair ☒ Other

Comments: Trees on north down stream face (currently under way).
Thick vegetation on downstream slopes, north & west sides.
Animal burrows on north slope.
Wave erosion on interior face of east and south slopes

H IMPOUNDMENT AREA

GOOD ☒
ACCEPTABLE ☐
DEFICIENT ☐
POOR ☐

Problems Noted: ☐ None ☒ Exposed Ash ☐ Ponded Water within Ash ☐ Ash blocking spill way ☐ Signs of damage from dredging ☐ Ash deposits in spillway ☐ Other

Impoundment receives surface water runoff in addition to sluiced ash: Yes ☐ No ☒

Release of ponded water could cause overtopping of dam: Yes ☐ No ☒ N/A ☐

Comments:

DAM ASSESSMENT FORM

I OVERALL CONDITIONS		Comments: No urgent problems noted, maintenance & monitoring required.
SATISFACTORY	☒	
FAIR	☐	
CONDITIONALLY POOR	☐	
POOR	☐	
UNSATISFACTORY	☐	

If this rating is different than the previous inspection, please attach an explanation and reasons for change on page 5.

Summary of Findings and Recommendations in Attached Table

This visual dam assessment was conducted to assess the general overall condition of the reservoir/ash pond/dam, identify visible deficiencies, and recommend areas for monitoring, additional investigative studies and corrective actions. The assessment is based only on visible features/areas of the dam on the day of inspection; it does not constitute a formal safety inspection nor a review or evaluation from each specialist of an inspection team, such as geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. This assessment does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies.

Professional Engineer's Signature: _____ Date: 1-26-09

Reviewed by: _____ Date: _____

Owner/Owner Representative Signature

GUIDELINES FOR DETERMINING CONDITIONS

Conditions Observed – Applies to Upstream Slope, Crest, Downstream Slope, Principal Spillway , Auxiliary Spillway and Impoundment area			
Good In general, this part of the structure has a good appearance, and conditions observed in this area do not appear to threaten the safety of the dam	**Acceptable** Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new conditions. Conditions in this area do not currently appear to threaten the safety of the dam.	**Deficient** Continued deterioration and/or unusual loading may threaten the safety of the dam.	**Poor** Conditions observed in this area appear to threaten the safety of the dam. Conditions observed in this area are unacceptable.
Conditions Observed – Applies to Seepage			
Good No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.	**Acceptable** Some seepage exposits at areas other than drain outfalls, or other designed drains. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.	**Deficient** Excessive seepage exists at areas other than drain outfalls and other designed drains. Seepage needs to be evaluated; increase flow and/or continued deterioration in seepage conditions may threaten the safety of the dam.	**Poor** Excessive seepage conditions observed appear to threaten the safety of the dam and is unacceptable. Examples: 1) Designed drain or seepage flow have increased without increase in reservoir level. 2) Drain or seepage flows contain sediment. 3) Widespread seepage, concentrated seepage or ponding appears to threaten the safety of the dam.
Conditions Observed – Applies to Maintenance and Repair			
Good Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.	**Acceptable** Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are required.	**Deficient** Level of maintenance of the dam needs significant improvement. Major repairs may be required. Continued neglect of maintenance may threaten the safety of the dam.	**Poor** Dam does not receive adequate maintenance. One or more items needing maintenance or repair have begun to threaten the safety of the dam. Level of maintenance is unacceptable.

Overall Conditions				
Satisfactory No existing or potential dam safety deficiencies recognized. Safe performance is expected under all anticipated loading conditions, including such events as infrequent hydrologic and/or seismic events. Project files contain necessary hydrologic and other engineering calculations to verify dam safety and performance.	**Fair** No existing dam safety deficiencies are recognized for normal loading conditions. Infrequent hydrologic and/or seismic events would probably result in a dam safety deficiency.	**Conditionally Poor** A potential safety deficiency is recognized for unusual loading conditions which may realistically occur during the expected life of the structure. This designation 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.	**Poor** A potential dam safety deficiency is clearly recognized for normal loading conditions. Immediate actions to resolve the deficiency are recommended; reservoir restrictions may be necessary until problem resolution.	**Unsatisfactory** A dam safety deficiency exists for normal conditions. Immediate remedial action is required for problem resolution.

Findings and Recommendations

Plant Name: Trimble County
Structure Name: Bottom Ash Pond (BAP)
State Facility ID: 928
Assessment date: 1/20/2009

Item Number	Priority Rating	Photo Number	Location Description	Action Item
1	High	11, 12	Downstream Slope	Mow downstream slopes west side (completed 1-26-09)
2	High	13	Downstream Slope	Cut trees on north downstream slope (completed 1-26-09)
3	High	13, 14	Downstream Slope	Mow downstream slope north side (completed 1-26-09)
4	Moderate	14	Downstream Slope	Repair scarps and animal burrows on North slope
5	Normal	7	Downstream Slope	Monitor previous scarp areas on east embankment north side
6	Moderate	10	Downstream Slope	Repair erosion under pipe rack on south embankment
7	Moderate	--	Downstream Slope	Repair erosion gullies on west embankment south end (Numerous places)
8	Normal	--	Toe	Evaluate and repair erosion gullies below toe of embankment on west side (Numerous Places)
9	Normal	15, 16	Crest	Regrade west embankment crest to divert runoff toward pond (Note 1)
10	Normal		Crest	Grade road bed on east embankment to remove small berm at west side of road and to promote
				sheet flow runoff to pond
11	Moderate	1, 3, 5	Upstream Slope	Evaluate and repair wave erosion along east and south slopes
12	Normal	--	Toe	Monitor wet area at toe of south slope, east side
13	Moderate	N/A	General	Conduct visual inspection of facility during 2009 growing season
14	Normal	N/A	General	Prepare Operation and Maintenance Plan for all aspects of structure
15	Moderate	N/A	General	Prepare Emergency Action Plan (EAP) for structure distress scenarios
16	Normal	N/A	General	Prepare current topographic mapping
17	Moderate	N/A	General	Institute and document regular structure inspection plan

Priority: High - Recommend that action item be addressed as soon as possible.
Moderate - Recommend that action item be addressed as soon as feasible - preferably before the next state inspection.
Normal - Recommend that action item be addressed as part of the ongoing maintenace of the structure.

Note 1: Area to be raised during future expansion

Location:
Crest
Abutments
Downstream Slope
Upstream Slope
Principal Spillway
Emergency Spillway
Toe

TRIMBLE COUNTY, BOTTOM ASH POND
January 20, 2009

Photo #1: Wave erosion, East embankment, downstream slope, looking North

Photo #2: East embankment, crest, looking North

TRIMBLE COUNTY, BOTTOM ASH POND
January 20, 2009

Photo #3: South embankment, upstream slope, looking West

Photo #4: East embankment, crest and downstream slope, looking North

TRIMBLE COUNTY, BOTTOM ASH POND

January 20, 2009

Photo #5: Wave erosion, steep drop near water surface, East embankment, upstream slope, directly across from bottom ash reclaim, looking South

Photo #6: Appears to be filled in gully, East embankment, upstream slope, directly across from bottom ash reclaim, looking West

TRIMBLE COUNTY, BOTTOM ASH POND

January 20, 2009

Photo #7: Old slough, East embankment, downstream slope, looking East near NE corner of pond

Photo #8: North embankment(shared dike with emergency ash pond), upstream slope, looking West

TRIMBLE COUNTY, BOTTOM ASH POND
January 20, 2009

Photo #9: West embankment, upstream slope, looking North

Photo #10: Minor erosion below piping, South embankment downstream slope

TRIMBLE COUNTY, BOTTOM ASH POND

January 20, 2009

Photo #11: West embankment, downstream slope and toe, looking North

Photo #12: West embankment, downstream slope and toe, looking South

TRIMBLE COUNTY, BOTTOM ASH POND

January 20, 2009

Photo #13: North embankment, shared dike with emergency ash pond, looking East

Photo #14: North embankment, shared dike with emergency ash pond, looking West

TRIMBLE COUNTY, BOTTOM ASH POND
January 20, 2009

Photo #15: West embankment crest, North end, looking South

Photo #16: West embankment, crest and downstream slope, north end, looking South

ATC ASSOCIATES INC
132 Citizens Boulevard
Simpsonville, KY 40067
(502) 722-1401

PROJECT NO: 27.11000.9G99		
DESIGNED BY: RR	SCALE:N/A	REVIEWED BY: JE
DRAWN BY: RR	DATE: 1/27/09	FIGURE: 1

SITE VICINITY MAP

TRIMBLE COUNTY BAP
EON-US Dam Inspections
Bedford, KY

S:\PROJECTS\GEOTECHNICAL\2009 Projects\27.11000.9G99 - E.ON Dam Inspections Kentucky Facilities\Drawings

Figure 2	Scale: N.T.S.	Date: 1/09	**2009 POND ASSESSMENT SITE PLAN** **TRIMBLE COUNTY BOTTOM ASH POND** KU/E.ON U.S. 487 CORN CREEK ROAD BEDFORD, KY	**LEGEND:** (NO) LOCATION OF PHOTOGRAPHY DIRECTION OF PHOTOGRAPHY PHOTO DESIGNATION	Project Number: 27.11000.9G99 Drawing File: E.ON Dam Inspections ATC ASSOCIATES INC.

Drn. By:	Chk. By:	App'd By:	Chk. Date:
SP/RR	JE		

ATC ASSOCIATES INC

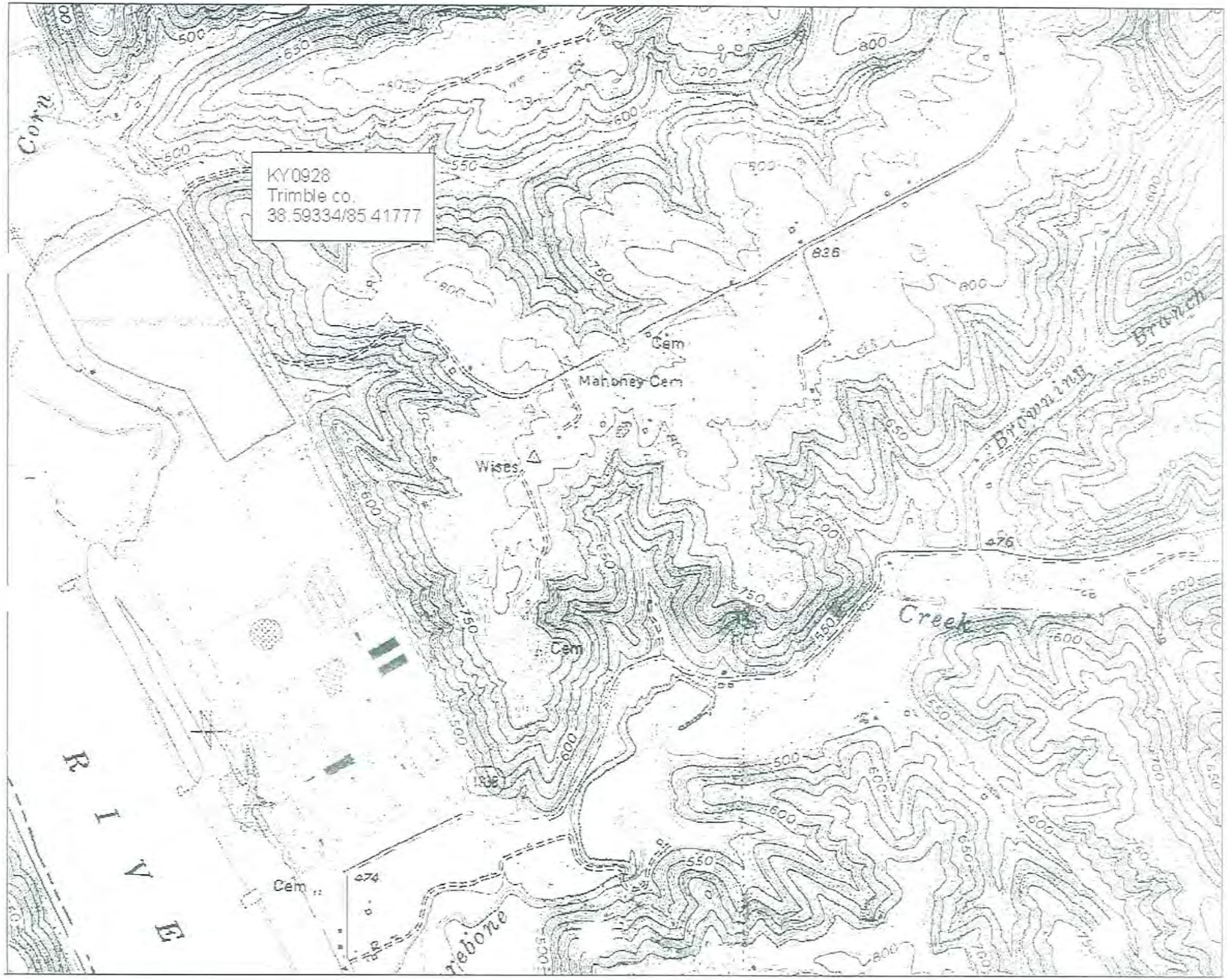
STATE FILE REVIEW
INFORMATION WORK SHEET

SITE : Trimble County BAP
ID #: 928
HAZARD RATING: __B (moderate)____
COPY OF RATING CERTIFICATION: _Referenced in file _
RECOMMENDED INSPECTION FREQUENCY: _____
DATE OF LAST INSPECTION: _9/7/05___
DATES OF PREVIOUS INSPECTIONS:
10/20/00
10/29/98
8/2/96
10/3/94
3/26/92
8/24/89
5/19/83

INSPECTION FINDINGS (deficiencies):
9/05 - Mow entire structure
10/00 - Remove small trees
10/98 - Remove small trees
8/96 - Remove small trees
10/94 - Remove small trees
5/83 - Mow, install riprap on upstream slope, revised from low to moderate hazard

OTHER INFORMATION AVAILABLE (design criteria, modifications, etc):
None noted.

Date: __1/22/09___
By: ___DHB_____
Additional Sheets: _5 copies from DOW files


KY0928
Trimble co.
38.59334/85.41777
Mahoney Cem
Wises
Cem
Cem
Cem
Creek
R I V E
835
476
474

INVENTORY FILE UPDATE FORM

Dam Name	LG&E TRIMBLE CO STATION	Inventory No.	928
County	TRIMBLE	Hazard Class	MOD.

Does file contain the following studies ?

Study	Yes	No	Model Used	Date Completed	By Whom
Phase I		X	N/A		
Phase II		X	N/A		
Seismic Stability	X		SLOPE	1976	ATEC ASSOC.
Static Stability	X		"	"	"
Hydrologic / Hydraulic		X			
Breach		X			
Emergency Action Plan		X	N/A		

Study Comments: STRUCTURE IS BUILT AS A NO DISCHARGE FACILITY-ALL SURROUNDING DRAINAGE IS DITCHED AWAY FROM DAM

Was a D.O.W. permit issued for this dam? **YES #1940 ISSUED 12/19/78**

- Is the dam currently in compliance with the state's minimum design criteria? YES

  Date of last modification: _____

  If **NO**, list the **DESIGN** deficiencies: _____

- When was the owner last notified of any DESIGN / MAINTENANCE deficiency?

  Was a Notice of Violation issued for a DESIGN / MAINTENANCE deficiency?

  Notice of Violation was issued on: _____

  What action has been taken by the owner to bring this dam into compliance? _____

- I need to issue a Notice of Violation for DESIGN / MAINTENANCE deficiency. NO
- I need to transfer this case to the Enforcement Branch. NO

  NOV or Enforcement Referral needed because: _____

Reviewer's Name: GEORGE CHILDERS

Date Reviewed: August 1, 1996

ERNIE FLETCHER
GOVERNOR

LAJUANA S. WILCHER
SECRETARY

COMMONWEALTH OF KENTUCKY
ENVIRONMENTAL AND PUBLIC PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY RD
FRANKFORT, KY 40601

September 8, 2005

Louisville Gas & Electric Co
220 W Main St
Louisville, KY 40232

Re: Scheduled Inspection
ID of Dam: 0928
LG & E TRIMBLE CNTY STA ASH DAM
Trimble County, KY
Hazard Class: MODERATE

Dear Louisville Gas & Electric Co:

On September 7, 2005, personnel from the Natural Resources and Environmental Protection Cabinet, Division of Water, inspected the above referenced structure. A copy of the inspection report is enclosed. The Division of Water is responsible for performing safety inspections of dams in Kentucky.

Kentucky Revised Statutes Chapter 151 (KRS 151) and associated regulations establish minimum maintenance and design criteria for dams. KRS 151.125 gives the Division of Water authority to require any measures necessary to bring the dam into compliance with statutes and regulations. As the owner you are required to maintain the dam to assure public safety.

Based on our visual inspection of the dam, the structure needs to be mowed. If you have any questions concerning this matter, please contact Marilyn Thomas at (502) 564-3410.

Sincerely,

Ron Dutta

Ron Dutta, P.E., Supervisor
Dam Safety and Floodplain Compliance Section
Water Resources Branch
Division of Water

Enclosure:

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

CERTIFICATE OF INSPECTION
FOR
DAM AND APPURTENANT WORKS

Note: The Division of Water does not intend this report to be taken as an assurance that no other problems exist at this site or that this dam is safe. The reports sole intent is to provide you a factual account of the conditions observed at the site during the inspection. If you have questions, write this office at the above listed address or call (502) 564-3410.

ID of Dam:	0928	**Hazard Class:**	MODERATE
Name of Dam:	LG & E TRIMBLE CO STA ASH DAM	**Owner:**	Louisville Gas & Electric Co
County:	Trimble	**Address:**	220 W Main St
Inspection Date:	September 7, 2005	**City:**	Louisville
		State:	KY
Weather:	72 Deg, F, Clear	**Zip:**	40232
		Phone:	
Inspection Type:	Dams		

Persons Present at Inspection: Marilyn Thomas and Tony Childers-KY Division of Water, Diana Doyle-LG&E

Height of Dam:	40 Feet	**Normal Pool Elevation (MSL):**	455'
Latitude Dec Deg:	38.593334	**Current Pool Elevation (MSL):**	450'
Longitude Dec Deg:	85.417778	**Emer. Spillway Elevation (MSL):**	NO ES
Type of Dam:	Earth		

Upstream Slope of Dam: The upstream slope has a tall weed/grass cover. No animal burrows, slides or slumps were noted

Crest of Dam: The crest has a road with a grass cover. No animal burrows, slides, slumps, or trees were noted.

Downstream Slope of Dam: The downstream slope has a tall grass/weed cover. No animal burrows or trees were noted.

Toe Drains: None noted

CERTIFICATE OF INSPECTION
FOR

KY ID: 0928

Principal Spillway: None

Emergency Spillway: NONE

Drawdown System: water is pumped into and out of the structure

Does Hazard Classification need to be reevaluated? The dam is currently classified as low hazard.

Were Photographs Taken? Yes

General Comments and Recommendations:
The entire structure needs to be mowed.

Inspector: Marilyn Thomas
Reviewer: Ron Dutta **Date:** 9/12/2005