Draft Report

Tanner's Creek Bottom Ash Complex Assessment Report

Lockheed Martin

June 2009

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5851/44642

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June 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 CCW 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 Purchase Order No. 710051854, dated May 29, 2009.

1.2. Project Purpose and Scope

As stated in the Request for Proposal (RFP), the purpose of this work is to provide Dam Safety Assessments 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 select 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 environmental permits issued for the management units
- Identify 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 Complex management unit at Tanner's Creek Power Plant owned and operated by Indiana Michigan Power Company (IMPC). IMPC is a subsidiary of American Electric Power Company (AEP). As such, AEP regularly provides engineering assistance to the IMPC Tanners Creek Power Plant.

2. Project/Facility Description

The Tanner's Creek Power Plant is located in the City of Lawrenceburg, Dearborn County, Indiana. It is owned and operated by the IMPC. The facility operates two surface impoundments for storing CCW: the Fly Ash Pond and the Bottom Ash Complex. The safety assessment summarized in this report details the June 2009 inspection of the Bottom Ash Complex. The inspection of the Fly Ash Pond is covered in a separate report.

A site location map is provided as Figure 1.

2.1. Management Unit Identification

For the purposes of this report, the impoundment will be referred to as the Bottom Ash Complex. The Bottom Ash Complex carries the following identification numbers:

- Indiana Department of Natural Resources (IDNR) state dam identification number 15-23 and permit number G1097.
- National Inventory of Dams #IN04002

A site layout map highlighting the location of the Bottom Ash Complex is provided as Figure 2. Please note the direction of plant north as commonly used by plant personnel. Plant north is referenced to the location of the plant relative to the Bottom Ash Complex and is not true north. Plant north will be used for compass reference of locations within this report.

2.2. Hazard Potential

The definitions for the four hazard potentials (less than low, low, significant and high) are included in the US EPA CCW checklist found in Appendix A. Based on the checklist definitions and as a result of this assessment, the hazard potential rating assigned to the Bottom Ash Complex is **SIGNIFICANT.** This rating was identified because failure of the embankments would result in a release of ash slurry directly to the Ohio River or tributary waterway. Potential damage from a failure of the Bottom Ash Complex would primarily be environmental damage to the Ohio River.

For reference, it should be noted that the IDNR and AEP also have assigned ratings to the Bottom Ash Complex. For IDNR, the 2006 inspection has listed the impoundment as a "low" hazard. For internal purposes, AEP refers to the impoundment as a "significant" hazard structure.

2.3. Impounding Structure Details

The following sections summarize the structural components and basic operations of the Bottom Ash Complex. A diagram of the Bottom Ash Complex and its relevant features is provided as Figure 3. Additionally, photos taken during the visual inspection are incorporated in a Photographic Log provided as Appendix B.

2.3.1. Embankment Configuration

The Bottom Ash Complex is comprised of diked embankments on the south, east, and west sides. The north side of the Bottom Ash Complex is incised. The original south, east and west dikes were constructed in the late 1950's and early 1960's to a crest elevation of 475' using borrowed soil from the site. In 1973 to 1974, the south, east, and west dikes were raised to their current height using boiler slag and ash as the construction material with a layer of soil along the outside slope of the embankment to promote vegetative growth. The current minimum crest height is approximately 482' with a pool elevation of 480'.

A typical embankment cross section is provided as Figure 4 and views of the embankment slopes can be seen in Photos 1 through 4 of Appendix B.

2.3.2. Type of Materials Impounded

The Bottom Ash Complex is typically used to store bottom ash, but is occasionally used to store fly ash. Under normal operations, it is used for the primary settling of bottom ash slurry and tertiary settling of fly ash slurry. At the time of the inspection, the separate Fly Ash Pond was out of service leaving the Bottom Ash Complex to provide primary settling for bottom ash and fly ash slurries.

A photo of the influent slurries is provided as Photo 5 in Appendix B.

2.3.3. Stormwater Inflows

Stormwater inflows to the Bottom Ash Complex are minimal. The impounding structure is comprised of diked embankments on three sides which direct stormwater away from the impoundment and limit runoff to that which falls directly on the water surface. The land area to the north is comprised of a small (approximately 5 acre) boiler slag recovery pond and an open field area which are not likely to contribute significant volumes of runoff.

2.3.4. Outlet Works

The outlet of the Bottom Ash Complex is comprised of a "T"-shaped weir, a drop structure and a 36-inch diameter discharge pipe. The crest of the weir is fixed at elevation 480' and two rows of floating booms protect the outlet from intake of floating debris and material.

A sketch of the outlet works is provided in the inspection checklist provided as Appendix A and Photo 6 in Appendix B provides a view of the weir structure.

2.3.5. Instrumentation

The Bottom Ash Complex has instrumentation to monitor flow discharged from the impoundment and thirteen perimeter piezometers to monitor phreatic water levels within the embankments. The flow meter is an electronic style meter located at the outlet. Facility personnel reported that totalized flow is recorded by a facility data logging system. The water level in the thirteen piezometers is measured and recorded monthly by plant personnel.

3. Records Review

At the time of the site visit, Indiana Michigan Power Company provided historical Bottom Ash Complex documents for review. O'Brien & Gere also contacted IDNR to obtain historical permits on file. The following table summarizes reviewed documentation.

Table 1 *Summary of Bottom Ash Complex Documents Reviewed*

Document	Dates	By	Description
Permit/Certificate of Approval	1962	State of Indiana – Flood Control and Water Resources Commission	Approval for construction in floodplain. Contains State engineer's report and partial plans submitted by IMPC
Design Drawings	1968-1973	Indiana Michigan Power Company	Various construction drawings detailing the raising of the dike from original height to it's current height
Design Drawings	1977	Kellermann & Dragnett Consulting Engineers	Construction drawings detailing the structure of the existing decant outlet works
Proposed Modifications to Ash Pond Dike	2006	Geo/Environmental Associates	Details of boring logs, seepage/stability analysis, design calculations, construction specifications and drawings to install a seepage collection drain in the south dike
IDNR Inspection Checklist	2006	IDNR	Basic checklist documenting most recent (September 2006) state inspection
Site NPDES Permit	2008	Indiana Michigan Power Company	NPEDS Permit #IN0002160 detailing allowable discharge parameters from the Bottom Ash Complex
Annual Inspection Report	2008	American Electric Power Company	Annual inspection report documenting inspection completed by corporate engineering staff
Summary of Seepage and Stability Evaluation	2009	Geo/Environmental Associates	Details of boring logs, seepage/stability analysis, design calculations to install a seepage collection drain in the west dike
Construction Specifications and Design Drawings	2009	Geo/Environmental Associates	Construction drawings and specifications to construct the proposed seepage collection drain
Monthly Inspection Logs	2009	Indiana Michigan Power Company	Recent monthly inspection checklists completed by Tanner's Creek personnel

Source: O'Brien & Gere

3.1. Design Documents

3.1.1. Stability Analyses

Available documentation of the original soil embankment construction of the Bottom Ash Complex dike system is limited to information shown in the design drawings prepared in 1968-1973 for the vertical expansion of the pond to its current elevation. In 2006, Geo/Environmental Associates, Inc. designed improvements to address seepage conditions observed on the mid-slope of the south dike (referred to as the west dike in their report). Their March 2006 report (see Table 2) supporting the proposed modifications to the dike includes seepage and stability analyses for the embankment with

and without the proposed improvements. The results indicate significant increases in factor of safety for the embankment with the installation of the proposed French Drain system.

Similar seepage conditions have been observed on the mid-slope of the west dike (opposite the Ohio River side). These conditions were observed during this inspection. Geo/Environmental Associates, Inc. conducted an evaluation of a seepage collection drain proposed for this dike (referred to as the north dike) as described in their March 2009 report (see Table 2). The evaluation includes seepage and slope stability analyses. As in the 2006 evaluation, the slope stability analyses show that significant increases in factor of safety will result from the installation of the proposed French Drain system.

3.1.2. Modifications since Initial Construction

The original dikes were constructed of soil borrowed from the site. The following modifications have been made since initial construction.

- The dikes were raised from a general elevation of 475' to 482' in 1973-1974. Boiler slag and ash were used in the dike raising construction.
- The use of a northern section of the impoundment was ceased in the 1970's. The remaining ash was left in place and covered with soil/gravel. To date, other minor facility structures (such as storage tanks) have been constructed in this area. The area is also currently used for equipment storage and as a driveway for vehicular traffic.
- The outlet structure was upgraded to its current configuration in 1977.
- A seepage collection system was installed in the south dike in 2006. Discharge was originally installed south of the decant outlet. Due to issues with the site NPDES permit, the discharge was moved to its current location coinciding with the existing decant outlet.
- A seepage collection system is scheduled for installation in the west dike in 2009.

3.1.3. Monitoring Instrumentation

Water levels in thirteen piezometers located in the embankments around the perimeter of the Bottom Ash Complex are reported to be measured and recorded monthly by plant personnel. Records of these measurements were not provided by IMPC.

Additionally, design documents show that the seepage collection system installed in 2006 and the seepage collection system planned for 2009 were designed using measurements from these monitoring points. In the instance of the south embankment, the piezometers are located between the static water level of the impoundment and the installed seepage collection system. Measurements from these piezometers will not likely provide data to show the effectiveness of the seepage collection system. However, the downstream slope of the south embankment was observed to be dry during the inspection.

Plant personnel reported that flow discharged from the Bottom Ash Complex is recorded in the facility's data logging system. No physical record of the discharge volumes was reviewed during the inspection.

3.2. Previous Inspections

The Bottom Ash complex is inspected monthly by plant personnel. Completed monthly inspection checklists from February 2009 through May 2009 were provided by IMPC at the time of the inspection.

A comprehensive annual inspection is performed by the AEP corporate engineering staff. The 2008 inspection report was reviewed. In general, action items noted in the annual report have been carried out or are reported as scheduled for completion. Specifically, the seepage along the west dike was documented. The ongoing engineering and planned construction to correct this issue with a seepage collection system was also documented.

Additionally, the 2008 annual inspection noted that plant personnel desire to eliminate an isolated seepage area on the east embankment where the abandoned decant outlet from the original pond is located. At the time of the inspection, seepage was still observed at this location.

State inspections performed by the IDNR are also performed on an indefinite interval. The most recent inspection forms provided were completed in September 2006 and September 2000. Items noted in the 2006 inspection, such as overgrown vegetative growth along Tanner's Creek and the Ohio River, were addressed by IMPC prior to the June 2009 inspection.

3.3. Facility Operator Interviews

Numerous plant and corporate owner personnel took part in the inspection proceedings. The following is a list of participants from the inspection of the Bottom Ash Complex:

Table 2 *List of Participants*

Name	Affiliation	Title
Sharon McFarland	IMPC – Tanner's Creek	Plant Environmental Coordinator
Mitch Montgomery	IMPC – Tanner's Creek	Material Handling Supervisor
Paul Bischoff	IMPC – Tanner's Creek	Material Handling Process Owner
Jim Bockstiegel	IMPC – Tanner's Creek	Energy Production Superintendent
Pedro Amaya, PE	AEP – Corporate Engineering	Principal Engineer
Tim Howdyshell	AEP – Corporate Engineering	Principal Coordinator
Dana Sheets	AEP – Corporate Environmental	Principal Engineer
Craig Dufficy	US EPA	
Jana Englander	US EPA	
Gary Romesser	Indiana Department of Environmental Management	
Scott Cormier, PE	O'Brien & Gere	Vice President
Gary Emmanuel, PE	O'Brien & Gere	Project Manager
Jason Huber	O'Brien & Gere	Design Engineer

Source: O'Brien & Gere

Facility personnel provided a good working knowledge of the Bottom Ash Complex and provided requested historical documentation. These personnel also accompanied O'Brien & Gere and US EPA staff throughout the visual inspections to answer questions and provide additional information as needed in the field.

3.4. Site Geology Summary

The Tanner's Creek site is located in the Dearborn Upland (the eastern-most physiographic region in southern Indiana) and it is a dissected plateau underlain by limestone and shale of mostly Ordovician age (dating from 510 million to 439 million years ago). The project site has been documented by many borings related to the ash ponds' construction. These borings generally indicate that the site stratigraphy consists of a layer of clay from the ground surface at an approximate elevation of 437 feet to an elevation of 465 feet underlain by a layer of coarse-grained sand with gravel that extends to shale bedrock at an approximate elevation of 395 feet.

The site clay was likely used in the construction of the Bottom Ash Complex dike embankments, similar to the way that it was selectively used in the construction of the original embankments for the Fly Ash Pond.

4. Visual Inspection

The following sections summarize the inspection of the Bottom Ash Complex which occurred on June 1, 2009. At the time of the inspection, O'Brien & Gere completed a US EPA inspection checklist which was submitted electronically to US EPA June 5, 2009. A copy of the completed inspection checklist is included as Appendix A.

4.1. Overview

The visual inspection consisted of a thorough site walk along the perimeter of the Bottom Ash Complex. O'Brien & Gere team members made observations at the toe, mid-slope and crest of the embankments and also observed inlet/outlet structures, monitoring instrumentation and current operation.

Photos were taken during the visual inspection. A photo log of relevant items is incorporated as Appendix B and locations of photos are noted within Figure 3.

4.2. Findings

The following is a summary of observations made during the visual inspection. Figure 3 depicts the locations of the observations listed below.

- Seepage was observed at the mid-slope and toe along a majority of the west embankment. (Appendix B – Photos 7 and 8)
- A non uniform slope was observed along the entire west embankment and is likely related to existing seepage and past growth of woody vegetation.
- Animal burrows were observed at various locations on the west and south embankments.
- The remnants of heavy vegetative growth were observed along the entire west embankment. (Appendix B – Photo 1)
- Bottom ash materials were observed on the slope of the west embankment at various locations. These may have been a result of the 1970's addition to the embankment. (Appendix B – Photo 9)
- Water from the seepage collection system in the south embankment was observed discharging from the outlet indicating that the system is, at a minimum, operational. (Appendix B – Photo 10)
- Minor scarps approximately three to five feet in height were observed at the top of the slope along the upstream side of the south and east embankments. (Appendix B – Photo 11)
- Shrub type growth up to 2-inch diameter was observed on the upstream side of the east embankment. (Appendix B – Photos 11 and 12)
- Isolated seeps were observed at two locations along the east embankment. One was located at a former spillway (Appendix B – Photo 13). The other was located where the south embankment seepage collection system formerly discharged. When initially constructed, the discharge from the collection system was located approximately 100' south of its current location.

- Minor erosion was observed near the roadway on the crest along the east embankment. Eroded areas are typically less than 1-foot deep and extend five to seven feet down the slope (Appendix B – Photo 14).

5. Conclusions

Based on the ratings defined in the RFP (satisfactory, fair, poor and unsatisfactory), the information reviewed and the visual inspection, the overall condition of the Bottom Ash Complex appears to be **FAIR**.

Based on planned upgrades to the west embankment, the condition of the Bottom Ash Complex is likely to improve. Upon installation of the seepage collection system in the west embankment and an acceptable period of monitoring, this rating could potentially be upgraded, pending subsequent inspection of the impoundment.

5.1. Stability

Stability analyses performed in support of the design of seepage collection improvements show adequate factors of safety for normal, static conditions once those improvements are installed. The inspection found the south and east dikes to appear sound, with no evidence of movement. The rip rap-covered outboard slopes are uniform with no visible evidence of settlement or sloughing. The observed discharge from the seepage collection system (French drain) in the south dike and the dry surface conditions found on the slope and at the toe of the south dike suggest that the drain is functioning as designed.

The west dike is in need of attention to address uncontrolled seepage observed on the downstream slope, animal burrows, fugitive bottom ash and remnants of woody vegetation. The stability of the west dike will be improved by the installation of the proposed seepage collection system and addressing the above deficiencies during the work.

5.2. Operations and Maintenance

Current operations and maintenance of the Bottom Ash Complex are satisfactory. The owner has implemented regular inspections and maintenance which enable the impoundment to be kept in a good working order.

6. Recommendations

6.1. Immediate/Urgent Repair Recommendations

No immediate or urgent repairs are recommended at this time.

6.2. Long Term Improvements

The owner should proceed as planned with installation of the proposed French drain to control seepage in the west dike and increase its stability. This seepage collection system is scheduled to be installed in the west dike later in 2009.

Woody vegetation should be removed from the in-board slopes of the dikes and kept from re-establishing growth. Active maintenance of the vegetative growth should continue along with regular filling of rodent burrows.

Beyond the items noted above, no other long term improvements are recommended at this time.

6.3. Monitoring and Future Inspection Recommendations

Monitoring and future inspections should continue on their current schedule. For future monthly inspections, additional detail regarding visual observations made at the time of inspection should be included.

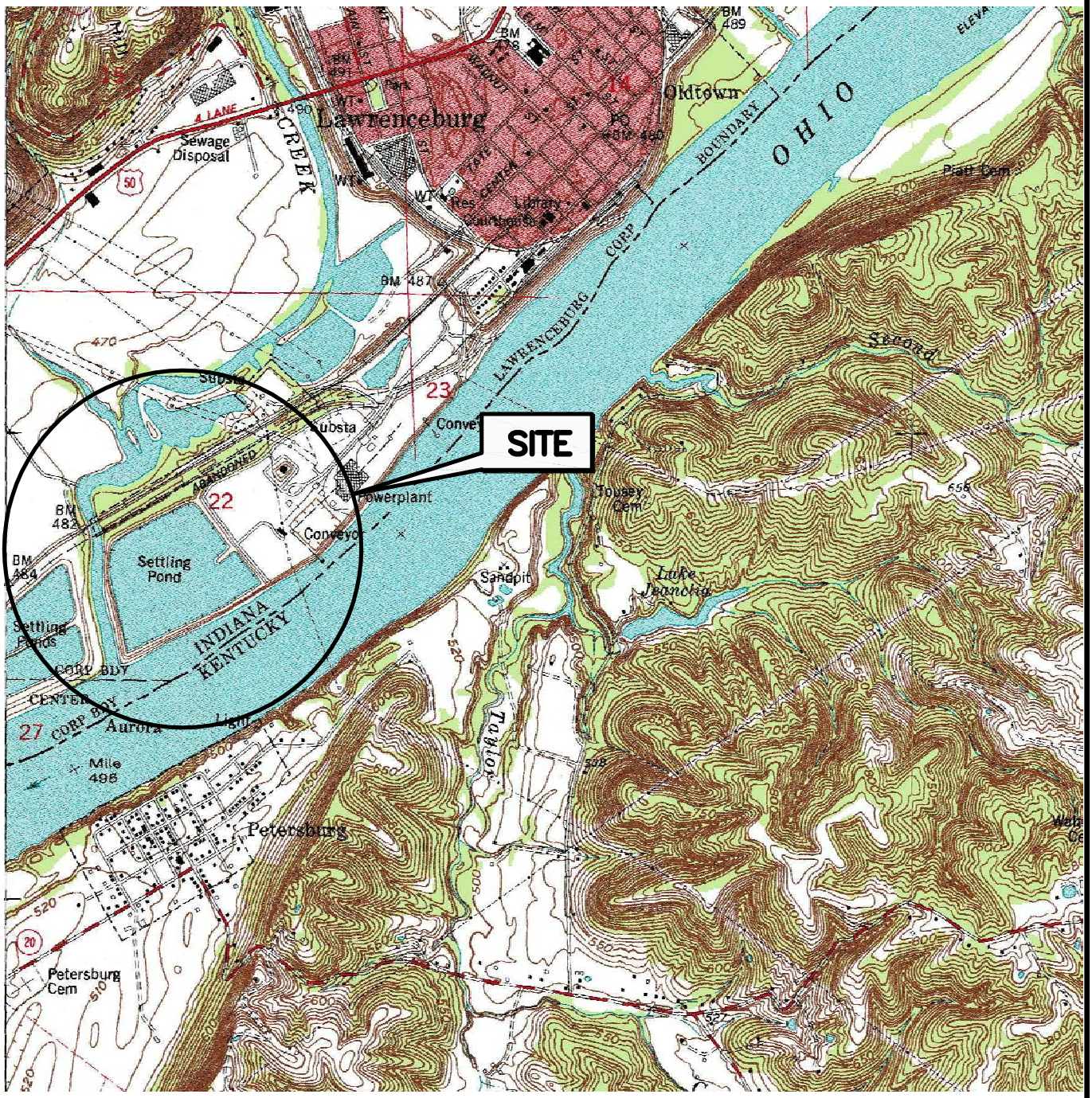
Monitoring of the two isolated seeps noted along the east embankment should continue with the monthly inspections performed by the plant. These items have been noted in previous annual inspections and methods to repair these locations should be investigated in the event that these seeps worsen and immediate repair is needed.

6.4. Time Frame for completion of Repairs/Improvements

The owner cited a 2009 completion date for the installation of the west dike seepage collection system. The owner should continue toward completion of this project as planned.

The isolated seeps on the east embankment should continue to be monitored. In the event these areas are observed to worsen, they should be repaired immediately.

FIGURE 1



ADAPTED FROM: LAWRENCEBURG QUADRANGLE, INDIANA U.S.G.S. 7.5 MIN. QUAD

QUADRANGLE LOCATION

TANNER'S CREEK POWER PLANT
LAWRENCEBURG, INDIANA

SITE LOCATION MAP

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

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

JULY 2009

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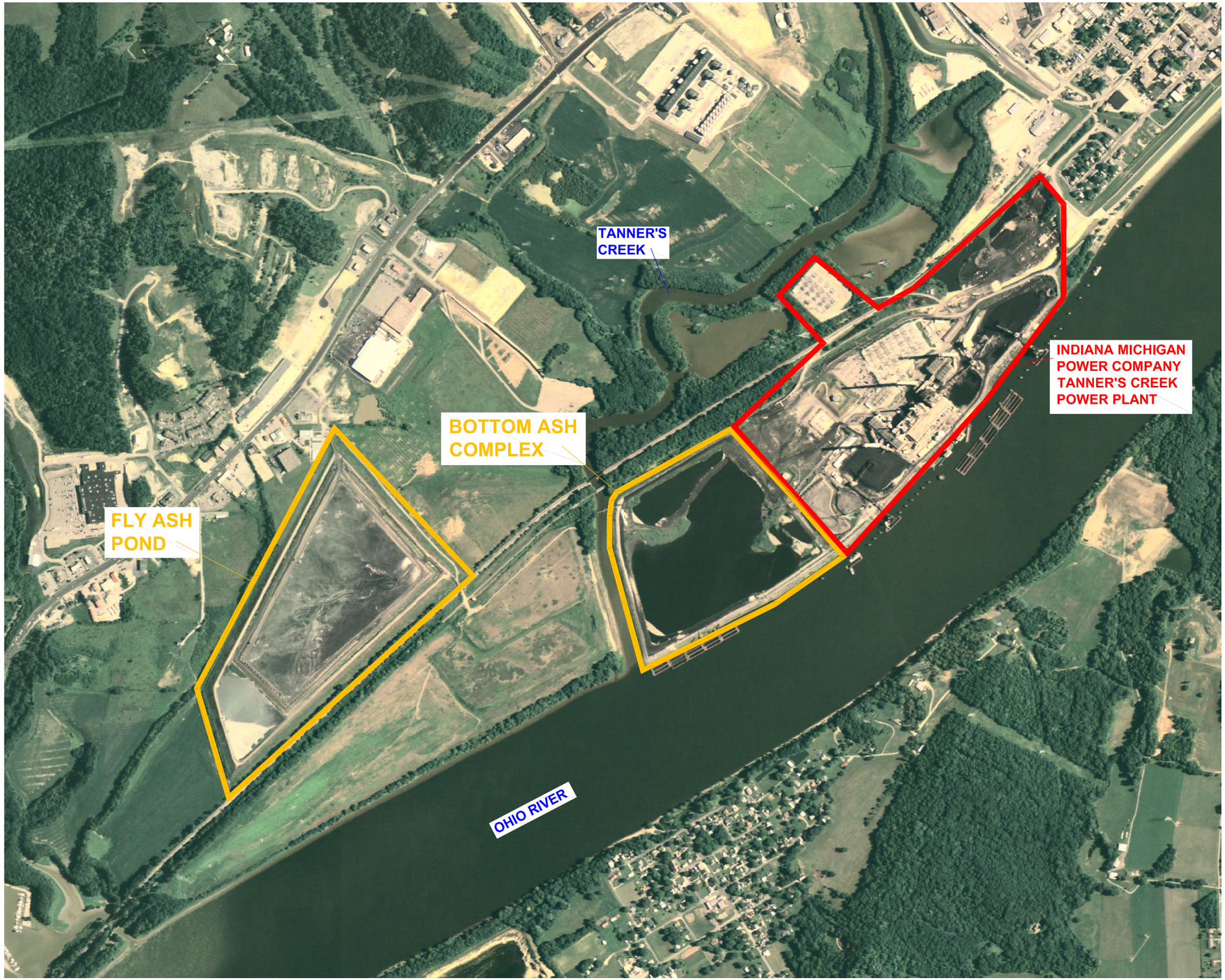

FIGURE 2

TRUE NORTH

PLANT NORTH

US EPA &
LOCKHEED MARTIN
DAM SAFETY ASSESSMENT
OF CCW IMPOUNDMENTS

TANNER'S CREEK POWER PLANT
LAWRENCEBURG, IN

SITE LAYOUT MAP

1000 0 1000

1"=1000'

FILE NO. 5851/44642-002
JUNE 2009

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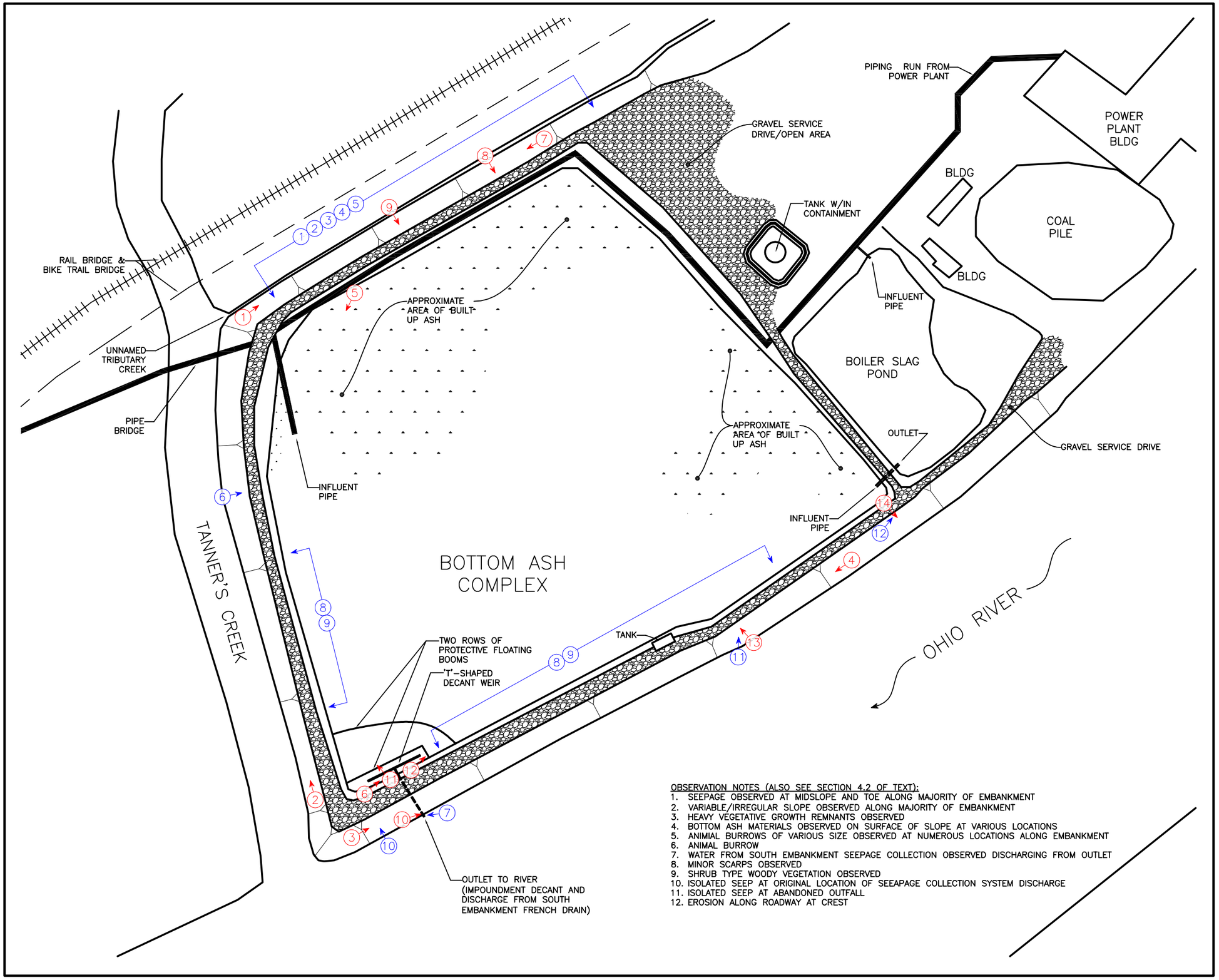
FIGURE 3



OBSERVATION NOTES (ALSO SEE SECTION 4.2 OF TEXT):

1. SEEPAGE OBSERVED AT MIDSLOPE AND TOE ALONG MAJORITY OF EMBANKMENT
2. VARIABLE/IRREGULAR SLOPE OBSERVED ALONG MAJORITY OF EMBANKMENT
3. HEAVY VEGETATIVE GROWTH REMNANTS OBSERVED
4. BOTTOM ASH MATERIALS OBSERVED ON SURFACE OF SLOPE AT VARIOUS LOCATIONS
5. ANIMIAL BURROWS OF VARIOUS SIZE OBSERVED AT NUMEROUS LOCATIONS ALONG EMBANKMENT
6. ANIMAL BURROW
7. WATER FROM SOUTH EMBANKMENT SEEPAGE COLLECTION OBSERVED DISCHARGING FROM OUTLET
8. MINOR SCARPS OBSERVED
9. SHRUB TYPE WOODY VEGETATION OBSERVED
10. ISOLATED SEEP AT ORIGINAL LOCATION OF SEEAPAGE COLLECTION SYSTEM DISCHARGE
11. ISOLATED SEEP AT ABANDONED OUTFALL
12. EROSION ALONG ROADWAY AT CREST

LEGEND

(#) APPENDIX B PHOTO REFERENCE – ARROW DEPICTS ORIENTATION OF PHOTO

(#) VISUAL INSPECTION OBSERVATION – ARROW DENOTES LOCATION OF OBSERVATION(S) – SEE INSET NOTES

US EPA & LOCKHEED MARTIN DAM SAFETY ASSESSMENT OF CCW IMPOUNDMENTS

TANNER'S CREEK POWER PLANT LAWRENCEBURG, IN

BOTTOM ASH COMPLEX PLAN DIAGRAM

1"=300' 300 0 300

FILE NO. 5851/44642-003A
JUNE 2009

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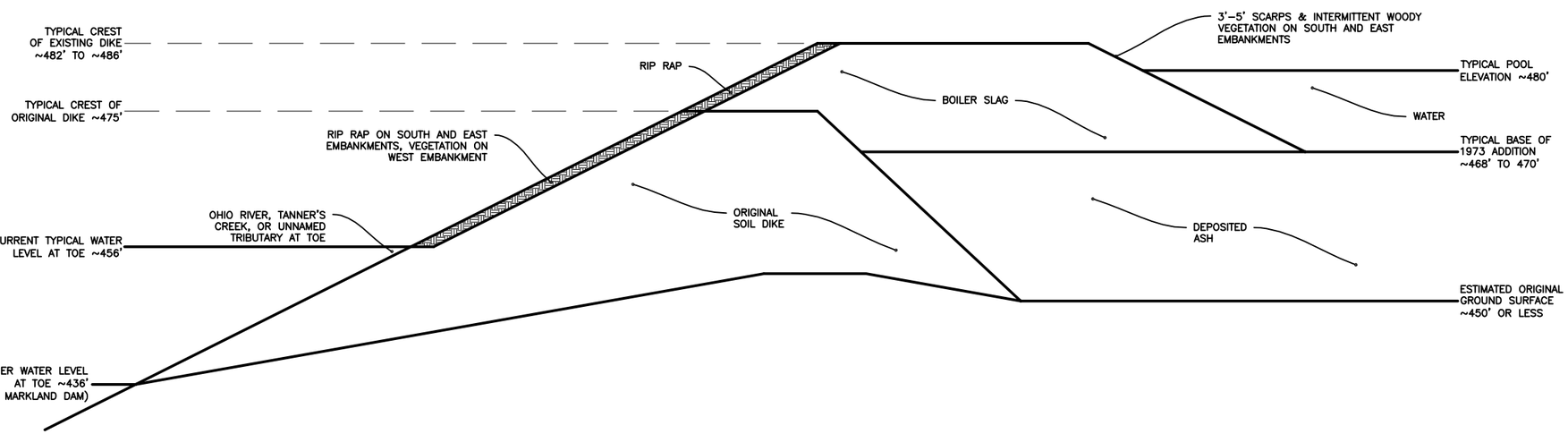
FIGURE 4



US EPA &
LOCKHEED MARTIN
DAM SAFETY ASSESSMENT
OF CCW IMOUNDMENTS

TANNER'S CREEK POWER PLANT
LAWRENCEBURG, IN

BOTTOM ASH COMPLEX TYPICAL SECTION

1"=20' 20 0 20

APPROXIMATE SCALE

FILE NO. 5851/44642-004A
JUNE 2009

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APPENDIX A

Visual Inspection Checklist

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Indiana Michigan Power - Tanner's Creek Plant Date: June 1, 2009

Unit Name: Bottom Ash Complex Operator's Name: Tim Kerns - Plant Manager

Unit I.D.: N/A Hazard Potential Classification: High (Significant) Low

Inspector's Name: Scott Cormier, PE & Gary Emmanuel, PE

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?	Multiple		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	480'		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	480'		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	None		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	482'		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?	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?	X		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?		N/A	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

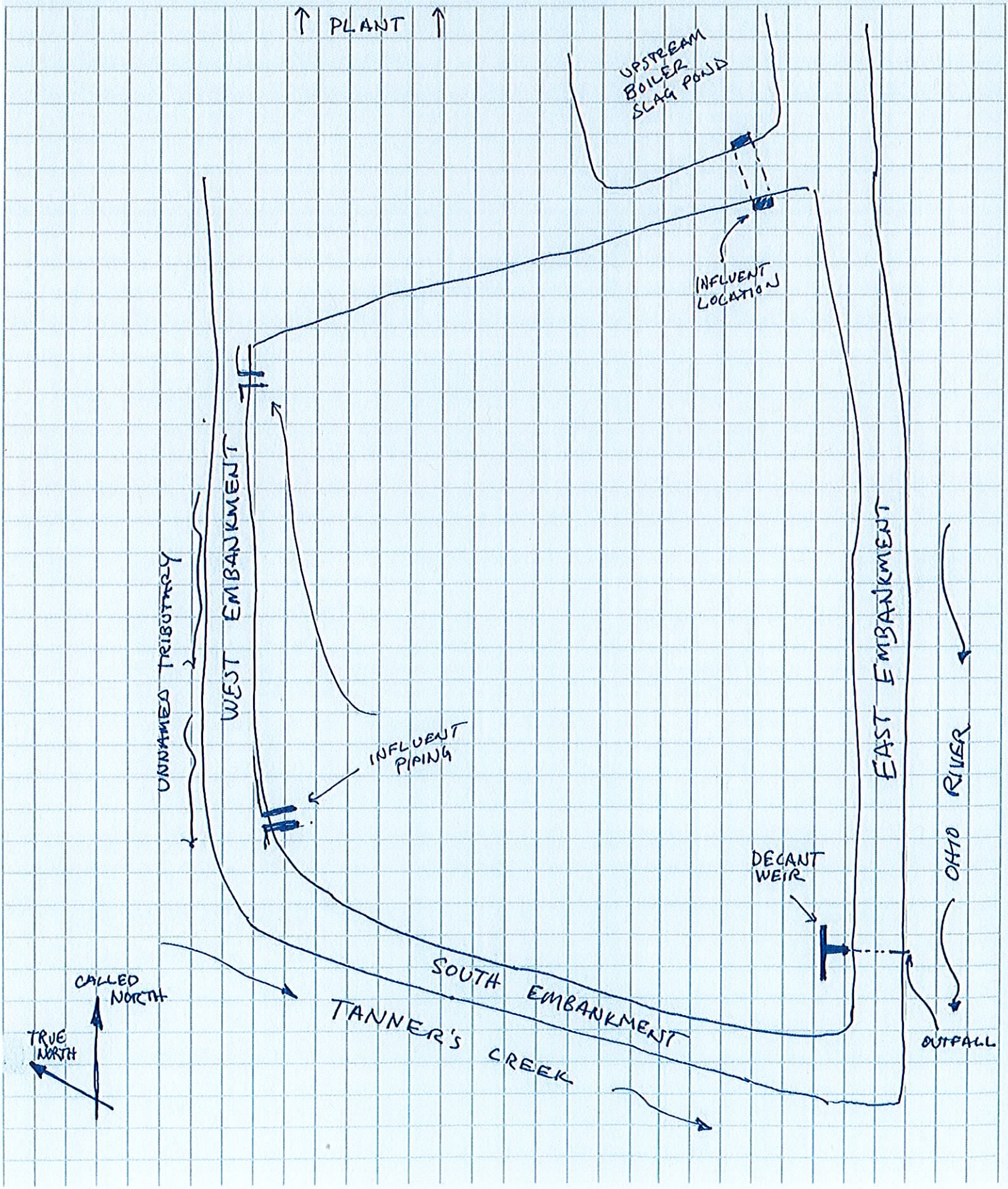
(Please refer to next page for list of comments - 2nd Page)

(Please refer to plan sketch for naming of features - 3rd Page)

Inspection Issue #	Comments
1	Impoundment is inspected monthly by plant personnel and annually by a PE from corporate engineering staff
4	No open channel or emergency spillway exists for this impoundment. The decant weir provides the only outlet.
6	Totalized flow for discharge from impoundment is recorded electronically via plant data monitoring system. Additionally, the phreatic surface in 13 piezometers located around the impoundment is measured and recorded monthly.
8	Insufficient historical data available to assess.
9	Shrub type growth (approx 2" max) dia on upstream side of 'east' embankment (bordering Ohio River). Plant has recently applied herbicide to control the growth and plans to remove the shrubbery in the future.
12	Two floating booms are in place to prevent floating materials from entering the outlet weir structure
17	Numerous minor scarps observed at the top of the slope along the upstream side of 'east' and 'south' embankments (along Ohio River and Tanner's Creek, respectively). Scarps are typically 3' - 5' feet in height along embankment and are made more prominent by the addition of the roadway aggregate to build up the crest road surface.
19	A non-uniform surface was observed along entire length of the 'west' embankment. Seepage was observed at the mid-slope and toe along the majority of the length of 'west' embankment. Heavy vegetative growth was recently "brush hogged" on 'west' embankment. Bottom ash materials were observed on the slope at several locations along the 'west embankment' which may have traveled down slope during embankment addition of 1970's.
21	Underdrain is installed in 'south' berm (along Tanner's creek) and seepage was observed from discharge pipe of system.
21	Isolated seepage was observed at two locations along the 'east' embankment (Ohio River side). One location is located where the discharge piping from the 'south' embankment underdrain was formerly located prior to moving to existing location. Another location was observed at location of a former spillway/decant discharge which has been filled in.
21	Widespread seepage was observed nearly continously at the midslope of the 'west' embankment. The plant reports that a new french drain system is slated for installation along the length of the 'west' embankment later this year.
23	Water is permanently located against the downstream toe on the 'east' and 'south' sides (Ohio River and Tanner's Creek respectively). The normal elevation of the river is approximately 456'.

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO.
BOTTOM ASH COMPLEX - PLAN SKETCH	1/2	JPH	6/3/09	44642



U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IN0002160 INSPECTOR Scott Cormier, PE & Gary Emmanuel, PE

Date June 1, 2009

Impoundment Name Bottom Ash Complex

Impoundment Company Indiana Michigan Power

EPA Region V

State Agency (Field Office) Addresss N/A

Name of Impoundment Noted above

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

New _____ Update X

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

IMPOUNDMENT FUNCTION: Settling of Bottom Ash and Fly Ash

Nearest Downstream Town : Name Aurora, IN

Distance from the impoundment Approximately 2.5 Miles

Impoundment Location:

Longitude 39 Degrees 4 Minutes 38.55 Seconds

Latitude -84 Degrees 52 Minutes 0.52 Seconds

State Indiana County Dearborn

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

If So Which State Agency? IDNR - (Indiana Department of Natural Resources)

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

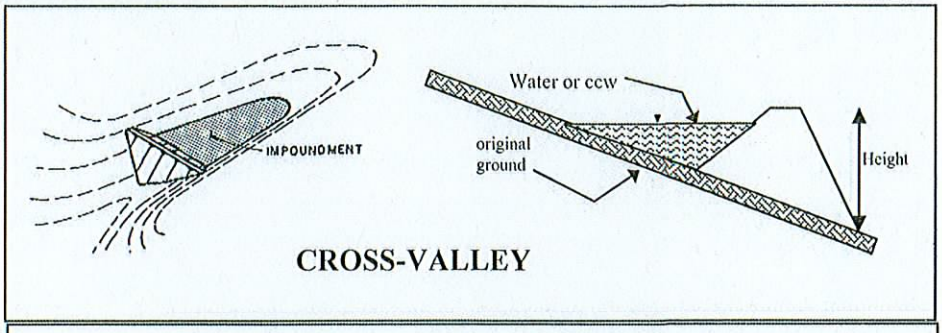
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

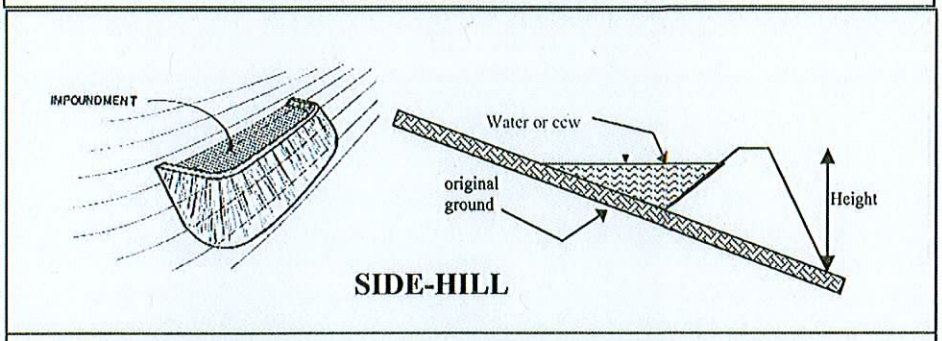
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

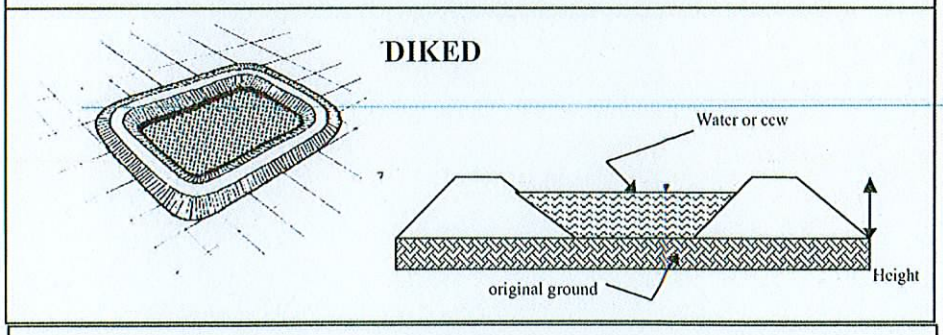
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

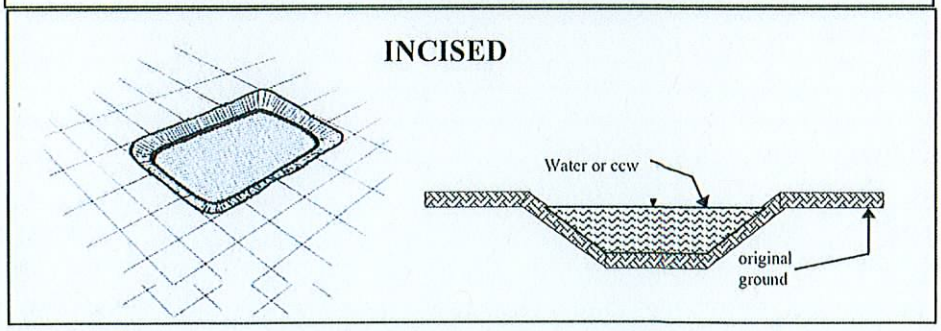
Failure of impoundment would result in release of ash slurry directly to Ohio River and immediate off-site migration

CONFIGURATION:









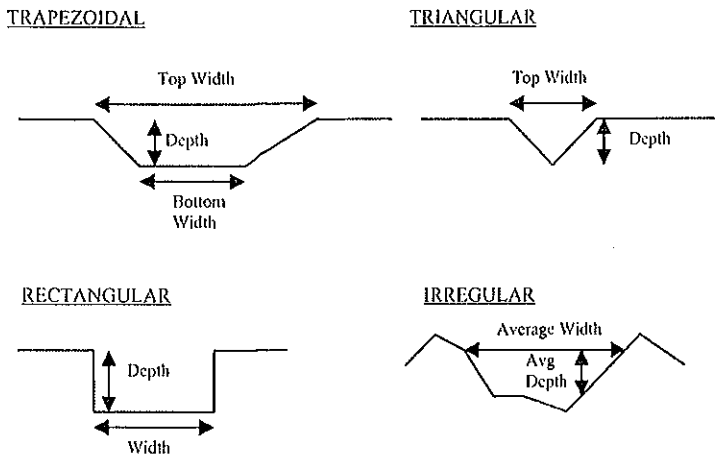
_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
X Combination Incised/Diked

Embankment Height Approx 52 feet
Embankment Material Original 1950's construction - soil 1970's addition - ash/boiler slag
Pool Area Approx 63.3 acres
Liner none
Current Freeboard 2 feet
Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

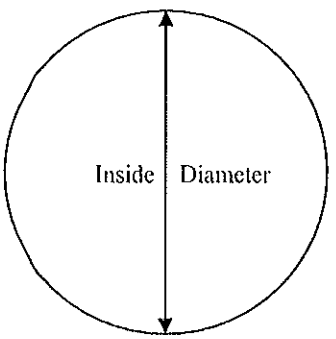
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



_____ **Outlet**

_____ inside diameter



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

_____

Is water flowing through the outlet? YES __X__ NO _____

_____ **No Outlet**

_____

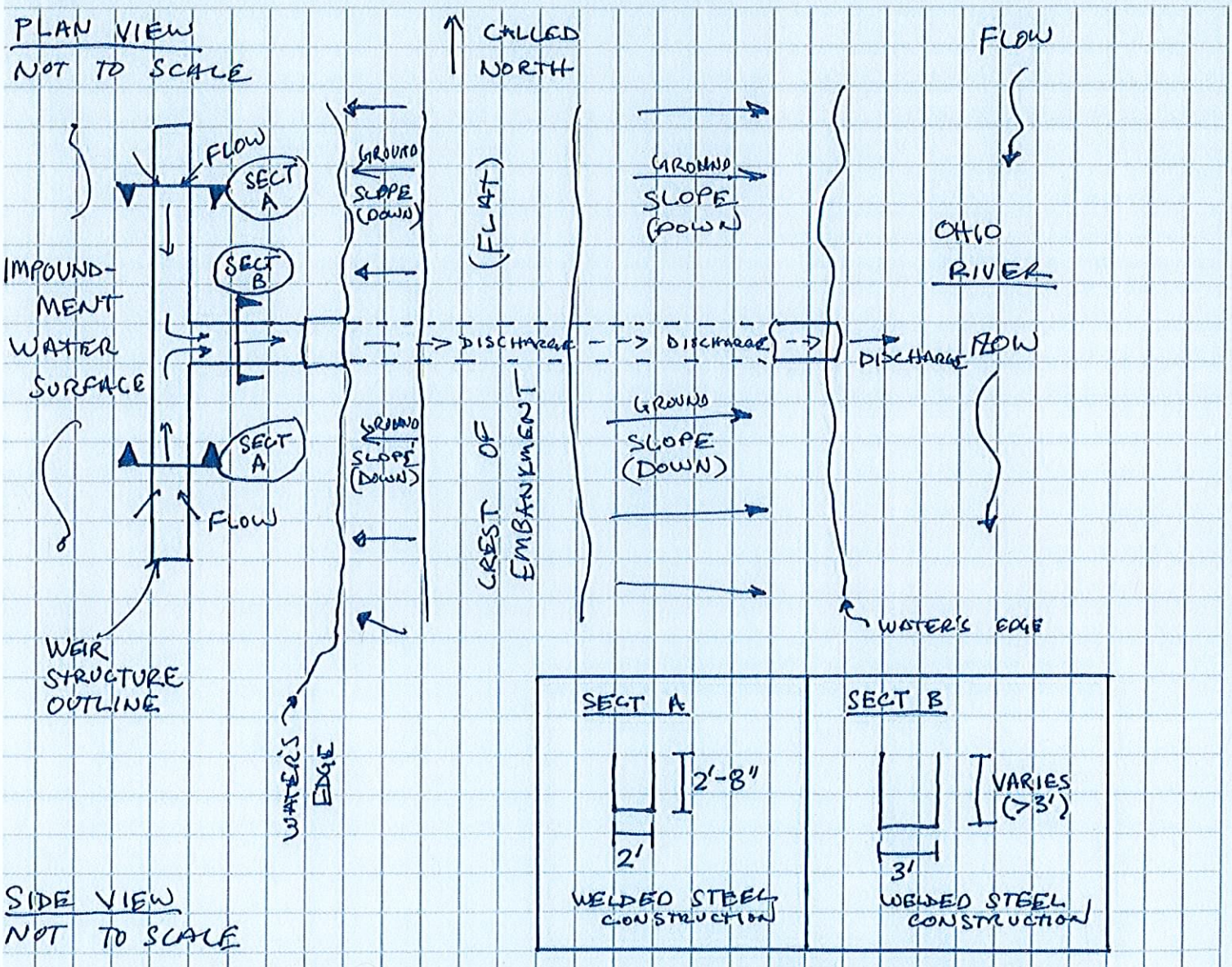
__X__ **Other Type of Outlet** (specify) __(See attached sketch - next page)__

The Impoundment was Designed By Original 1950's design by Kellerman & Dragnett Consulting Engineers
1970's addition designed in-house by Indiana Michigan Power

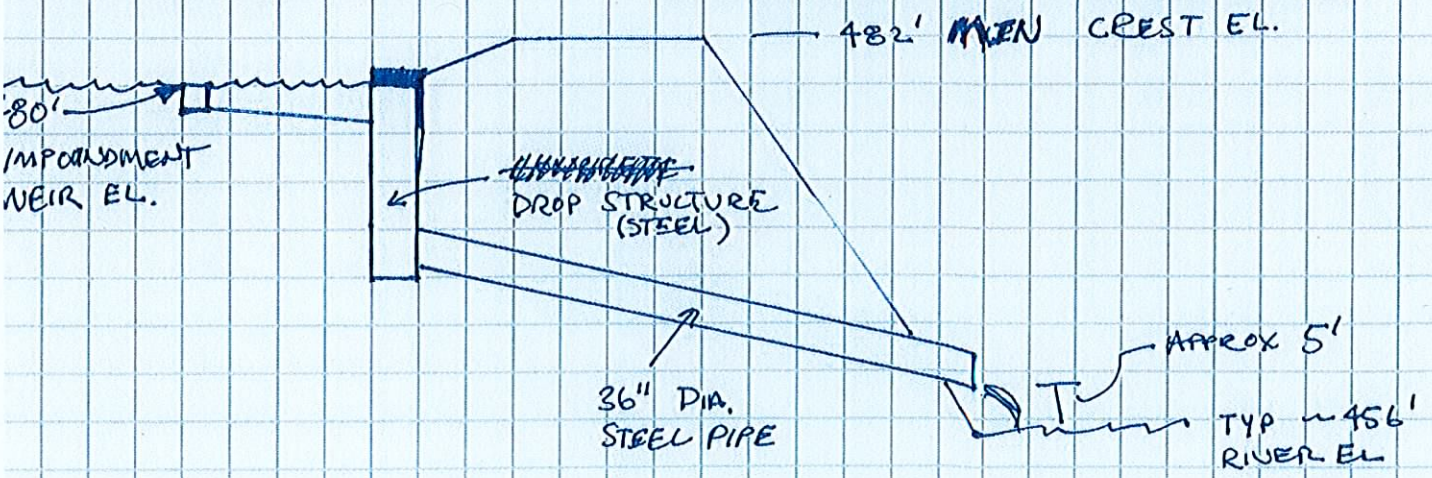
O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO.
BOTTOM ASH COMPLEX OUTLET WEIR	2/2	JPH	6/3/09	44642

PLAN VIEW
NOT TO SCALE



SIDE VIEW
NOT TO SCALE



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? Current and historical (see note below)

IF So Please Describe:

South Side

Historical seepage occurred along the 'south' embankment (along Tanner's Creek). A french drain was installed along the length of the 'south' embankment in 2006 in response to the problem. During the inspection, no seepage was observed on the 'south' embankment.

West Side

During the inspection, seepage was observed on the slope along the majority of the 'west' embankment. This seepage is apparently emanating from the longitudinal seam where the slag/ ash addition of the 1970's was placed on top of the original embankment. A french drain similar to the system installed in 2006 on the 'south' embankment is planned for construction by end of 2009.

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,...)? Piezometers

If so Please Describe :

Thirteen piezometers were installed around the perimeter of the impoundment in response to seepage issues. Along the 'south' embankment, data from the piezometers was used to determine the phreatic water level and aid in the design of the french drain installed in 2006. According to corporate engineering personnel, piezometer readings currently indicate that the 2006 french drain is working to help lower the phreatic water level in the 'south' embankment. Similarly, the perimeter piezometer data will again be used to design the 2009 french drain that will be installed in the 'west' embankment.

APPENDIX B

Photographs

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

Orientation: North

Description: View along west embankment. Note heavy vegetation recently mowed

Date: 6/1/09

Photo Number: 1

Photographer: JPH

Orientation: West

Description: View along south embankment. Tanner's Creek at left. Debris collected on slope from Ohio River/Tanner's Creek flooding events.

Date: 6/1/09

Photo Number: 2

Photographer: JPH

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

Orientation: North

Description: View along east embankment. Ohio River at right.

Date: 6/1/09

Photo Number: 3

Photographer: JPH

Orientation: South

Description: View along east embankment. Ohio River at left.

Date: 6/1/09

Photo Number: 4

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

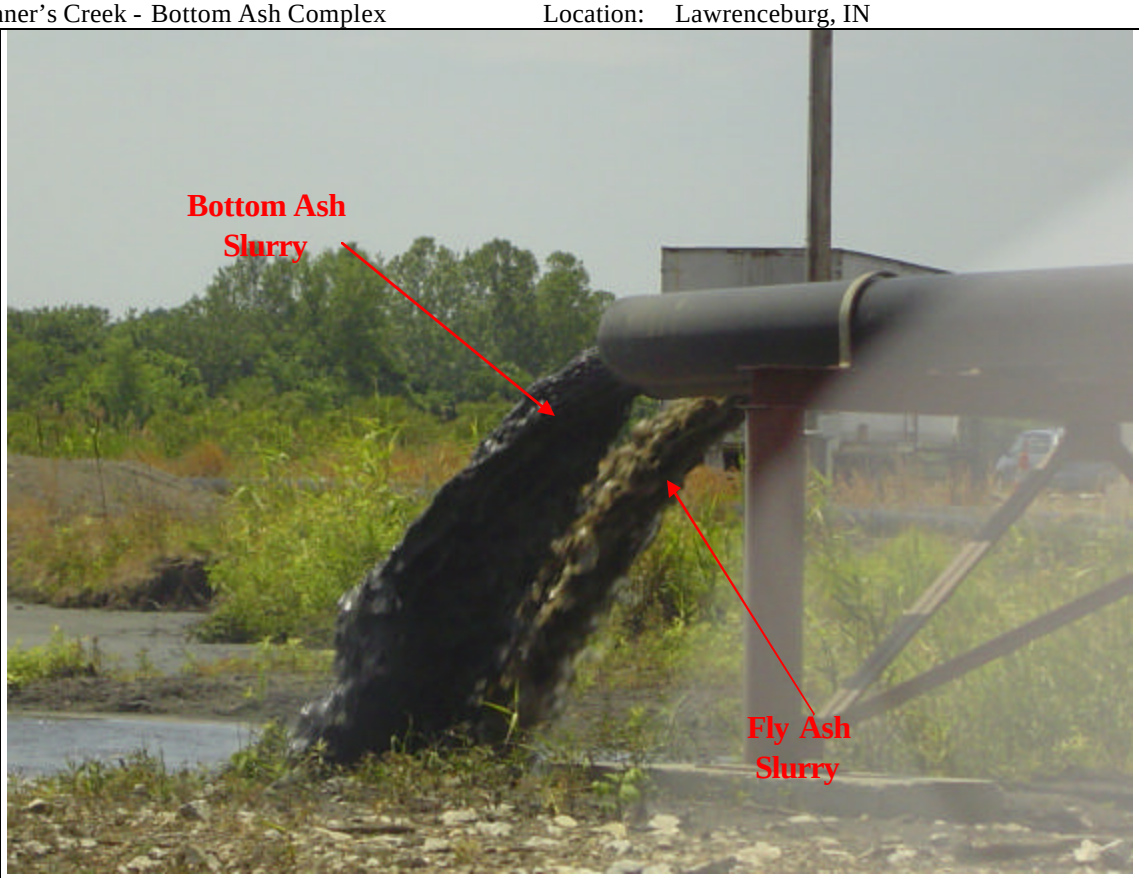
Orientation: Southeast

Description: Inlet to Bottom Ash Complex. Note light and dark slurries being pumped. At time of inspection, fly ash and bottom ash were being sent to Bottom Ash Complex.

Date: 6/1/09

Photo Number: 5

Photographer: JPH



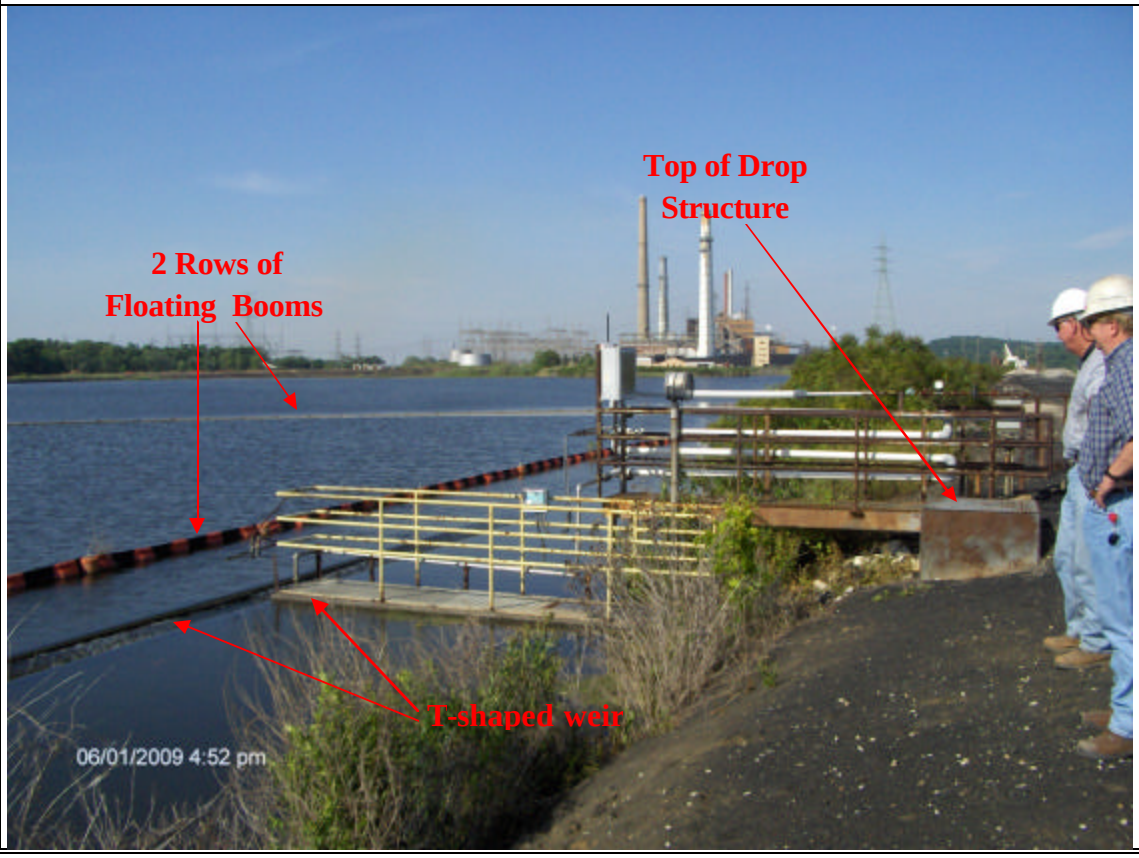
Orientation: North

Description: Decant weir. See sketch in Appendix A for additional details.

Date: 6/1/09

Photo Number: 6

Photographer: JPH



PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

Orientation: South

Description: Typical seepage at mid-slope of west embankment. Note standing water at bottom right.

Date: 6/1/09

Photo Number: 7

Photographer: JPH

Orientation: East

Description: Typical seepage at mid-slope along west embankment. Note wetland vegetation growing

Date: 6/1/09

Photo Number: 8

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

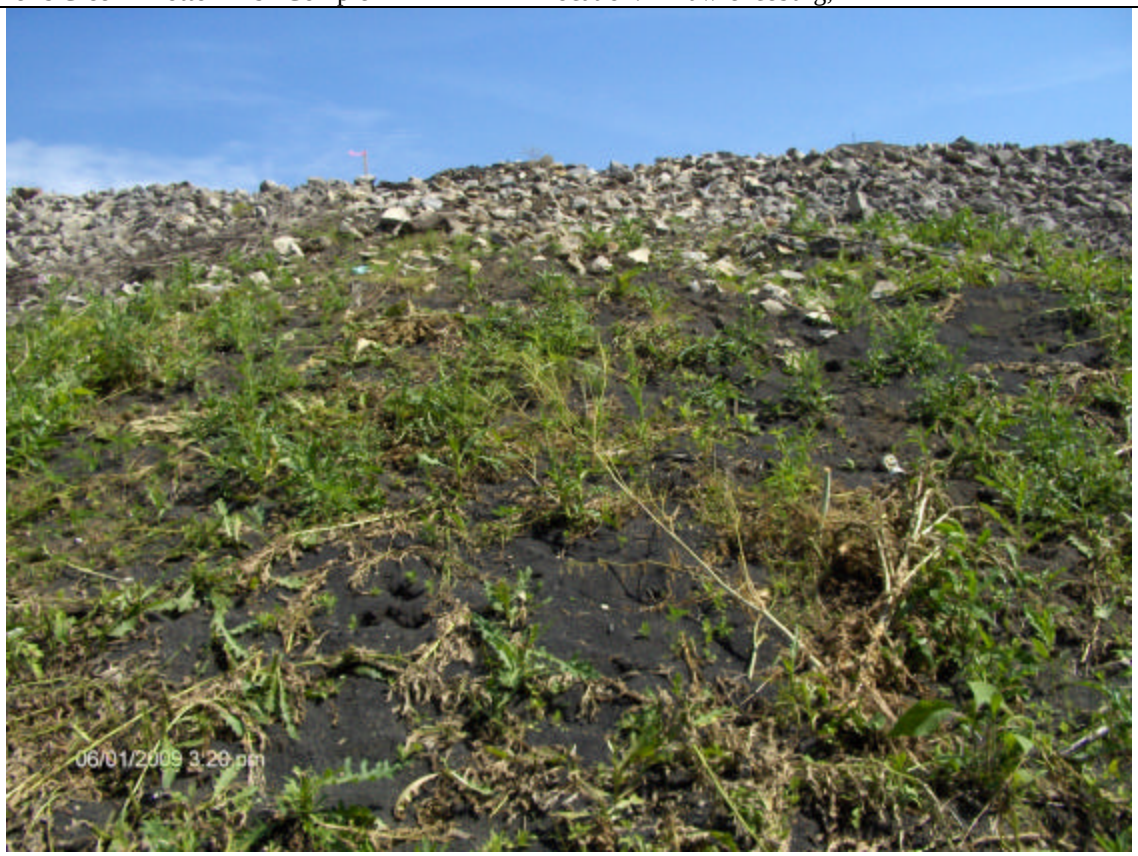
Orientation: East

Description: Bottom ash on surface of west embankment slope

Date: 6/1/09

Photo Number: 9

Photographer: JPH



Orientation: North

Description: Discharge piping into Ohio River. Bottom pipe is decant outlet from Bottom Ash Complex. Upper pipe is outlet for french drain seepage collection system installed in south embankment.

Date: 6/1/09

Photo Number: 10

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

Orientation: Southwest

Description: Woody vegetation growing along upstream side of south embankment. Note minor scarping at edge of crest roadway.

Date: 6/1/09

Photo Number: 11

Photographer: JPH

Orientation: North

Description: Woody vegetation growing on upstream side of east embankment. Note north leg of T-shaped outlet weir at left.

Date: 6/1/09

Photo Number: 12

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Tanner's Creek - Bottom Ash Complex	Location: Lawrenceburg, IN

Orientation: East

Description: Abandoned former outfall. Seepage was noted at this location. Seepage not visible in picture.

Date: 6/1/09

Photo Number: 13

Photographer: JPH

Orientation: West

Description: Typical erosion at edge of roadway on crest of east embankment. Approximately 12" deep and 5' to 7' long

Date: 6/1/09

Photo Number: 14

Photographer: JPH