

US EPA ARCHIVE DOCUMENT



**FINAL REPORT  
ROUND 10 DAM ASSESSMENT  
UGI DEVELOPMENT COMPANY  
HUNLOCK CREEK POWER STATION  
ASH BASIN 003 (EAST BASIN) & ASH BASIN 005 (WEST BASIN)  
HUNLOCK CREEK, PENNSYLVANIA**

**AUGUST 17, 2012**

**PREPARED FOR:**



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**U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460**

**PREPARED BY:**



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**GZA GeoEnvironmental, Inc.  
One Edgewater Drive  
Norwood, Ma 02062  
GZA File No. 01.0170142.30**



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**GZA GeoEnvironmental, Inc.  
One Edgewater Drive  
Norwood, Ma 02062  
GZA File No. 01.0170142.30**

August 17, 2012  
GZA File No. 170142.30



Mr. Stephen Hoffman  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

Dear Mr. Hoffman,

In accordance with our proposal 01.P0000177.11 dated March 28, 2011, and U.S. Environmental Protection Agency (EPA) Contract No. EP10W001313, Order No. EP-B115-00049, GZA GeoEnvironmental, Inc. (GZA) has completed our inspection of the Hunlock Creek Power Station Ash Basin 003 (East Basin) and Ash Basin 005 (West Basin) located in Hunlock Creek, Pennsylvania. The site visit was conducted on May 19, 2011. The purpose of our efforts was to provide the EPA with a site specific inspection of the impoundments to assist EPA in assessing the structural stability of the impoundments under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e). We are submitting one hard copy and one CD-ROM copy of this final Report directly to the EPA.

One Edgewater Drive  
Norwood,  
Massachusetts 02062  
Phone: 781-278-3700  
Fax: 781-278-5701  
<http://www.gza.com>

Based on our visual inspection, and in accordance with the EPA's criteria, both the East Basin and West Basin are currently in **POOR** condition, in our opinion. Further discussion of our evaluation and recommended actions are presented in the Task 3 Dam Assessment Report. The report includes: (a) a completed Coal Combustion Dam Inspection Checklist Form for each Basin; (b) a field sketch; and (c) selected photographs with captions. Our services and report are subject to the Limitations found in **Appendix A** and the Terms and Conditions of our contract agreement.

We are happy to have been able to assist you with this inspection and appreciate the opportunity to continue to provide you with dam engineering consulting services. Please contact the undersigned if you have any questions or comments regarding the content of this Task 3 Dam Assessment Report.

Sincerely,

GZA GeoEnvironmental, Inc.

A handwritten signature in blue ink that reads "C. Brad Nourse".

C. Brad Nourse  
Project Engineer  
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Peter H. Baril, P.E. (MA)  
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## PREFACE

The assessment of the general condition of the dam reported herein was based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam was based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the reported condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Prepared by:

GZA GeoEnvironmental, Inc.



  
James P. Guarente, P.E.

Pennsylvania License No.: 077916  
Senior Project Manager  
GZA GeoEnvironmental, Inc.

## EXECUTIVE SUMMARY



This Assessment Report presents the results of a visual assessment of the UGI Development Company (UGI) – Hunlock Creek Power Station Coal Combustion Waste (CCW) Impoundments located at 390 Route 11 Hunlock Creek, Pennsylvania. These assessments were performed on May 19, 2011 by representatives of GZA GeoEnvironmental, Inc (GZA), accompanied by representatives of UGI, the Pennsylvania Department of Environmental Protection (PADEP) and UGI's decommissioning consultant QUAD3 Architecture, Engineering, Environmental Services (QUAD3).

Hunlock Creek Power Station contains two earthen embankment CCW impoundments known as Ash Basins 003 (East Basin) and 005 (West Basin), separated by a common dike. The impoundments were constructed in the early 1960's for the purpose of storing CCW and discharging plant waste water. Currently no CCW discharge enters the East or West Basins due to the permanent closure of the Station's coal burning facilities in May 2010. In conjunction with the construction of a new gas fired power plant at the site, UGI plans to permanently decommission the East and West Basins by means of removing CCWs within the impoundments followed by, breaching of the Ash Basin embankments (such that water can no longer be impounded) and subsequent re-grading of the site to provide positive drainage. At the time of GZA's assessment, UGI, in cooperation with the PADEP Division of Waste Management, was in the process of executing their decommissioning plan by removing all CCWs from the East and West Basins via excavation and loading into trucks for off-site disposal. According to UGI, the CCWs are being legally disposed of in a regulated mine reclamation facility. UGI indicated they anticipate obtaining official permanent closure status for the basins within approximately two years from the date of GZA's assessment visit.

The East Basin in its current configuration has a maximum height of approximately 30 feet above natural ground and a storage volume of approximately 76 acre-feet at the top of embankment elevation 534± feet. The West Basin in its current configuration has a maximum height of approximately 15 feet above natural ground surface and an original maximum storage volume of approximately 40 acre-feet at the top of embankment elevation of 534± feet. In accordance with United States Army Corps of Engineers (USACE) criteria the East and West Basins are both considered **Small** structures, respectively. Note the PADEP, Division of Dam Safety (DDS) does recognize that both impoundments do have dam embankments associated with them and are jurisdictional dams in Pennsylvania due to their use to store fluids or semifluids other than water (in this case ash), the escape of which may result in air, water, or land pollution or in danger to persons or property. DDS will assign dam numbers to the Basins and will review decommissioning plans.

In GZA's opinion, the East and West Basins are **Low** Hazard structures as classified under the Environmental Protection Agency (EPA) hazard rating criteria due to their small size the fact that no loss of life would be expected if there was a failure, and despite the close proximity of the Susquehanna River, environmental or economic damage due to failure would be minimal.

Based on the results of the visual assessment, discussions with UGI personnel, and a review of available design documentation, East Basin was judged to be in FAIR condition. However, based on EPA's assessment criteria, the impoundment has been given a **POOR** condition rating, because

Ash Basins 003 (East) and 005 (West)  
Hunlock Creek Power Station

Date of Assessment: 5/19/11



no geotechnical computations were made available to GZA to review. Thus the stability of the embankments could not be independently verified even though, in GZA's professional opinion, the embankments in their current state at the time of the visual assessment appeared to be suitably stable and no immediate remedial action appears necessary. The West Basin was judged to be in **POOR** condition in GZA's opinion based on the results of our visual assessment alone notwithstanding the fact that no geotechnical computations were made available to GZA for review. The following deficiencies were noted at the CCW impoundments:

Ash Basin 003 (East Basin):

1. Rutting and depressions along the crest of the embankment primarily from construction vehicles.
2. Trees generally 3 to 4 inches in diameter, brush and overgrown vegetation at the downstream slope.
3. Animal burrows observed at downstream slope of south embankment.
4. Portion of exposed earth observed at the south east end of the downstream slope.
5. Large diameter trees (greater than 18 inches) at toe of downstream slope.
6. No riprap or slope protection at the downstream toe and adjacent to the Susquehanna River.
7. Decant outflow structure appears to be near completely silted in.
8. No emergency/auxiliary spillway.
9. Sloughing of downstream riprap slope protection at decant structure outlet pipe.
10. No Geotechnical computations with respect to the embankments' stability were made available to GZA for review.
11. No Hydrologic/Hydraulic computations with respect to the impoundments' ability to safely pass the Spillway Design Flood (SDF) were made available to GZA for review.

Ash Basin 005 (West Basin):

1. Rutting and depressions along the crest of the embankment primarily from construction vehicles.
2. Heavy tree cover up to 18 inches in diameter, brush and overgrown vegetation on the downstream slope of the north embankment.
3. Exposed earth and limited to no grass cover at the downstream slope.
4. Downstream embankment slopes appeared on average to be over-steep, approximately 1.5H:1V (locally steeper).
5. Sloughing and erosion along the upstream slope, near the waterline, at the west end of the impoundment.
6. No emergency/auxiliary spillway.
7. Minor erosion at the downstream slope in various locations.
8. No riprap or erosion protection at the decant structure outlet pipe.
9. No Geotechnical computations with respect to the embankments' stability were made available to GZA for review.
10. No Hydrologic/Hydraulic computations with respect to the impoundments' ability to safely pass the Spillway Design Flood (SDF) were made available to GZA for review.

**Studies and Analyses:**

*East and West Ash Basins  
UGI – Hunlock Creek Power Station*

Date of Assessment: 05/19/2011



1. Perform a detailed hydrologic and hydraulic study using current methodology to evaluate the impoundment's ability to safely pass the SDF at the East and West Basins.
2. Perform a geotechnical stability analysis of the East and West Basin embankments under all applicable loading conditions, including earthquake-induced loading.
3. Perform a seepage analysis to assess the factor of safety against piping failure, at the East and West Basins.
4. Consider development of an Emergency Action Plan to establish protocols to be undertaken and warning notifications to be implemented in the event of an emergency concerning the operational integrity of the CCW impoundments.

#### **Operations and Maintenance Activities:**

1. Fill ruts and animal burrows.
2. Record and maintain monthly measurements of the pond water surface elevation and observation wells and establish response action protocols for various elevation levels as appropriate.
3. Monitor and repair sloughing at the upstream slope at the West Basin and at the East Basin decant structure outlet pipe.
4. Clear inappropriate woody vegetation, including trees and brush and maintain grass cover on the downstream slope and toe area approximately 15 feet beyond. The USACE recommends vegetation be kept less than 12 inches in height on embankments.
5. Monitor decant outflow structures and clear silt or debris which may block or impede outflow.
6. Remove stoplogs from the weir intake at each decant outlet structure so that the normal water level in the impoundment cannot rise above elevation 531.8 feet.

#### **Minor Repairs:**

1. Remove trees, stumps, and their associated root systems from the embankments.
2. Reset any displaced riprap at the East Basin.
3. Provide riprap or erosion protection at the West Basin outfall.

#### **Remedial Measures:**

1. In conjunction with the results of the updated hydrologic and hydraulic analyses, make provisions for an emergency overflow spillway.



2. In conjunction with the results of the slope and seepage analyses, make provisions to address over-steep slopes as/if necessary.

It is GZA's opinion that the slopes appeared to be stable based on observed conditions at the time of assessment, and no imminent signs of distress were observed. It should be noted that during the over the 12 months time since the filing our Draft Report and receipt of comments from the EPA thereon, it is GZA's understanding that decommissioning of the Basins has been ongoing. According to UGI, a Draft Closure Plan was submitted for approval by UGI to PADEP Division of Waste Management in June 2011, which included the removal of CCW and decommissioning of the East and West Basins. Expedient implementation of the CCW removal activities (approximately 288,000 tons) as defined by the scope of work in the Draft Closure Plan began on May 2, 2011. Based on their current engineering estimate and anticipated schedule, UGI anticipates removal of the remaining 112,000 tons of CCW will be completed by May 2013 and the impoundments officially decommissioned shortly thereafter.

These ongoing events may therefore make moot most, if not all, of the comments and recommendations in this report. However, in keeping with good engineering practice, it is our opinion that it would be prudent for UGI to at least implement the above recommended Recurrent Operations and Maintenance activities to the extent practicable until permanent closure status is obtained for the two Basins. This includes at a minimum that all stop logs be removed from the decant outlet structures so as to limit maximum pool elevation to the top of weir elevation of 531.8 feet. We acknowledge that implementation of the above Studies and Analyses, Minor Repair Recommendations and Remedial Measures Recommendations are no longer critical given the nature of and current extent of actions being undertaken to decommission the impoundments coupled with the fact that failure of the impoundments, in our opinion, is unlikely to result in the loss of life and losses (economic or environmental) would be principally limited to the owner's property.

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## 1.0 DESCRIPTION OF PROJECT

### 1.1 General

#### 1.1.1 Authority

The United States Environmental Protection Agency (EPA) has retained GZA GeoEnvironmental, Inc. (GZA) to perform visual assessments and develop a report of conditions for the UGI Development Company's (UGI, Owner) Hunlock Creek Power Station Coal Combustion Waste (CCW) impoundments in Hunlock Creek, Pennsylvania. These assessments were authorized by the EPA under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e). These assessments and report were performed in accordance with Task 3 of RFQ-DC-16 Round 10 for EPA's Office of Resource Conservation and Recovery in support for the Assessment of Dam Safety of Coal Combustion Surface Impoundments, dated March 16, 2011. The assessment generally conformed to the requirements of the Federal Guidelines for Dam Safety<sup>1</sup>, and this report is subject to the limitations contained in **Appendix A** and the Terms and Conditions of our Contract Agreement.

#### 1.1.2 Purpose of Work

The purpose of this investigation was to visually assess and evaluate the present condition of the dam, dikes and appurtenant structures to attempt to identify conditions that may adversely affect their structural stability and functionality, to note the extent of any deterioration that may be observed, review the status of maintenance and needed repairs, and to evaluate the conformity with current design and construction standards of care.

The investigation was divided into four parts: 1) obtain and review available reports, investigations, and data from the Owner pertaining to the dam and appurtenant structures; 2) perform an on site review with the Owner of available design, inspection, and maintenance data and procedures for the management unit(s); 3) perform a visual assessment of the site; and 4) prepare and submit a draft and a final report presenting the evaluation of the structure, including recommendations and proposed remedial actions.

#### 1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in **Appendix B**. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; 5) general; and 6) condition rating.

### 1.2 Description of Project

#### 1.2.1 Location

Hunlock Creek Power Station is located approximately 10 miles west of Wilkes-Barre in Luzerne County, Pennsylvania. The site is accessible from the west and east via Route 11.

<sup>1</sup> FEMA/ICODS, April 2004: <http://www.ferc.gov/industries/hydropower/safety/guidelines/fema-93.pdf>





The CCW impoundments are located adjacent to the power station at the west side at approximate latitude 41° 12' 4" North and longitude 76° 04' 10" West. A site locus of the impoundments and surrounding area is shown in **Figure 1**. An aerial photograph of the impoundments and surrounding area is provided in **Figure 2**. The impoundments can be accessed directly from the power station and by gravel trails along the crest of the embankments.

1.2.2 Owner/Caretaker

The basins and power station are owned and operated by the UGI Development Company.

	Dam Owner/Caretaker
Name	UGI Development Company
Mailing Address	One Meridian Blvd. Suite 2C01
City, State, Zip	Wyomissing, PA 19610
Contact	Jeff Steeber
Title	Facilities Engineer
E-Mail	<a href="mailto:jsteeber@ugies.com">jsteeber@ugies.com</a>
Daytime Phone	(570)542-5369 ext. 232
Emergency Phone	911

1.2.3 Purpose of the Basins

Hunlock Creek Power Station was a coal fired power station with a maximum generating capacity of approximately 50 Megawatts. According to UGI representatives the plant has been in operation since approximately 1924, however the 50 Megawatt unit was not in operation until 1959. According to UGI representatives the East and West Basins were constructed sometime in the early 1960's to collect Coal Combustion Wastes (CCW) from the power station. The basins were dredged regularly, approximately every two years, and the ash obtained was temporarily stored on-site (for drying purposes) and later disposed of legally off-site.

In May 2010 the coal fired unit at the Hunlock Creek Power Station was permanently shut down. Since that time CCWs and station waste water is no longer sluiced into the East and West Basins. At the time of the assessment a new gas generating station was under construction adjacent to the former coal station. In conjunction with the new gas generating station, UGI plans to permanently decommission the East and West Basins by means of removing CCWs within the impoundments followed by breaching of the ash basin embankments (such that water can no longer be impounded) and subsequent re-grading of the site to provide positive drainage. At the time of the assessment, UGI, in cooperation with the PADEP Division of Waste Management, was in the process of executing their decommissioning plan by removing CCWs from the East and West Basins via excavation and loading into trucks for off-site disposal. According to UGI, the CCWs are being legally disposed of in a regulated mine reclamation facility. Additionally it was noted that some of

the bottom ash was being used for road anti-skid material. UGI indicated they anticipate obtaining official permanent closure status for the basins within approximately two years from the date of GZA's assessment visit.

#### 1.2.4 Description of the East Basin Embankment and Appurtenances

The following description of the East Basin is based on information from original design<sup>2</sup> and modification<sup>3</sup> drawings, the caretaker interview, and our on-site assessment on May 19, 2011.

The East Basin is located southeast of the West Basin separated by a common dike and west of the former coal fired power station. The basin is believed to have been constructed in conjunction with the West Basin in the early 1960's. A significant portion of the basin appears to have been incised below the existing ground surface at the time of its original construction. Prior to May 2010, fly ash was sluiced into the basin and allowed to settle. Water exited the present decant outlet structure, which was constructed approximately in 1976. Approximately bi-annually, the basin was dredged. Dredged fly ash was temporarily stored on-site northeast of the East Basin. After sufficient drying time, the ash was disposed of legally off-site. On May 22, 2010 the coal fired power station was permanently shut down and ash was no longer sluiced into the East Basin.

The East Basin has an embankment crest length of approximately 1290 feet<sup>4</sup>, not including the common dike or incised portions of the embankment. From the top of dam elevation 534 ± feet, the embankment structure has a maximum height of approximately 30 feet (generally along the south side). The original design drawings specified re-use of material excavated from creating the basin to construct the embankments. This material consisted primarily of previously placed ash. Recent borings<sup>5</sup> through the embankments conducted by Geological and Environmental Associates (GEA) as part of the decommissioning process confirm the use of ash in their construction. Therefore based on review of the existing data and the fact that some form of ash disposal has been ongoing at the site since 1924, it appears that portions of the Basin were built of and/or over previously placed ash.

To limit seepage an impermeable liner was constructed from on-site clay excavated during the construction of the East and West Basins. The approximately 5-foot-thick liner extends from the heel to the crest of the inside face of the embankment. It appears, based on review of the design drawings, the East and West Basins originally had a common outlet structure and were hydraulically connected at the southwest end. Modifications undertaken circa 1976 appear to have included fully separating the basins by extending the common dike and constructing the present day decant outflow structures for each basin.

Several monitoring wells are located within the embankments of the structure. Over the active life of the basin, these wells were periodically sampled for water quality. However

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<sup>2</sup> Plan view by United Engineers & Constructors, Inc. entitled "Ash Settling Basin; Ash Disposal Area; Structural – Hunlock Plant – 1957 Extension," dated September 30, 1957

<sup>3</sup> Intake Plan and Sections by United Engineers & Constructors, Inc. entitled "Settling Pond Outfall Plan – Sections – Details; Hunlock Plant – Waste Water Streams Modification," dated June 21, 1976

<sup>4</sup> Embankment length estimated using Google Earth measuring tools.

<sup>5</sup> Logs performed by GEA in August 2008 and March 2010 and Quad3 in November 2008, refer to Appendix F for site location plan and selected boring logs.





no formal documentation of water level is maintained and no information concerning historic water levels was provided.

The reinforced concrete and sheet pile decant outflow structure consists of an approximately 25.5 foot wide weir controlled via stoplogs above a fix crest of 531.8'. Decant water is channeled to a 24-inch diameter iron pipe (20 inches measured during assessment) for discharge to a naturally-lined channel which outlets to the adjacent Susquehanna River as regulated under the National Pollutant Discharge Elimination System (NPDES) Permit No. PA000864.

UGI is currently executing the decommissioning of the East Basin and anticipates achieving permanent closure status approximately two years from the date of GZA's assessment.

#### 1.2.5 Description of the West Basin Embankment and Appurtenances

The following description of the West Basin is based on information from original design and modification drawings, the caretaker interview, and our on-site assessment on May 19, 2011.

The West Basin is located north of and is separated from the East Basin by a common dike. Similar to the East Basin, it appears a significant portion was incised below the existing ground surface at the time of its original construction. According to UGI, bottom ash was sluiced into the basin prior to permanent shut down of the coal fired power station. The West Basin has an embankment crest length of approximately 1470 feet<sup>6</sup>, not including the common dike or incised portions of the embankment. The north embankment has an approximate maximum height of 15 feet. The inside face of the embankment is lined with a five-foot thick natural clay layer. As with the East Basin, the original design drawings specified re-use of material excavated from creating the basin to construct the embankments. This material consisted primarily of previously placed ash. Borings performed in 2008/2010 by GEA and Quad3 confirmed the presence of ash fill. Therefore based on review of the existing data and the fact that some form of ash disposal has been ongoing at the site since 1924, it appears that portions of the Basin were built of and/or over previously placed ash. Decommissioning of the basin is being performed in conjunction with the East basin.

Similar to the East Basin, several monitoring wells are located within the West Basin embankments. Over the active life of the basin, these wells were periodically sampled for water quality. However no formal documentation of water level is maintained and no information concerning historic water levels was provided.

The decant outlet structure is of similar construction as described for the East Basin.

#### 1.2.6 Operations and Maintenance

The basins are maintained and operated by UGI personnel. Operation of both basins includes maintaining the free flow of water through the decant outflow structures and removing/replacing stoplogs as necessary. According to UGI grassed embankment slope portions are mowed once annually.

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<sup>6</sup> Embankment length estimated using Google Earth measuring tools.



### 1.2.7 Size Classification

For the purposes of this EPA-mandated assessment, the size of the dam and its impoundment will be based on United States Army Corps of Engineers (USACE) criteria. The East Basin in its current configuration has a maximum height of approximately 30 feet above natural ground and a storage volume of approximately 76 acre-feet at the top of embankment elevation 534 ± feet. The West Basin in its current configuration has a maximum height of approximately 15 feet above natural ground surface and an original maximum storage volume of approximately 40 acre-feet at the top of embankment elevation 534 ± feet. According to guidelines established by the USACE, dams with a storage volume less than 1,000 acre-feet and/or a height less than 40 feet are classified as Small sized structures. Therefore in accordance with USACE criteria the East and West Basins are both considered **Small** structures, respectively.

### 1.2.8 Hazard Potential Classification

Under the EPA classification system, as presented on page 2 of the EPA check list (**Appendix C**) and Definitions section (**Appendix B**), it is GZA's opinion that the East and West Basins are **Low** Hazard potential structures. The hazard potential rating is based on limited human habitation downstream, their small size, the fact that no loss of life would be expected if there was a failure, and despite the close proximity of the Susquehanna River, environmental or economic damage due to failure would be minimal. The area downstream of the dam is shown in **Figure 3**.

Note the PADEP, Division of Dam Safety (DDS) does recognize that both impoundments do have dam embankments associated with them and are jurisdictional dams in Pennsylvania due to their use to store fluids or semifluids other than water (in this case ash), the escape of which may result in air, water, or land pollution or in danger to persons or property. DDS will assign dam numbers to the Basins and will review decommissioning plans.

## 1.3 Pertinent Engineering Data

### 1.3.1 Drainage Area

Based on the design documents and as estimated by GZA, the East and West Basins do not receive drainage from the surrounding areas. The only water that enters the impoundments is from direct precipitation. The estimated drainage area is shown in **Figure 4**.

### 1.3.2 Reservoir

The East Basin has a surface area of approximately 5 acres and a storage volume of 76 acre-feet at the top of dam, elevation 534 ± feet. According to the original design drawings, normal pool elevation was approximately 533 feet. At the time of the assessment, the pool level was estimated to be approximately 531 feet at the intake structure. Most of the basin had been filled in by ash to approximately the top of embankment at elevation 534 feet (See Photos 8 & 15).



The West Basin has a surface area of approximately 5 acres and a storage volume of approximately 40 acre-feet at the top of dam, elevation 534 ± feet. According to the original design drawings, normal pool elevation was approximately 533 feet. At the time of the assessment, the pool level was estimated to be approximately 531 feet at the intake structure. Approximately 2/3rds of the basin was filled in with ash to the top of embankment at the time of assessment (See Photo 1).

1.3.3 Discharges at the Dam Site

No records of discharge exist. Since the permanent shut down of the coal fired power station in May of 2010 CCWs are no longer discharged into the basins. The only water entering the basins is from rainwater falling over the surface area of the basin. At the time of our assessment no discharge was observed flowing out of the basins, after a week of heavy rains prior to our assessment visit.

1.3.4 General Elevations (feet – MSL)

Elevations are taken from design drawings, reports and data provided by UGI. Elevations are based upon the USGS topographic map MSL vertical datum.

A. Top of Dam (Minimum)	534 ± feet
B. Spillway Design Flood Pool (Design)	Unknown
C. Normal Pool (Maximum Operating Pool)	533 feet
D. Spillway Crest	533 feet
E. Upstream Water at Time of Assessment	± 531 feet
F. Downstream Tail Water at Time of Assessment	None (No tailwater)
G. Low Point along Toe of Dam	± 504 feet

1.3.5 Spillway Data

A. Type	Stoplog weir to Iron Pipe
B. Weir Length	25.5 feet 20-inch O.D. Iron Pipe
C. Weir Crest/Control Elevation	531.8'

1.3.6 Design and Construction Records and History

The original design and construction of the East and West Basins is believed to been undertaken by United Engineers and Constructors, Inc. based upon an original design drawing dated September 30, 1957. According the representatives of UGI the basins were built sometime in the early 1960's. A structural modification drawing was provided for new decant outlet structures (presumably the same general configuration for each basin and that which exists as of the date of our assessment) by United Engineers and Constructors, Inc. dated June 21, 1976. Original plans, available to GZA, are provided in **Appendix F**.

According to the original design drawings the embankments were to be constructed of on-site ash and material excavated during construction of the basins amounting to approximately 40,600 CY of material. The inside face of the embankments was to have a 5-foot-thick impervious layer of earth (on-site clay excavated during construction) amounting

to 5,800 CY of material. Inside and outside embankments were originally designed to have 2H:1V slopes.

### 1.3.7 Operating Records

No operating records were available for GZA to review at the time of this assessment.

### 1.3.8 Previous Inspection Reports

No previous inspection reports were available for GZA to review at the time of this assessment.

## 2.0 ASSESSMENT

### 2.1 Visual Assessment

Ash Basin 003 (East Basin) and Ash Basin 005 (West Basin) were assessed on May 19, 2011 by Brad Nourse and James P. Guarente, P.E. of GZA GeoEnvironmental, Inc. At the time of the assessment the weather was cloudy with occasional rain and temperatures in the 60's Fahrenheit. Photographs to document the current conditions of the embankments were taken during the assessment and are included in **Appendix D**. At the time of the assessment, the water levels in the East and West Basins were approximately 531 feet, based on stoplog settings. Underwater areas were not assessed, as this level of investigation was beyond that of GZA's scope of services. Copies of the EPA Checklists are included in **Appendix C**.

With respect to our visual assessment, there was no evidence of prior releases, failures, or recent remedial repair work observed by GZA.

#### 2.1.1 Ash Basin 003 (East Basin) General Findings

In general, the East Basin was found to be in FAIR condition. However, based on EPA's assessment criteria, the impoundment has been given a **POOR** condition rating, because no geotechnical computations were made available to GZA to review. Thus the stability of the embankments could not be independently verified even though, in GZA's professional opinion, the embankments in their current state at the time of the visual assessment appeared to be suitably stable and no immediate remedial action appears necessary. An overall site plan showing the impoundment is provided as **Figure 5**. The location and orientation of photographs provided as **Figure 6**.

Some water was present near the intake structure at the East Basin at the time of our site visit, but in general the East Basin is filled in with previously water borne ash (See Photos 13 & 14).

#### 2.1.2 Ash Basin 005 (West Basin) General Findings

In general, the West Basin was found to be in **POOR** condition based on the results of our visual assessment alone, notwithstanding the fact that no geotechnical computations were made available to GZA for review. An overall site plan showing the impoundment is provided as **Figure 5**. The location and orientation of photographs provided as **Figure 6**.



Water was present beginning at and extending outward approximately 400 feet from the decant outlet structure at the West Basin at the time of our site visit (See Photo 1). Note heavy rainfall occurred the week prior to our assessment.

#### 2.1.3 East Basin Embankment (Photos 8, 11, 12, 19, & 20)

The downstream embankment was approximately 2H:1V and vegetated with grass greater than 12 inches high, possibly obscuring features of the embankment. Large trees generally greater than 18 inches in diameter exist at the toe of slope adjacent to the Susquehanna River. Generally the downstream slope appeared to be in good condition, no sloughs or seeps were observed during the time of the assessment. Some animal burrows were observed at the embankment crest and downstream slope above (former) normal pool elevation.

Ruts and depressions were observed at the crest of the embankment and appeared primarily to be due to the ongoing construction activity associated with the decommissioning of the basin.

#### 2.1.4 West Basin Embankment (Photos 2, 4, 5)

The downstream embankment at the north side of the West Basin had heavy tree cover (including trees greater than 18 inches diameter). Slopes were observed to be oversteep, on average approximately 1.5H:1V (which apparently is steeper than called for on the original design drawings) and mostly exposed earth with no grass cover.

Scarps were observed on the inside slopes near the water line, causing vertical benching along much of the inside slope.

#### 2.1.5 East Basin Decant Outflow Structure (Photos 15, 16, & 17)

The East Basin Decant outflow structure was generally in poor condition. The weir intake structure was almost completely silted in. Heavy corrosion was observed along the sheeting and hand rails. Rails were separated from the stanchions at some places. Operation of the stoplogs was not performed during the assessment.

#### 2.1.6 West Basin Decant Outflow Structure (Photos 4 & 7)

The West basin decant outflow structure was generally in poor condition. Heavy corrosion was observed along the sheeting and hand rails. Operation of the stoplogs was not performed during the assessment.

#### 2.1.7 Basin Decommissioning (Photos 9 & 10)

UGI in cooperation with the PADEP Division of Waste Management is in the process of executing their decommissioning plan, which includes removing CCWs from the East and West Basins, breaching the embankments and re-grading the site such that the basins can no longer impound water. Refer to **Appendix F** for a depiction of the proposed post closure grading plan as prepared by UGI's decommissioning consultant QUAD3. At the time of the assessment UGI was excavating and removing ash from the site. According to UGI



representatives approximately 1,000 tons of ash is removed per day, after environmental testing, for disposal at a mine reclamation site. UGI anticipates permanent closure status of the basins will be obtained within approximately two years from the time of GZA's assessment.

#### 2.1.8 Downstream Area

The downstream channel carries the combined outflow from the East and West Basins in a westerly direction and merges with another channel adjacent to the south side of Route 11 and separated from the Susquehanna River. The channel which runs between Route 11 and the Susquehanna River is reportedly a former canal, according to UGI representatives. The outlet channel and downstream area is heavily wooded. Ground slopes down to the Susquehanna River south of the basins and outflow channel and steeply up beyond Route 11 to the north of the basins. An access bridge across the Susquehanna River and the SCI Retreat Correctional facility exist approximately one mile downstream of the basins.

As part of a groundwater quality and ash assessment program related to the decommissioning efforts, borings were performed downstream of the basins by GEA in August 2008 and March 2010, and by Quad3 in November 2008. Near the outflow channel, west of the basins, boring B-26 through B-29 indicate approximately 12 feet of ash fill, likely deposited prior to construction of the basins in the 1960's.

#### 2.2 Caretaker Interview

GZA met with Jeff Steeber of UGI Development Company during the site visit on May 19, 2011 and discussed the current operations and maintenance procedures, regulatory requirements, and the history of the basins. The observations, descriptions and findings presented herein this report reference our discussions with Mr. Steeber.

Mr. Steeber indicated during the on-site assessment that neither basin had failed since their construction in the early 1960s.

#### 2.3 Operation and Maintenance Procedures

As discussed in Section 1.2.5, UGI personnel are responsible for the regular operations and maintenance of the basins. No written operations and maintenance procedure was available for review by GZA at the time of the assessment.

#### 2.4 Emergency Warning System

No emergency action plan has been prepared for the East or West Basins.

#### 2.5 Hydrologic/Hydraulic Data

No hydrologic or hydraulic data was available for review by GZA at the time of this assessment. GZA did not perform an independent assessment of the hydraulics and hydrology for the basins as this was beyond the scope of our services.

It is re-iterated that the basins no longer receive sluiced ash from coal operations since coal operations at the plant were permanently ceased in May 2010. Based on GZA's review of



topographic maps and onsite assessment, it appears there is no contributory drainage area. Inflow into the basins appears to be solely from rainfall directly alighting within the impoundment.

## 2.6 Structural and Seepage Stability

No engineering design computations were available for review by GZA at the time of this assessment regarding structural and seepage stability. Original design drawings from 1957, by United Engineers and Constructors, Inc., made available to GZA, indicate inside and outside embankment slopes at 2H:1V. As previously noted, some portions of the West Basin have slopes steeper than specified on the design drawings. No major sloughs or related structural instabilities were noted during the visual assessment.

Seepage is controlled by a 5 foot thick clay liner at the inside face of the embankment. No seepage analyses were available for review by GZA at the time of this assessment. GZA did not see any evidence of ongoing or past seepage during our assessment.

GZA did not perform an independent assessment of the structural and seepage stability of the basins as this was beyond our scope of services.

## 3.0 ASSESSMENTS AND RECOMMENDATIONS

### 3.1 Assessments

In general, the overall condition of Ash Basin 003 (East Basin) was judged to be **POOR**. The East Basin was found to have the following deficiencies:

1. Rutting and depressions along the crest of the embankment primarily from construction vehicles.
2. Trees generally 3 to 4 inches in diameter, brush and overgrown vegetation at the downstream slope.
3. Animal burrows observed at the downstream slope of the south embankment.
4. Portion of exposed earth observed at the south east end of the downstream slope.
5. Large diameter trees (greater than 18 inches) at the toe of downstream slope.
6. No riprap or slope protection at the downstream toe and adjacent to the Susquehanna River.
7. Decant outflow structure appears to be near completely silted in.
8. No emergency/auxiliary spillway.
9. Sloughing of downstream riprap slope protection at decant structure outlet pipe.
10. No Geotechnical computations with respect to the embankments' stability were made available to GZA for review.
11. No Hydrologic/Hydraulic computations with respect to the impoundments' ability to safely pass the Spillway Design Flood (SDF) were made available to GZA for review.





In general, the overall condition of Ash Basin 005 (West Basin) was judged to be POOR. The West Basin was found to have the following deficiencies:

1. Rutting and depressions along the crest of the embankment from construction vehicles.
2. Heavy tree cover up to 18 inches in diameter, brush and overgrown vegetation on the downstream slope of the north embankment.
3. Exposed earth and limited to no grass cover at the downstream slope.
4. Downstream embankment slopes appeared on average to be over-steep, approximately 1.5H:1V (locally steeper).
5. Sloughing and erosion along the upstream slope, near the waterline, at the west end of the impoundment.
6. No emergency/auxiliary spillway.
7. Minor erosion at the downstream slope in various locations.
8. No riprap or erosion protection at the decant structure outlet pipe.
9. No Geotechnical computations with respect to the embankments' stability were made available to GZA for review.
10. No Hydrologic/Hydraulic computations with respect to the impoundments' ability to safely pass the Spillway Design Flood (SDF) were made available to GZA for review.

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of the appropriate regulatory agencies.

### 3.2 Studies and Analyses

GZA recommends the following studies and analyses:

1. Perform a detailed hydrologic and hydraulic study using current methodology to evaluate the impoundment's ability to safely pass the SDF at the East and West Basins.
2. Perform a geotechnical stability analysis of the East and West Basin embankments under all applicable loading conditions, including earthquake-induced loading.
3. Perform a slope stability and seepage analysis to assess the factor of safety against slope and piping failure, at the East and West Basins.
4. Consider development of an Emergency Action Plan to establish protocols to be undertaken and warning notifications to be implemented in the event of an emergency concerning the operational integrity of the CCW impoundments.



### 3.3 Recurrent Operation & Maintenance Recommendations

GZA recommends the following operation and maintenance level activities:

1. Fill ruts and animal burrows.
2. Record and maintain monthly measurements of the pond water surface elevation and observation wells and establish response action protocols for various elevation levels as appropriate.
3. Monitor and repair sloughing at the upstream slope at the West Basin and the East Basin decant structure outlet pipe.
4. Clear inappropriate woody vegetation, including trees and brush and maintain grass cover on the downstream slope and toe area approximately 15 feet beyond. The USACE recommends vegetation be kept less than 12 inches in height on embankments.
5. Monitor decant outflow structures and clear silt or debris which may block or impede outflow.
6. Remove stoplogs from the weir intake at each decant outlet structure so that the normal water level in the impoundment cannot rise above elevation 531.8 feet.

### 3.4 Minor Repair Recommendations

GZA recommends the following minor repairs which may improve the overall condition of the basins, but do not alter their current design. The recommendations may require design by a professional engineer and construction contractor experienced in dam construction.

1. Remove trees, stumps, and their associated root systems from the embankments.
2. Reset any displaced riprap at the East Basin.
3. Provide riprap or erosion protection at the West Basin outfall.

### 3.5 Remedial Measures Recommendations

1. In conjunction with the results of the updated hydrologic and hydraulic analyses, make provisions for an emergency overflow spillway.
2. In conjunction with the results of the slope and seepage analyses, make provisions to address over-steep slopes as/if necessary.

It is GZA's opinion that the slopes appeared to be stable based on observed conditions at the time of assessment, and no imminent signs of distress were observed. It should be noted that during the over the 12 months time since the filing our Draft Report and receipt of comments from the EPA thereon, it is GZA's understanding that decommissioning of the Basins has been ongoing. According to UGI, a Draft Closure Plan was submitted for approval by UGI to PADEP Division of Waste Management in June 2011, which included the removal of CCW and decommissioning of the East and West Basins. Expedient implementation of the CCW



removal activities (approximately 288,000 tons) as defined by the scope of work in the Draft Closure Plan began on May 2, 2011. Based on their current engineering estimate and anticipated schedule, UGI anticipates removal of the remaining 112,000 tons of CCW will be completed by May 2013 and the impoundments officially decommissioned shortly thereafter.

These ongoing events may therefore make moot most, if not all, of the comments and recommendations in this report. However, in keeping with good engineering practice, it is our opinion that it would be prudent for UGI to at least implement the above recommended Recurrent Operations and Maintenance activities to the extent practicable until permanent closure status is obtained for the two Basins. This includes at a minimum that all stop logs be removed from the decant outlet structures so as to limit maximum pool elevation to the top of weir elevation of 531.8 feet. We acknowledge that implementation of the above Studies and Analyses, Minor Repair Recommendations and Remedial Measures Recommendations are no longer critical given the nature of and current extent of actions being undertaken to decommission the impoundments coupled with the fact that failure of the impoundments, in our opinion, is unlikely to result in the loss of life and losses (economic or environmental) would be principally limited to the owner's property.

### 3.6 Alternatives

There are no alternatives currently recommended. **It must be noted however that full implementation of all of our recommendations should be undertaken if the time to obtain permanent closure status for the basins (in accordance with applicable engineering and regulatory requirements) is extended beyond UGI's expected two year time frame.**

## 4.0 ENGINEER'S CERTIFICATION

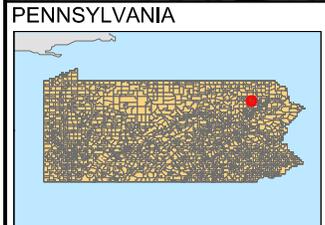
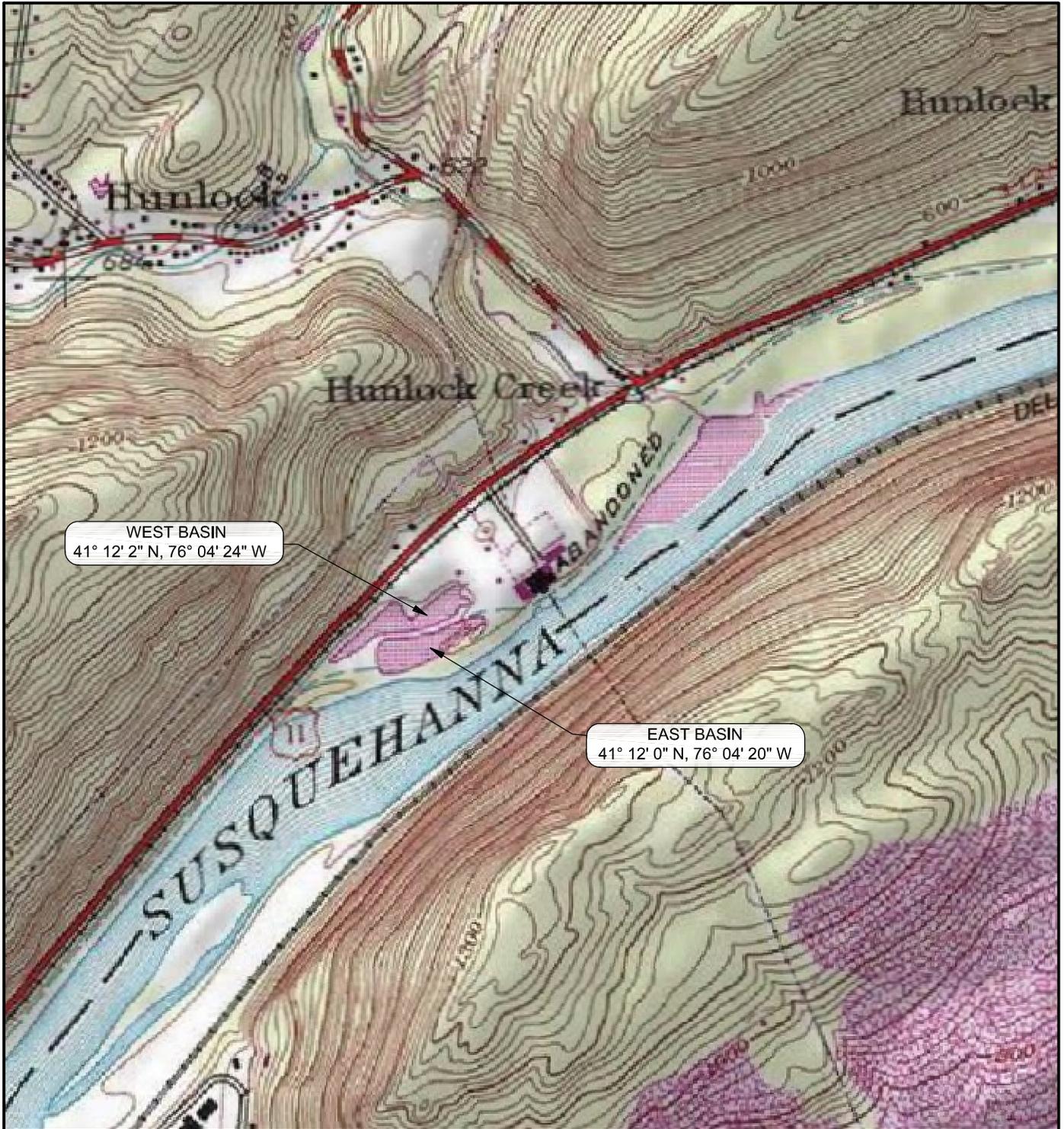
I acknowledge that the management units referenced herein, Ash Basin 003 (East Basin) has been assessed to be in **POOR** condition and Ash Basin 005 (West Basin) has been assessed to be in **POOR** condition on May 19, 2011.

A handwritten signature in black ink that reads 'James P. Guarente'.

James P. Guarente, P.E.  
Senior Project Manager

J:\170,000-179,999\170142\170142-30 Round 10\UGI Hunlock Creek\Report\Final Report\Final Report\_text.docx

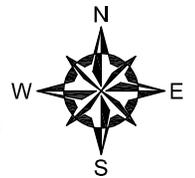
**FIGURES**



APPROXIMATE SITE LOCATION

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**HUNLOCK CREEK POWER STATION**  
 390 RT. 11  
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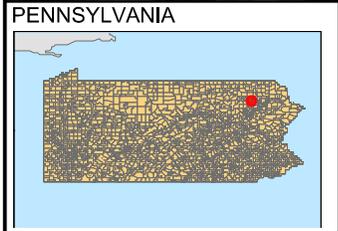
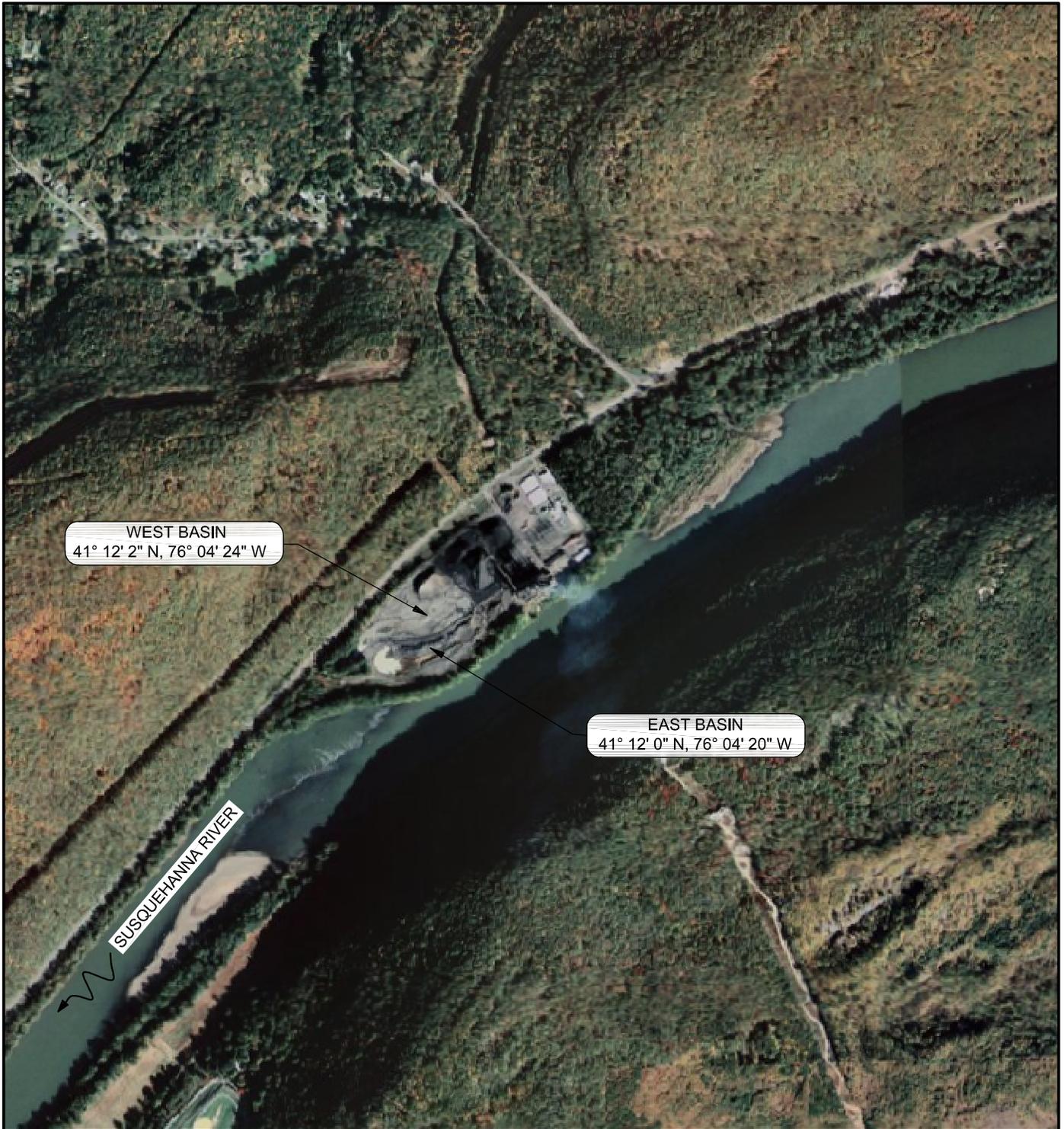
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**LOCUS MAP**  
**COAL COMBUSTION**  
**SURFACE IMPOUNDMENTS**

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DESIGNED BY:	CBN	DRAWN BY:	JRC
DATE:	06-28-2011	PROJECT NO.:	170142.30

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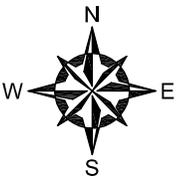
**FIGURE 1**  
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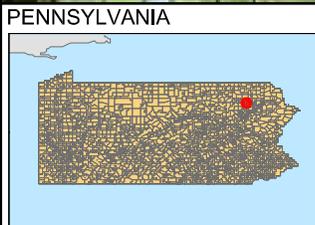
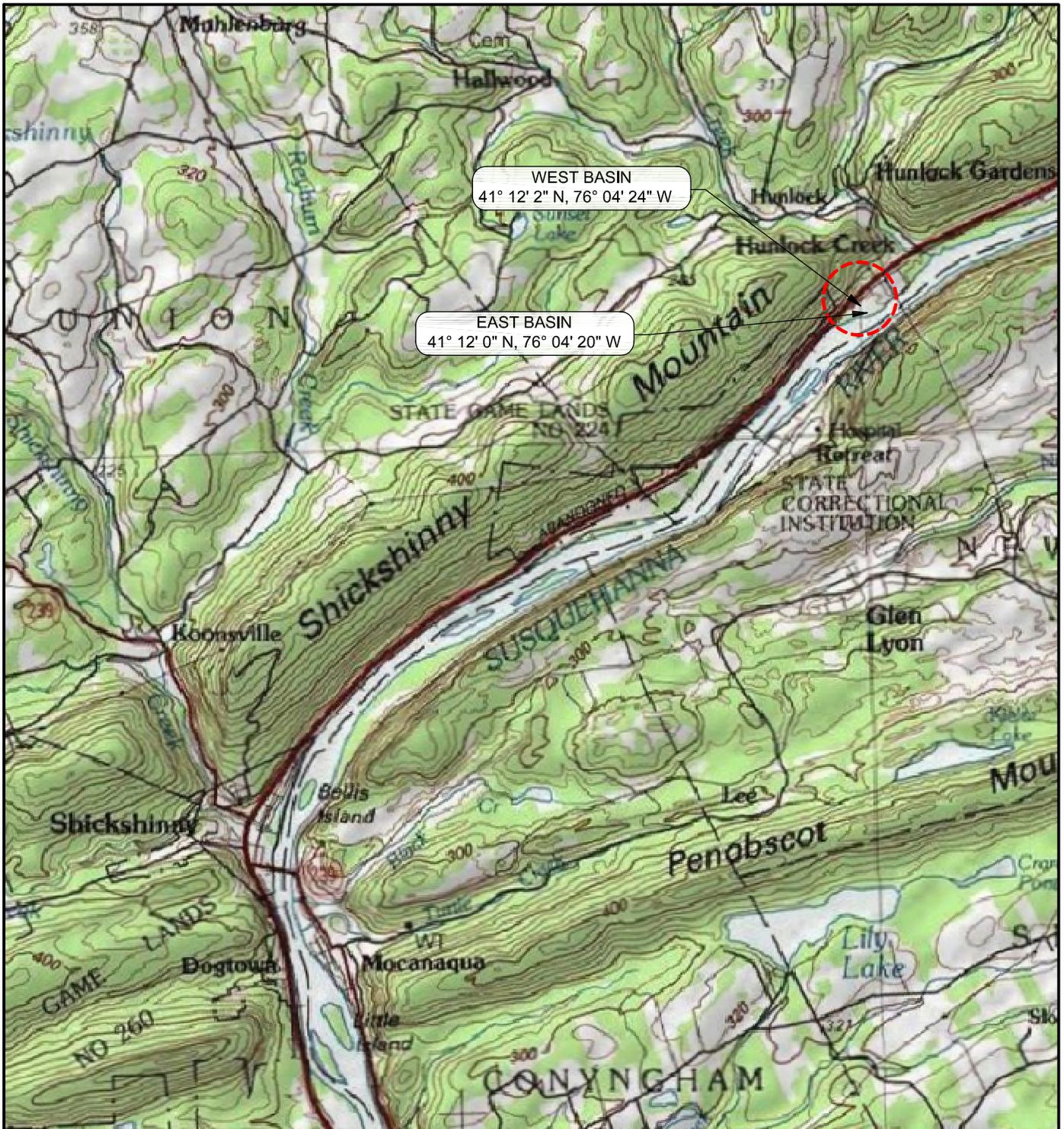
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**ORTHO-PHOTO LOCUS MAP**  
**COAL COMBUSTION**  
**SURFACE IMPOUNDMENTS**

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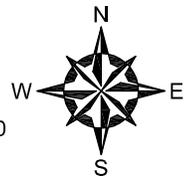
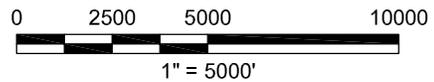
**FIGURE**  
**2**  
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**DOWNSTREAM AREA MAP  
COAL COMBUSTION  
SURFACE IMPOUNDMENTS**

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**FIGURE**  
**3**  
SHEET NO.

© 2011 - GZA GeoEnvironmental, Inc. GZA-J:\170,000-179,999\170142\170142-30 Round 10\UGI Hunlock Creek\Drawings\170142-30\_HunlockCreek\_East & West Basin.dwg [FIGURE 4] June 24, 2011 - 5:24pm charlie.nourse

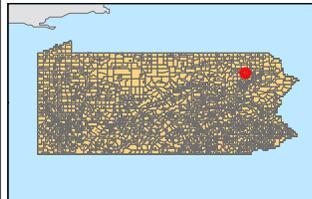
**LEGEND**

-  APPROXIMATE WEST BASIN DRAINAGE AREA
-  APPROXIMATE EAST BASIN DRAINAGE AREA
-  DRAINAGE AREA DELINIATION/BOUNDARY



NOTE:  
DRAINAGE AREAS ARE APPROXIMATELY EQUAL TO THE SURFACE AREA OF THE IMPOUNDMENTS AT THE EAST AND WEST BASINS.

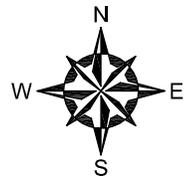
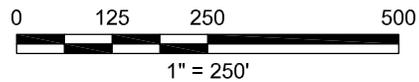
**PENNSYLVANIA**



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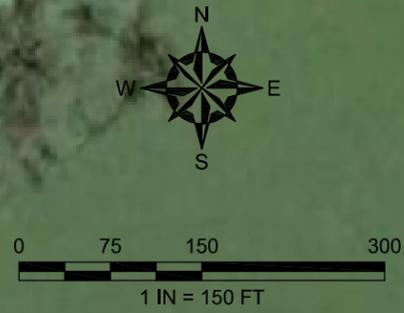
**DRAINAGE AREAS  
COAL COMBUSTION  
SURFACE IMPOUNDMENTS**

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**FIGURE**  
**4**  
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© 2011 - GZA GeoEnvironmental, Inc. GZA-U:\170,000-179,999\170142-30 Round 10\UGI Hunlock Creek Drawings\170142-30\_HunlockCreek\_East & West Basin.dwg [FIGURE 5] June 28, 2011 - 1:12pm charles.nourse



**PENNSYLVANIA**

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**HUNLOCK CREEK POWER STATION**  
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**SITE PLAN/FIELD SKETCH  
 EAST & WEST BASINS  
 COAL COMBUSTION SURFACE IMPOUNDMENTS**

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 THE U.S. ENVIRONMENTAL PROTECTION  
 AGENCY RESOURCE AND RECOVERY

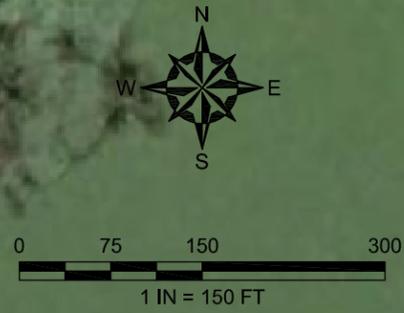
PROJ MGR: JPG	REVIEWED BY: JPG	CHECKED BY: PHB	FIGURE <b>5</b>
DESIGNED BY: CBN	DRAWN BY: OCO	SCALE: 1" = 150'	
DATE: 06-28-2011	PROJECT NO. 170142.30	REVISION NO.	SHEET NO.

©2011 - GZA GeoEnvironmental, Inc. GZA-U:\170,000-179,999\170142-30 Round 10\UGI Hunlock Creek Drawings\170142-30\_HunlockCreek\_East & West Basin.dwg [FIGURE 6] June 24, 2011 - 5:25pm charles.nourse



**LEGEND**

1 (with arrow) GZA PHOTO LOCATION/DIRECTION  
 PHOTO NUMBER



PENNSYLVANIA

APPROXIMATE SITE LOCATION

**SOURCE:**

This map contains the ESRI ArcGIS Online World Topographic Map or Aerial Imagery service, Published February 2011 by ESRI ARCIMS Services. The service was compiled to uniform cartography using a variety of best available sources from several data providers.

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**HUNLOCK CREEK POWER STATION**  
 390 RT. 11  
 HUNLOCK CREEK, PA 18621

**PHOTO LOCATION PLAN  
 EAST & WEST BASIN  
 COAL COMBUSTION SURFACE IMPOUNDMENTS**

PREPARED BY: **GZA GeoEnvironmental, Inc.**  
 Engineers and Scientists  
 www.gza.com

PREPARED FOR:  
 THE U.S. ENVIRONMENTAL PROTECTION  
 AGENCY RESOURCE AND RECOVERY

PROJ MGR: JPG	REVIEWED BY: JPG	CHECKED BY: PHB	FIGURE <b>6</b> SHEET NO.
DESIGNED BY: CBN	DRAWN BY: OCO	SCALE: 1" = 150'	
DATE: 06-28-2011	PROJECT NO. 170142.30	REVISION NO.	

**APPENDIX A**

LIMITATIONS

## DAM ENGINEERING & VISUAL INSPECTION LIMITATIONS

1. The observations described in this report were made under the conditions stated herein. The conclusions presented in the report were based solely on the services described therein, and not on scientific tasks or procedures beyond the scope of described services.
2. In preparing this report, GZA GeoEnvironmental, Inc. (GZA) has relied on certain information provided by UGI Development Company, and Federal, state, and local officials and other parties referenced therein. GZA has also relied on other parties which were available to GZA at the time of the inspection. Although there may have been some degree of overlap in the information provided by these various sources, GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this work.
3. In reviewing this Report, it should be realized that the reported condition of the dam is based on observations of field conditions during the course of this study along with data made available to GZA. The observations of conditions at the dam reflect only the situation present at the specific moment in time the observations were made, under the specific conditions present. It may be necessary to reevaluate the recommendations of this report when subsequent phases of evaluation or repair and improvement provide more data.
4. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions may be detected.
5. Water level readings have been reviewed and interpretations have been made in the text of this report. Fluctuations in the level of the groundwater and surface water may occur due to variations in rainfall, temperature, and other factors different than at the time measurements were made.
6. GZA's comments on the hydrology, hydraulics, and embankment stability for the dam are based on a limited review of available design documentation provided by UGI Development Company.
7. This report has been prepared for the exclusive use of the US EPA for specific application to the existing dam facilities, in accordance with generally accepted dam engineering practices. No other warranty, express or implied, is made.
8. This dam inspection report has been prepared for this project by GZA. This report is for the owner's broad evaluation and management purposes only and is not sufficient, in and of itself, to prepare construction documents or an accurate bid.

**APPENDIX B**

DEFINITIONS

## COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to references published by the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

### Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

### Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

### General

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam (Structural Height) – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the lowest point on the crest of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

### **Condition Rating**

**SATISFACTORY** - No existing potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

**FAIR** – Acceptable performance is expected under all required loading conditions (Static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

**POOR** – A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

**UNSATISFACTORY** – Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

### **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 classifications are those dams where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

**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.

**APPENDIX C**

**INSPECTION CHECKLISTS**



Site Name: Hunlock Creek Power Station Date: May 19, 2011  
 Unit Name: Ash Basin 003 (East Basin) Operator's Name: UGI Development Company  
 Unit I.D.: Hazard Potential Classification: High Significant Low

Inspector's Name: James P. Guarente, P.E. and C. Brad Nourse

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

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.	Impoundment not on PADEP Dams Inventory and therefore is not inspected by PADEP Dam Safety Office. Site Personnel conduct a daily walk-over but not documented.
2 & 3.	The basin is inactive and no longer receives coal ash slurry. Surface water and stormwater runoff can accumulate within the impoundment but it is allowed to outlet via the existing outlet structures.
5.	Crest elevation generally at elevation 534+/- based on review of recent topographic plans.
6.	Several monitoring wells are located within embankment. Wells are periodically sampled for water quality; no formal documentation of water level is maintained.
7.	Common embankment with Ash Basin 005 currently being excavated as part of decommissioning process. Both basins inactive.
8.	Original design drawings and 2008/2010 borings by GEA and Quad3 indicate embankments constructed of on-site ash.
9.	Generally 3 to 4 inches along southern and eastern sides only.



Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # PA 000864 Date May 19, 2011

INSPECTOR C. Brad Nourse James P. Guarente, P.E.

Impoundment Name Hunlock Creek Power Station-Ash Basin 003 (East Basin) Impoundment Company UGI Development Company EPA Region Region III State Agency (Field Office) Address PADEP Northeast Regional Office 2 Public Square, Wilkes-Barre, PA 18701-1915

Name of Impoundment Hunlock Creek Power Station-Ash Basin 003 (East Basin) (Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New Update x

Is impoundment currently under construction? Is water or ccw currently being pumped into the impoundment? Yes No x (In process of being decommissioned)

IMPOUNDMENT FUNCTION: Formerly received fly ash. No longer active and in process of being decommissioned.

Nearest Downstream Town: Name Glen Lyon, PA Distance from the impoundment 1.9 miles measured in straight line on Google Earth. Location: Longitude 76 Degrees 04 Minutes 20 Seconds Latitude 41 Degrees 12 Minutes 0 Seconds State PA County Luzerne

Does a state agency regulate this impoundment? YES x NO

If So Which State Agency? PA Department of Environmental Protection, Waste Division

US EPA ARCHIVE DOCUMENT

**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.

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

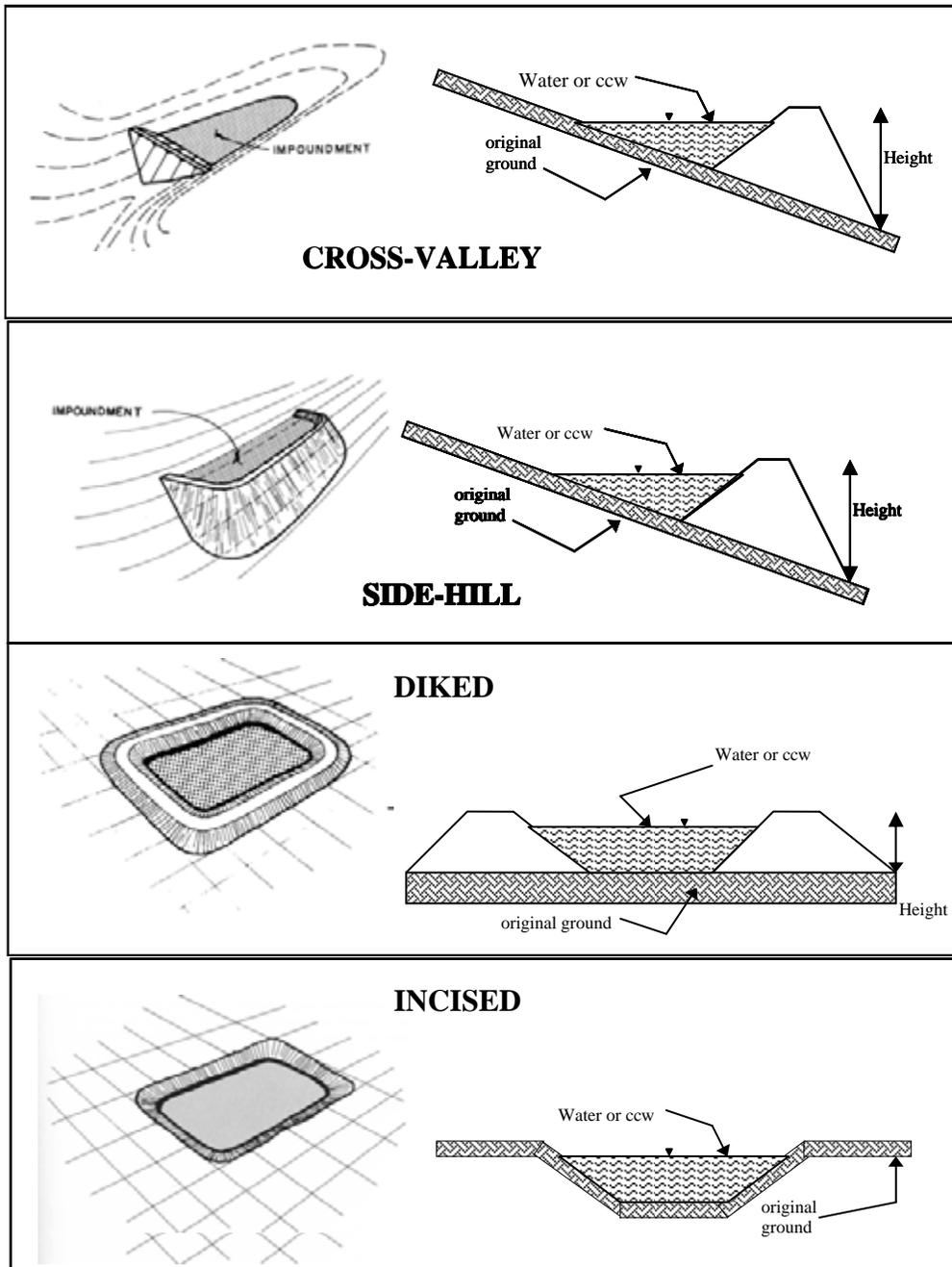
\_\_\_\_\_ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

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

**DESCRIBE REASONING FOR HAZARD RATING CHOSEN:**

Failure of impoundment is not likely to result in loss of life. Hunlock Creek Power Station permanently shut down their coal fired boiler and (two) storage impoundments (Ash Basin 003 and Ash Basin 005 [see separate checklist]) in May 2010. The impoundment is no longer in service and is in the process of being officially decommissioned through the PADEP Division of Waste Management. The active drainage area is generally limited to the surface area of the basin as there is no contributory watershed. Briefly the decommissioning involves dewatering followed by excavation of ash waste and disposal off-site at a regulated mine reclamation facility. Thereafter the impoundment will be re-graded such that it can no longer impound water. While in its current state the impoundment can impound overland stormwater runoff which has been in contact with ash waste, the engineered outlet controls are still functional so as to allow for controlled (decanted) outflow. Additionally as a result of the decommissioning activity, the capacity of the mpoundment has been significantly reduced. Therefore any economic or environmental losses are expected to be principally limited to the owner's property.

**CONFIGURATION:**



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

Embankment Height See Note 1 feet      Embankment Material Original design specified on-site ash with 5 ft natural clay at inside face.

Pool Area Approx. 5 acres      Liner None

Current Freeboard See Note 2 feet      Liner Permeability N/A

Note 1: Varies; maximum height approximately 30 ft. (south side).

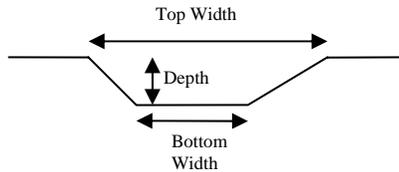
Note 2: Approximately 5 ft; (pond is inactive and only receives surface area stormwater runoff).

**TYPE OF OUTLET** (Mark all that apply)

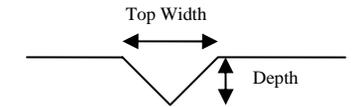
       **Open Channel Spillway**

- Trapezoidal
- Triangular
- Rectangular
- Irregular

TRAPEZOIDAL

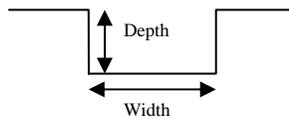


TRIANGULAR

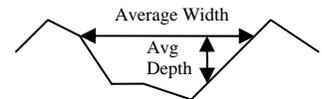


- depth
- bottom (or average) width
- top width

RECTANGULAR



IRREGULAR



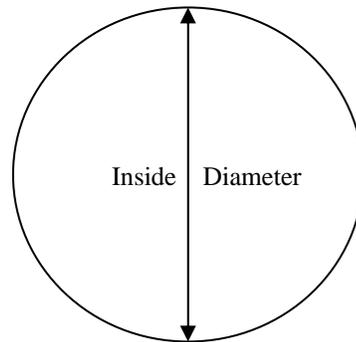
  **X**   **Outlet**

  **24"**   inside diameter Per design drawings however pipe at outlet observed to be approx. 18"-20" diameter during inspection.

**Material**

- corrugated metal
- welded steel
- concrete
- plastic (hdpe, pvc, etc.)

  **X**   other (specify) Design drawings depict asphalt coated corrugated metal pipe (16 gage); however pipe at outlet observed to be made of steel during inspection.



Is water flowing through the outlet? YES        NO   **X**  

       **No Outlet**

       **Other Type of Outlet** (specify) \_\_\_\_\_

The Impoundment was Designed By United Engineers and Constructors Inc.









Site Name: Hunlock Creek Power Station Date: May 19, 2011  
 Unit Name: Ash Basin 005 (West Basin) Operator's Name: UGI Development Company  
 Unit I.D.: Hazard Potential Classification: High Significant Low

Inspector's Name: James P. Guarente, P.E. and C. Brad Nourse

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

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
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2 & 3.	The basin is inactive and no longer receives coal ash slurry. Surface water and stormwater runoff can accumulate within the impoundment but it is allowed to outlet via the existing outlet structures which are still operable.
5.	Crest elevation generally at elevation 534+/- based on review of recent topographic plans.
6.	Several monitoring wells are located within embankment. Wells are periodically sampled for water quality; no formal documentation of water level is maintained.
7.	Common embankment with Ash Basin 003 currently being excavated as part of decommissioning process. Both basins are inactive.
8.	Original design drawings and 2008/2010 borings by GEA and Quad3 indicate embankments constructed of on-site ash.
9.	North embankment heavily wooded with trees up to 18 inches in diameter.



Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # PA 000864 Date May 19, 2011

INSPECTOR James Guarente, P.E. C. Brad Nourse

Impoundment Name Hunlock Creek Power Station - Ash Basin 005 (West Basin) Impoundment Company UGI Development Company EPA Region Region III State Agency (Field Office) Address PADEP Northeast Regional Office 2 Public Square, Wilkes-Barre, PA 18701-1915

Name of Impoundment Hunlock Creek Power Station - Ash Basin 005 (West Basin) (Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New Update X

Is impoundment currently under construction? Is water or ccw currently being pumped into the impoundment?

Yes No X (In process of being decommissioned) X

IMPOUNDMENT FUNCTION: Formerly received bottom ash. No longer active and in process of being decommissioned.

Nearest Downstream Town: Name Glen Lyon, PA Distance from the impoundment 1.9 miles measured in straight line on Google Earth. Impoundment

Location: Longitude 76 Degrees 04 Minutes 24 Seconds Latitude 41 Degrees 12 Minutes 2 Seconds State PA County Luzerne

Does a state agency regulate this impoundment? YES X NO

If So Which State Agency? PA Department of Environmental Protection, Waste Division

US EPA ARCHIVE DOCUMENT

**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.

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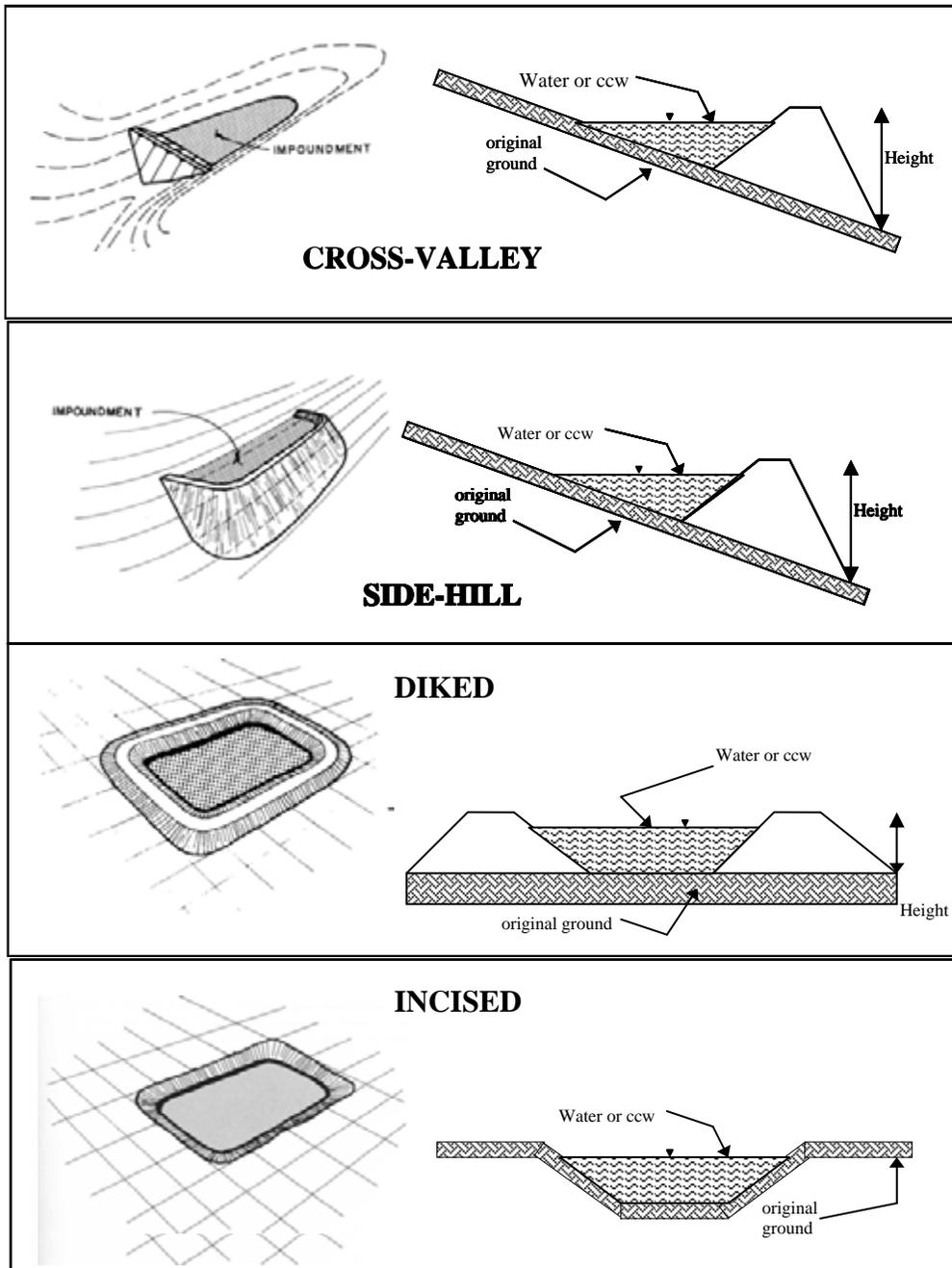
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**CONFIGURATION:**



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

Embankment Height See Note 1 feet      Embankment Material natural clay at inside face.  
 Pool Area Approx. 5.5 acres      Liner None  
 Current Freeboard See Note 2 feet      Liner Permeability N/A

Original design specified on-site ash with 5 ft

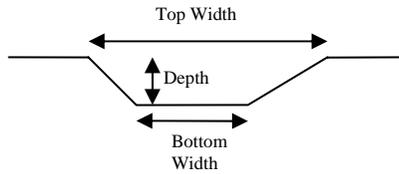
Note 1: Varies; maximum height approx. 15 ft. (North Side)  
 Note 2: Approx. 5 ft; (pond is inactive and only receives surface area runoff)  
 EPA Form XXXX-XXX, Jan 09

**TYPE OF OUTLET** (Mark all that apply)

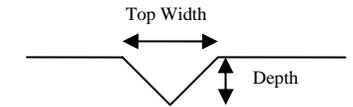
       **Open Channel Spillway**

- Trapezoidal
- Triangular
- Rectangular
- Irregular

TRAPEZOIDAL

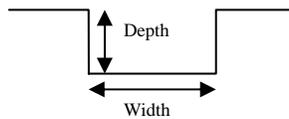


TRIANGULAR

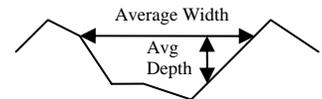


- depth
- bottom (or average) width
- top width

RECTANGULAR



IRREGULAR



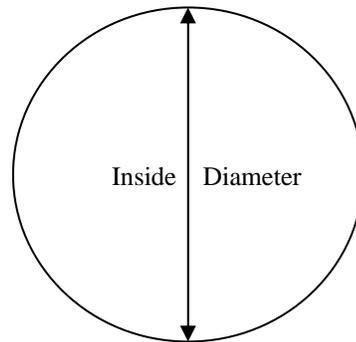
  **x**   **Outlet**

  **24"**   inside diameter Per design drawings however pipe at outlet observed to be approx. 18"-20" dia. during inspection.

**Material**

- corrugated metal
- welded steel
- concrete
- plastic (hdpe, pvc, etc.)

  **x**   other (specify) Design drawings depict asphalt coated corrugated metal pipe (16 gage); However, pipe at outlet observed to be made of steel during inspection.



Is water flowing through the outlet? YES        NO   **x**  

       **No Outlet**

       **Other Type of Outlet** (specify) \_\_\_\_\_

The Impoundment was Designed By United Engineers and Constructors Inc.







**APPENDIX D**

PHOTOS



**Client Name:**  
U.S. Environmental Protection Agency

**Site Location:**  
Hunlock Creek Station, Hunlock Creek, PA

**Project No.**  
170142.30

**Photo No.**  
1      **Date:**  
5/19/2011

**Direction Photo Taken:**  
Northeasterly

**Description:**  
Overview of the West Basin from south end near the downstream outlet. Note outlet structure at right side of picture (foreground).



**Photo No.**  
2      **Date:**  
5/19/2011

**Direction Photo Taken:**  
Southwesterly

**Description:**  
View of West Basin pond and outlet structure from embankment crest on northern side.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 3	<b>Date:</b> 5/19.2011
-----------------------	---------------------------

**Direction Photo Taken:**  
Northerly

**Description:**  
View of West Basin impoundment. Note heavily vegetated, uneven, partially eroded upstream slope.



<b>Photo No.</b> 4	<b>Date:</b> 5/19/2011
-----------------------	---------------------------

**Direction Photo Taken:**  
Westerly

**Description:**  
View of downstream side of embankment from crest at the northeastern end of the West Basin impoundment. Note channel between embankment and roadway was reportedly a former canal.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 5	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Southerly	

**Description:**  
Downstream slope opposite outlet structure at the West Basin. Note dense trees and heavily overgrown vegetation on slope.



<b>Photo No.</b> 6	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Westerly	

**Description:**  
West Basin decant outlet structure from crest of embankment. Note water in pond is surface/storm water runoff accumulated from prior week's heavy rainfall.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
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<b>Photo No.</b> 7	<b>Date:</b> 5/19/2011
-----------------------	---------------------------

**Direction Photo Taken:**  
Westerly

**Description:**  
View of approximately 18-inch diameter outlet pipe from the West Basin decant outlet structure. Arrow points to pipe outfall.



<b>Photo No.</b> 8	<b>Date:</b> 5/19/2011
-----------------------	---------------------------

**Direction Photo Taken:**  
Westerly

**Description:**  
Overview of crest of East Basin from north end. Roadway along left traverses embankment crest. Ash waste within the interior of the impoundment (a large portion of which is shown from the construction debris pile to beyond the large fork lift truck) will be excavated and disposed of off-site as part of the decommissioning process.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 9	<b>Date:</b> 5/19/2011
-----------------------	---------------------------

**Direction Photo Taken:**  
Northwesterly

**Description:**  
Overview of filled in portions of the East and West Basins. Note ash waste (previously sluiced/deposited when plant was active) is currently in the process of being excavated and disposed off-site as part of the decommissioning process.



<b>Photo No.</b> 10	<b>Date:</b> 5/19/2011
------------------------	---------------------------

**Direction Photo Taken:**  
Northerly

**Description:**  
Similar to previous photo, additional overview of filled in portions of the East and West Basins. Piles are from excavation of ash waste from other portions of the impoundment. Front loader in process of loading piles for off-site disposal.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 11	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Westerly	

**Description:**  
Downstream embankment along east slope at the East Basin. Note the Susquehanna River just beyond the tree line near the toe of dam. Portions of embankment along this side appear to tie into natural grades prior to meeting river.



<b>Photo No.</b> 12	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Easterly	

**Description:**  
Crest of East Basin from just northeast of the outlet structure. Note impoundment (beyond roadway) has been filled with sluiced fly ash during the time the facility was active. As with all other areas of the basin, the material will be removed, disposed of off-site, and the area regarded as part of the decommissioning process.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 13	<b>Date:</b> 5/19/2011
------------------------	---------------------------

**Direction Photo Taken:**  
Northeasterly

**Description:**  
View of East Basin just northeast of the East Basin outlet structure. Ash waste in this area will be excavated and disposed offsite as part of the decommissioning process.



<b>Photo No.</b> 14	<b>Date:</b> 5/19/2011
------------------------	---------------------------

**Direction Photo Taken:**  
Easterly

**Description:**  
Overview of East Basin taken from on top of its outlet structure. Note stockpiles of waste ash. Decommissioning process includes excavation and temporary stockpiling of waste ash which is tested prior to off-site disposal.



US EPA ARCHIVE DOCUMENT



Client Name:  
U.S. Environmental Protection Agency

Site Location:  
Hunlock Creek Station, Hunlock Creek, PA

Project No.  
170142.30

Photo No.  
15      Date:  
5/19/2011

Direction Photo Taken:  
Northwesterly

Description:  
View of East Basin Decant  
Outlet Structure from crest  
of East Basin embankment.  
Note water in pond is  
surface/storm water runoff  
accumulated from prior  
week's heavy rainfall.



Photo No.  
16      Date:  
5/19/2011

Direction Photo Taken:  
Northerly

Description:  
Downstream slope near East  
Basin outlet pipe. Note  
manhole in foreground  
recently constructed as part  
of the storm water drainage  
system associated with the  
site's new natural gas fired  
facility.



US EPA ARCHIVE DOCUMENT



<b>Client Name:</b> U.S. Environmental Protection Agency	<b>Site Location:</b> Hunlock Creek Station, Hunlock Creek, PA	<b>Project No.</b> 170142.30
---	---	---------------------------------

<b>Photo No.</b> 17	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Northeasterly	

**Description:**  
Approximately 18 to 20-inch diameter decant structure steel outlet pipe from the East Basin.



<b>Photo No.</b> 18	<b>Date:</b> 5/19/2011
<b>Direction Photo Taken:</b> Southerly	

**Description:**  
View of East and West Basin discharge channel. Surficial sediment present is free of coal ash/residue.



US EPA ARCHIVE DOCUMENT



**Client Name:**  
U.S. Environmental Protection Agency

**Site Location:**  
Hunlock Creek Station, Hunlock Creek, PA

**Project No.**  
170142.30

**Photo No.**  
19

**Date:**  
5/19/2011

**Direction Photo Taken:**  
Southwesterly

**Description:**  
View of water quality monitoring well on the crest of the East Basin embankment. Note the Susquehanna River in the background.



**Photo No.**  
20

**Date:**  
5/19/2011

**Direction Photo Taken:**  
N/A

**Description:**  
Animal burrow observed on the downstream slope of the East Basin embankment.



US EPA ARCHIVE DOCUMENT

**APPENDIX E**

REFERENCES

## PREVIOUS REPORTS AND REFERENCES

The following is a list of drawings and related information that was located during the file review, or was referenced in previous reports.

1. United Engineers & Constructors, Inc., “Ash Settling Basin; Ash Disposal Area,” Structural – Hunlock Plant – 1957 Extension drawing, 1957.
2. United Engineers & Constructors, Inc., “Settling Pond Outfall Plan – Sections – Details,” Hunlock Plant – Waste Water Streams Modification drawing, 1976
3. Quad3, Hunlock Power Project Drawings, C-1 through C-5 & ENV-1 through ENV-3 & G-1, 2010.
4. Geological and Environmental Associates, Boring Logs, B-01 through B-030, August 2008.
5. Quad3, Boring Logs, B-031 through B-163, November 2008.
6. Geological and Environmental Associates, Boring Logs, MW-15 and B-164 through B-169, March 2010.

The following references were utilized during the preparation of this report and the development of the recommendations presented herein.

1. USACE, “Recommended guidelines for safety inspection of dams,” EM 1110-2-106, 1979.
2. FEMA, “Federal Guidelines for Dam Safety,” May 2005.
3. Pennsylvania Code Title 25, Chapter 105, Dam Safety and Waterway Management

**APPENDIX F**

**SELECTED FIGURES & BORINGS**



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 12, 2008

Logged By:

Boring Dia: 2 Inches

Boring Number: B-014

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					100% RECOVERY. TOP ASH
			5		100% RECOVERY. TOP ASH
			10		100% RECOVERY. TOP ASH
			15		100% RECOVERY. TOP ASH
			20		90% RECOVERY. TOP ASH WITH TRACE FINE GRAVEL
			25		100% RECOVERY. TOP ASH WITH TRACE FINE GRAVEL
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**

B-014 consists of 20-ft of 0.75" dia. "pre-packed" .01 slot well screen and 17.25' of 0.75" dia. Schedule 40 riser. The well is completed with a steel pipe stick-up, cemented in-place, approx. 3.0' above ground surface.

**Site:**

UGI Development Corp.  
U.S. ROUTE 11  
HUNLOCK CREEK,

Project No.: 0199.01

Page 1



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 21, 2008

Logged By:

Boring Dia: 2 Inches

Boring Number: B-015

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					100% RECOVERY. TOP ASH
			5		100% RECOVERY. TOP ASH
			10		100% RECOVERY. TOP ASH
			15		100% RECOVERY. TOP ASH
			20		100% RECOVERY. TOP ASH
			25		40% RECOVERY. TOP ASH WITH TRACE FINE GRAVEL
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-015 consists of 15-ft of 0.75" dia. "pre-packed" .01 slot well screen and 9.8' of 0.75" dia. Schedule 40 riser.  
 The well is completed with a steel pipe stick-up, cemented in-place, prox. 3.0' above ground surface.

**Site:**  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 18, 2008

Logged By:

Boring Dia: 2 Inches

Boring Number: B-026

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					100% RECOVERY. TOP ASH
			5		100% RECOVERY. TOP ASH
			10		100% RECOVERY. TOP ASH
			15		100% RECOVERY. 2' TOP ASH, 2' BROWN CLAYEY SILT
			20		
			25		
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-026 consists of 20-ft of 0.75" dia. "pre-packed" .01 slot well screen and 11.18' of 0.75" dia. Schedule 40 riser. The well is completed with a steel pipe stick-up, cemented in-place, approx. 3.0' above ground surface.

**Site:**  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,

Project No.: 0199.01      Page 1



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 20, 2008

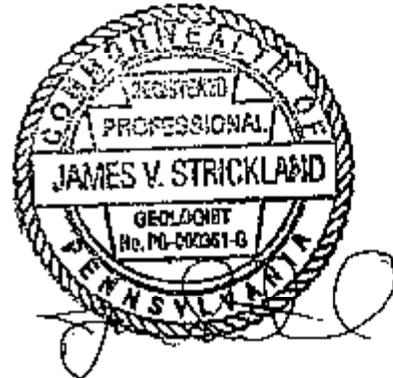
Logged By:

Boring Dia: 2 Inches

Boring Number: B-027

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					90% RECOVERY. TOP ASH
			6		50% RECOVERY. TOP ASH
			10		100% RECOVERY. TOP ASH
			15		80% RECOVERY. BROWN FINE SAND, ROCK FRAGMENTS.
			20		
			25		
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-027 consists of 15-ft of 0.75" dia. "pre-packed" .01 slot well screen and 12.76' of 0.75" dia. Schedule 40 riser. The well is completed with a steel pipe stick-up, cemented in-place, prox. 3.0' above ground surface.

**Site:**  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,

Project No.: 0199.01      Page 1



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 18, 2008

Logged By:

Boring Dia: 2 Inches

Boring Number: B-028

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					100% RECOVERY. TOP ASH
			5		100% RECOVERY. TOP ASH
			10		50% RECOVERY. TOP ASH
			15		90% RECOVERY. 2' TOP ASH, 2' GRAY CLAYEY SILT
			20		100% RECOVERY. BROWN CLAYEY SILT
			25		
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-028 consists of 20-ft of 0.75" dia. "pre-packed" .01 slot well screen and 11.30' of 0.75" dia. Schedule 40 riser.  
 The well is completed with a steel pipe stick-up, cemented in-place, prox. 3.0' above ground surface.

**Site:**  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,

Project No.: 0199.01      Page 1



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 18, 2008

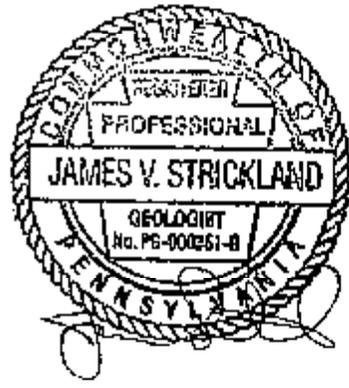
Logged By:

Boring Dia: 2 Inches

Boring Number: B-029

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					100% RECOVERY. TOP ASH
			5		100% RECOVERY. TOP ASH
			10		90% RECOVERY. TOP ASH
			15		50% RECOVERY. 1' TOP ASH, 1' GRAY CLAYEY SILT
			20		100% RECOVERY. BROWN CLAYEY SILT
			25		
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-029 consists of 20-ft of 0.75" dia. "pre-packed" .01 slot well screen and 12.02' of 0.75" dia. Schedule 40 riser. The well is completed with a steel pipe stick-up, cemented in-place, prox. 3.0' above ground surface.

Site:  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,



# BORING LOG

Drill Rig: GEOPROBE 5410

Date Drilled: August 18, 2008

Logged By:

Boring Dia: 2 Inches

Boring Number: B-030

Jim Strickland, PG

Sample	PID Reading	Completion	Depth Feet	Lithology	Description
					90% RECOVERY. BROWN SILT, TOP ASH
			5		100% RECOVERY. 3' TOP ASH, 1' CLAYEY SILT
			10		100% RECOVERY. BROWN CLAYEY SILT
			15		100% RECOVERY. GRAY CLAYEY SILT
			20		100% RECOVERY. BROWN SILT, TRACE CLAY
			25		
			30		
			35		
			40		
			45		
			50		
			55		



**Completion Notes:**  
 B-030 consists of 20-ft of 0.75" dia. "pre-packed" .01 slot well screen and 6.25' of 0.75" dia. Schedule 40 riser. The well is completed with a steel pipe stick-up, cemented in-place, prox. 3.0' above ground surface.

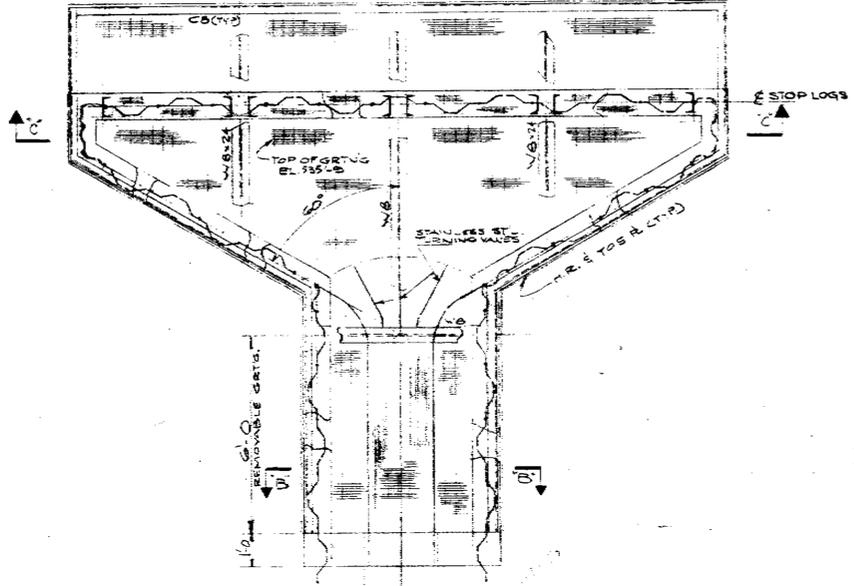
**Site:**  
 UGI Development Corp.  
 U.S. ROUTE 11  
 HUNLOCK CREEK,



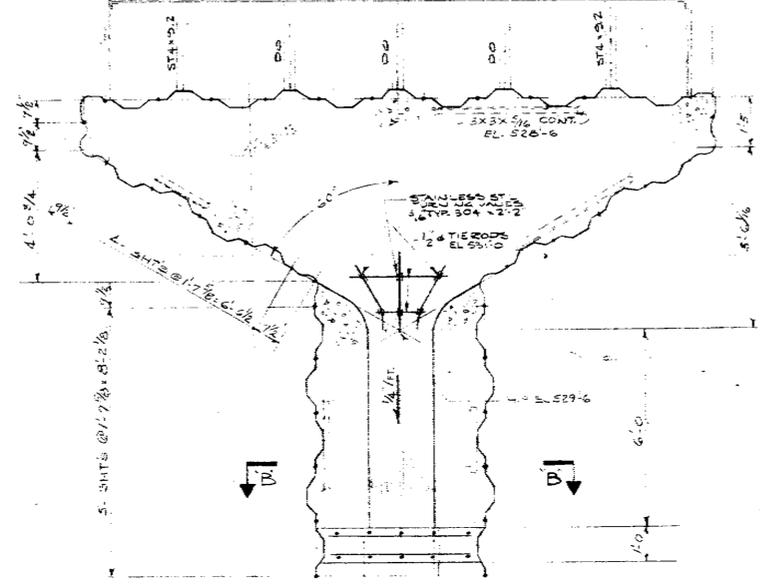


G  
F  
E  
D  
C  
B  
A

G  
F  
E  
D  
C  
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A

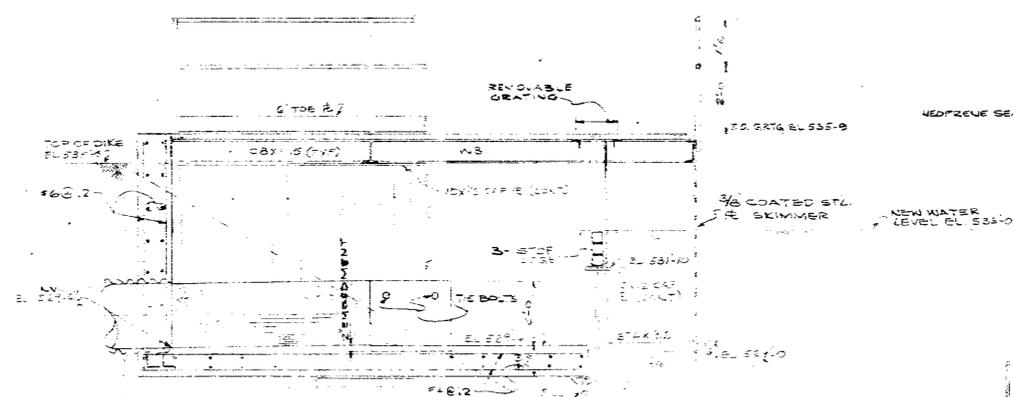


PLAN  
SETTLING POND OUTFALL  
(2-RECD)

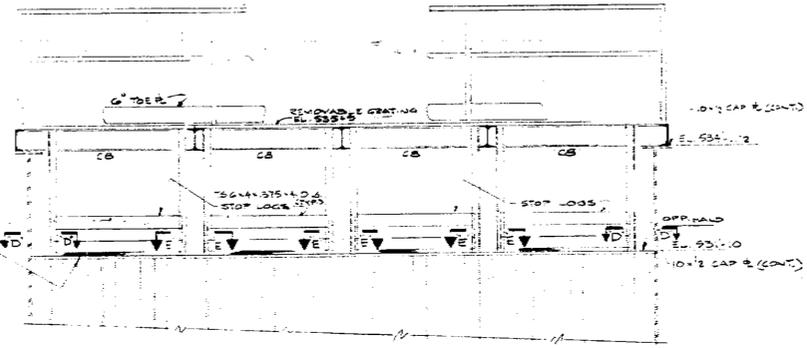


PLAN  
SLAB & FLUME

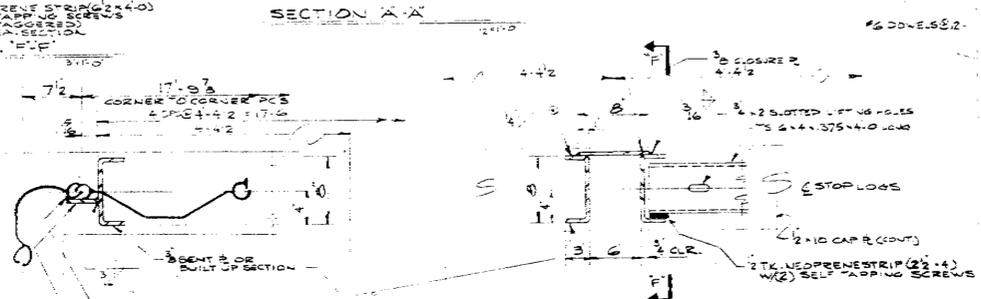
NOTE:  
ALL WORK SHALL BE IN ACCORDANCE  
WITH U.S.C. GENERAL CONSTRUCTION  
SPECIFICATION 6132.00-111



SECTION A-A



SECTION C-C

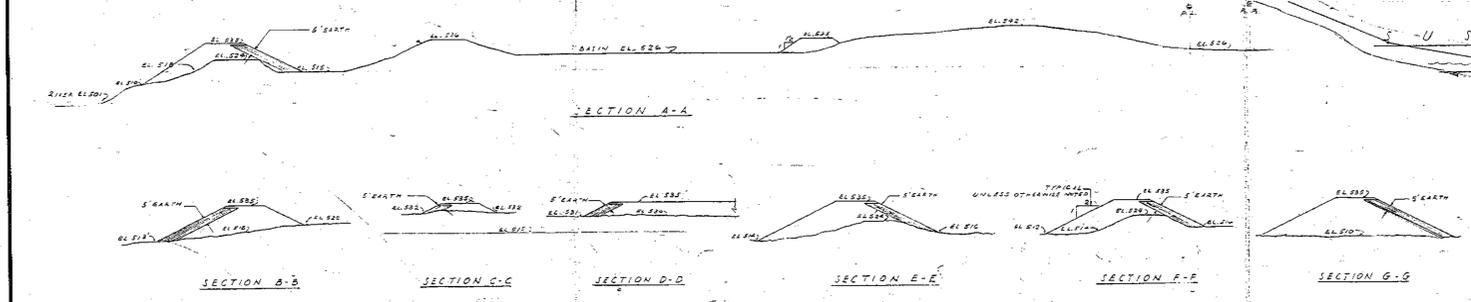
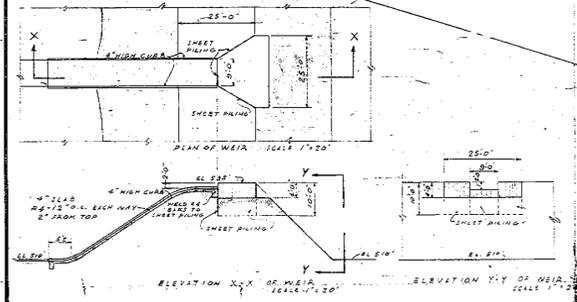
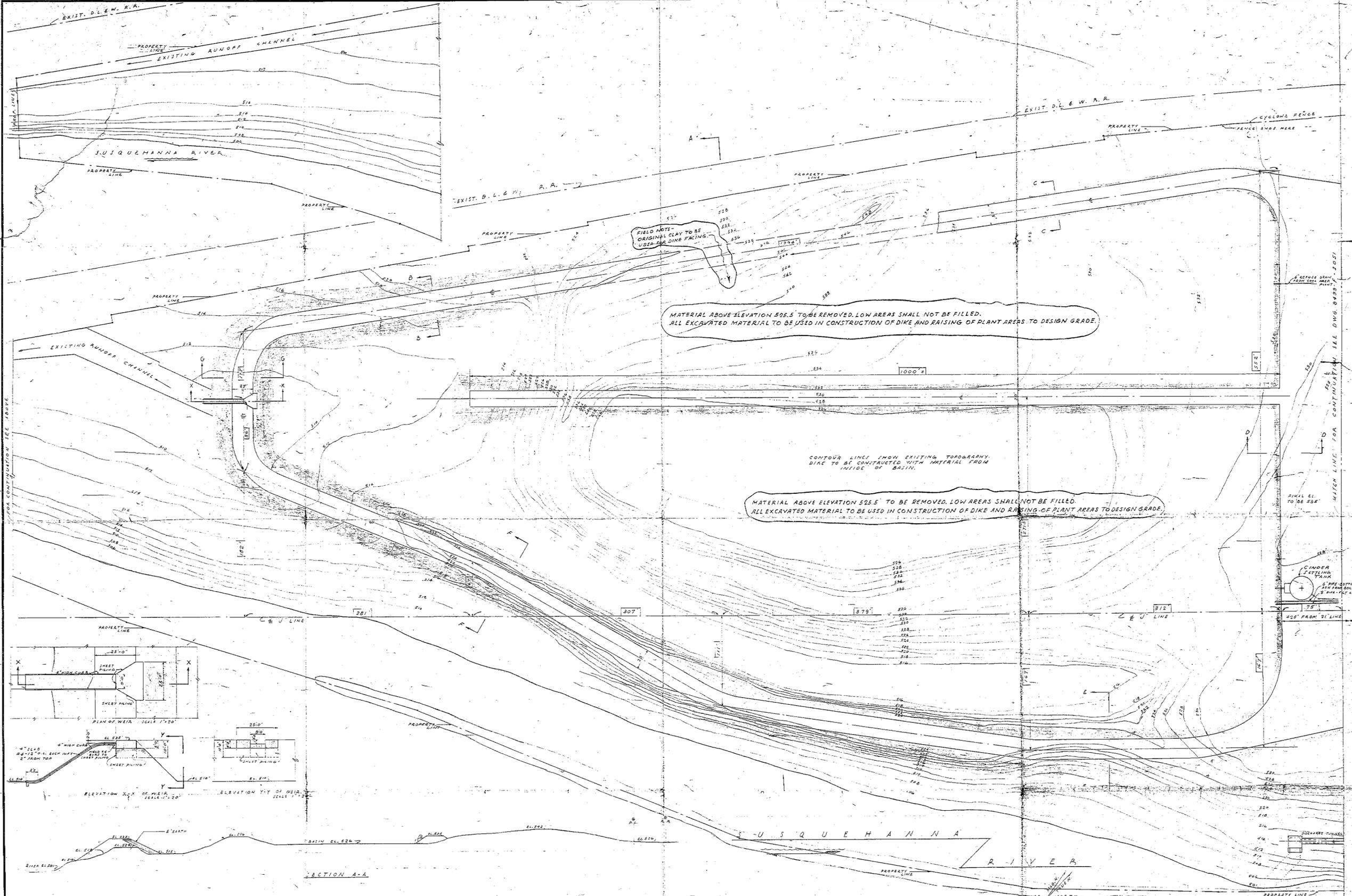


SECTION B-B

FOR BIDDING ONLY  
REVISED  
DATE: JUNE 2, 1970

REV.	DATE	DESCRIPTION	ENGR.	SUP. ENGR.

SETTLING POND OUTFALL  
PLAN-SECTIONS-DETAILS  
STRUCTURAL



- NOTES:**
- VOLUME OF DIKE: 40,600 YDS. ASHES  
5,800 YDS. EARTH  
TOTAL: 46,400 YDS. (PO. CLASS '10')
  - CAPACITY OF ASH DISPOSAL AREA: 212,400 YDS.
  - INSIDE OF DIKE TO BE 5" THICK IMPERVIOUS LAYER OF EARTH OBTAINED AT THE SITE.
  - TOP ELEVATION OF DIKE MAY BE INCREASED IF NECESSARY TO UTILIZE EXCAVATED MATERIAL WITHOUT REMOVAL FROM SITE.



TABLE OF REVISIONS				CHECKED				INSPECTED				CORRECT				APPROVED			
NO.	DATE	DESCRIPTION	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY		
1	1/24/57	REVISED PLAN & NOTES TO PLAN	GER	1/24/57	WJS	1/24/57	WJS	1/24/57	WJS	1/24/57	WJS	1/24/57	WJS	1/24/57	WJS	1/24/57	WJS		
2	2/1/57	REVISED PLAN & NOTES TO PLAN	GER	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS		
3	2/1/57	REVISED PLAN & NOTES TO PLAN	GER	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS		
4	2/1/57	REVISED PLAN & NOTES TO PLAN	GER	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS	2/1/57	WJS		

**ASH SETTLING BASIN  
ASH DISPOSAL AREA**  
STRUCTURAL - HUNLOCK PLANT - 1957 EXTENSION  
LUZERNE ELECTRIC DIVISION  
**THE UNITED GAS IMPROVEMENT COMPANY**  
UNITED ENGINEERS & CONSTRUCTORS INC.  
PHILADELPHIA

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