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Coal Combustion Residue Impoundment

Round 12 - Dam Assessment Report

Conemaugh Generating Station

Filter Ash Ponds & CT Desilting Basin
GenOn Energy
New Florence, PA

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry Consultants, LLC
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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, is a wake-up call for diligence on coal combustion residue disposal units. We must marshal our best efforts to prevent such catastrophic failure and damage. A first step toward this goal is to assess the stability and functionality of the ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the CCR management units, Ash Filter Ponds (also known as the Ash Recycle Ponds) and the Cooling Tower Desilting Basin (Note: A new desilting basin was constructed in 2012 after the site visit) at the Conemaugh Generating Station, is based on a review of available documents and on the site assessment conducted by Dewberry personnel on September 14, 2012. We found the supporting technical documentation, supplemented with new design reports and studies of slope stability and hydrologic analyses performed in 2013, to be adequate. The maintenance and operating procedures appear to be adequate. The surveillance program was upgraded in 2013 to include all coal waste management units, so it is now adequate.

In summary, both of the CCR management units at the Conemaugh Generating Station are **SATISFACTORY** for continued safe and reliable operation, with no recognized existing or potential management unit safety deficiencies.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

In February 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units and to determine the hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry & Davis LLC about the facility that were reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit September 14, 2012, review of technical documentation provided by GenOn Energy, and comments from the utility after reviewing the draft report (see Appendix C, Doc. 14).

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The Ash Filter Ponds dike, Desilting Basin dikes, and the associated outlet structures appear to be structurally sound based on a November 2013 seismic analysis performed by Geosyntec for the utility (see Appendix C – Doc 15) and the Design Engineer's Report for the new desilting basin built in 2013 (see Appendix C – Doc 16). The report shows that under both static and seismic conditions the Desilting Basin and Filter Ash Pond have factors of safety that exceed minimum requirements. These findings are consistent with the review of engineering data provided by GenOn's technical staff and Dewberry engineers' observations during the site visit.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

The Ash Filter Ponds and the Desilting Basin, which do not receive off-site runoff, but do receive runoff from the yard drains at the cooling towers, appear to have adequate hydrologic/hydraulic safety against design rainfall events. This conclusion is based on review of furnished project information (see Appendix C, Docs. 15 and 16) and Dewberry engineers' simple calculations to check capacity of the Ash Filter Ponds and Desilting Basin to safely contain design rainfall.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The furnished supporting technical documentation for the Ash Filter Ponds and the Desilting Basin is adequate.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The descriptions of the subject management units provided by GenOn are generally accurate representations of what Dewberry observed in the field. However, Dewberry did not observe the newly reconstructed desilting basin built in 2013. Dewberry was provided the Design Engineer's Report (see Appendix C – Doc 16) and the design drawings (see Appendix C – Doc 17) which document the adequacy of the new basin.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the subject management units required to conduct a thorough field observation. The visible parts of the impounding embankments and outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. The embankments appeared structurally sound. No animal burrows were observed. There were no apparent indications of unsafe conditions or conditions needing emergency remedial action.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation for both the Ash Filter Ponds and the Desilting Basin appear to be adequate. There was no evidence of significant embankment repairs or prior releases observed during the field inspection.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

In 2013, Conemaugh upgraded its pond surveillance program. There are now formal quarterly inspection checklists to document the conditions of the two basins (see Appendix C – Docs 18, 19).

There is no dam performance monitoring instrumentation in place at either the Ash Filter Ponds or the Desilting Basin. No problem or suspect condition, such as excessive settlement, significant flowing seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation for long-term performance monitoring. Therefore, there is no need for performance monitoring instrumentation at this time.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

Both the Ash Filter Ponds and the Desilting Basin are rated SATISFACTORY for continued safe and reliable operation. No existing or 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.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

No recommendations for remedial work to ensure structural stability appear warranted at this time.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

No recommendations for remedial work to ensure hydrologic/hydraulic safety appear warranted at this time.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

No recommendations for additional technical documentation are warranted at this time.

1.2.4 Recommendations Regarding the Surveillance and Monitoring Program

There are no recommendations concerning inspection of the management units now that a formal program has been established.

1.2.5 Recommendations Regarding Continued Safe and Reliable Operation

No additional recommendations appear warranted at this time.

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1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Stephen M. Frank, GenOn
Sr. Environmental Specialist
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Benjamin L. Williams, PA Department of Environmental Protection
Solid Waste Specialist
Fred Tucker, P.E. Dewberry
Senior Engineer/Project Manager
Edward Farquhar, Dewberry
Senior Project Manager

1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on September 14, 2012.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL FREDERIC C. TUCKER ENGINEER 052800-E

Fred C. Tucker, P.E.

Edward A. Farquhar

2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Conemaugh Generating Station is located in the southeast section of Indiana County at 1442 Power Plant Road, New Florence PA on 2,838 acres. Conemaugh River borders the facility to the south. See Figure 2.1-1 for the location of the Conemaugh Generating Plant on a USGS topographic map. Conemaugh Generating Station is a coal-fired electric generating station featuring two pulverized coal, supercritical boilers that total 1,700 megawatts and four diesel units with a total generating capacity of 12 megawatts.

The two units were originally commissioned in 1967 and 1968. Conemaugh Generating Station is jointly owned by a group of eight co-owners. GenOn owns a 16.45 percent undivided interest in the Conemaugh station. The station operator is GenOn Northeast Management Company (GenOn), a subsidiary of NRG Energy, Inc. (NRG).

The generating facility maintains a relatively small CCR management complex called the Ash Filter Ponds, that has four individual cells (Ponds A, B, C and D) that receive water produced from dewatering of bottom ash. See Figure 2.1-2 for an aerial view of the Ash Filter Ponds. The water originates at the Bottom Ash Dewatering Bins located north of the Ash Filter Ponds. During bottom ash sluicing, water is drained from the ash water storage ponds via an overflow weir into the ash water recycle sump and pumped to the bottom ash hoppers. Bottom ash is transferred from the hoppers to the dewatering bins. In the bins, ash settles and water overflows to two of the four cells at the Ash Filter Ponds. Each individual cell is nominally 350 ft by 75 ft in surface area. The individual cells receive the sluiced ash at the east end of the cells. The discharged water exits the cells on the west end via saw tooth weir to a 36-inch diameter Steel Pipe (SPE) to manhole No. 4 which contains a weir. The over flow weir discharges to the ash recycle water sump.

During normal operations, two ponds are valved to settle ash particles carried over from the dewatering bins; one cell is valved for storage of ash water that is drained from the dewatering bin during ash truck loading; and the remaining cell is valved out of service for cleaning or maintenance. The ash water recycle sump contains three ash recycle pumps, one per Unit and one spare. These sump pumps provide water to both Units' bottom ash sluice pumps as described above and to both Units' bottom ash hopper refractory cooling water supply headers. The ash water recycle sump also contains two level control pumps, one operating and one spare. These pumps are used to transfer excess water to the Cooling Tower Desilting Basin (aka C.T. Desilting Basin or Desilting Basin) for temporary storage and use as makeup water to the Flue Gas Desulfurization (FGD) system.

The desilting basin was re-constructed in 2013. The existing basin was taken out of service and completely re-constructed with new dikes, liners, and an underground leak detection system (see Appendix C – Docs 14, 16, and 17). Construction was completed on November 1, 2013. Values, descriptions, and photographs shown in Sections 2, 3, 4, and 5 are for the desilting basin as observed during the site visit,

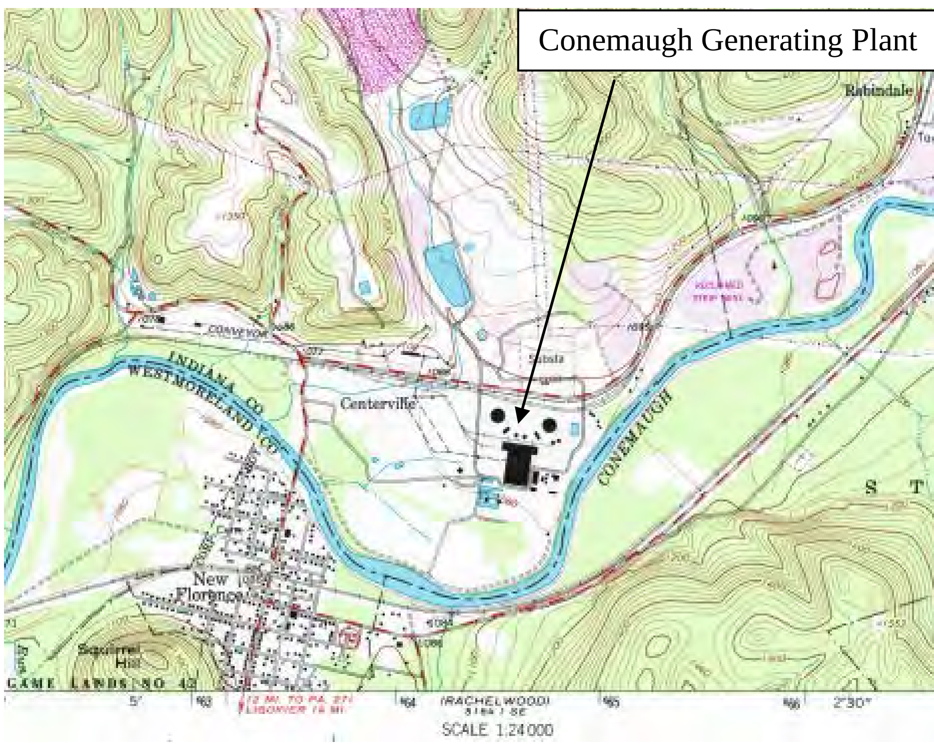

Figure 2.1-1: Conemaugh Generating Plant Location Plan

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Table 2.1 shows a summary of the size and dimensions of the Ash Filter Ponds perimeter dike and Desilting Basin.

Table 2.1: Summary of Dam Dimensions and Size		
	Ash Filter Ponds (4 Cells)	**Desilting Basin**
Dam Height (ft)	Varies 0 to 11 ft	Varies 0 to 8 ft
Crest Width (ft)	25 ft	15 ft
Length (ft)	1,420 ft	115 ft
Side Slopes (upstream) H:V	2:1	Varies 0 to 5:1
Side Slopes (downstream) H:V	2:1	5:1

**The desilting basin was reconstructed in 2013. Correct values for the dimensions and size are in Appendix C – Doc. 14, Section 1.5.*

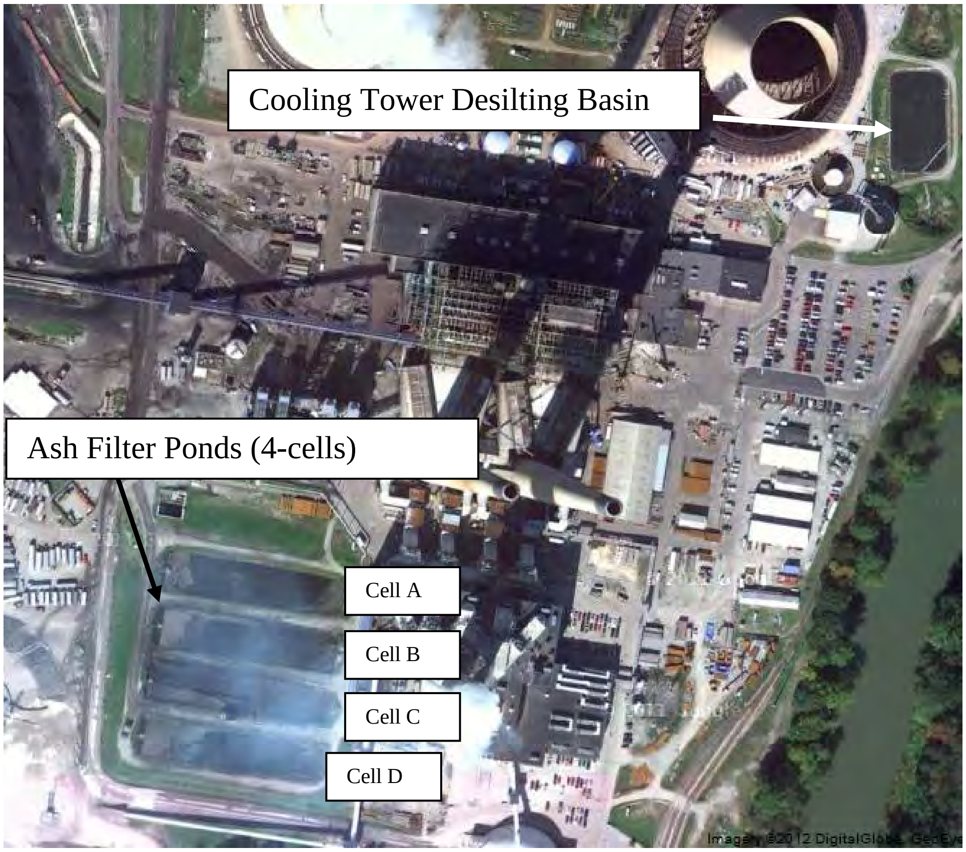

Figure 2.1-2: CCR Impoundment Ash Filter Ponds and Desilting Basin at Conemaugh Generating Plant.

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

Fly ash generated through the coal combustion process is collected at the precipitator hoppers and pneumatically conveyed in the dry state to storage/load-out bins. After conditioning with some moisture to control dust and to facilitate handling, the fly ash is loaded onto trucks and taken to a landfill on site.

2.2.2 Bottom Ash

The bottom ash is sluiced from ash hoppers in each of Units 1 and 2 to dewatering bins. In the bins, ash settles and water overflows to two of the four ash storage ponds. Four cells are within the Ash Filter Ponds. Normal operation is two ponds in service at all times, with the third pond being drained, cleaned, and prepared for return to service. The fourth pond is used to store the decant water for later use.

2.2.3 Boiler Slag

Boiler slag is not handled separately but included in the bottom ash and therefore treated as bottom ash.

2.2.4 Flue Gas Desulfurization Sludge

Gypsum produced from the flue gas desulfurization system, which uses wet scrubbers, is dewatered and transported through an enclosed tubular gallery conveyor to a dome covered storage pad. Depending on market conditions and quality, the gypsum is sold to an off-site third party for beneficial reuse or transported and disposed in the on-site landfill.

2.3 SIZE AND HAZARD CLASSIFICATION

Size classification per U.S. Army Corps of Engineers (USACE) criteria (ER 1110-2106) is based on maximum potential storage capacity (of water) or maximum dam height, as shown in Table 2.2a. Either dam height or storage capacity may determine the size classification, whichever gives the larger size. See Tables 2.1 and 2.3 for embankment height and estimated pond storage capacity.

According to the information GenOn provided and the field inspection, the Ash Filter Ponds, complex has a maximum capacity of 24.8 acre-ft total for the four cells with a maximum height of 13 ft. The Desilting Basin has a maximum capacity of 4.2 acre-ft with a maximum height of 8 ft. In accordance with the USACE ER 1110-2-106 criteria (Table 2.21), the Ash Filter Ponds, complex and the Desilting Basin has a Small Size classification considering either dam height or storage capacity. The Ash Filter Ponds' embankments are regulated for dam safety by the state (see Section 3.2).

Table 2.2a: USACE ER 1110-2-106 Size Classification		
	Impoundment	
Category	Storage (Ac-ft)	Height (ft)
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

For both the Ash Filter Ponds and the Desilting Basin loss of human life is not expected and economic and environmental losses are expected to be minimal or low. If failure occurred, ash residuals would remain on GenOn property. Therefore, in accordance with the Federal Guidelines (Table 2.2b), a Low hazard potential classification is given for both the Ash Filter Ponds and the Desilting Basin.

Table 2.2b: Hazard Potential Classification (FEMA Federal Guidelines for Dam Safety)		
Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

Each cell of the Ash Filter Ponds is cleaned out when the ash residuals (sediment) accumulates up to near the normal water level. The clean out is done once or twice a year on a rotating basis, with two cells remaining in operation while the third is cleaned out. Thus, the maximum amount of residuals in the Ash Filter Ponds never reaches the value shown for current storage capacity (18.6 acre-ft or 20,796 cubic yards) or for maximum storage capacity (the total volume of all three cells from original bottoms to the top of the perimeter dike embankment) in Table 2.3 below.

The Desilting Basin receives no ash residuals, except as an emergency overflow from the Ash Filter Ponds.

Table 2.3: Maximum Capacity of Unit		
	Ash Filter Ponds	**Desilting Basin[3]**
Surface Area (acre)[1]	3.4	0.53
Current Storage Capacity (cubic yards) [1]	30,000	6,727
Current Storage Capacity (acre-feet)	18.6	4.2
Max Storage Capacity (cubic yards) [1, 2]	40,000	6,727
Max Storage Capacity (acre-feet)	24.8	4.2
Crest Elevation (feet) [1, 3]	1092	1081
Normal Pond Level (feet) [1, 3]	1090	1079

1) Doc 3 – Part D – Pond/Impoundment Systems and other wastewater treatment operations
2) One cell at the Ash Filter Ponds was drained and in the process of being cleaned
3) See Doc 17 - Reconstructed Cooling Tower Desilting Basin design drawings. Values shown are superseded.

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

Ash Filter Ponds

The Ash Filter Ponds consist of four contiguous cells surrounded by a perimeter dike and separated by divider dikes. Each cell is approximately 350 ft by 75 ft at top of dike embankment elevation, with the long dimension of the cells oriented generally east to west. The top of embankment elevation (inside edge) varies from 1092.5 (west side) to 1095.8 (east side). Normal water level elevation in the cells is 1090 ft. The interior side slopes are 2 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 13.5 ft above the outside toe on the south side and has an exterior slope that is typically 2:1. The height of the perimeter dike embankment on the north and west sides varies from 3 ft to 13 ft (southwest corner). The crest width of the perimeter dikes around the pond is approximately 25 ft wide and the typical crest width of the divider dikes is 25 ft.

Drawings indicate that the dikes are constructed with random fill. On the bottom the liner is indicated to consist of the following, in descending order:

1. 2.5 ft bottom ash;
2. 1.5 ft #8 coarse aggregate;
3. 8 inch impervious fill treated with bentonite;
4. 1 ft 4 in impervious fill; and
5. Compacted subgrade.

On the side slopes the liner is indicated to consist of:
1. 1.5 ft R-3 Rock lining; and
2. 2 ft impervious fill and impervious fill treated with bentonite.

Desilting Basin

The configuration of the Desilting Basin is classified as “Cross Valley”. The top of embankment elevation is 1081 ft. The normal water elevation is 1079 ft. The interior side slopes of the basin is 2 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 8 ft above the outside toe on the south side and has an exterior slope that has a 5:1 slope.

On the bottom the liner is indicated to consist of the following, in descending order:

1. 6 inch #ID-2 bituminous concrete;
2. 6 inches of sand fill;
3. Composite liner (calymax plus 50 mil HDPE);
4. Non-woven Geotextile fabric;
5. 6 inch thick No. 8 stone (leak detection zone); and
6. Non-woven Geotextile fabric and 50 mil textured HDPE liner.

On the side slopes the liner is indicated to consist of:
1. 6 inch #ID-2 bituminous concrete;
2. 6 inches of sand fill;
3. Composite liner (calymax plus 50 mil HDPE);
4. Non-woven Geotextile fabric; and
5. HDPE Drainage net over 50 mil textured HDPE liner

The underdrain system is indicated to consist of a central 4-inch diameter perforated polyethylene (CPE) pipe (running north-south) with 4 inch diameter CPE lateral pipes (5 each) connected to the center pipe. The perforated pipes are indicated to be within the 6-inch No. 8 stone layer on the bottom of the basin.

2.5.2 Outlet Structures

The principal spillway at the Ash Filter Ponds from each cell is through "saw tooth" weirs into a weir trough to concrete riser with bottom discharge through 36" diameter SPE pipe to ash water recycle sump during normal operation.

The outlet structure at the Desilting Basin is via an overflow 24-inch diameter Standard Dimension Ratio (SDR)-26 pipe (elevation 1079.0 ft). The pipe discharges to a 60-inch Reinforce Concrete Pipe (RCP) then to a 22-inch diameter SDR-26 pipe.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

"Critical" infrastructure includes facilities such as schools, hospitals, fire stations, police stations, etc. There appears that such facilities may be considered critical or potentially critical infrastructure located within a 5-mile radius of the plant (down gradient). The facilities are noted on the 5-mile radius map. (See Figure 2.6-1). Critical infrastructures consist of schools and fire departments. It does not appear that the facilities would be threatened or directly impacted by failure of the dikes at the Conemaugh plant. In general the land use around Conemaugh is rural. The town of New Florence is located just southwest of the plant (1,000 ft). Flood water and CCR released from a postulated failure of the Ash Ponds perimeter dike and the Desilting Basin would primarily impact GenOn property and not impact the Conemaugh River or the surrounding area.

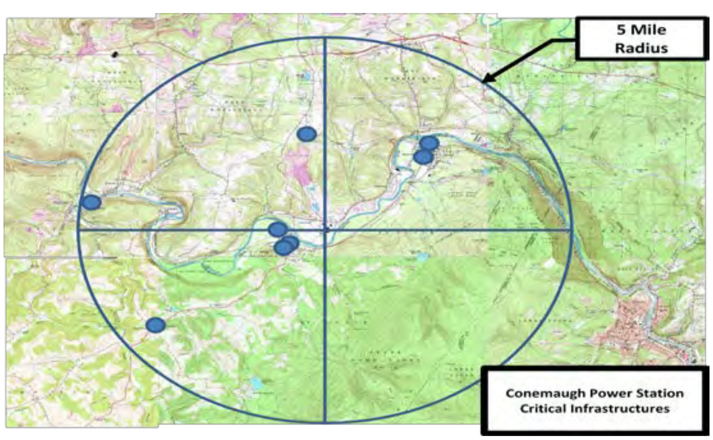

Figure 2.6-1: Critical Infrastructures within a 5 mile radius of the facility.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

No safety reports were provided.

3.2 SUMMARY OF LOCAL, STATE, AND FEDERAL PERMITS

Pennsylvania DEP Dam Safety determined that the Filter Ash Ponds cells collectively comprise a jurisdictional dam under 25 PA Code §105.3(a)(3) - Dams used for the storage of fluids or semifluids other than water. The Pennsylvania DEP will regulate the ring dike structure containing four cells and the appurtenant structures of the dam. The Department (preliminarily) designated the structure as class "C-4" dam based on the size and hazard potential and will regulate the dam until it is no longer deemed a jurisdictional dam by the Department. The dam is identified by the Department as D32-091– Conemaugh Gen Station WWT Lagoon Dam. The dam will be periodically inspected by the Department and any deficiencies will be reported to the owner. (See Appendix C – Doc 20).

The State determined it would not regulate the new desilting basin, but approved a Water Quality Management, Post Construction Certificate in 2013. (See Appendix C – Doc 21)

Discharge from the desilting basin is regulated by the Pennsylvania Department of Environmental Protection Bureau of Waste Management and the impoundment has been issued a National Pollutant Discharge Elimination System permit. Permit No. PA0005011 was issued December 2001 (See Appendix A – Doc 01).

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The Conemaugh Generation Plant began commercial operation in 1967 and 1968.

The Pond cells were constructed in 1985-1986; the Desilting Basin was constructed in 1996.

4.1.2 Significant Changes/Modifications in Design since Original Construction

The fourth cell to the Ash Filter Ponds was reconstructed in 2005 (See Appendix A-Doc 12). In 2013 the desilting basin at the Conemaugh Plant was reconstructed at its original location. The basin was expanded, lined, and an under-drain system installed (see Appendix C – Doc 16).

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No documentation was provided to indicate any significant repair/rehabilitation due to dike failures or deterioration has taken place since the original construction.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The Ash Filter Ponds' impoundment was designed and operated for bottom ash sedimentation and control. The ponds receive plant process waste water, and coal combustion waste slurry. Treated (via sedimentation) process water is discharged through an overflow outlet structure and recycled.

4.2.2 Significant Changes in Operational Procedures and Original Startup

No documents were provided to indicate any operational procedures have changed.

4.2.3 Current Operational Procedures

The sluice ash originates from the Dewatering Bins located east of the Ash Filter Ponds to a distribution box. The individual cells in the Ash Filter Ponds receive the sluice ash at the east end of the cells. The discharged water exits the cells on the west end via saw tooth weir to a 36-in dia. SPE pipe to ash water recycle sump during normal operation. The Desilting Basin is only used in an emergency and typically does not receive ash water.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry concerning notable events impacting the operation of ash disposal activities

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Fred Tucker P.E. and Edward Farquhar performed a site visit on September 14, 2012 in company with the participants listed in Section 1.3.

The site visit began at 9:00 AM. The weather was sunny with the temperatures in the high 70's. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix B. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

5.2 EARTH EMBANKMENT 1 (ASH FILTER PONDS)

5.2.1 Crest

The crest of the embankment had no signs of significant depressions, tension cracks or other indications of settlement or shear failure. Figure 5.2.1-1 shows the typical crest conditions along the embankment.

Figure 5.2.1-1. North end of the crest

5.2.2 Upstream/Inside Slope

The inside slopes of all the cells within the Ash Filter Ponds are lined with a 2-ft thick layer of both impervious fill and impervious fill mixed with bentonite clay lined with R-3 rock covering. On the north end of the cell #3 an additional layer of an 8-inch aggregate layer with a filter fabric “B” is beneath the clay layer. The interior slopes appear stable and maintained. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability.

Figure 5.2.2-1 Inside slopes of the Ash Pond and interior dikes between the cells.

5.2.3 Downstream/Outside Slope and Toe

The outside slope of the embankment appeared to have a fairly well maintained cover of grasses/weeds. No scarps, sloughs, bulging, cracks, depressions or other indications of slope instability were observed along the slope. Figures 5.2.3-1 through 5.2.3-2 show representative sections of the embankment.

Figure 5.2.3-1 Toe of the downstream dike (south side of Pond).

Figure 5.2.3-2 Toe of the east side dike of Ash Filter Ponds).

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5.2.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability at dike abutments and groin areas of the Ash Filter Ponds.

Figure 5.2.4-1 Groin area of the Ash Filter Ponds (southeast corner)

Figure 5.2.4-2 Groin area of the Ash Filter Ponds (southwest corner)

5.3 EARTH EMBANKMENT 2 (DESILTING BASIN)

The pictures and descriptions in this section describe the desilting basin as it existed at the time of the site visit. The desilting basin was re-constructed in 2013. That is, the information in this section does not reflect the current configuration or condition of the desilting basin.

5.3.1 Crest

The crest of the embankment had no signs of significant depressions, tension cracks or other indications of settlement or shear failure.

Figure 5.3.1-1 Crest and embankments of the Desilting Basin.

5.3.2 Upstream/Inside Slope

Inside slope of the Desilting Basin is covered with a 6 inch #ID-2 bituminous concrete. The slopes appear stable and well maintained. The operating pool elevation was 1079 ft, consequently only 2 ft of the inside was visible during the site visit. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability.

5.3.3 Downstream/Outside Slope and Toe

The outside slope of the Desilting Basin embankment appeared to have a satisfactorily maintained cover of grasses/weeds. No scarps, sloughs, bulging, cracks, depressions or other indications of slope instability were observed along the slope. Figures 5.3.3-1 shows a section of the Desilting Basin outside slope.

Figure 5.3.3-1 Desilting Basin Outside slope.

5.3.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability at dike abutments and groin areas of the Desilting Basin.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

The outlet structures for the Ash Filter Ponds (via 4 cells) is through "saw tooth" weirs into a weir trough to a 36-inch diameter SPE to manhole No. 4 which contains a weir. The over flow weir discharges to the ash recycle water sump. A metal skimmer is located in front of the saw tooth weir (Figure 5.4.1-1). Water is forced to flow under the metal skimmer and over the top of the saw tooth weir to skim any floating material and prevent clogging. The over flow structure at the Desilting Basin is via an over flow 24-inch diameter SDR-26 pipe (Figure 5.4.1-2). The pipe discharges to a 60-inch RCP then to a 22-inch diameter SDR-26 pipe.

Figure 5.4.1-1 Typical outlet structure for Ash Filter Ponds.

Figure 5.4.1-2 Outlet structure for Desilting Basin.

5.4.2 Outlet Conduit

The Ash Filter Ponds complex recycles the water to a recycle sump structure that contains three ash recycle pumps, one per coal-fired Unit and one spare. These sump pumps provide water to both Units. The ash water recycle sump also contains two level control pumps, one operating and one spare (See Figure 5.4.2-3). These pumps are used to transfer excess water to the cooling tower Desilting Basin for temporary storage. Figure 5.4.2-1 shows the outlet pipe from the Ash Filter Ponds to the recycle sump structure (Figure 5.4.2-2).

Figure 5.4.2-1 Outlet structure from the Ash Filter Ponds to the recycling structure.

Figure 5.4.2-2 Recycling structure

Figure 5.4.2-3 Recycling Pumps.

5.4.3 Emergency Spillway

Not applicable; no emergency spillway exists at this facility.

5.4.4 Low Level Outlet

Not applicable; no low level outlet exists at this facility

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No documentation has been provided about the flood of record. However, neither the Ash Filter Ponds nor the Desilting Basin receives off-site drainage. The water levels in the ponds are controlled more by plant processes than by flood events. Thus, a flood of record for the ponds is not applicable.

In addition, there are no reported instances of plant operational problems that would have caused the pond water levels to significantly exceed the normal water levels.

6.1.2 Inflow Design Flood

The Ash Filter Ponds and the Desilting Basin at the Conemaugh Generating Station do not receive uncontrolled inflows from off-site. For such ponds that are totally contained within a perimeter dike system or otherwise isolated from off-site drainage, safe containment of water within the ponds is provided by maintaining sufficient freeboard to contain 100 percent of design precipitation over the pond areas. The design precipitation amounts may be determined as discussed below.

For the “small” size and “low” hazard potential classification assigned to both the Ash Filter Ponds and Desilting Basin dikes, the USACE hydrologic evaluation guidelines (ER-1110-2-106 26 Sept 1979 “Recommended Guidelines for the Safety Inspection of Dams”) recommend a spillway design flood (SDF) of 50-year to 100-year frequency, where the magnitude selected most closely relates to the involved risk. For comparison, the Pennsylvania Dam Safety Regulations (amended 2011) require the same SDF (50-year to 100-year frequency) for dams classified C-4, which is equivalent to the small size, low hazard potential classification. The precipitation depths for 24-hour duration at the Ash Filter Ponds coordinates are 5.08 inches and 5.77 inches for 50-year frequency and 100-year frequency, respectively, from the National Weather Service’s on-line Precipitation Frequency Data Server, which gives point precipitation frequency estimates from “Precipitation-Frequency Atlas of the United States” NOAA Atlas 14, Volume 2, Version 3.

6.1.3 Spillway Rating

No spillway rating was provided for the outlet structures at the Ash Filter Ponds and the Desilting Basin. However, no outfall is assumed in the assessment in Section 6.3

6.1.4 Downstream Flood Analysis

No downstream flood analysis has been provided for the Ash Filter Ponds or the Desilting Basin. Qualitative analysis for each management unit based on field observations and review of available data is given below.

Ash Filter Ponds – Failure of the low perimeter dike impounding the 3.4-acre Ash Filter Ponds would discharge coal combustion residue onto surrounding plant property. A failure would most likely be of only one cell, which contains only a fourth of the total volume of the Ash Filter Ponds complex or less than 4.65 acre-ft. The failure would not be expected to cause loss of life but would cause minor onsite environmental damage. In case of failure, the preferential direction of flow of water leaving the vicinity of the Ash Filter Ponds would be toward lowest ground to the south, toward the Conemaugh River approximately 0.2 mile away. Any ash sediment that is carried with the water would mostly be deposited in the immediately adjacent areas to the south and would remain well within the plant boundaries. Water released that reaches the plant railroad embankment to the south would be diminished and contained on the north side of the embankment before reaching the river. Some of the water would likely flow through any culvert(s) under the embankment but would be highly attenuated before reaching the floodplain and river on the south side. There would be no flood wave impact to the river.

Desilting Basin – The Desilting Basin was formed by isolating a section of a natural drainage feature with low dams (dikes) across the drainage feature at the north and south ends of the basin. The natural storm water flow in the drainage feature is diverted through a pipe to by-pass the basin and discharge into a low area on the south side of the basin. Thus, postulated failure of this 0.53-acre basin could be either through the north dike embankment or the south dike embankment. Failure in either direction would release only minor amounts of CCR, since this basin contains incidental amounts of ash carried in pump discharge from the ash recycle sump at the Ash Filter Ponds complex. Water released by failure through either dike would end up in the same low area on the south side of the basin. The low area is contained by an embankment with a crest elevation at or slightly above the basin rim elevation. The Conemaugh River is on the other side of the embankment approximately 290 ft southeast of the Desilting Basin. Normal discharge from the Desilting Basin to the river is through a pipe that passes through a larger pipe (sleeve) in the embankment. Water from a postulated failure would pool in the low area and would be gradually released to the river by flowing through the annular space between the outside of the discharge pipe and the inside of the pipe sleeve in the embankment. Thus, there would be no flood wave impact to the river.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Hydrologic/hydraulic analyses were provided for the Ash Filter Ponds and the Desilting Basin (see Appendix C, Doc. 15). Therefore, the supporting technical documentation for hydrologic safety is adequate.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Both the Ash Filter Ponds and the Desilting Basin have adequate hydrologic safety for the design 24-hour, 100-year rainfall event (see Appendix C – Doc 15). That is both ponds have freeboard greater than 1.5 feet for the design maximum precipitation events.

The Ash Filter Ponds and the Desilting Basin should continue to have adequate hydrologic safety unless the average surface elevation of ash sediment is allowed to build up to approximately the design precipitation depth below the crest elevation. However, because of the periodic maintenance cleaning of the ash sediment in the ponds/basin, the sediment level should never reach such a high level (especially in the Desilting Basin, which receives only incidental amounts of ash) and most likely would never be allowed to build up above the normal operating level.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Slope stability analyses were provided by Geosyntec Consultants for the Ash Filter Ponds or Desilting Basin (see Appendix C, Doc. 15).

7.1.2 Design Parameters and Dam Materials

No appreciable information on design parameter for the two impoundment dikes was provided. Information on the composition of the dikes was provided in the Geosyntec Consultants report (see Appendix C – Doc 15) based on borings taken in October 2013. In addition, a furnished drawing (D-782-018, Rev B, dated 4/6/1984) for the Ash Filter Ponds Addition (Pond 4, now designated Pond D) notes “Dike Material – Sandy Clayey Gravel and/or Sandy Clay” and “Existing Material – Silty Sand” apparently in the area of the addition before development.

7.1.3 Uplift and/or Phreatic Surface Assumptions

No data concerning phreatic surface assumptions was provided. However, since both the Ash Filter Ponds and the Desilting Basin are lined, no phreatic surface would be expected to develop in the dike embankments, if the liners function properly. Based on the Natural Resources Conservation Service (NRCS) Web Soil Survey, the groundwater level at the Ash Filter Ponds site likely is at shallow depth below the ponds and at comparatively greater depth below the Desilting Basin.

7.1.4 Factors of Safety and Base Stresses

Information concerning slope stability factors of safety for the dike embankment slopes was provided (see Sections 7.2 and 7.3).

7.1.5 Liquefaction Potential

Documentation concerning liquefaction potential was provided by the utility. There is not liquefaction concern at this site (see Appendix C, Doc. 15).

7.1.6 Critical Geological Conditions

Information on soil composition in the embankments and impoundments is provided in Appendix C, Doc. 15. Based on a map from "Map 61 – Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania," 1981, PA Geological Survey, New Florence Quadrangle, the Conemaugh Generating Station is shown to be underlain by the Glenshaw Formation (Pcg). The Glenshaw Formation is described as "Cyclic sequences of shale, sandstone, red beds, and then limestone and coal. It also includes four marine limestone or shale horizons. The red beds are involved in landslides and the base is at the top of Upper Freeport Coal." The source of this description is the Pennsylvania Bureau of Topographic and Geologic Survey, Department of Conservation and Natural Resources, 2001, Bedrock Geology of Pennsylvania, edition: 1.0, digital map. The primary rock type is shale and the secondary rock type is sandstone

From the NRCS Web Soil Survey, the areas of both the Ash Filter Ponds and the Desilting Basin are mapped primarily with soils identified as Monongahela Silt Loam (MoA2), 0 to 3 percent slopes. Pertinent information about this soil is listed below.

Landform: Terrace
Parent material: Old alluvium derived from sandstone and shale
Depth to restrictive layer (fragipan, uncemented): 25 to 35 inches
Depth to water table: 17 to 27 inches
Drainage Class: Moderately well drained
Frequency of flooding: None
Frequency of ponding: None
Typical profile:

- 0-9 inches: Silt Loam; Unif. Soil Classif. (USC) = CL-ML, ML, SC-SC, SM; Plasticity Index (PI) = 1-10
- 9-29 inches: Loam; USC = CL-ML, CL; PI = 5-15
- 29-63 inches: Loam; USC = SC, SM, CL, ML; pi = 3-15
- 63-80 inches: Cobbly Sandy Loam; USC = SM, CL, ML, SC: PI = 1-15

Allegheny Silt Loam (AhA) is mapped slightly within the areas of the ponds and basin but mostly outside immediately to the south. This soil is similar to the above but there is no restrictive layer and the water table is greater than 80 inches deep.

Hazards associated with the geology of the region include the potential presence of old mine tunnels in former coal seams or possibly solution voids in the limestone layers and risk of landslides in redbeds exposed in natural slopes or in manmade cut slopes.

Seismicity – The Conemaugh Generation Station is located in a region of relatively low seismic hazard, based on internet review of published information concerning seismicity in this part of Pennsylvania. From the USGS Interactive Deaggregation website, based on the USGS Seismic-Hazard Maps for Central and Eastern United States, dated 2008, the Ash Filter Ponds and the Desilting Basin are at locations anticipated to experience 0.050g peak (horizontal) ground acceleration (PGA) with a 2-percent probability of exceedance in 50 years (2,475-year exceedance return time), assuming uniform firm-rock site conditions, i.e., a site with average shear wave velocity of 2,500 feet per second (fps) in the upper 100 feet below the ground surface.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation has been provided for the Ash Filter Ponds and Desilting Basin dikes. Therefore, the supporting technical documentation for slope stability is adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Ash Filter Ponds – Structural stability of the Ash Filter Ponds containment dike is **Satisfactory** based on the Geosyntec Report results (see Table 7.3-1 below).

The outflow structures at the Ash Filter Ponds appeared to be in satisfactory condition and stable.

Desilting Basin – Structural stability of the desilting basin dam appears **Satisfactory**, based on the Geosyntec Report, shown in Table 7.3-1 below.

The outflow structure at the Thermal Pond appeared to be in satisfactory condition and stable.

Table 7.3-1: Lowest Calculated Slope Stability Factors of Safety vs. Required Value

Cross Section	Condition	Failure Mode	Calculated Safety Factor	Required Safety Factor
Ash Filter Pond C-C	Undrained	Block	2.57	--
	Drained	Block; Circular	1.5	1.5
	Seismic	Circular	2.29	1.0
Desilting Basin A-A	Undrained	Circular	1.3	--
	Drained	Circular	1.59	1.5
	Seismic	Circular	1.20	1.0

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

The Ash Filter Ponds and nominally the Desilting Basin are the only CCR surface impoundments at the Conemaugh Generating Station. Both are used for bottom ash management. Boiler slag is not distinguished from the bottom ash. As previously described in this report, fly ash is dry handled and disposed in an on-site landfill. FGD sludge (gypsum) is dewatered, temporarily stored on a dome-covered pad, and either sold for beneficial reuse or trucked to the on-site landfill. The water removed from the FGD sludge is sent to the wastewater treatment plant and reused after treatment.

Operation of the Ash Filter Ponds and the Desilting Basin has been previously described in this report (see Sections 2.1, 2.2, and 4.2). The primary source of operating information is the "System Description - Ash Water Recycle" (see Appendix A – Doc 04).

The Ash Filter Ponds complex is operated for treating water removed from the bottom ash at the dewatering bins by settling residual suspended ash particles in the water and temporarily storing the ash sediment until the sediment has built up to the highest allowed level; then the cell is dewatered and the ash sediment drained, so that the ash can be removed and disposed in the on-site landfill. When a cell is dewatered for removal of the ash sediment, valves for the two (per cell) underdrain pipes are opened to allow drainage of the ash sediment; the water in the sediment drains into the discharge structure, where the valves are located. The valves are closed before placing the cell back into service after removal of the ash sediment.

The treated (clarified) water normally flows to the ash recycle sump where it is recycled back to the bottom ash sluice system to transport ash from the bottom ash hoppers to the dewatering bins; overflow from the dewatering bins returns back to the Ash Filter Ponds. This is the basic cycle, although the Ash Filter Ponds receive inputs from a variety of other sources (e.g., treated effluent from landfill leachate clarifier, intake clarifier sludge pumps, etc.). When there is excess water in the system, the excess is pumped to the Desilting Basin from a dedicated pump (with backup) at the ash recycle sump. Water in the Desilting Basin can be pumped back to the Ash Filter Ponds, when there is a shortage in the system. A minimum flow must be maintained through the operating pumps to keep them from overheating. The minimum flow is maintained by continuous recirculation through Pond A, which is not used for ash settling but dedicated for recirculation.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Station personnel are present daily at both the Ash Filter Ponds and the Desilting Basin to check proper functioning of structures, piping, and equipment. Maintenance is performed as required.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on field observations and review of operations pertaining to CCR containment at the Ash Filter Ponds and the Desilting Basin, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Maintenance of the impounding embankments and outlet works of the Ash Filter Ponds and the Desilting Basin appears to be generally adequate. No significant maintenance issues were observed during the field walkover.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

As of 2013 there is a formal quarterly inspection program for both impoundments. The inspection sheets are provided in Appendix C, Documents 18 and 19. Also, daily observations are made by station personnel, and appropriate maintenance and any needed corrective actions are performed as required.

9.2 INSTRUMENTATION MONITORING

There is no dam performance monitoring instrumentation in place in the impounding embankments of the Ash Filter Ponds or the Desilting Basin.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

As of 2013 there is a formal inspection program in place for the Ash Filter Ponds and the Desilting Basin. Based on the information required in the inspection forms and the daily observations by station personnel, this program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

There is no dam performance monitoring instrumentation in place at either the Ash Filter Ponds or the Desilting Basin. No problem or suspect condition, such as excessive settlement, significant flowing seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation for long-term performance monitoring. In the absence of stability problems or significant seepage issues, there is no need for performance monitoring instrumentation at this time.

APPENDIX A

Document 1

Part A – Steam Electric Power Plant Operations

OMB Control Number: 2040-0281
Approval Expires: 05/31/2013

Plant ID: 02268
Plant Name: Conemaugh

Steam Electric Questionnaire

PART A - STEAM ELECTRIC POWER PLANT OPERATIONS

Table of Contents

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 1.1. Plant Contact Information

Instructions: Throughout Section 1.1 (Questions A1-1 to A1-5), provide information requested on plant contacts. Please provide all free response answers in the highlighted yellow areas.

CBI?
☐ Yes

A1-1. Provide the physical plant address in the yellow spaces provided below.

Plant Name: Conemaugh
Street Address: 1442 Power Plant Rd
City: New Florence
State: PA Zip Code: 15944

CBI?
☐ Yes

A1-2. Provide the name, title, telephone and fax numbers, and e-mail address of the primary contact for technical information supplied in this questionnaire.

Primary Technical Contact Name: Anthony Garaventa
Primary Technical Contact Title: Technical Manager
Email: agaraventa@rrienergy.com
Street Address: 1442 Power Plant Rd
City: New Florence
State: PA Zip Code: 15944
Telephone Number: 724-235-4597
Fax Number: 724-235-4511
Convenient time to call between (Eastern Time): 7:00 AM am
to 4:00 PM pm

CBI?
☐ Yes

A1-3. Provide the name, title, telephone and fax numbers, and e-mail address of the secondary contact for technical information supplied in this questionnaire.

Secondary Technical Contact Name: Stephen Frank
Secondary Technical Contact Title: Senior Environmental Specialist
Email: sfrank@rrienergy.com
Street Address: 121 Champion Way, STE 200
City: Canonsburg
State: PA Zip Code: 15317
Telephone Number: 724-597-8310
Fax Number: 724-597-8870
Convenient time to call between (Eastern Time): 8:00 AM am
to 5:00 PM pm

CBI?
☐ Yes

A1-4. Provide the name, title, telephone and fax numbers, and e-mail address of the primary contact for economic/financial information supplied in this questionnaire.

Primary Economic/Financial Contact Name: Anthony Garaventa
Primary Economic/Financial Contact Title: Technical Manager
Email: agaraventa@rrienergy.com
Street Address: 1442 Power Plant Rd
City: New Florence
State: PA Zip Code: 15944
Telephone Number: 724-235-4597
Fax Number: 724-235-4511
Convenient time to call between (Eastern Time): 7:00 AM am
to 4:00 PM pm

CBI?
☐ Yes

A1-5. Provide the name, title, telephone and fax numbers, and e-mail address of the secondary contact for economic/financial information supplied in this questionnaire.

Secondary Economic/Financial Contact Name: Fran Macey

Secondary Economic/Financial Contact Title: Accounting Manager

Email: fmacey@rrienergy.com

Street Address: 121 Champion Way, STE 200

City: Canonsburg

State: PA Zip Code: 15317

Telephone Number: 724-597-8909

Fax Number: 724-597-8877

Convenient time to call between (Eastern Time): 8:00 AM am

to 5:00 PM pm

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 1.2. General Plant Operating Characteristics

Instructions: Throughout Section 1.2 (Questions A1-6 to A1-14), provide information requested on general *plant* operating characteristics. Please provide all free response answers in the highlighted yellow areas.

CBI?
☐ Yes

A1-6. Is the plant permanently retired or will it be permanently retired by December 31, 2011?

○ Yes (Stop)
◉ No (Continue)

STOP

STOP! IF YOU ANSWERED YES TO QUESTION A1-6, DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

CBI?
☐ Yes

A1-7. Does the plant generate or have the potential to generate electricity from a steam electric generating unit (i.e., a generating unit that utilizes a thermal cycle employing the steam/water system as the thermodynamic medium (steam turbine))? [NOTE: Combined cycle systems with at least one associated steam turbine are considered steam electric generating units.]

◉ Yes (Continue)
○ No, this plant does not generate or have the potential to generate electricity from a steam electric generating unit. (Stop)

STOP

STOP! IF YOU ANSWERED NO TO QUESTION A1-7, DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

CBI?
☐ Yes

A1-8. Indicate all of the fossil or nuclear fuels that the plant used to generate electricity in 2009 (refer to Table A-17 for a further breakdown of fossil-type fuels in the "Type of Fuel" tab). [NOTE: Do **NOT** include fuels only used for start up or emergency generators when answering this question.]

- ☑ Coal
- ☐ Oil
- ☑ Gas
- ☐ Petroleum Coke
- ☐ Nuclear Fuel
- ☐ None (the plant did not use fossil or nuclear fuels other than for start up in 2009)

STOP

STOP! IF YOU ANSWERED NONE IN QUESTION A1-8, DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

CBI?
☐ Yes

A1-9. Identify how the plant uses/handles the electricity generated and indicate the percent of **electricity** by end use/handling. [Check all boxes that apply.]

- ☑ Used on site 5.60% %
- ☑ Distributed for sale 94.40% %
- ☐ Other ____ %

If "Other" was selected, use the yellow space below to provide a description of electricity end use/handling.

CBI?
☐ Yes

A1-10. Provide the primary, secondary, and tertiary six-digit North American Industry Classification System (NAICS) codes that best describe the plant's activities. Refer to the U.S. Census Bureau's website to identify appropriate NAICS codes (http://www.census.gov/eos/www/naics/).

Primary NAICS: 221112
Secondary NAICS: ____
Tertiary NAICS: ____

CBI?
☐ Yes

A1-11. Is the generation of electricity the *primary purpose* (i.e., the predominant source of revenue and principal reason for operation) of the plant?

◉ Yes
○ No, specify the primary purpose of the plant to the right: ____________

STOP

STOP! IF YOU ANSWERED NO IN QUESTION A1-11,
DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

CBI?
☐ Yes

A1-12. Identify how the plant uses steam generated at the plant and indicate the percent of steam by use. [Check all boxes that apply.]

☑ Electricity Generation 100.00% %
☐ Heating and/or Cooling ______ %
☐ Other ______ %

If "Other" was selected, use the space below to provide a description of the use for steam.

CBI?
☐ Yes

A1-13. Provide the total plant nameplate electric generating capacity, as reported in U.S. DOE/EIA Form 860, schedule 3, line 1, and the total electric net summer and winter capacities.

Nameplate capacity	1883.2	MW
Net summer capacity	1712	MW
Net winter capacity	1712	MW

CBI?
☐ Yes

A1-14. In Table A-1, provide the total net and *gross electrical generation* for all electric generating units at the plant during calendar years 2007 through 2009.

Table A-1. Net and Gross Plant Electrical Generation for 2007-2009

Calendar Year	Net Electrical Generation (MW-hrs)	Gross Electrical Generation (MW-hrs)
2007	12956157 MW-hrs	13708771 MW-hrs
2008	11474941 MW-hrs	12171114 MW-hrs
2009	12155841 MW-hrs	12921194 MW-hrs

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 2.1. Plant Identification and Information on Permits and Studies

Instructions: Throughout Section 2.1 (Question A2-1 to A2-4), provide information requested on plant identity, permits, and studies. Please provide all free response answers in the highlighted yellow areas.

CBI? ☐ Yes

A2-1. Provide the identification code of this plant as reported on U.S. DOE/EIA Form-860, "Annual Electric Generator Report," schedule 2, line 1.

EIA Plant Identification Code: 3118 ☐ Check here if not applicable

CBI? ☐ Yes

A2-2. Provide the identification code of this plant as used when reporting to the Rural Utilities Service (RUS).

RUS Plant Identification Code: ______ ☑ Check here if not applicable

CBI? ☐ Yes

A2-3. Did the plant conduct any Environmental Assessment (EA) or Environmental Impact Statement (EIS) studies on receiving waters or pond/impoundments reported in Table A-4?

○ Yes (Continue)
◉ No (Skip to Question A2-4)

If yes, please attach results from the study(ies).

☐ I have attached the results from the study(ies)
☐ I did not attach the results from the study(ies). Explain why: ______

CBI? ☐ Yes

A2-4. In Table A-2, provide a list of the plant's most recently approved permits that are associated with industrial activities. If the plant has more than one ID for a permit type, list all IDs in the space provided. Also indicate if the plant has a new/pending permit under development.

Note: Do **NOT** include the following types of permits: permits required for construction of wastewater and/or sanitary sewage facilities, erosion and sediment control permits associated with construction activities, temporary and general permits for hydrostatic testing water, water obstruction and encroachment permits, and/or water allocation permits.

Table A-2. Permit Information

Permit Type	Permit ID(s)	Approval Date		Expiration Date		New/Pending Permit is Under Development
		Month	Year	Month	Year	
National Pollutant Discharge Elimination System (NPDES)		Select	Select	Select	Select	Yes
	PA0005011	December	2001	December	2006	
		Select	Select	Select	Select	
Resource Conservation and Recovery Act (RCRA)		Select	Select	Select	Select	No
	PAD000621219	Select	Select	Select	Select	
		Select	Select	Select	Select	
Stormwater		Select	Select	Select	Select	No
		Select	Select	Select	Select	
		Select	Select	Select	Select	
Air Pollution Operating		Select	Select	Select	Select	No
	32-00059	March	2008	March	2013	
		Select	Select	Select	Select	
Underground Injection Control (UIC)		Select	Select	Select	Select	No
		Select	Select	Select	Select	
		Select	Select	Select	Select	

If the plant does not have an individual *NPDES permit*, skip to Section 3.

Plant ID: 02268
Plant Name: Conemaugh
Outfall Number: 004

Part: A
Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI? ☐ Yes

A2-5. Provide the name, latitude/longitude, the typical volume of *discharge* in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Cooling Tower Desilting Basin

Coordinates	Degrees	Minutes	Seconds
Latitude	40	23	8
Longitude	79	3	28

Discharge Flow:

____ gpy **and** ____ dpy	**OR**	300000 gpd **and** 220 dpy	**OR**	____ gpm **and** ____ hpd **and** ____ dpy

CBI? ☐ Yes

A2-6. Identify if the outfall is an internal or final outfall.

○ Internal Outfall (Skip to Section 3)
◉ Final Outfall (Continue)

Approved: May 20, 2010

CBI?
☐ Yes

A2-7. Does the outfall release water to a discharge canal prior to discharging to surface water?

○ Yes
◉ No

CBI?
☐ Yes

A2-8. Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

Receiving Surface Water Name: Conemaugh River

Type of Surface Water: River/Stream Other, specify: ______

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name. ______

CBI?
☐ Yes

A2-9. Has a mixing zone been applied to the outfall?

◉ Yes
○ No

CBI?
☐ Yes

A2-10. In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

Table A-3. Wastewaters Discharged Through Outfall

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	10.00%
Fly Ash Sluice	
Bottom Ash Sluice	
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	
Coal Pile Runoff	
Metal Cleaning Waste	
Storm Water	10.00%
Other	80.00%
Total	100%

☐ **Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)**

Plant ID: 02268
Plant Name: Conemaugh
Outfall Number: 707

Part: A
Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI? ☐ Yes

A2-5. Provide the name, latitude/longitude, the typical volume of *discharge* in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Emergency Overflow Bottom Ash

Coordinates	Degrees	Minutes	Seconds
Latitude	40	23	5
Longitude	79	3	52

Discharge Flow:

______ gpy **and** ______ dpy	**OR**	0 gpd **and** 0 dpy	**OR**	______ gpm **and** ______ hpd **and** ______ dpy

CBI? ☐ Yes

A2-6. Identify if the outfall is an internal or final outfall.

◉ Internal Outfall (Skip to Section 3)
○ Final Outfall (Continue)

CBI?
☐ Yes

A2-7. Does the outfall release water to a discharge canal prior to discharging to surface water?

○ Yes
◉ No

CBI?
☐ Yes

A2-8. Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

Receiving Surface Water Name: ______________________

Type of Surface Water: Select ▼ Other, specify: ______

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name. ______________

CBI?
☐ Yes

A2-9. Has a mixing zone been applied to the outfall?

○ Yes
◉ No

CBI?
☐ Yes

A2-10. In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

Table A-3. Wastewaters Discharged Through Outfall

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	
Fly Ash Sluice	
Bottom Ash Sluice	
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	
Coal Pile Runoff	
Metal Cleaning Waste	
Storm Water	
Other	
Total	100%

☑ Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)

Plant ID: 02268
Plant Name: Conemaugh
Outfall Number: 007

Part: A
Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI? ☐ Yes

A2-5. Provide the name, latitude/longitude, the typical volume of *discharge* in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Outfall 007 - IMP 107, 207, 307, 507,

Coordinates	Degrees	Minutes	Seconds
Latitude	40	23	5
Longitude	79	4	12

Discharge Flow:

____ gpy **and** ____ dpy	**OR**	350000 gpd **and** 365 dpy	**OR**	____ gpm **and** ____ hpd **and** ____ dpy

CBI? ☐ Yes

A2-6. Identify if the outfall is an internal or final outfall.

○ Internal Outfall (Skip to Section 3)
◉ Final Outfall (Continue)

CBI? ☐ Yes

A2-7. Does the outfall release water to a discharge canal prior to discharging to surface water?

○ Yes
◉ No

CBI? ☐ Yes

A2-8. Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

Receiving Surface Water Name: Unnamed tributary

Type of Surface Water: River/Stream Other, specify: ______

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name. Conemaugh River

CBI? ☐ Yes

A2-9. Has a mixing zone been applied to the outfall?

◉ Yes
○ No

CBI? ☐ Yes

A2-10. In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

Table A-3. Wastewaters Discharged Through Outfall

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	
Fly Ash Sluice	
Bottom Ash Sluice	
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	78.00%
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	
Coal Pile Runoff	
Metal Cleaning Waste	
Storm Water	17.00%
Other	5.00%
Total	100%

☐ Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 3. Ponds/Impoundments

Instructions: Throughout Section 3 (Questions A3-1 to A3-3), provide information for all *ponds/impoundments* the plant has or is currently constructing/installing or planning to construct/install by December 31, 2020.

CBI? ☐ Yes

A3-1. Does the plant have or is the plant currently constructing/installing or planning to construct/install by December 31, 2020 any ponds/impoundments used for the storage, treatment, and/or disposal of *process wastewater*, *residues*, or by-products (including *sludge* or water streams containing residues or by-products)?

Note: This includes ponds/impoundments located on non-adjoining property that are under the operational control of the plant.

● Yes (Continue)
○ No (Skip to Section 4)

CBI? ☐ Yes

A3-2. In Table A-4 below list all pond/impoundment units located at the plant, or pond/impoundments the plant is currently constructing/installing or planning to construct/install by December 31, 2020, including those located on non-adjoining property, used for storage, treatment, and/or disposal of process wastewater, residues, or by-products (including sludge or water streams containing residues or by-products). For each pond/impoundment unit, EPA assigned an ID number (e.g., SPD-1, SPD-2) in Table A-4, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each pond/impoundment unit.

Additionally, provide the latitude and longitude at the pond outlet (see glossary), the closest distance from the pond/impoundment unit to the nearest surface water, the year the pond/impoundment unit was brought online (or is planned to be brought online), and indicate whether the pond/impoundment is lined or unlined and whether leachate (see glossary) is collected from the pond/impoundment (e.g., the pond/impoundment has a leachate collection system or other means for collecting leaks or seepage, etc.). Note: If the pond/impoundment does not have a pond outlet, provide the latitude and longitude corresponding to the emergency outlet for the pond/impoundment.

Table A-4. Identification of Plant Pond/Impoundment Units

Pond/ Impoundment Unit ID	Plant Designation	Latitude and Longitude at Pond Outlet	deg	min	sec	Is the Pond Lined?	Is Leachate (including Leaks or Seepage) Collected?	Closest Distance to Nearest Surface Water (ft)	Year Initially Brought Online Or Planned to be Brought Online	Is the Pond/ Impoundment Inactive?
Active/Inactive/Open Pond/Impoundment Units										
SPD-1	Cooling Tower Desilting Basin	Lat:	40	23	8	Yes	No	8	1970	No
		Long:	79	3	28					
SPD-2	Yard Drainage Pond	Lat:	40	23	6	Yes	Yes	300	2004	No
		Long:	79	4	10					
SPD-3	Bottom Ash Sluice Recycle Pond - A	Lat:	40	23	2	Yes	No	730	1970	No
		Long:	79	3	48					
SPD-4	Bottom Ash Final Settling Pond - B	Lat:	40	23	1	Yes	No	600	1970	No
		Long:	79	3	48					
SPD-5	Bottom Ash Final Settling Pond - C	Lat:	40	22	59	Yes	No	500	1970	No
		Long:	79	3	48					
SPD-6	Bottom Ash Final Settling Pond - D	Lat:	40	22	58	Yes	No	360	1986	No
		Long:	79	3	48					
SPD-7	Coal Pile Runoff Pond	Lat:	40	23	5	Yes	Yes	150	1973	No
		Long:	79	4	12					

SPD-8	Storage Impoundment	Lat:	40	23	31	Yes	Yes	75	1986	No
		Long:	79	3	53					
SPD-9	Limestone Area Pond	Lat:	40	22	58	Yes	No	350	1995	No
		Long:	79	3	55					
SPD-10	Gypsum Dome Area Pond	Lat:	40	22	55	No	No	75	1993	No
		Long:	79	3	35					
SPD-11	Haul Road Sediment Trap 1	Lat:	40	23	24	No	No	75	2007	No
		Long:	79	3	50					
SPD-12	Haul Road Sediment Trap 2	Lat:	40	23	22	No	No	75	2009	No
		Long:	79	3	50					
SPD-13		Lat:				Select	Select			Select
		Long:								
SPD-14		Lat:				Select	Select			Select
		Long:								
Retired/Closed Pond/Impoundment Units										
RET-SPD-1	Ash Silo Drainage Pond	Lat:	40	23	4	No	No	890	1970	
		Long:	79	3	46					
RET-SPD-2	Final Settling Pond 1	Lat:	40	23	5	No	No	340	1970	
		Long:	79	4	5					
RET-SPD-3	Final Settling Pond 2	Lat:	40	23	6	No	No	300	1970	
		Long:	79	4	6					
RET-SPD-4		Lat:				Select	Select			
		Long:								
Planned Pond/Impoundment Units										
SPD-A		Lat:				Select	Select			
		Long:								
SPD-B		Lat:				Select	Select			
		Long:								
SPD-C		Lat:				Select	Select			
		Long:								
SPD-D		Lat:				Select	Select			
		Long:								
SPD-E		Lat:				Select	Select			
		Long:								

CBI?
☐ Yes

A3-3. In Table A-5 below, indicate all process wastewater, residues, or by-products (or sludges or water streams containing the wastes, residues or by-products) that are stored, treated, and/ or disposed of in each pond/impoundment unit identified in Table A-4. [Check all boxes that apply.] For solid waste and process wastewater not listed in the checkboxes or the drop down menu provide the name and description in the yellow box provided. Do not include treatment chemicals that are added to the pond/impoundment.

Table A-5. Wastes Stored or Disposed of in Plant Pond/Impoundment Units

Pond/ Impoundment Unit ID	Solid Waste	Process Wastewater
SPD-1	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Cooling Tower Sediment Other, specify: Storm Water Sediment Other, specify: Ash Residuals Other, specify:	General runoff / Other Other / Select Other / Select Other, specify: Effluent from SPD-3, 4, 5, 6 (BAS Recycle Pond - A and BAS Pond B, C & D) Other, specify: Cooling Tower Drains Other, specify: Intake Clarifier Drains Other, specify:
SPD-2	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Coal and ash handling area residuals Other, specify: Other, specify: Other, specify:	General runoff / Other Other / Select Other / Select Other, specify: Storm water runoff from coal conveyor and ash handling areas Other, specify: Equipment wash water Other, specify: Air pre heat drains (cooling tower water) during maintenance Other, specify:
SPD-3	☐ Boiler Slag ☑ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Fly Ash Residuals Other, specify: Other, specify: Other, specify:	Other / Select Other / Select Cooling tower blowdown / Select Other, specify: Effluent from Ponds SPD-4, SPD-5, and SPD-6 Other, specify: Other, specify: Other, specify:
SPD-4	☐ Boiler Slag ☑ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Intake Clarifier Sludge Other, specify: Fly Ash Residuals Other, specify: Other, specify:	Bottom ash sluice / Limestone pile runoff Cooling tower blowdown / Other Floor drain wastewater / Other Other, specify: Treated Effluent from HDS Wastewater Treatment System Other, specify: Intake Clarifier Sludge Other, specify: Other, specify:

SPD-5	☐ Boiler Slag ☑ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Intake Clarifier Sludge Other, specify: Fly Ash Residuals Other, specify: Other, specify:	Bottom ash sluice Cooling tower blowdown Floor drain wastewater Limestone pile runoff Other Other Other, specify: Treated Effluent from HDS Wastewater Treatment System Other, specify: Intake Clarifier Sludge Other, specify: Other, specify:
SPD-6	☐ Boiler Slag ☑ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Intake Clarifier Sludge Other, specify: Fly Ash Residuals Other, specify: Other, specify:	Bottom ash sluice Cooling tower blowdown Floor drain wastewater Limestone pile runoff Other Other Other, specify: Treated Effluent from HDS Wastewater Treatment System Other, specify: Intake Clarifier Sludge Other, specify: Other, specify:
SPD-7	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Coal Fines Other, specify: Precipitated metals Other, specify: Other, specify:	Coal pile runoff Air heater cleaning water General runoff Select Other Select Other, specify: Coal pile underdrain wastewater Other, specify: Other, specify: Other, specify:
SPD-8	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Sediment Other, specify: Precipitated metals Other, specify: Other, specify:	Landfill runoff - uncapped landfill Leachate Other Other Other Select Other, specify: Effluent from SPD-2 (Yard Drainage Pond) Other, specify: Effluent from SPD-7 (Coal Pile Runoff Pond) Other, specify: Sludge from the Landfill Leachate WWTP Other, specify:
SPD-9	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: Limestone fines Other, specify: Other, specify: Other, specify:	Limestone pile runoff Select Select Select Select Select Other, specify: Other, specify: Other, specify: Other, specify:
SPD-10	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash ☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD Other, specify: FGD calcium sulfate residuals from haul Other, specify: Sediment Other, specify: Other, specify:	General runoff Other Select Select Select Select Other, specify: Storm water runoff containing FGD calcium sulfate residuals from haul roads and gypsum Other, specify: Other, specify: Other, specify:

SPD-11	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash	☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD	General runoff / Select Other / Select Select / Select
	Other, specify: Landfill haul road residuals Other, specify: Other, specify: Other, specify:		Other, specify: Storm water runoff containing landfill haul road residuals Other, specify: Other, specify: Other, specify:
SPD-12	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash	☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD	General runoff / Select Other / Select Select / Select
	Other, specify: Landfill haul road residuals Other, specify: Other, specify: Other, specify:		Other, specify: Storm water runoff containing landfill haul road residuals Other, specify: Other, specify: Other, specify:
RET-SPD-1	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash	☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD	General runoff / Select Select / Select Select / Select
	Other, specify: Ash handling area residuals Other, specify: Other, specify: Other, specify:		Other, specify: Storm water runoff containing ash handling area residuals Other, specify: Other, specify: Other, specify:
RET-SPD-2	☐ Boiler Slag ☐ Bottom Ash ☐ Fly Ash	☐ FGD Calcium Sulfate (Gypsum) ☐ FGD Calcium Sulfite – Not Pozzolanic ☐ FGD Pozzolanic Material ☐ Solids from Dry FGD	General runoff / Select Select / Select Select / Select
	Other, specify: Coal and ash handling area residuals Other, specify: Other, specify: Other, specify:		Other, specify: Storm water runoff containing coal and ash handling area residuals Other, specify: Other, specify: Other, specify:

CBI?
☐ Yes

A5-3. Attach a water balance diagram for the plant that shows all sources of water, plant *process operations*, process wastewaters generated and how they are handled/*treated*, flow rates of all water streams, and all outfalls at the plant. Specific instructions for the diagram are provided in the checklist below.

NOTE: You may use an existing diagram, such as a water balance diagram included in the plant's NPDES Form 2C, and mark the additional required information on the diagram by hand. You may also use a diagram from previous years as long as the diagram is still representative of current operations.

Provide as many diagrams as necessary to convey the information requested in the checklist below. Number each block diagram in the upper right corner; the first block diagram should be numbered WB-1, the second WB-2, etc. Include the plant name and plant ID in the upper right hand corner of the diagram.

☑ Diagram is attached.

Block Diagram Checklist

Mark the boxes below to verify that you have completed each checklist item...

☑ Include the water balance diagram number, plant name, and plant ID on the diagram.

☑ Show and label all water sources (e.g., lakes and rivers), *process wastewater* generated by each steam electric generating unit and process operation, and outfalls. Use the codes provided in the Codes Tables tab. Effluent streams may include process wastewater and *sludges*.

- ☑ Identify all *wastewater treatment systems* used to treat the process wastewaters generated by the steam electric generating units. Represent the wastewater treatment systems as a block or other shape. Use EPA-assigned numbers from other parts of the questionnaire if applicable. If the wastewater treatment system does not have an EPA-assigned number, use the plant-designated name for the wastewater treatment system.
- ☑ Identify the final destination of the *treated* wastewater and process wastewater (e.g., treated wastewater effluent to *POTW* or surface waters; solid wastes to on- or off-site destinations). Use codes provided in the Codes Table tab.
- ☑ Indicate, as appropriate, where treated wastewater is *reused* or *recycled* within the plant (e.g., reuse of settling pond/impoundment water as fly ash sluice).
- ☑ Identify all outfall locations. Include *NPDES permit* outfall numbers, if applicable.
- ☑ Provide the typical flow rates for all streams on the diagram (in gpm or gpd). If the wastewater stream is intermittent, provide amount and frequency; for example "100 gal, twice/day, 100 dpy" or "1000 gpm, 4 hpd, 365 dpy". For sludges, provide amount in tpd.

If you believe that the diagram should be treated as confidential, stamp it "Confidential" or write "Confidential" or "CBI" across the top. If any diagram is not marked "Confidential", it will be considered nonconfidential under 40 CFR Part 2, Subpart B.

Review:

If any of the statements above were not checked, revise the block diagram(s) and ensure all statements have been checked.

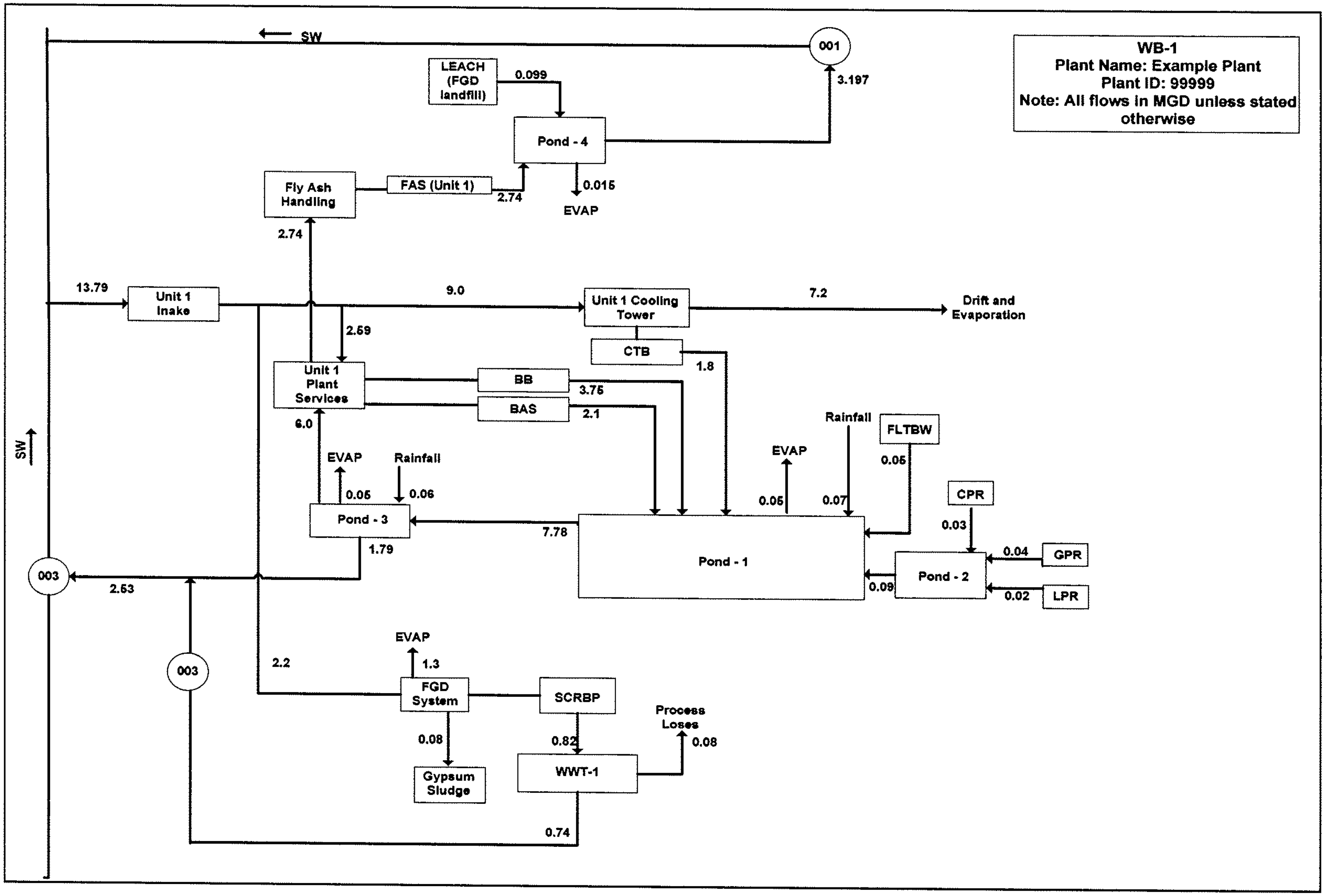


Figure A-1: Example Water Balance Diagram

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 6. Steam Electric Generating Unit Information

Instructions: Throughout Section 6 (Questions A6-1 to A6-2), provide information requested on each steam electric generating unit that the plant has operated or any steam electric generating units the plant is currently constructing/installing or planning to construct/install by December 31, 2015. Plants do NOT need to include information on units retired before January 1, 2009. Please provide all free response answers in the highlighted yellow areas.

CBI?
☐ Yes

A6-1. In Table A-8, provide information for each steam electric generating unit that commenced operating prior to January 1, 2010. Plants do NOT need to include information on units retired before January 1, 2009. For combined cycle systems, provide EIA Generator IDs for all steam and combustion turbines associated with the combined cycle system. Provide the electric generation for the entire combined cycle system in 2009. In the "Type of Unit" column, if you indicate "Other", provide an explanation in the Comments page. See the glossary for definitions of *base load, peaking*, *cycling*, and *intermediate*.

Table A-8. Steam Electric Units Operated Prior to January 1, 2010

Steam Electric Unit	EIA Generator ID	Operated in 2009	Type of Steam Electric Prime Mover (or Turbine)	Total Unit Electric Generation in 2009 (MW-hrs)	Total Unit Nameplate Capacity: Steam Turbine Capacity (MW)	Total Unit Nameplate Capacity: Combustion Turbine Capacity (MW)	Type of Unit	Is this Unit Now Retired?
SE Unit-1	1	● Yes Calendar days of operation: 350 ○ No Was operated in previous years	Stand-Alone Steam Turbine	6186589	850		● Base load ○ Peaking ○ Cycling ○ Intermediate ○ Other, specify:	○ Yes ● No
SE Unit-2	2	● Yes Calendar days of operation: 335 ○ No Was operated in previous years	Stand-Alone Steam Turbine	5969098	850		● Base load ○ Peaking ○ Cycling ○ Intermediate ○ Other, specify:	○ Yes ● No
SE Unit-3		○ Yes Calendar days of operation: ○ No Was operated in previous years	Select				○ Base load ○ Peaking ○ Cycling ○ Intermediate ○ Other, specify:	○ Yes ○ No

Plant ID: 02268
Plant Name: Conemaugh
SE Unit ID: 1

Part: A

Section Title: 8. Fuel Usage by Steam Electric Generating Unit

Instructions: In Section 8 (Questions A8-1 through A8-3), provide information for all steam electric generating units that were operated in 2009, including units that operated for only part of 2009 (i.e., those units for which you responded "Yes" in Question A6-1, Table A-8, "Operated in 2009" column). Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 8 for each steam electric generating unit ID operated in 2009 using the "Copy Section 8" button below. Enter the steam electric generating unit ID (use unit IDs assigned in Table A-8) in the space above titled "SE Unit ID".

Copy Section 8

CBI? ☐ Yes

A8-1. In Table A-11, provide the types and amounts of fuels used in 2009. [Check all boxes that apply.] Include fuels used for start up. Also provide the BTU generated by each general fuel type reported for the year 2009.

Note: EPA is requesting the BTUs actually generated by the fuel. Additionally, for reporting barrels of oil, use a conversion of one barrel is equal to 42 U.S. gallons, if needed.

Table A-11. Fuel Usage for Steam Electric Power Generation in 2009

Fossil/Nuclear Fuels								
Coal and Petroleum Coke		**Gas**		**Oil**		**Nuclear**		
BTU Generated by Coal and/or Petroleum Coke	5.97E+13	**BTU Generated by Gas**	17304308000	**BTU Generated by Oil**		**BTU Generated by Nuclear Fuels**		
Type	**Amount (tons)**	**Type**	**Amount (Million ft^3)**	**Type**	**Amount (barrels)**	**Type**	**Amount**	**Units (Specify)**
☐ Anthracite		☑ Natural Gas	27.1	☐ No. 1 Fuel Oil		☐ Nuclear		
☑ Bituminous	2342188	☐ Blast Furnace Gas		☐ No. 2 Fuel Oil		☑ None		
☐ Lignite		☐ Gaseous Propane		☐ No. 4 Fuel Oil				
☐ Subbituminous		☐ Other Gases (Provide Below)		☐ No. 5 Fuel Oil				
☐ Waste Coal				☐ No. 6 Fuel Oil				
☐ Coal Synfuel		☐ None		☐ Diesel Fuel				
☐ Other Coal (Provide below)				☐ Jet Fuel				
				☐ Kerosene				
☐ Petroleum Coke				☐ Waste Oil				
☐ None				☐ Other Oil (Provide below)				
				☑ None				
							Total BTU Generated by Fossil/Nuclear Fuels	5.97E+13

Other Fuels (i.e., Fuels other than Fossil or Nuclear)								
Type	**Amount**	**Units (Specify)**	**Type**	**Amount**	**Units (Specify)**	**Type**	**Amount**	**Units (Specify)**
☐ Municipal Solid Waste			☐ Landfill Gas			☑ None		
☐ Wood			☐ Other Biomass			☐ Other (Provide below)		
							Total BTU Generated by Other Fuels	0
							Total BTU Generated by All Fuels	5.97E+13

CBI?
☐ Yes

A8-2. Do the total BTUs generated by the fossil/nuclear fuels comprise 50 percent or more of the total BTUs generated by all fuels for the steam electric generating unit in 2009?

● Yes
○ No

CBI?
☐ Yes

A8-3. Did the plant report a fossil or nuclear fuel as the predominant or second most predominant energy source for this generating unit on Form EIA-860 for reporting year 2009? NOTE: This information is reported in Schedule 3, Part B, lines 9 and 11.

● Yes
○ No

If the plant responded "Yes" to either Question A8-2 or A8-3, then this steam electric generating unit is classified as a "fossil/nuclear electric generating unit" for the purposes of this questionnaire. If the plant responded "No" to both Questions A8-2 and A8-3, then this electric generating unit is classified as an "other electric generating unit" for the purposes of this questionnaire.

NOTE: IF <u>ALL</u> STEAM ELECTRIC GENERATING UNITS IDENTIFIED IN TABLE A-8 ARE CLASSIFIED AS "OTHER ELECTRIC GENERATING UNITS" (BASED ON THE CLASSIFICATION DETERMINED FROM QUESTIONS A8-2 AND A8-3), DO <u>NOT</u> COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

Plant ID: 02268
Plant Name: Conemaugh
SE Unit ID: 2

Part: A
Section Title: 8. Fuel Usage by Steam Electric Generating Unit

Instructions: In Section 8 (Questions A8-1 through A8-3), provide information for all steam electric generating units that were operated in 2009, including units that operated for only part of 2009 (i.e., those units for which you responded "Yes" in Question A6-1, Table A-8, "Operated in 2009" column). Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 8 for each steam electric generating unit ID operated in 2009 using the "Copy Section 8" button below. Enter the steam electric generating unit ID (use unit IDs assigned in Table A-8) in the space above titled "SE Unit ID".

CBI?
☐ Yes

A8-1. In Table A-11, provide the types and amounts of fuels used in 2009. [Check all boxes that apply.] Include fuels used for start up. Also provide the BTU generated by each general fuel type reported for the year 2009.

Note: EPA is requesting the BTUs actually generated by the fuel. Additionally, for reporting barrels of oil, use a conversion of one barrel is equal to 42 U.S. gallons, if needed.

Table A-11. Fuel Usage for Steam Electric Power Generation in 2009

Fossil/Nuclear Fuels								
Coal and Petroleum Coke		Gas		Oil		Nuclear		
BTU Generated by Coal and/or Petroleum Coke	5.61E+13	BTU Generated by Gas	18342380000	BTU Generated by Oil		BTU Generated by Nuclear Fuels		
Type	Amount (tons)	Type	Amount (Million ft^3)	Type	Amount (barrels)	Type	Amount	Units (Specify)
☐ Anthracite		☑ Natural Gas	47.5	☐ No. 1 Fuel Oil		☐ Nuclear		
☑ Bituminous	2203955	☐ Blast Furnace Gas		☐ No. 2 Fuel Oil		☑ None		
☐ Lignite		☐ Gaseous Propane		☐ No. 4 Fuel Oil				
☐ Subbituminous		☐ Other Gases (Provide Below)		☐ No. 5 Fuel Oil				
☐ Waste Coal				☐ No. 6 Fuel Oil				
☐ Coal Synfuel		☐ None		☐ Diesel Fuel				
☐ Other Coal (Provide below)				☐ Jet Fuel				
				☐ Kerosene				
☐ Petroleum Coke				☐ Waste Oil				
☐ None				☐ Other Oil (Provide below)				
				☑ None				
							Total BTU Generated by Fossil/Nuclear Fuels	5.61E+13

Other Fuels (i.e., Fuels other than Fossil or Nuclear)								
Type	Amount	Units (Specify)	Type	Amount	Units (Specify)	Type	Amount	Units (Specify)
☐ Municipal Solid Waste			☐ Landfill Gas			☑ None		
☐ Wood			☐ Other Biomass			☐ Other (Provide below)		
							Total BTU Generated by Other Fuels	0
							Total BTU Generated by All Fuels	5.61E+13

CBI?
☐ Yes

A8-2. Do the total BTUs generated by the fossil/nuclear fuels comprise 50 percent or more of the total BTUs generated by all fuels for the steam electric generating unit in 2009?

● Yes

○ No

CBI?
☐ Yes

A8-3. Did the plant report a fossil or nuclear fuel as the predominant or second most predominant energy source for this generating unit on Form EIA-860 for reporting year 2009? NOTE: This information is reported in Schedule 3, Part B, lines 9 and 11.

● Yes

○ No

If the plant responded "Yes" to either Question A8-2 or A8-3, then this steam electric generating unit is classified as a "fossil/nuclear electric generating unit" for the purposes of this questionnaire. If the plant responded "No" to both Questions A8-2 and A8-3, then this electric generating unit is classified as an "other electric generating unit" for the purposes of this questionnaire.

NOTE: IF ALL STEAM ELECTRIC GENERATING UNITS IDENTIFIED IN TABLE A-8 ARE CLASSIFIED AS "OTHER ELECTRIC GENERATING UNITS" (BASED ON THE CLASSIFICATION DETERMINED FROM QUESTIONS A8-2 AND A8-3), DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.

Plant ID: 02268
Plant Name: Conemaugh

Part: A
Section Title: 9. NOx Control Systems

Instructions: Throughout Section 9 (Questions A9-1 to A9-11), provide information for all *NOx control systems* operated on fossil-fueled electric generating units on or after January 1, 2009 and all NOx control systems the plant is currently constructing/installing or planning to construct/install on fossil-fueled electric generating units by December 31, 2020. See Part A Section 8 for unit classifications. You will need to indicate the steam electric generating units that are serviced by these air pollution control systems. Use codes from Table A-8 or Table A-9 to designate the SE Unit ID.

CBI?
☐ Yes

A9-1. Did the plant operate any NOx control systems on fossil-fueled electric generating units after January 1, 2009 or is the plant currently constructing/installing or planning to construct/install any NOx control system on fossil-fueled electric generating units by December 31, 2020? See Part A Section 8 for unit classifications.

◉ Yes (Complete Table A-12)
○ No (Skip to Section 10)

In Table A-12, provide information for NOx control systems that the plant operated after January 1, 2009, is currently constructing/installing, or planning to construct/install by December 31, 2020 on each operating or planned fossil-fueled electric generating unit (identified in Table A-8 or Table A-9). Provide the steam electric generating unit ID (use codes from Table A-8 or Table A-9), the type of NOx control system(s) operating or planned for the steam electric generating unit, whether the NOx control system(s) are operating or planned, and the date the NOx control was/will be installed. In addition, for the steam electric generating units serviced by a SCR system, identify the date and location (i.e., on- or off-site) of the last and next SCR catalyst replacement/regeneration.

Table A-12. NOx Control Systems

SE Unit ID	Type of NOx Control System	Status of NOx Control System	Date of Installation, Previous or Planned		For Steam Electric Generating Units Serviced by a SCR System					
					Date of Last SCR Catalyst Replacement or Regeneration		Where Last SCR Catalyst Regeneration Occurred	Date of Next Planned SCR Catalyst Replacement or Regeneration		Where Next SCR Catalyst Regeneration is Planned to Occur
			Month	Year	Month	Year		Month	Year	
	☑ SCR	Planned	Select							
	☐ SNCR	Select	Select		Select	Select		Select	Select	
SE Unit-1	☑ Overfire Air	Operating	January	1997			Select			Select
	☑ Low NOx burners	Operating	January	1997	Select			Select		
	☐ Other:	Select	Select							
	☑ SCR	Planned	Select							
	☐ SNCR	Select	Select		Select	Select		Select	Select	
SE Unit-2	☑ Overfire Air	Operating	January	1997			Select			Select
	☑ Low NOx burners	Operating	January	1997	Select			Select		
	☐ Other:	Select	Select							

	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low NOx burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					
	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low NOx burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					
	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low Nox burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					
	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low NOx burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					
	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low NOx burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					
	☐ SCR	Select	Select					
	☐ SNCR	Select	Select		Select Select		Select Select	
Select	☐ Overfire Air	Select	Select			Select		Select
	☐ Low NOx burners	Select	Select		Select		Select	
	☐ Other:	Select	Select					

CBI?
☐ Yes

A9-2. If the plant has sent an SCR catalyst off site for regeneration, provide the company name, location, and phone number for the company(ies) that performed the last two *SCR catalyst regenerations*.

☑ Plant did not send SCR catalyst offsite for regeneration.

Table A-13. Companies that performed the last two SCR catalyst regenerations

Company Name	City	State	Telephone Number
		Select	
		Select	

APPENDIX A

Document 2

Part C – Ash Handling

OMB Control Number: 2040-0281
Approval Expires: 05/31/2013

Plant ID: 02268
Plant Name: Conemaugh

Steam Electric Questionnaire

PART C - ASH HANDLING

Table of Contents

Plant ID: 02268
Plant Name: Conemaugh

Part: C
Section Title: 1. Ash Generation

CBI? ☐ Yes

C1-1. Is ash generated in any fossil-fueled steam electric generating units at the plant? See Part A Section 8 for steam electric generating unit fuel classifications.

◉ Yes (Continue)
○ No (Skip to next Questionnaire Part)

CBI? ☐ Yes

C1-2. In Table C-1, indicate the total acreage of the *plant* for each of the following categories, including all contiguous and non-adjoining property within 20 miles under the operational control of the plant or operated by the same ultimate parent, and receiving the plant's waste.

Table C-1. Plant Acreage Breakdown

Category	Acreage
Total Plant Area	2838
Parking lots	10.2
Buildings and Other Developed Areas	217
Active/Inactive/Open ash ponds	4.3
Active/Inactive/Open landfills	348
Closed ponds/impoundments and landfills	161
Unusable land (e.g., wetlands, cooling reservoir) Specify type(s): wetlands & floodway	83.1
Other:	
Other:	

CBI? ☐ Yes

C1-3. Is fly ash generated in any fossil-fueled steam electric generating units at the plant? See Part A Section 8 for steam electric generating unit fuel classifications.

◉ Yes (Continue)
○ No (Skip to Section 3.1)

Plant ID: 02268
Plant Name: Conemaugh
SE Unit ID: 1

Part: C
Section Title: 3.1. Bottom Ash Handling - Generating Unit Level Information

Instructions: Throughout Section 3.1 (Questions C3-1 through C3-31), provide ash handling information for each steam electric generating unit operated at any time in 2009, including units that may have been idle for an extended period of time. Make copies of Section 3.1 for each steam electric generating unit using the "Copy Section 3.1" button below. Enter the steam electric generating Unit ID (use Unit IDs assigned in Table A-8) in the space above titled "SE Unit ID".

CBI? ☐ Yes

C3-1. Is bottom ash generated in any fossil-fueled steam electric generating units at the plant? See Part A Section 8 for steam electric generating unit fuel classifications.

● Yes (Continue)
○ No (Skip to Section 4)

CBI? ☐ Yes

C3-2. Provide bottom ash handling information in Table C-18, for each steam electric generating unit reported in Table A-8, following these instructions:

- Provide bottom ash handling information at the steam electric generating unit level. For the purpose of this questionnaire, more than one type of bottom ash handling (e.g., wet sluicing, SCC) may be selected for one generating unit. Check all types of bottom ash handling that apply to this steam electric generating unit.
- Refer to the glossary and the "Part C Instructions" tab for definitions related to wet and dry bottom ash handling systems.

Table C-18. Bottom Ash Handling Systems Operated in 2009 by Generating Unit

Type of Boiler	Type of Bottom Ash Handling System	Typical Amount of Bottom Ash Produced in 2009 (Dry weight basis)		Typical Percent Moisture of Bottom Ash in 2009		Design Ash Handling Rate (Dry weight basis)		Number of Days Ash was Handled by the Bottom Ash Handling System in 2009		Loss on Ignition of Bottom Ash Produced (Provide typical range for 2009)	
		Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed
Example: Dry-bottom Other:	☑ Wet sluicing ☐ Mechanical drag system ☐ Dry vacuum ☐ Dry pressure ☐ Other:	1,500 tpd 365 dpy	0 tpd 0 dpy	30 % ☐ NA	% ☑ NA	5 tpd 5 dpy	0 tpd 0 dpy	365 days	0 days	1 to 2 % ☐ Not monitored ☐ NA	to % ☐ Not monitored ☑ NA
Dry-bottom Other:	☑ Wet sluicing ☐ Mechanical drag system ☐ Dry vacuum ☐ Dry pressure ☐ Other:	122.5 tpd 365 dpy	tpd dpy	24.00% % ☐ NA	% ☐ NA	855 tpd 365 dpy	tpd dpy	365 days	days	0.00% to 1.00% % ☐ Not monitored ☐ NA	to % ☐ Not monitored ☐ NA

CBI? ☐ Yes

C3-3. Is wet sluicing used to collect bottom ash for this steam electric generating unit?

● Yes (Continue)

○ No (Skip to Question C3-11)

Provide information for the wet bottom ash handling system in Table C-19. For the source of sluice water, you may enter more than one source from the following options:

- "IN" if *raw intake water* is used;
- "IN-Makeup" if raw intake water is only used as makeup;
- "TR" for use of *intake water* that has been *treated* on site prior to use;
- "TR-Makeup" if treated intake water is used only as makeup; and/or
- Process wastewater and/or treated wastewater described the code tables on the "Code Tables" tab provided at the end of this workbook.

An example is provided in Table C-19 for a plant that uses the effluent from its ash pond (WWT-1, as would be defined in Part A) for bottom ash sluicing and also makes up for losses with untreated river water (which is code IN-Makeup as shown above).

Table C-19. Process Wastewater Generated from Wet Bottom Ash Handling in 2009

Average Sluice Water Flow Rate (gpd)	Typical Duration AND Frequency of Sluicing (hpd AND dpy)	Source(s) of Sluice Water	Percent Contribution of Source to Sluice Water Flow
EXAMPLE:		WWT-2 Effluent	*90* %
14,400,000 gpd	*24* hpd	TR	*10* %
	365 dpy	Select	%
		Other:	%
		POND-1 Effluent	100.00% %
5000000 gpd	24 hpd	Select	%
	365 dpy	Select	%
		Other:	%

CBI? ☐ Yes

C3-4. For water sources that may be used as a source of *bottom ash sluice* water (e.g., fresh intake, recycled process water), indicate the maximum chlorides concentration and the maximum solids percentage that is acceptable for the water to be used for those purposes. [Check all boxes that apply.]

☐ Chlorides concentration, less than: ________ ppm

☐ Solids percentage, less than: ________ %

☑ Other: Not ________ ppm

CBI? ☐ Yes

C3-5. Is any of the wet *bottom ash sluice* water immediately recycled (e.g., without treatment such as a pond) back to plant process?

○ Yes (Continue)

● No (Skip to Question C3-6)

Describe how the wet *bottom ash sluice* is reused:

CBI? ☐ Yes

C3-6. Is any of the wet *bottom ash sluice* indirectly discharged to a publicly or privately owned treatment works?

○ Yes

● No

CBI? ☐ Yes

C3-7. Does solids removal (other than in pond(s)/impoundment(s)) occur at the plant?

● Yes (Continue)

○ No (Skip to Question C3-11)

CBI? ☐ Yes

C3-8. In Table C-20 provide solids removal information, on a dry ton basis, for the wet ash sluice system. For the purpose of Table C-20, solids removal does NOT include ash ponds.

Table C-20. Wet Ash Sluice Systems Operated in 2009

Solids Removal [Check all boxes that apply]	Bottom Ash Disposal [Check all boxes that apply]	Amount (tons) of Solids Disposed (Dry weight basis)	Typical Percent Moisture of Bottom Ash Disposed
☑ Dewatering bin	☐ Sold or given away without further treatment	____ tons	____ %
☐ Hydrocyclones	☐ Sold or given away after further treatment	____ tons	____ %
☐ Centrifuges	☐ Stored in/transferred to a pond/impoundment reported in Table A-4	____ tons	____ %
☐ Filters	☑ Stored in landfills reported in Table A-6	35490 tons	24.00% %
☐ Other:	☐ Stored in landfills NOT reported in Table A-6	____ tons	____ %
	☐ Other: ____	____ tons	____ %

CBI? ☐ Yes

C3-9. Provide the amount of wastewater overflow from solids removal (e.g., dewatering bins) for the wet ash sluice system.

1260000 gpd

CBI? ☐ Yes

C3-10. What is the destination(s) of the wastewater overflow from solids removal? If the plant recycles the wastewater, indicate the amount and the plant process to which this waste is recycled. [Check all boxes that apply.]

☐ Immediately recycled back to plant process.

Provide the amount of wastewater overflow that is recycled.

____ gpd

Describe how the wastewater overflow is reused:

☑ Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]

☑ Settling pond ☐ Constructed wetlands

☑ pH adjustment ☐ Other, specify: ____

☐ Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2): ____

☐ Indirect discharge to a publicly or privately owned treatment works

☑ Other, explain: Stored in SPD-3 our recycle basin for reuse in ash sluice system or transferred to SPD-1 for reuse

CBI? ☐ Yes

C3-11. Does the plant use a mechanical drag system (e.g., submerged chain conveyor (SCC)) to remove bottom ash from this generating unit boiler?

○ Yes (Continue)

● No (Skip to Question C3-15)

Name the type and describe the process of removing bottom ash from the generating unit boiler(s).

____

CBI? ☐ Yes

C3-12. Is any process wastewater generated from overflow, or other means, from the mechanical drag system?

○ Yes (Continue)

○ No (Skip to Question C3-15)

CBI? ☐ Yes

C3-13. Provide the amount of wastewater overflow from the mechanical drag system.

__________ gpd

CBI? ☐ Yes

C3-14. What is the destination(s) of the wastewater overflow from the mechanical drag system? If the plant recycles the wastewater, indicate the amount and the plant process to which this waste is recycled. [Check all boxes that apply.]

☐ Immediately recycled back to plant process.

Provide the amount of wastewater overflow that is recycled.

__________ gpd

Describe how the wastewater overflow is reused:

____

☐ Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]

☐ Settling pond ☐ Constructed wetlands

☐ pH adjustment ☐ Other, specify: __________

☐ Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2): __________

☐ Indirect discharge to a publicly or privately owned treatment works

☐ Other, explain: ______________________________

CBI? ☐ Yes

C3-15. In Table C-21, identify the destination(s) for wet and dry bottom ash transferred from the hopper(s) of this steam electric generating unit. Provide the distribution of the wet and dry ash by destination and whether the storage indentified is an intermediate or final destination.

Note: The sum of the percentage of ash distribution should equal 100% for the dry and wet bottom ash, separately.

Table C-21. Storage Destinations that Receive Bottom Ash

Dry Conveyed Bottom Ash			Wet Conveyed Bottom Ash		
Storage Destination(s)	Percent of Dry Conveyed Bottom Ash to this Destination	Destination Type	Storage Destination(s)	Percent of Wet Conveyed Bottom Ash to this Destination	Destination Type
Select If other, explain:	%	○ Intermediate ● Final	LANDFILL-1 If other, explain:	100.00% %	○ Intermediate ● Final
Select If other, explain:	%	○ Intermediate ● Final	Select If other, explain:	%	○ Intermediate ○ Final
Select If other, explain:	%	○ Intermediate ○ Final	Select If other, explain:	%	○ Intermediate ○ Final
Select If other, explain:	%	○ Intermediate ○ Final	Select If other, explain:	%	○ Intermediate ○ Final
Select If other, explain:	%	○ Intermediate ○ Final	Select If other, explain:	%	○ Intermediate ○ Final
Total Dry	100 %		Total Wet	100 %	

CBI? ☐ Yes

C3-16. Was the bottom ash from this steam electric generating unit conveyed both *wet and dry* in 2009?

○ Yes (Continue)

● No (Skip to Question C3-19)

CBI? ☐ Yes

C3-17. Indicate why bottom ash from the steam electric generating unit was conveyed both wet and dry in 2009. [Check all boxes that apply.] For each selection, identify the number of days in 2009 the wet system was operated for this reason.

- ☐ Wet bottom ash handling system operated during times in which the dry collected bottom ash was not marketable. ______ days
- ☐ Wet bottom ash handling system operated when the dry bottom ash collection system was not operational due to maintenance issues. ______ days
- ☐ Wet bottom ash handling system operated in order to maintain its function as a backup to the dry system (i.e., wet system operated to ensure that it is still functional.) ______ days
- ☐ Wet bottom ash handling system operated because the dry bottom ash handling system does not have the capacity to handle all of the bottom ash. ______ days
- ☐ Other, explain: ______ ______ days

CBI? ☐ Yes

C3-18. What modifications would be required to handle all the bottom ash with a dry bottom ash handling system? [Check all boxes that apply.]

- ☐ No system modifications necessary. Procedural changes would be sufficient.
- ☐ Increase the capacity of the silo(s).
- ☐ Increase the number of silos.
- ☐ Modify the loading silos to have the ability to moisture condition the ash.
- ☐ Install/increase the capacity of landfills.
- ☐ Increase the capacity of the dry bottom ash conveying equipment.
- ☐ Design/develop new infrastructure to dispose of dry ash. Specify the new infrastructure needed: ______
- ☐ Other, explain: ______

CBI? ☐ Yes

C3-19. If the current bottom ash handling operations for the steam electric generating unit are expected to significantly change by December 31, 2020, indicate how (i.e., convert to or add dry handling capability). [Check all boxes that apply.]

- ☐ Expand capacity (handling and/or storage).
- ☐ Decreased use of wet bottom ash handling system. ____________ (expected operating days per year for wet system)
- ☐ End use of wet bottom ash handling system. ____________ (expected end date)
- ☑ No change expected in bottom ash handling operations.
- ☐ Other, explain: ____________

CBI? ☐ Yes

C3-20. Was the dry bottom ash handling installed as a retrofit to the steam electric generating unit?

- ○ NA, this unit does not use dry bottom ash handling (Skip to Question C3-24)
- ● No (Skip to Question C3-24)
- ○ Yes (Continue)

Year Built: ____________

Shutdown time (days) required to bring dry bottom ash handling system on line: ____________

Was a generating unit outage(s), outside of regularly scheduled outages, required to bring the dry bottom ash handling system on line?

- ○ Yes
- ○ No

CBI? ☐ Yes

C3-21. What type of retrofit was the dry bottom ash handling system?

- ○ The retrofit was made to an existing dry system. (Skip to Question 3-29)
- ○ A dry bottom ash handling system was installed (for operation in addition to the wet fly ash handling system). (Continue)
- ○ The retrofit was a complete conversion from a wet to dry bottom ash handling system. (Continue)

CBI? ☐ Yes

C3-22. Describe the changes that were required to retrofit (for a retrofit to an existing dry system, an installation of a dry system, or a complete conversion from wet to dry). [Check all boxes that apply.]

- ☐ Physical changes to facility
  - ☐ Installation of pressure/vacuum system and piping
  - ☐ Boiler alteration to accommodate the mechanical drag system
  - ☐ Expansion of pressure/vacuum system and piping
  - ☐ Installation of storage silos
  - ☐ Modification of the silos to moisture-condition the ash
  - ☐ Modification of the silos for ash transfer to rail cars
  - ☐ Modification of the silos for marketable ash
  - ☐ Construction of haul roads
  - ☐ Construction of rail track
  - ☐ Construction of landfill. Provide the landfill ID(s) from Table A-6: ____________
  - ☐ Increasing landfill capacity. Provide the landfill ID(s) from Table A-6: ____________
  - ☐ Changes to air permit
  - ☐ Other, explain: ____________
- ☐ Changes in personnel/training, explain: ____________
- ☐ Changes in ash disposal practices
  - ☐ Storage of ash in landfills. Provide the landfill ID(s) from Table A-6: ____________
  - ☐ Marketing of ash
  - ☐ Hauling ash to off-site storage
  - ☐ Dust suppression activities
  - ☐ Other, explain: ____________

CBI? ☐ Yes

C3-23. Attach an engineering process diagram(s) for the dry bottom ash handling system retrofit that depicts (with dimensions) the conveyance portion of the system (e.g., a diagram(s) that depicts how the dry bottom ash system is configured within the building to convey bottom ash from the boiler(s) to the building exit).

☐ Diagram attached.

CBI? ☐ Yes

C3-24. Is the plant in the process of installing a dry bottom ash handling system to handle some or all of the ash currently handled by the wet bottom ash handling system?

○ Yes Estimated shutdown time (days) required to bring dry bottom ash handling system online: ________ (Skip to Question C3-26)

● No (Continue to Question C3-25)

CBI? ☐ Yes

C3-25. Is the plant planning to install a dry bottom ash handling system to handle some or all of the ash currently handled by the wet bottom ash handling system?

○ Yes Estimated shutdown time (days) required to bring dry bottom ash handling system online: ________ (Continue to Question C3-26)

● No (Skip to Question C3-29)

CBI? ☐ Yes

C3-26. If the plant is in the process of installing, or planning to install, a dry bottom ash handing system by December 31, 2020, provide the cost estimates that have been developed for such a conversion/installation.

○ Yes (Provide documentation/costs, for example, bid proposals or internal plant engineering estimates.)

● No (Skip to Question C3-29)

Note: All bid proposals and/or other documentation/costs originally submitted to the plant as CBI, should be marked CBI for the purpose of this collection request.

○ I have attached documentation/costs.

○ I did not attach documentation/costs. Below, explain why:

____

CBI? ☐ Yes

C3-27. Describe the modifications that will be required to install the dry bottom ash handling system. [Check all boxes that apply.]

- ☐ Physical changes to facility
  - ☐ Installation of mechanical drag system
  - ☐ Boiler alteration to accommodate the mechanical drag system
  - ☐ Installation of completely dry bottom ash handling system
  - ☐ Installation of storage silos
  - ☐ Modification of the silos to moisture-condition the ash
  - ☐ Modification of the silos for ash transfer to rail cars
  - ☐ Modification of the silos for marketable ash
  - ☐ Construction of haul roads
  - ☐ Construction of rail track
  - ☐ Construction of landfill. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Increasing landfill capacity. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Changes to air permit
  - ☐ Other, explain: ________
- ☐ Changes in personnel/training, explain: ________
- ☐ Changes in ash disposal practices
  - ☐ Storage of ash in landfill. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Marketing of ash
  - ☐ Hauling ash to off-site storage
  - ☐ Dust suppression activities
  - ☐ Other, explain: ________

CBI?
☐ Yes

C3-28. Indicate the types of destinations expected for the dry bottom ash from the planned system and the percentage of the dry bottom ash that is expected to go to each destination. [Check all boxes that apply.]

☐ Marketed, sold, and/or given away
- Select ______ % of the dry bottom ash
  - If other, specify: ______
- Select ______ % of the dry bottom ash
  - If other, specify: ______
- Select ______ % of the dry bottom ash
  - If other, specify: ______

☐ Stored in landfills reported in Table A-6 ______ % of the dry bottom ash

☐ Stored in landfills NOT reported in Table A-6 ______ % of the dry bottom ash

☐ Other, specify: ______ ______ % of the dry bottom ash

CBI?
☑ Yes

C3-29. If the plant is not in the process of installing or planning to install a dry bottom ash handling system, have cost estimates been obtained/developed since January 1, 1995, for such a conversion/installation?

● Yes (Provide documentation/costs, for example, bid proposals or internal plant engineering estimates.)
○ No (Skip to Question C3-30)

Note: All bid proposals and/or other documentation/costs originally submitted to the plant as CBI, should be marked CBI for the purpose of this collection request.

● I have attached documentation/costs.
○ I did not attach documentation/costs. Below, explain why:

______

CBI?
☐ Yes

C3-30. Has the plant encountered any unscheduled outages on this generating unit caused by the bottom ash handling system in the last five years?

○ Yes (Continue)
● No (Skip to Section 3.2)

CBI?
☐ Yes

C3-31. In Table C-22, provide information on unscheduled generating unit outages caused by bottom ash handling for each of the last five years.

Table C-22. Unscheduled Generating Unit Outages Caused by Bottom Ash Handling

Year	Ash Handling	Total Days of Outage	Reason(s) for outage(s)	Method(s) Used to Resolve Outage(s)
2005	Dry			
	Wet			
2006	Dry			
	Wet			
2007	Dry			
	Wet			
2008	Dry			
	Wet			
2009	Dry			
	Wet			

Plant ID: 02268
Plant Name: Conemaugh
SE Unit ID: 2

Part: C
Section Title: 3.1. Bottom Ash Handling - Generating Unit Level Information

Instructions: Throughout Section 3.1 (Questions C3-1 through C3-31), provide ash handling information for each steam electric generating unit operated at any time in 2009, including units that may have been idle for an extended period of time. Make copies of Section 3.1 for each steam electric generating unit using the "Copy Section 3.1" button below. Enter the steam electric generating Unit ID (use Unit IDs assigned in Table A-8) in the space above titled "SE Unit ID".

CBI? ☐ Yes

C3-1. Is bottom ash generated in any fossil-fueled steam electric generating units at the plant? See Part A Section 8 for steam electric generating unit fuel classifications.

● Yes (Continue)
○ No (Skip to Section 4)

CBI? ☐ Yes

C3-2. Provide bottom ash handling information in Table C-18, for each steam electric generating unit reported in Table A-8, following these instructions:

- Provide bottom ash handling information at the steam electric generating unit level. For the purpose of this questionnaire, more than one type of bottom ash handling (e.g., wet sluicing, SCC) may be selected for one generating unit. Check all types of bottom ash handling that apply to this steam electric generating unit.
- Refer to the glossary and the "Part C Instructions" tab for definitions related to wet and dry bottom ash handling systems.

Table C-18. Bottom Ash Handling Systems Operated in 2009 by Generating Unit

Type of Boiler	Type of Bottom Ash Handling System	Typical Amount of Bottom Ash Produced in 2009 (Dry weight basis)		Typical Percent Moisture of Bottom Ash in 2009		Design Ash Handling Rate (Dry weight basis)		Number of Days Ash was Handled by the Bottom Ash Handling System in 2009		Loss on Ignition of Bottom Ash Produced (Provide typical range for 2009)	
		Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed	Wet Conveyed	Dry Conveyed
Example: Dry-bottom Other: ____	☑ Wet sluicing ☐ Mechanical drag system ☐ Dry vacuum ☐ Dry pressure ☐ Other: ____	*1,500* tpd *365* dpy	*0* tpd *0* dpy	*30* % ☐ NA	____ % ☑ NA	*5* tpd *5* dpy	*0* tpd *0* dpy	*365* days	*0* days	*1* to *2* % ☐ Not monitored ☐ NA	____ to ____ % ☐ Not monitored ☑ NA
Dry-bottom Other: ____	☑ Wet sluicing ☐ Mechanical drag system ☐ Dry vacuum ☐ Dry pressure ☐ Other: ____	122.5 tpd 365 dpy	____ tpd ____ dpy	24.00% % ☐ NA	____ % ☐ NA	855 tpd 365 dpy	____ tpd ____ dpy	365 days	____ days	0.00% to 1.00% % ☐ Not monitored ☐ NA	____ to ____ % ☐ Not monitored ☐ NA

CBI? ☐ Yes

C3-3. Is wet sluicing used to collect bottom ash for this steam electric generating unit?

● Yes (Continue)

○ No (Skip to Question C3-11)

Provide information for the wet bottom ash handling system in Table C-19. For the source of sluice water, you may enter more than one source from the following options:

- "IN" if *raw intake water* is used;
- "IN-Makeup" if raw intake water is only used as makeup;
- "TR" for use of *intake water* that has been *treated* on site prior to use;
- "TR-Makeup" if treated intake water is used only as makeup; and/or
- Process wastewater and/or treated wastewater described the code tables on the "Code Tables" tab provided at the end of this workbook.

An example is provided in Table C-19 for a plant that uses the effluent from its ash pond (WWT-1, as would be defined in Part A) for bottom ash sluicing and also makes up for losses with untreated river water (which is code IN-Makeup as shown above).

Table C-19. Process Wastewater Generated from Wet Bottom Ash Handling in 2009

Average Sluice Water Flow Rate (gpd)	Typical Duration AND Frequency of Sluicing (hpd AND dpy)	Source(s) of Sluice Water	Percent Contribution of Source to Sluice Water Flow
EXAMPLE:		WWT-2 Effluent	*90* %
14,400,000 gpd	*24* hpd	TR	*10* %
	365 dpy	Select	%
		Other:	%
5000000 gpd	24 hpd	POND-1 Effluent	100.00% %
	365 dpy	Select	%
		Select	%
		Other:	%

CBI? ☐ Yes

C3-4. For water sources that may be used as a source of *bottom ash sluice* water (e.g., fresh intake, recycled process water), indicate the maximum chlorides concentration and the maximum solids percentage that is acceptable for the water to be used for those purposes. [Check all boxes that apply.]

☐ Chlorides concentration, less than: ________ ppm

☐ Solids percentage, less than: ________ %

☑ Other: Not ________ ppm

CBI? ☐ Yes

C3-5. Is any of the wet *bottom ash sluice* water immediately recycled (e.g., without treatment such as a pond) back to plant process?

○ Yes (Continue)

● No (Skip to Question C3-6)

Describe how the wet *bottom ash sluice* is reused:

CBI? ☐ Yes

C3-6. Is any of the wet *bottom ash sluice* indirectly discharged to a publicly or privately owned treatment works?

○ Yes

● No

CBI? ☐ Yes

C3-7. Does solids removal (other than in pond(s)/impoundment(s)) occur at the plant?

● Yes (Continue)

○ No (Skip to Question C3-11)

CBI? ☐ Yes

C3-8. In Table C-20 provide solids removal information, on a dry ton basis, for the wet ash sluice system. For the purpose of Table C-20, solids removal does NOT include ash ponds.

Table C-20. Wet Ash Sluice Systems Operated in 2009

Solids Removal (Check all boxes that apply)	Bottom Ash Disposal (Check all boxes that apply)	Amount (tons) of Solids Disposed (Dry weight basis)	Typical Percent Moisture of Bottom Ash Disposed
☑ Dewatering bin	☐ Sold or given away without further treatment	tons	%
☐ Hydrocyclones	☐ Sold or given away after further treatment	tons	%
☐ Centrifuges	☐ Stored in/transferred to a pond/impoundment reported in Table A-4	tons	%
☐ Filters	☑ Stored in landfills reported in Table A-6	35490 tons	24.00% %
☐ Other:	☐ Stored in landfills NOT reported in Table A-6	tons	%
	☐ Other:	tons	%

CBI? ☐ Yes

C3-9. Provide the amount of wastewater overflow from solids removal (e.g., dewatering bins) for the wet ash sluice system.

1260000 gpd

CBI? ☐ Yes

C3-10. What is the destination(s) of the wastewater overflow from solids removal? If the plant recycles the wastewater, indicate the amount and the plant process to which this waste is recycled. [Check all boxes that apply.]

☐ Immediately recycled back to plant process.

Provide the amount of wastewater overflow that is recycled.

gpd

Describe how the wastewater overflow is reused:

☑ Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]

☑ Settling pond ☐ Constructed wetlands

☑ pH adjustment ☐ Other, specify:

☐ Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2):

☐ Indirect discharge to a publicly or privately owned treatment works

☑ Other, explain: Stored in SPD-3 our recycle basin for reuse in ash sluice system or transferred to SPD-1 for reuse

CBI? ☐ Yes

C3-11. Does the plant use a mechanical drag system (e.g., submerged chain conveyor (SCC)) to remove bottom ash from this generating unit boiler?

○ Yes (Continue)

● No (Skip to Question C3-15)

Name the type and describe the process of removing bottom ash from the generating unit boiler(s).

____

CBI? ☐ Yes

C3-12. Is any process wastewater generated from overflow, or other means, from the mechanical drag system?

○ Yes (Continue)

○ No (Skip to Question C3-15)

CBI? ☐ Yes

C3-13. Provide the amount of wastewater overflow from the mechanical drag system.

__________ gpd

CBI? ☐ Yes

C3-14. What is the destination(s) of the wastewater overflow from the mechanical drag system? If the plant recycles the wastewater, indicate the amount and the plant process to which this waste is recycled. [Check all boxes that apply.]

☐ **Immediately recycled back to plant process.**

Provide the amount of wastewater overflow that is recycled.

__________ gpd

Describe how the wastewater overflow is reused:

____

☐ **Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]**

☐ **Settling pond** ☐ **Constructed wetlands**

☐ **pH adjustment** ☐ **Other, specify:** __________

☐ **Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2):** __________

☐ **Indirect discharge to a publicly or privately owned treatment works**

☐ **Other, explain:** ______________________________

CBI? ☐ Yes

C3-15. In Table C-21, identify the destination(s) for wet and dry bottom ash transferred from the hopper(s) of this steam electric generating unit. Provide the distribution of the wet and dry ash by destination and whether the storage indentified is an intermediate or final destination.

Note: The sum of the percentage of ash distribution should equal 100% for the dry and wet bottom ash, separately.

Table C-21. Storage Destinations that Receive Bottom Ash

Dry Conveyed Bottom Ash			Wet Conveyed Bottom Ash		
Storage Destination(s)	Percent of Dry Conveyed Bottom Ash to this Destination	Destination Type	Storage Destination(s)	Percent of Wet Conveyed Bottom Ash to this Destination	Destination Type
Select If other, explain:	%	O Intermediate O Final	LANDFILL-1 If other, explain:	100.00% %	O Intermediate ● Final
Select If other, explain:	%	O Intermediate O Final	Select If other, explain:	%	O Intermediate O Final
Select If other, explain:	%	O Intermediate O Final	Select If other, explain:	%	O Intermediate O Final
Select If other, explain:	%	O Intermediate O Final	Select If other, explain:	%	O Intermediate O Final
Select If other, explain:	%	O Intermediate O Final	Select If other, explain:	%	O Intermediate O Final
Total Dry	100 %		Total Wet	100 %	

CBI? ☐ Yes

C3-16. Was the bottom ash from this steam electric generating unit conveyed both *wet and dry* in 2009?

O Yes (Continue)

● No (Skip to Question C3-19)

CBI? ☐ Yes

C3-17. Indicate why bottom ash from the steam electric generating unit was conveyed both wet and dry in 2009. [Check all boxes that apply.] For each selection, identify the number of days in 2009 the wet system was operated for this reason.

☐ Wet bottom ash handling system operated during times in which the dry collected bottom ash was not marketable. ______ days

☐ Wet bottom ash handling system operated when the dry bottom ash collection system was not operational due to maintenance issues. ______ days

☐ Wet bottom ash handling system operated in order to maintain its function as a backup to the dry system (i.e., wet system operated to ensure that it is still functional.) ______ days

☐ Wet bottom ash handling system operated because the dry bottom ash handling system does not have the capacity to handle all of the bottom ash. ______ days

☐ Other, explain: ______ ______ days

CBI? ☐ Yes

C3-18. What modifications would be required to handle all the bottom ash with a dry bottom ash handling system? [Check all boxes that apply.]

☐ No system modifications necessary. Procedural changes would be sufficient.

☐ Increase the capacity of the silo(s).

☐ Increase the number of silos.

☐ Modify the loading silos to have the ability to moisture condition the ash.

☐ Install/increase the capacity of landfills.

☐ Increase the capacity of the dry bottom ash conveying equipment.

☐ Design/develop new infrastructure to dispose of dry ash. Specify the new infrastructure needed: ______

☐ Other, explain: ______

CBI? ☐ Yes

C3-19. If the current bottom ash handling operations for the steam electric generating unit are expected to significantly change by December 31, 2020, indicate how (i.e., convert to or add dry handling capability). [Check all boxes that apply.]

- ☐ Expand capacity (handling and/or storage).
- ☐ Decreased use of wet bottom ash handling system. ______ (expected operating days per year for wet system)
- ☐ End use of wet bottom ash handling system. ______ (expected end date)
- ☑ No change expected in bottom ash handling operations.
- ☐ Other, explain: ______

CBI? ☐ Yes

C3-20. Was the dry bottom ash handling installed as a retrofit to the steam electric generating unit?

- ○ NA, this unit does not use dry bottom ash handling (Skip to Question C3-24)
- ● No (Skip to Question C3-24)
- ○ Yes (Continue)

Year Built: ______

Shutdown time (days) required to bring dry bottom ash handling system on line: ______

Was a generating unit outage(s), outside of regularly scheduled outages, required to bring the dry bottom ash handling system on line?

- ○ Yes
- ○ No

CBI? ☐ Yes

C3-21. What type of retrofit was the dry bottom ash handling system?

- ○ The retrofit was made to an existing dry system. (Skip to Question 3-29)
- ○ A dry bottom ash handling system was installed (for operation in addition to the wet fly ash handling system). (Continue)
- ○ The retrofit was a complete conversion from a wet to dry bottom ash handling system. (Continue)

CBI? ☐ Yes

C3-22. Describe the changes that were required to retrofit (for a retrofit to an existing dry system, an installation of a dry system, or a complete conversion from wet to dry). [Check all boxes that apply.]

- ☐ Physical changes to facility
  - ☐ Installation of pressure/vacuum system and piping
  - ☐ Boiler alteration to accommodate the mechanical drag system
  - ☐ Expansion of pressure/vacuum system and piping
  - ☐ Installation of storage silos
  - ☐ Modification of the silos to moisture-condition the ash
  - ☐ Modification of the silos for ash transfer to rail cars
  - ☐ Modification of the silos for marketable ash
  - ☐ Construction of haul roads
  - ☐ Construction of rail track
  - ☐ Construction of landfill. Provide the landfill ID(s) from Table A-6: ______
  - ☐ Increasing landfill capacity. Provide the landfill ID(s) from Table A-6: ______
  - ☐ Changes to air permit
  - ☐ Other, explain: ______
- ☐ Changes in personnel/training, explain: ______
- ☐ Changes in ash disposal practices
  - ☐ Storage of ash in landfills. Provide the landfill ID(s) from Table A-6: ______
  - ☐ Marketing of ash
  - ☐ Hauling ash to off-site storage
  - ☐ Dust suppression activities
  - ☐ Other, explain: ______

CBI? ☐ Yes

C3-23. Attach an engineering process diagram(s) for the dry bottom ash handling system retrofit that depicts (with dimensions) the conveyance portion of the system (e.g., a diagram(s) that depicts how the dry bottom ash system is configured within the building to convey bottom ash from the boiler(s) to the building exit).

☐ Diagram attached.

CBI? ☐ Yes

C3-24. Is the plant in the process of installing a dry bottom ash handling system to handle some or all of the ash currently handled by the wet bottom ash handling system?

○ Yes Estimated shutdown time (days) required to bring dry bottom ash handling system online: ________ (Skip to Question C3-26)
● No (Continue to Question C3-25)

CBI? ☐ Yes

C3-25. Is the plant planning to install a dry bottom ash handling system to handle some or all of the ash currently handled by the wet bottom ash handling system?

○ Yes Estimated shutdown time (days) required to bring dry bottom ash handling system online: ________ (Continue to Question C3-26)
● No (Skip to Question C3-29)

CBI? ☐ Yes

C3-26. If the plant is in the process of installing, or planning to install, a dry bottom ash handing system by December 31, 2020, provide the cost estimates that have been developed for such a conversion/installation.

○ Yes (Provide documentation/costs, for example, bid proposals or internal plant engineering estimates.)
● No (Skip to Question C3-29)

Note: All bid proposals and/or other documentation/costs originally submitted to the plant as CBI, should be marked CBI for the purpose of this collection request.

○ I have attached documentation/costs.

○ I did not attach documentation/costs. Below, explain why:

____

CBI? ☐ Yes

C3-27. Describe the modifications that will be required to install the dry bottom ash handling system. [Check all boxes that apply.]

- ☐ Physical changes to facility
  - ☐ Installation of mechanical drag system
  - ☐ Boiler alteration to accommodate the mechanical drag system
  - ☐ Installation of completely dry bottom ash handling system
  - ☐ Installation of storage silos
  - ☐ Modification of the silos to moisture-condition the ash
  - ☐ Modification of the silos for ash transfer to rail cars
  - ☐ Modification of the silos for marketable ash
  - ☐ Construction of haul roads
  - ☐ Construction of rail track
  - ☐ Construction of landfill. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Increasing landfill capacity. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Changes to air permit
  - ☐ Other, explain: ________
- ☐ Changes in personnel/training, explain: ________
- ☐ Changes in ash disposal practices
  - ☐ Storage of ash in landfill. Provide the landfill ID(s) from Table A-6: ________
  - ☐ Marketing of ash
  - ☐ Hauling ash to off-site storage
  - ☐ Dust suppression activities
  - ☐ Other, explain: ________

CBI?
☐ Yes

C3-28. Indicate the types of destinations expected for the dry bottom ash from the planned system and the percentage of the dry bottom ash that is expected to go to each destination. [Check all boxes that apply.]

☐ Marketed, sold, and/or given away

- Select ▼ ________ % of the dry bottom ash
  - If other, specify: ________
- Select ▼ ________ % of the dry bottom ash
  - If other, specify: ________
- Select ▼ ________ % of the dry bottom ash
  - If other, specify: ________

☐ Stored in landfills reported in Table A-6 ________ % of the dry bottom ash

☐ Stored in landfills NOT reported in Table A-6 ________ % of the dry bottom ash

☐ Other, specify:
________ ________ % of the dry bottom ash

CBI?
☑ Yes

C3-29. If the plant is not in the process of installing or planning to install a dry bottom ash handling system, have cost estimates been obtained/developed since January 1, 1995, for such a conversion/installation?

● Yes (Provide documentation/costs, for example, bid proposals or internal plant engineering estimates.)

○ No (Skip to Question C3-30)

Note: All bid proposals and/or other documentation/costs originally submitted to the plant as CBI, should be marked CBI for the purpose of this collection request.

● I have attached documentation/costs.

○ I did not attach documentation/costs. Below, explain why:

CBI?
☐ Yes

C3-30. Has the plant encountered any unscheduled outages on this generating unit caused by the bottom ash handling system in the last five years?

○ Yes (Continue)

● No (Skip to Section 3.2)

CBI?
☐ Yes

C3-31. In Table C-22, provide information on unscheduled generating unit outages caused by bottom ash handling for each of the last five years.

Table C-22. Unscheduled Generating Unit Outages Caused by Bottom Ash Handling

Year	Ash Handling	Total Days of Outage	Reason(s) for outage(s)	Method(s) Used to Resolve Outage(s)
2005	Dry			
	Wet			
2006	Dry			
	Wet			
2007	Dry			
	Wet			
2008	Dry			
	Wet			
2009	Dry			
	Wet			

Plant ID: 02268
Plant Name: Conemaugh

Part: C
Section Title: 3.2 Bottom Ash Handling - Storage and Use Data

Instructions: Complete Section 3.2 (Questions C3-32 through C3-34). Provide information for bottom ash handling and bottom ash storage at the plant.

CBI?
☐ Yes

C3-32. For each storage destination reported in Table C-21, provide the distance the bottom ash is transported from the generating unit to intermediate storage or from intermediate storage to the final disposal/destination, the amount of bottom ash transported in 2009, and the percent moisture of the bottom ash entering storage, if transported dry. Additionally, for each destination indicate how the bottom ash is transported by entering one of the following options: conveyor belt, pipe, truck, barge, rail, or other (provide a description). If the bottom ash is sold to more than one destination (e.g., some bottom ash is sold for cement manufacturing and some is sold for structural fill) enter the average percent moisture for all bottom ash sold in Table C-23. Tables C-24 and C-25 will request information by market.

Table C-23. Bottom Ash Storage Information

Storage Destination ID	Distance from the Generating Unit to Intermediate Storage or from the Intermediate Storage to the Final Disposal/Destination	Tons of Bottom Ash Transported to Destination in 2009 (dry weight basis)	How is Bottom Ash Transported to Destination?	Percent Moisture of the Bottom Ash Entering Destination
LANDFILL-1 Other:	1 miles	70980 tons	Truck If other, explain:	24.00% %
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%
Select Other:	miles	tons	Select If other, explain:	%

APPENDIX A

Document 3

Part D – Pond/Impoundment Systems and Other Wastewater Treatment Operations

OMB Control Number: 2040-0281
Approval Expires: 05/31/2013

Plant ID: 02268
Plant Name: Conemaugh

Steam Electric Questionnaire

PART D - POND/IMPOUNDMENT SYSTEMS AND OTHER WASTEWATER TREATMENT OPERATIONS

Table of Contents

Plant ID: 02268
Plant Name: Conemaugh

Part: D
Section Title: 1. Plant Pond/Impoundment Systems and Wastewater Treatment Systems

CBI? ☐ Yes

D1-1. Have you used, do you use, OR do you plan to use (or begin construction/installation of) by December 31, 2020 any *ponds/impoundments* for the storage, treatment, and/or disposal of *process wastewater*, *residues*, or by-products (or *sludges* or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to *fly ash*, *bottom ash*, boiler slag, or flue gas emission control residues?

Note: This includes ponds/impoundments located on non-adjoining property that are under the operational control of the plant.

◉ Yes
○ No

CBI? ☐ Yes

D1-2. Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any wastewater treatment systems, other than pond/impoundment systems, for the treatment of process wastewaters from ash handling or FGD operations?

Note: This includes systems located on non-adjoining property that are under the operational control of the plant.

◉ Yes
○ No

STOP! **If you answered "No" to both Questions D1-1 and D1-2, do NOT complete the remainder of Part D. Skip to the next Questionnaire Part. Otherwise, continue to Part D Section 2.**

Plant ID: 02268
Plant Name: Conemaugh

Part: D
Section Title: 2. Pond/Impoundment System and Wastewater Treatment System Identification

Instructions: Complete Section 2 (Questions D2-1 through D2-7) for *pond/impoundment systems* and/or *wastewater treatment systems* that the plant operates and/or plans to operate (or begin construction/installation of) by December 31, 2020, including those located on non-adjoining property, for the treatment of *process wastewaters* from ash handling or FGD operations. Please provide all free response answers in the highlighted yellow areas.

CBI? ☑ Yes

D2-1. Has the plant been involved with any ash or FGD wastewater treatment studies (pilot- or full-scale), including studies on pond/impoundment systems, since 2000?

◉ Yes (Continue)
○ No (Skip to Question D2-4)

CBI? ☑ Yes

D2-2. Are any of these studies ongoing?

○ Yes
◉ No

CBI? ☑ Yes

D2-3. Was a summary and/or report describing/documenting the pilot- or full-scale study prepared (including internal and published reports)?

◉ Yes (Provide a copy of the summary/report)
○ No (Continue)

Provide a description of the pilot- or full-scale study. Note the types of treatment technologies studied and the analytes measured in influent to and/or effluents from the wastewater treatment system.

• Between November 2004 and February 2005, Applied Bioscience conducted a joint pilot study of the ABMet® system at the Conemaugh Station with Duke Energy and Progress Energy using diluted Conemaugh purge water to evaluate the viability of biological removal of selenium from the FGDS wastewater at native pH. Influent and effluent parameters included pH, ORP, DO, temperature, chloride, sulfate, metals (Se, Hg, As, Be, B, Cu, Pb), TSS and TDS. The pilot study was successful in reducing selenium on the diluted purge water. This technology was not effective for boron and manganese removal.

CBI? ☑ Yes

D2-4. List any ash or FGD wastewater treatment technologies that have been studied by the plant that are not covered by Questions D2-1 through D2-3 (e.g., those that have been studied in bench-scale studies).

- In February of 2000, Radian conducted a Selenium Removal Study using a proprietary chemical. Testing was not successful.
- On March 24, 2003, a bench study to remove selenium from scrubber purge water was conducted by CONEMAUGH using hydrogen peroxide (H2O2). Testing was not successful.
- In September 2004, URS conducted a bench study to remove selenium by lowering the pH to less than 6 and using ferric chloride. Testing was not successful.
- In August and September of 2007, URS conducted bench scale testing of treatment technologies:

CBI? ☐ Yes

D2-5. Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any systems, including those located on non-adjoining property, for the treatment of process wastewaters from ash handling or FGD operations?

◉ Yes (Continue)

○ No (Skip to Section 4.1)

CBI? ☐ Yes

D2-6. Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any pond/impoundment systems, including those located on non-adjoining property, for the treatment of process wastewaters from ash handling or FGD operations?

◉ Yes (Continue)

○ No (Skip to Question D2-7)

List these pond/impoundment systems in Table D-1. For each pond/impoundment system, EPA assigned a number (e.g., POND-1, POND-2) in Table D-1, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each pond/impoundment system. In the "Individual Ponds/Impoundments Included in the Pond System" column, identify all pond/impoundment units from Table A-4 that are included in the pond system.

NOTE: Do NOT include a pond/impoundment unit in Table D-1 if the pond/impoundment unit is or is planned to be part of a broader wastewater treatment system containing *non-pond wastewater treatment units* (e.g., pond/impoundment unit in a biological wastewater treatment system).

Table D-1. Plant Pond/Impoundment Systems

Pond/ Impoundment System ID	Year Initially Brought Online	Plant Designation	Individual Pond/Impoundments (Identified in Table A-4) Included in the Pond/Impoundment System
Active/Inactive/Open Pond/Impoundment Systems			
POND-1	1970	Bottom Ash Final Settling Ponds	☐ SPD - 1 ☑ SPD - 3 ☑ SPD - 5 ☐ SPD - 7 ☑ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☑ SPD - 4 ☑ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-2			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-3			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-4			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-5			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-6			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-7			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-8			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-9			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-10			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14

Retired/Closed Pond/Impoundment Systems			
RET-POND-1	1970	Ash Silo Drainage	☑ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-2			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-3			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-4			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-5			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
Planned Pond/Impoundment Systems			
POND-A			☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D
POND-B			☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D
POND-C			☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D

CBI?
☑ Yes

D2-7. Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any wastewater treatment systems, including those located on non-adjoining property, other than pond/impoundment systems for the treatment of *process wastewaters* from ash handling or FGD operations?

◉ Yes (Continue)

○ No (Skip to Section 3.1)

List these wastewater treatment systems in Table D-2. For each wastewater treatment system, EPA assigned a number (e.g., WWT-1, WWT-2) in Table D-2, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each wastewater treatment system. As an example, if a plant operates a *chemical precipitation* FGD wastewater treatment system that discharges to an ash pond/impoundment system (as shown in EPA example diagrams EPA_D-1 and EPA_D-2 located at the bottom of Part D Section 3.1) the FGD wastewater treatment system should be identified in Table D-2 (e.g., as WWT-1) and the ash pond/impoundment system should have been previously identified in Table D-1 (e.g., as POND-1).

Note that "Approximate Length of Piping from FGD Scrubber System" refers to the length of piping from the *FGD solids separation* overflow storage tank (or *FGD scrubber absorber* if no FGD solids separation) to the beginning of the FGD wastewater treatment system. "Approximate Length of Piping to Subsequent Treatment or Discharge" refers to the length of piping from the end of the FGD wastewater treatment system to either the beginning of the subsequent treatment system or the wastewater discharge point,
as appropriate.

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment System ID or Wastewater Treatment System ID: POND-1

Part: D
Section Title: 3.1. Wastewater Treatment Diagram

Instructions: Complete Section 3.1 (Question D3-1) for each *pond/impoundment system* or *wastewater treatment system* identified in Table D-1 and Table D-2, including planned systems, systems under construction/installation, or planned to be under construction/installation by December 31, 2020. Enter the pond/impoundment system ID or wastewater treatment system ID in the yellow highlighted space provided above (use the pond/impoundment system ID or wastewater treatment system ID assigned in Table D-1 and Table D-2).

Make a copy of Section 3.1 for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2 using the "Copy Section 3.1" button below.

Copy Section 3.1

CBI?
☐ Yes

D3-1. Attach a block diagram that shows the pond/impoundment system or wastewater treatment system operations, the process wastewaters that currently enter or are planned to enter the pond/impoundment system or wastewater treatment system, and the ultimate destinations of the pond/impoundment system or wastewater treatment system effluent(s). Specific instructions for the diagram are provided in the checklist below. The diagram should have a similar level of detail as EPA's example diagrams, EPA_D-1 and EPA_D-2.

NOTE: You may use an existing diagram, such as a water balance diagram included in the plant's NPDES Form 2C, and mark the additional required information on the diagram by hand.

Provide as many diagrams as necessary to convey the information requested in the checklist below. Number each block diagram in the upper right corner; the first block diagram should be numbered D-1, the second D-2, etc. Include the plant name, plant ID, and pond/impoundment system ID or wastewater treatment system ID in the upper right hand corner of the diagram.

☑ Diagram attached.

Block Diagram Checklist

Mark the boxes below to verify that you have completed each checklist item...

- [x] Include the block diagram number, plant name, plant ID, and pond/impoundment system ID or wastewater treatment system ID on the diagram.
- [x] Include each pond/impoundment or wastewater treatment unit operation. Show all influent and effluent streams from the units and label all influent and effluent streams from the pond/impoundment system or wastewater treatment system using the code tables on the "Code Tables" tab provided at the end of this workbook. Note that the "Code Tables" tab provides codes for wastewater treatment units that are operated in series and/or in parallel (e.g., in EPA_D-1, Chemical Precipitation Reaction Tank 1-1 and Chemical Precipitation Reaction Tank 2-1 are in series). Effluent streams may include *process wastewater* and *sludges*.
- [x] If applicable, use EPA-assigned numbers from Part A or B (e.g., FGD-1) to label *process operations*. If a process operation does not have an EPA-assigned number (e.g., boiler, air preheater), use the plant-designated name for the process operation. When sources or destinations are not shown on the diagram (i.e., the stream is entering from a location not shown on the diagram), describe the source or destination and add the block diagram number, when appropriate, where the stream's previous location can be seen. Use codes from the code tables on the "Code Tables" tab provided at the end of this workbook.
- [x] Indicate where chemical addition occurs (i.e., into or between which wastewater treatment units). For pond/impoundment wastewater treatment units, indicate and note on the diagram where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). The chemicals indicated should correspond to the chemicals listed in Table D-7 and Table D-13.
- [x] Identify the final, general destination of the *treated* process wastewater and waste streams (e.g., treated process wastewater effluent to *POTW* or surface waters; solid wastes to on- or off-site destinations). Use codes from code tables on the "Code Tables" tab provided at the end of this workbook, when applicable.
- [x] Indicate, as appropriate, where treated process wastewater is *reused* or *recycled* within the plant (e.g., reuse of settling pond/impoundment water as fly ash sluice).
- [x] Include the average annual (2009) flow rates for influent and effluent streams from the wastewater treatment system on the diagram (in gpm or gpd). For planned pond/impoundment systems and wastewater treatment systems, provide the design flow rates for the system. Note that these should be the same flow rates that are entered into Tables D-3 and D-4 in Questions D3-2 and D3-3. If the actual number of days of operation for 2009 is not known, the total annual flow may be divided by 365 days and a comment added to the Comments page. If the process wastewater stream is intermittent, provide amount and frequency; for example "100 gal, twice/day, 100 dpy" or "1000 gpm, 4 hpd, 365 dpy". For sludges, provide amount in tpd.
- [x] Include *NPDES permit* outfall numbers, if applicable.

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment System ID or Wastewater Treatment System ID: POND-1

Part: D
Section Title: 3.2. Wastewater Treatment Wastewater Flows

Instructions: Complete Section 3.2 (Question D3-2 and D3-3) for each *pond/impoundment system* or *wastewater treatment system* identified in Table D-1 and Table D-2, including planned systems, systems under construction/installation, or planned to be under construction/installation by December 31, 2020. Enter the pond/impoundment system ID or wastewater treatment system ID in the yellow highlighted space provided above (use the pond/impoundment system ID or wastewater treatment system ID assigned in Table D-1 and Table D-2).

Make a copy of Section 3.2 for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2 using the "Copy Section 3.2" button below.

Copy Section 3.2

CBI?
☐ Yes

D3-2. Complete a row in Table D-3 for each *process wastewater* stream or *treated* wastewater stream that enters this pond/impoundment system or wastewater treatment system. For planned pond/impoundment systems and wastewater treatment systems, provide the design flow rates for the system. Use the process and treated wastewater terms provided in the drop down menus. Note that these terms originated from code tables on the "Code Tables" tab provided at the end of this workbook.

Note: The examples in Tables D-3 and D-4 are derived from the EPA examples diagrams, EPA_D-1 and EPA_D-2, provided at the bottom of Part D Section 3.1.

Table D-3. Pond/Impoundment System or Wastewater Treatment System Influent Flows in 2009

Process or Treated Wastewater	Average Annual (2009) Wastewater Flow Rate	Wastewater Treatment Unit ID
Example (from EPA_D-1):		
FGD scrubber purge	200 gpm 10 hpd 365 dpy	Equalization, Primary
Other:	OR gpd dpy	Other:
Example (from EPA_D-2):		
WWT-1 Effluent	175 gpm 24 hpd 365 dpy	Pond Unit - 1
Other:	OR gpd dpy	Other:
Floor drain wastewater	gpm hpd dpy	Pond Unit - 4
Other:	OR 70000 gpd 365 dpy	Other: Pond Unit 5 and Pond Unit 6
Yard drain wastewater	gpm hpd dpy	Pond Unit - 4
Other:	OR 400000 gpd 365 dpy	Other: Pond Unit 5 and Pond Unit 6
Other	gpm hpd dpy	Pond Unit - 4
Other: BAS Dewatering Bin Effluent	OR 9500000 gpd 360 dpy	Other: Pond Unit 5 and Pond Unit 6
Sludge	gpm hpd dpy	Pond Unit - 4
Other:	OR 200000 gpd 300 dpy	Other: Pond Unit 5 and Pond Unit 6
Other	gpm hpd dpy	Pond Unit - 4
Other: Treated SPD-8 Effluent	OR 1800000 gpd 220 dpy	Other: Pond Unit 5 and Pond Unit 6
Cooling tower blowdown	gpm hpd dpy	Pond Unit - 4
Other:	OR 1500000 gpd 145 dpy	Other: Pond Unit 5 and Pond Unit 6
Limestone pile runoff	gpm hpd dpy	Other
Other:	OR 7000 gpd 365 dpy	Other: Ash Recycle Sump
Floor drain wastewater	gpm hpd dpy	Other
Other:	OR 300 gpd 365 dpy	Other: Ash Recycle Sump

Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy	Select Other:

CBI?
☐ Yes

D3-3. Complete a row in Table D-4 for each treated wastewater stream or *sludge* stream that exits this pond/impoundment system or wastewater treatment system (i.e., streams that are *discharged*, *recycled*, or disposed). For planned pond/impoundment systems and wastewater treatment systems, provide the design flow rates for the system. Use the treated wastewater, wastewater treatment unit, and destination terms provided in the drop down menus. Note that these terms originated from code tables on the "Code Tables" tab provided at the end of this workbook.

*Provide the *NPDES permit* outfall number of the effluent in the last column of the table, if applicable.

Table D-4. Pond/Impoundment System or Wastewater Treatment System Effluent Flows in 2009

Treated Wastewater	Average Annual (2009) Wastewater Flow Rate	Solids and Sludge: Amount (tpd or gpm)		Solids and Sludge: % Moisture	Wastewater Treatment Unit ID	Final Destination: Destination	NPDES Permit Outfall Number*
Example (from EPA_D-1): Effluent - 1 Other:	175 gpm 24 hpd 365 dpy OR NA gpd NA dpy	NA	○ tpd ○ gpm	NA	NA Other:	POND-1 Other:	NA
Example (from EPA_D-1): Filter backwash Other:	NA gpm NA hpd NA dpy OR 10,000 gpd 365 dpy	NA	○ tpd ○ gpm	NA	Equalization, Secondary Other:	NA Other:	NA
Example (from EPA_D-2): Sludge Other:	NA gpm NA hpd NA dpy OR NA gpd NA dpy	500	● tpd ○ gpm	30	NA Other:	Hauled off site for reuse (removal fee) Other:	NA
Example (from EPA_D-2): Effluent - 2 Other:	5,000 gpm 24 hpd 365 dpy OR NA gpd NA dpy	NA	○ tpd ○ gpm	NA	NA Other:	Reuse as fly ash sluice Other:	NA
Example (from EPA_D-2): Effluent - 3 Other:	1,175 gpm 24 hpd 365 dpy OR gpd dpy	NA	○ tpd ○ gpm	NA	NA Other:	Discharge to surface water Other:	001
Effluent - 1 Other:	gpm hpd dpy OR 10000000 gpd 360 dpy		○ tpd ○ gpm		NA Other:	Reuse as bottom ash sluice Other:	
Effluent - 2 Other:	gpm hpd dpy OR 823000 gpd 360 dpy		○ tpd ○ gpm		Pond Unit - 1 Other:	Reuse as FGD absorber makeup Other: or Discharge to SW	004
Sludge Other:	gpm hpd dpy OR gpd dpy	29	● tpd ○ gpm	20.00%	NA Other:	On-site company owned landfill Other:	NA
Sludge Other:	gpm hpd dpy OR gpd dpy	0.12	● tpd ○ gpm	20.00%	NA Other:	On-site company owned landfill Other:	NA
Select Other:	gpm hpd dpy OR gpd dpy		○ tpd ○ gpm		Select Other:	Select Other:	
Select Other:	gpm hpd dpy OR gpd dpy		○ tpd ○ gpm		Select Other:	Select Other:	
Select Other:	gpm hpd dpy OR gpd dpy		○ tpd ○ gpm		Select Other:	Select Other:	
Select Other:	gpm hpd dpy OR gpd dpy		○ tpd ○ gpm		Select Other:	Select Other:	
Select Other:	gpm hpd dpy OR gpd dpy		○ tpd ○ gpm		Select Other:	Select Other:	

Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	
Select Other:	___ gpm ___ hpd ___ dpy OR ___ gpd ___ dpy		O tpd O gpm		Select Other:	Select Other:	

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment Unit ID: Pond Unit-3

Part: D
Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information

Instructions: Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open *pond/impoundment* unit used OR planned to be used (or constructed/installed), including those located on non-adjoining property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, *residues*, or by-products (or *sludges* or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?
☐ Yes

D4-2. Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

11 Residence time, hours (as currently operated)

30 Life of pond/impoundment unit, years (based on current estimation)

1 Number of cells in pond/impoundment unit

CBI?
☐ Yes

D4-3. Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

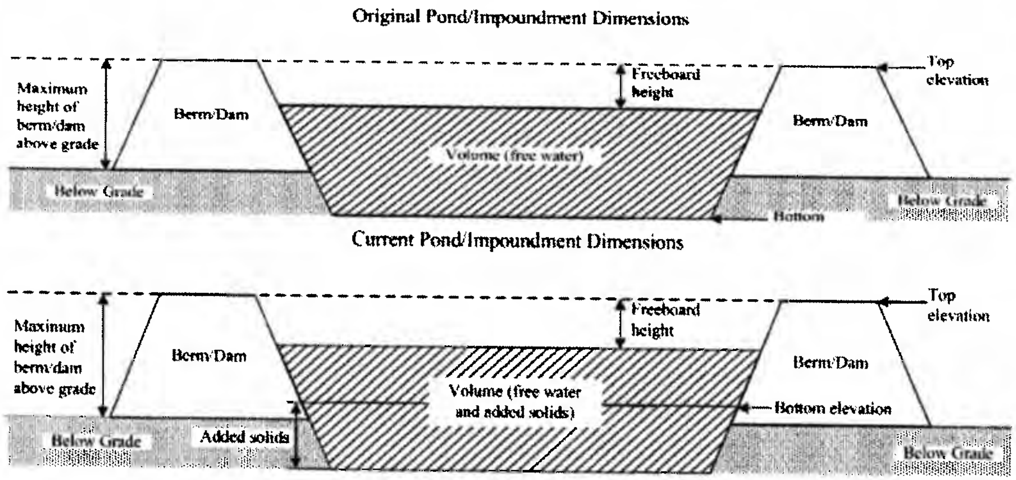


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	270000	270000	270000
Surface area, ft^2	36450	36450	36450
Bottom elevation, ft	1084.6	1084.6	1084.6
Top elevation, ft	1092	1092	1092
Freeboard height, ft	2	2	2
Maximum height of berms/dams above grade, ft	13	13	13
Total solids placed in the pond/impoundment, tons		0	0
Expected year of closure/retirement			2040

CBI?
☐ Yes

D4-4. Does the pond/impoundment unit have a *liner*?

● Yes (Complete Table D-6)
○ No (Skip to Question D4-5)
○ NA (Pond/Impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from inner to outer layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	● Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)	61	0.0000001
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI?
☐ Yes

D4-5. Has the pond/impoundment unit ever been dredged?

● Yes (Provide following Information)

2008 Year of last dredging
4 Frequency of dredging that year, dpy
220 Amount of material removed that year, tons
1 Number of times dredged in the last five years
4 Number of days dredged in the last five years
220 Amount of material removed in the last five years, tons

○ No (Skip to Question D4-7)
○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

- ○ Dredged solids used in embankment construction.
- ● Dredged solids transferred to landfill.
- ○ Dredged solids marketed/sold for reuse.
- ○ Other (Explain): ____________

CBI? ☐ Yes

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

- ○ Yes (Continue)
- ● No (Skip to Question D4-10)
- ○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-8. Identify the type of expansion.

- ○ Lateral expansion
- ○ Vertical expansion
- ○ Both lateral and vertical expansion

CBI? ☐ Yes

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

____

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

$____________ Total cost of expansion

CBI? ☐ Yes

D4-10. Indicate the *pollutants* targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

- ☐ Metals (specify): ____________
- ☐ TSS
- ☐ Nitrogen compounds (ammonia, nitrate, nitrite)
- ☐ Organic Acids
- ☐ Chlorine or other oxidizing agents
- ☐ Oil and grease
- ☐ Other: ____________
- ☑ NA (Skip to Question D4-12)

CBI?
☐ Yes

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: ____________________
Limitation: ____________________ Select ▼
Pollutant: ____________________
Limitation: ____________________ Select ▼
Pollutant: ____________________
Limitation: ____________________ Select ▼

CBI?
☐ Yes

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

- ○ Yes (Complete Table D-7)
- ● No (Skip to Section 4.2)
- ○ NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)			Frequency of Addition (dpy)
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment Unit ID: Pond Unit-4

Part: D
Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information

Instructions: Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open *pond/impoundment* unit used OR planned to be used (or constructed/installed), including those located on non-adjoining property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, *residues*, or by-products (or *sludges* or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI? ☐ Yes

D4-1. Do you use OR plan to use (or begin construction/installation of) by December 31, 2020, any active/inactive/open ponds/impoundments, including those located on non-adjoining property, for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues?

● Yes (Continue)
○ No (Skip to Section 4.2)

Copy Section 4.1

CBI? ☐ Yes

D4-2. Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

11 Residence time, hours (as currently operated)
30 Life of pond/impoundment unit, years (based on current estimation)
1 Number of cells in pond/impoundment unit

CBI? ☐ Yes

D4-3. Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

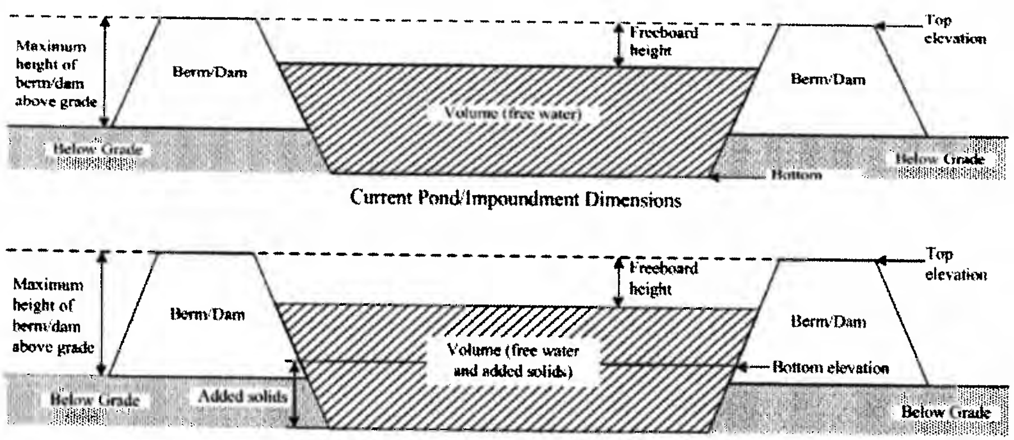


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	270000	270000	270000
Surface area, ft^2	36450	36450	36450
Bottom elevation, ft	1084.6	1084.6	1084.6
Top elevation, ft	1092	1092	1092
Freeboard height, ft	2	2	2
Maximum height of berms/dams above grade, ft	13	13	13
Total solids placed in the pond/impoundment, tons		0	0
Expected year of closure/retirement			2040

CBI?
☐ Yes

D4-4. Does the pond/impoundment unit have a *liner*?

● Yes (Complete Table D-6)
○ No (Skip to Question D4-5)
○ NA (Pond/Impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from inner to outer layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	● Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)	61	0.0000001
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI?
☐ Yes

D4-5. Has the pond/impoundment unit ever been dredged?

● Yes (Provide following information)

2010 Year of last dredging
1 Frequency of dredging that year, dpy
5135 Amount of material removed that year, tons
7 Number of times dredged in the last five years
35 Number of days dredged in the last five years
35000 Amount of material removed in the last five years, tons

○ No (Skip to Question D4-7)
○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

- ○ Dredged solids used in embankment construction.
- ● Dredged solids transferred to landfill.
- ○ Dredged solids marketed/sold for reuse.
- ○ Other (Explain): ____________

CBI? ☐ Yes

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

- ○ Yes (Continue)
- ● No (Skip to Question D4-10)
- ○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-8. Identify the type of expansion.

- ○ Lateral expansion
- ○ Vertical expansion
- ○ Both lateral and vertical expansion

CBI? ☐ Yes

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

____

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

$____________ Total cost of expansion

CBI? ☐ Yes

D4-10. Indicate the *pollutants* targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

- ☐ Metals (specify): ____________
- ☑ TSS
- ☐ Nitrogen compounds (ammonia, nitrate, nitrite)
- ☐ Organic Acids
- ☐ Chlorine or other oxidizing agents
- ☑ Oil and grease
- ☑ Other: pH
- ☐ NA (Skip to Question D4-12)

CBI?
☐ Yes

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS
Limitation: 30 mg/L
Pollutant: Oil and Grease
Limitation: 15 mg/L
Pollutant: pH
Limitation: ______ Select

CBI?
☐ Yes

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

● Yes (Complete Table D-7)
○ No (Skip to Section 4.2)
○ NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)			Frequency of Addition (dpy)
Hydrated Lime	Hydrated Lime	Graymont	pH adjustment	inlet distribution box	0.003	100	○ gpd ● lb/day	● Solid ○ Liquid	365
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment Unit ID: Pond Unit 5

Part: D
Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information

Instructions: Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open *pond/impoundment* unit used OR planned to be used (or constructed/installed), including those located on non-adjoining property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, *residues*, or by-products (or *sludges* or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?
☐ Yes

D4-2. Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

11 ____ Residence time, hours (as currently operated)

30 ____ Life of pond/impoundment unit, years (based on current estimation)

1 ____ Number of cells in pond/impoundment unit

CBI?
☐ Yes

D4-3. Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

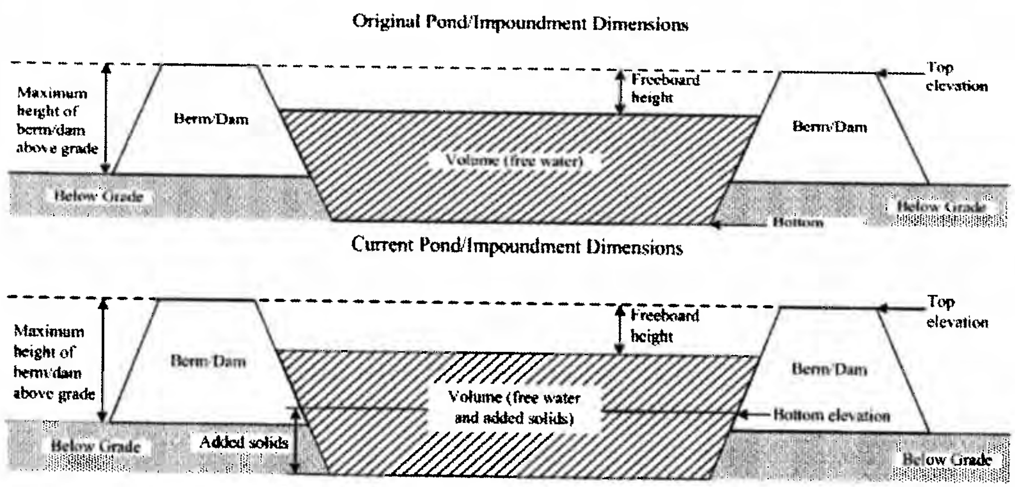


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	270000	270000	270000
Surface area, ft^2	36450	36450	36450
Bottom elevation, ft	1084.6	1084.6	1084.6
Top elevation, ft	1092	1092	1092
Freeboard height, ft	2	2	2
Maximum height of berms/dams above grade, ft	13	13	13
Total solids placed in the pond/impoundment, tons		0	0
Expected year of closure/retirement			2040

CBI?
☐ Yes

D4-4. Does the pond/impoundment unit have a *liner*?

● Yes (Complete Table D-6)
○ No (Skip to Question D4-5)
○ NA (Pond/Impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from inner to outer layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	● Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)	61	0.0000001
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI?
☐ Yes

D4-5. Has the pond/impoundment unit ever been dredged?

○ Yes (Provide following information)

2010 Year of last dredging
1 Frequency of dredging that year, dpy
3610 Amount of material removed that year, tons
7 Number of times dredged in the last five years
35 Number of days dredged in the last five years
30000 Amount of material removed in the last five years, tons

○ No (Skip to Question D4-7)
○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

- ○ Dredged solids used in embankment construction.
- ● Dredged solids transferred to landfill.
- ○ Dredged solids marketed/sold for reuse.
- ○ Other (Explain): ____________________

CBI? ☐ Yes

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

- ○ Yes (Continue)
- ● No (Skip to Question D4-10)
- ○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI? ☐ Yes

D4-8. Identify the type of expansion.

- ○ Lateral expansion
- ○ Vertical expansion
- ○ Both lateral and vertical expansion

CBI? ☐ Yes

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

____

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

$ ____________________ Total cost of expansion

CBI? ☐ Yes

D4-10. Indicate the *pollutants* targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

- ☐ Metals (specify): ____________________
- ☑ TSS
- ☐ Nitrogen compounds (ammonia, nitrate, nitrite)
- ☐ Organic Acids
- ☐ Chlorine or other oxidizing agents
- ☑ Oil and grease
- ☑ Other: pH
- ☐ NA (Skip to Question D4-12)

CBI?
☐ Yes

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS
Limitation: 30 mg/L
Pollutant: Oil and Grease
Limitation: 15 mg/L
Pollutant: pH
Limitation: ______ Select

CBI?
☐ Yes

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

- ● Yes (Complete Table D-7)
- ○ No (Skip to Section 4.2)
- ○ NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)			Frequency of Addition (dpy)
Hydrated Lime	Hydrated Lime	Graymont	pH adjustment	inlet distribution box	0.003	100	○ gpd ● lb/day	○ Solid ○ Liquid	365
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 02268
Plant Name: Conemaugh
Pond/Impoundment Unit ID: Pond Unit-6

Part: D
Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information

Instructions: Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open *pond/impoundment* unit used OR planned to be used (or constructed/installed), including those located on non-adjoining property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, *residues*, or by-products (or *sludges* or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?
☐ Yes

D4-2. Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

11 Residence time, hours (as currently operated)

30 Life of pond/impoundment unit, years (based on current estimation)

1 Number of cells in pond/impoundment unit

CBI?
☐ Yes

D4-3. Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

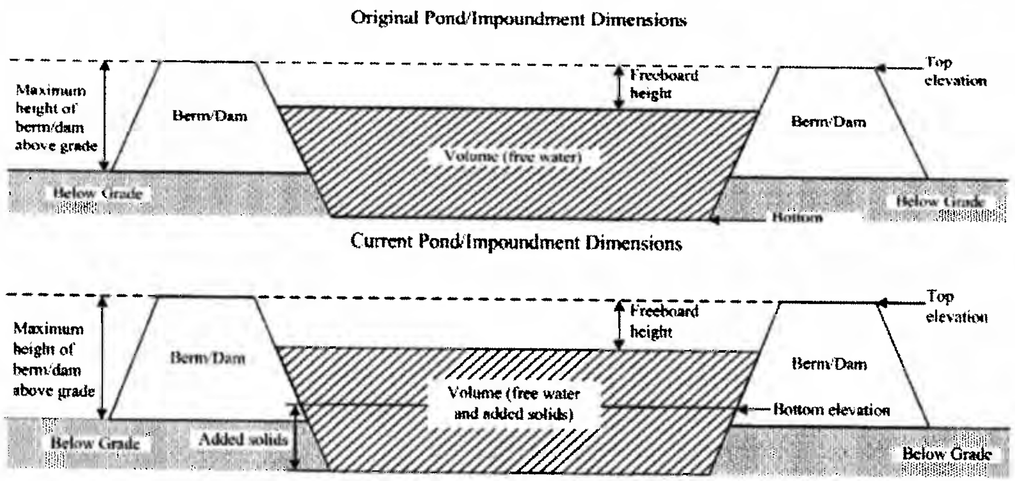


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	270000	270000	270000
Surface area, ft^2	36450	36450	36450
Bottom elevation, ft	1084.6	1084.6	1084.6
Top elevation, ft	1092	1092	1092
Freeboard height, ft	2	2	2
Maximum height of berms/dams above grade, ft	13	13	13
Total solids placed in the pond/impoundment, tons		0	0
Expected year of closure/retirement			2040

CBI?
☐ Yes

D4-4. Does the pond/impoundment unit have a *liner*?

● Yes (Complete Table D-6)
○ No (Skip to Question D4-5)
○ NA (Pond/Impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from inner to outer layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	● Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)	61	0.0000001
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI?
☐ Yes

D4-5. Has the pond/impoundment unit ever been dredged?

● Yes (Provide following information)

2010 Year of last dredging
1 Frequency of dredging that year, dpy
3523 Amount of material removed that year, tons
7 Number of times dredged in the last five years
35 Number of days dredged in the last five years
30000 Amount of material removed in the last five years, tons

○ No (Skip to Question D4-7)
○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI?
☐ Yes

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

- ○ Dredged solids used in embankment construction.
- ● Dredged solids transferred to landfill.
- ○ Dredged solids marketed/sold for reuse.
- ○ Other (Explain): ____________

CBI?
☐ Yes

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

- ○ Yes (Continue)
- ● No (Skip to Question D4-10)
- ○ NA (Pond/Impoundment is planned to be constructed. Skip to Question D4-10)

CBI?
☐ Yes

D4-8. Identify the type of expansion.

- ○ Lateral expansion
- ○ Vertical expansion
- ○ Both lateral and vertical expansion

CBI?
☐ Yes

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

____

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

$ ____________ Total cost of expansion

CBI?
☐ Yes

D4-10. Indicate the *pollutants* targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

- ☐ Metals (specify): ____________
- ☑ TSS
- ☐ Nitrogen compounds (ammonia, nitrate, nitrite)
- ☐ Organic Acids
- ☐ Chlorine or other oxidizing agents
- ☑ Oil and grease
- ☑ Other: pH
- ☐ NA (Skip to Question D4-12)

CBI?
☐ Yes

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS
Limitation: 30 mg/L
Pollutant: Oil and Grease
Limitation: 15 mg/L
Pollutant: pH
Limitation: Select

CBI?
☐ Yes

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

- ● Yes (Complete Table D-7)
- ○ No (Skip to Section 4.2)
- ○ NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)			Frequency of Addition (dpy)
Hydrated Lime	Hydrated Lime	Graymont	pH adjustment	inlet distribution box	0.003	100	○ gpd ● lb/day	● Solid ○ Liquid	365
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 02268
Plant Name: Conemaugh

Part: D
Section Title: Part D Comments

Instructions: Cross reference your comments by question number and indicate the confidential status of your comment by checking the box next to "Yes" under "CBI?" (Confidential Business Information).

CBI?	Question Number	Comments
☐ Yes	D2-6	Note that SPD-1, SPD-2, and SPD-7 through SPD-12 are not associated with FGD or Ash Handling systems and are, therefore, not included in Table D-1 or D-2 as described by Steamhelp (ERG) in an e-mail to us on August 16, 2010.
☑ Yes	D2-7	An upgrade to WWT-1 and WWT-2 is under consideration at this time. However, a final desicion has not been made as of October 15, 2010. The upgrade may include either the addition of an anoxic biological reactor for selenium removal and resin system for boron removal or replacement of WWT-1 and WWT-2 with a zero liquid discharge system consisting of brine concentrators and ash blending of the concentrate.
☐ Yes	D4-5	For Pond Units 4, 5, and 6, the number of days dredged in the last 5 years and the amount removed are estimated values.
☑ Yes	D5-2, D5-10 & D5-11	An upgrade to WWT-1 and WWT-2 is under consideration at this time. However, a final desicion has not been made as of October 15, 2010. The upgrade may include either the addition of an anoxic biological reactor for selenium removal and resin system for boron removal or replacement of WWT-1 and WWT-2 with a zero liquid discharge system consisting of brine concentrators and ash blending of the concentrate.
☐ Yes	D3-3 WWT-2 Table D-4	Flow rates for Effluents 2 through 4 are not measured and are rough estimates based on pump capacities and runtimes.
☐ Yes	D4-3	Pond Units 3, 4, 5 and 6 are dredged routinely to maintain solids storage capacity. For Pond Units 4, 5 and 6, solids accumulate from the bottom elevation at a rate of 1 to 2 feet per quarter. Upon closure of each pond, all solids will be removed.
☑ Yes	D5-10	Bid proposals from Siemens and Infilco Degremont (IDI) to upgrade the WWT-1 System were received for this proposed work, but were prepared at the request of Counsel and is privileged and confidential and are not included in this submittal. Both proposal included alternatives for the reduction of selenium via an anoxic system and the reduction of boron using precipitation and/or resins systems. The proposal from IDI was selected as the better of the two
☐ Yes		
☐ Yes		
☐ Yes		
☐ Yes		
☐ Yes		

Steam Electric Questionnaire Code Tables

Process Wastewaters	
For Use in Tables and Questions throughout Parts A, B, C, D, and F.	
Air heater cleaning water	AHCW
Ash pile runoff	APR
Boiler blowdown	BB
Boiler fireside cleaning water	BFCW
Boiler tube cleaning water	BTCW
Bottom ash sluice	BAS
Carbon capture wastewater	CCAPW
Coal pile runoff	CPR
Combined ash sluice	CAS
Combustion turbine cleaning (combustion gas portion of turbine) water	COMBCW
Combustion turbine cleaning (compressor portion of the turbine) water	COMPRCW
Combustion turbine evaporative coolers blowdown	TECB
Cooling tower blowdown	CTB
FGD scrubber purge	SCRBP
FGD slurry blowdown	FGDB
Filter Backwash	FLTBW
Floor drain wastewater	FDW
Flue gas mercury control system wastewater	FGMCW
Fly ash sluice	FAS
General runoff	GR
Gypsum pile runoff	GPR
Gypsum wash water	GYPWW
Ion exchange wastewater	IXW
Landfill runoff - capped landfill	LRC
Landfill runoff - uncapped landfill	LRUC
Leachate	LEACH
Limestone pile runoff	LPR
Mill reject sluice	MRS

Treated Wastewaters	
For Use as Effluents from Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-4.	
Effluent - 1	EFF-1
Effluent - 2	EFF-2
Effluent - 3	EFF-3
Effluent - 4	EFF-4
Effluent - 5	EFF-5
Effluent - 6	EFF-6
Filter backwash	FltBW
Sludge	SLDG
For Use as Influents to Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-3, AND Recycled Waters Throughout Questionnaire.	
POND-1 Effluent	POND-1-EFF
POND-2 Effluent	POND-2-EFF
POND-3 Effluent	POND-3-EFF
POND-4 Effluent	POND-4-EFF
POND-5 Effluent	POND-5-EFF
POND-6 Effluent	POND-6-EFF
POND-7 Effluent	POND-7-EFF
POND-8 Effluent	POND-8-EFF
POND-9 Effluent	POND-9-EFF
POND-10 Effluent	POND-10-EFF
POND-A Effluent	POND-A-EFF
POND-B Effluent	POND-B-EFF
POND-C Effluent	POND-C-EFF
WWT-1 Effluent	WWT-1-EFF
WWT-2 Effluent	WWT-2-EFF
WWT-3 Effluent	WWT-3-EFF
WWT-4 Effluent	WWT-4-EFF
WWT-5 Effluent	WWT-5-EFF

Steam Electric Questionnaire Code Tables

Process Wastewaters	
For Use in Tables and Questions throughout Parts A, B, C, D, and F.	
Once -through cooling water	CW
Reverse osmosis reject water	RORW
SCR catalyst regeneration wastewater	SCRRW
SCR catalyst washing wastewater	SCRWW
Soot blowing wash water	SOOTW
Steam turbine cleaning water	STCW
Yard drain wastewater	YARDW

Treated Wastewaters	
For Use as Influents to Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-3, AND Recycled Waters Throughout Questionnaire.	
WWT-6 Effluent	WWT-6-EFF
WWT-A Effluent	WWT-A-EFF
WWT-B Effluent	WWT-B-EFF
WWT-C Effluent	WWT-C-EFF

Steam Electric Questionnaire Code Tables

Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Adsorptive media	ADSORB
Aerobic Biological Reactor	AERBIO
Anaerobic Biological Reactor	ANBIO
Aerobic/Anaerobic Biological Reactor	AER/ANBIO
Chemical Precipitation Reaction Tank 1 - 1	CP-1-1
Chemical Precipitation Reaction Tank 1 - 2	CP-1-2
Chemical Precipitation Reaction Tank 2 - 1	CP-2-1
Chemical Precipitation Reaction Tank 2 - 2	CP-2-2
Chemical Precipitation Reaction Tank 3 - 1	CP-3-1
Chemical Precipitation Reaction Tank 3 - 2	CP-3-2
Clarification, Primary - 1	CL-P-1
Clarification, Primary - 2	CL-P-2
Clarification, Secondary - 1	CL-S-1
Clarification, Secondary - 2	CL-S-2
Clarification, Tertiary - 1	CL-T-1
Clarification, Tertiary - 2	CL-T-2
Constructed wetland - Cell 1	CWL -1
Constructed wetland - Cell 2	CWL -2
Constructed wetland - Cell 3	CWL -3
Constructed wetland - Cell 4	CWL -4
Constructed wetland - Cell 5	CWL -5
Constructed wetland - Cell 6	CWL -6
Constructed wetland system	CWTS
Equalization, Primary	EQ-P
Equalization, Secondary	EQ-S
Filter, Microfiltration - 1	FLT-M-1
Filter, Microfiltration - 2	FLT-M-2

Destinations	
For Use in Tables and Questions Throughout Parts A, C, D, and F.	
Burned on site	BURN
Deep-well injection	DWELL
Discharge to POTW	POTW
Discharge to PrOTW	PrOTW
Discharge to surface water	SW
Evaporation	EVAP
Hauled off site for reuse (removal fee)	HAULR - RF
Hauled off site for reuse (given away)	HAULR - GA
Hauled off site for reuse (marketed and sold)	SOLD
Hauled off site for disposal	HAUL
Mixed with fly ash for disposal	MFA
On-site landfill (as reported in Table A-6)	LANDF
POND-1	POND-1
POND-2	POND-2
POND-3	POND-3
POND-4	POND-4
POND-5	POND-5
POND-6	POND-6
POND-7	POND-7
POND-8	POND-8
POND-9	POND-9
POND-10	POND-10
POND-A	POND-A
POND-B	POND-B
POND-C	POND-C
WWT-1	WWT-1
WWT-2	WWT-2

Steam Electric Questionnaire Code Tables

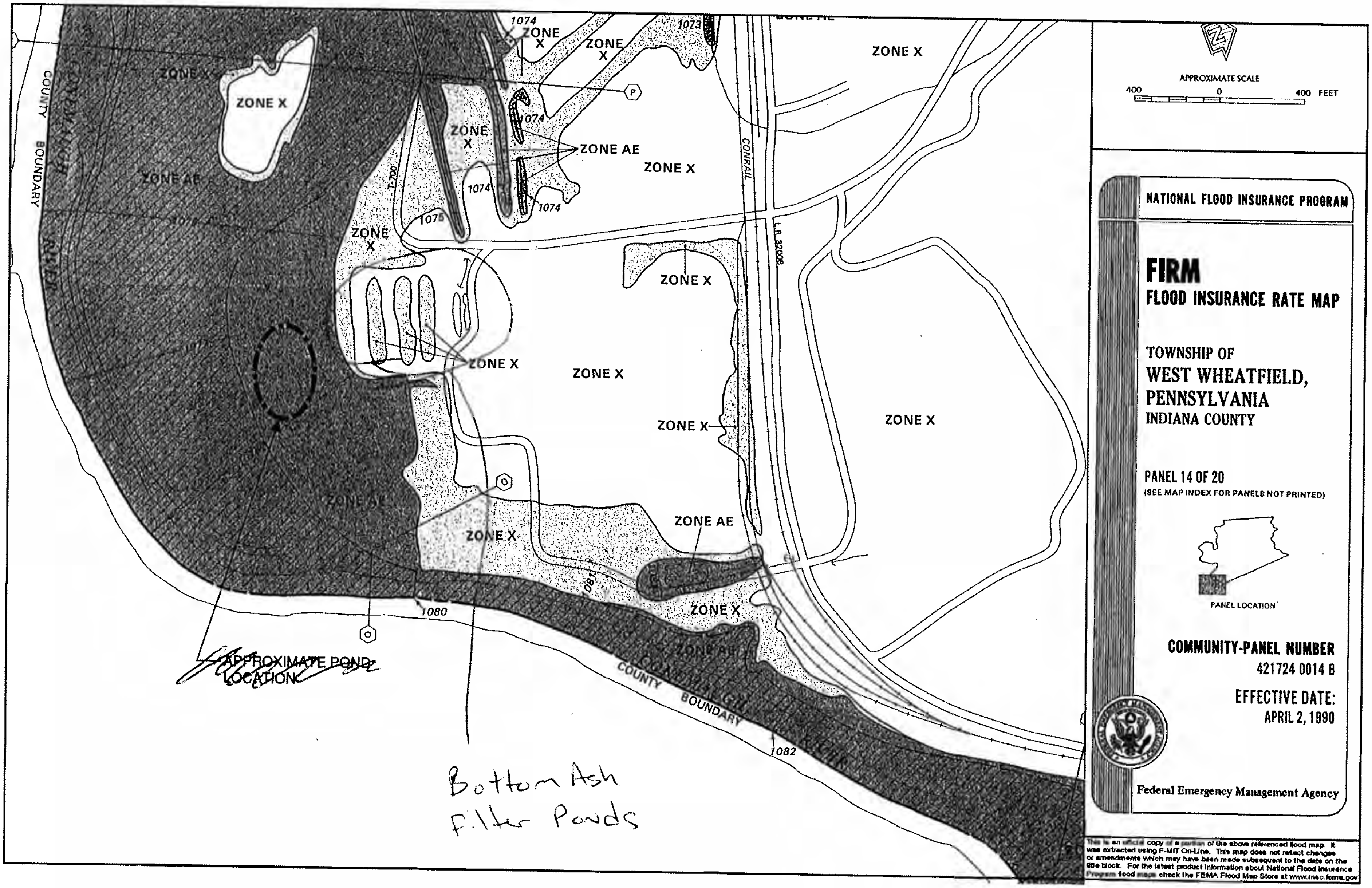
Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Filter, Microfiltration - 3	FLT-M-3
Filter, Microfiltration - 4	FLT-M-4
Filter, Sand/Gravity - 1	FLT-S-1
Filter, Sand/Gravity - 2	FLT-S-2
Filter, Sand/Gravity - 3	FLT-S-3
Filter, Sand/Gravity - 4	FLT-S-4
Filter, Ultrafiltration - 1	FLT-U-1
Filter, Ultrafiltration - 2	FLT-U-2
Filter, Ultrafiltration - 3	FLT-U-3
Filter, Ultrafiltration - 4	FLT-U-4
Filter press - 1	FP-1
Filter press - 2	FP-2
Holding tank	HT
Ion exchange	IX
Natural wetlands	NW
pH adjustment - 1	PH-1
pH adjustment - 2	PH-2
pH adjustment - 3	PH-3
Reverse osmosis	ROS
Pond Unit - 1	SPD-1
Pond Unit - 2	SPD-2
Pond Unit - 3	SPD-3
Pond Unit - 4	SPD-4
Pond Unit - 5	SPD-5
Pond Unit - 6	SPD-6
Pond Unit - 7	SPD-7
Pond Unit - 8	SPD-8
Pond Unit - 9	SPD-9

Destinations	
For Use in Tables and Questions Throughout Parts A, C, D, and F.	
WWT-3	WWT-3
WWT-4	WWT-4
WWT-5	WWT-5
WWT-6	WWT-6
WWT-A	WWT-A
WWT-B	WWT-B
WWT-C	WWT-C
Reuse as boiler water	RECYC - BW
Reuse as bottom ash sluice	RECYC - BAS
Reuse as combined ash sluice	RECYC - CAS
Reuse as FGD slurry preparation water	RECYC - FGDP
Reuse as FGD absorber makeup	RECYC - FGDAB
Reuse as fly ash sluice	RECYC - FAS
Reuse as mill reject sluice	RECYC - MRS
Reuse in cooling towers	RECYC - CW

Steam Electric Questionnaire Code Tables

Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Pond Unit - 10	SPD-10
Pond Unit - 11	SPD-11
Pond Unit - 12	SPD-12
Pond Unit - 13	SPD-13
Pond Unit - 14	SPD-14
Settling tank - 1	ST-1
Settling tank - 2	ST-2
Settling tank - 3	ST-3
Settling tank - 4	ST-4
Settling tank - 5	ST-5
Thickener - 1	TH-1
Thickener - 2	TH-2
Vacuum drum filter - 1	VF-1
Vacuum drum filter - 2	VF-2
Vacuum filter belt - 1	VFB-1
Vacuum filter belt - 2	VFB-2

Solids Handling	
For Use as Planned Solids Handling for the FGD Slurry Blowdown in Part B Table B-2.	
Centrifuge - 1	CENT-1
Centrifuge - 2	CENT-2
Centrifuge - 3	CENT-3
Centrifuge - 4	CENT-4
Hydrocyclones - 1	HYC-1
Hydrocyclones - 2	HYC-2
Hydrocyclones - 3	HYC-3
Hydrocyclones - 4	HYC-4
Filter press - 1	FP-1
Filter press - 2	FP-2
Thickener - 1	TH-1
Thickener - 2	TH-2
Vacuum drum filter - 1	VF-1
Vacuum drum filter - 2	VF-2
Vacuum filter belt - 1	VFB-1
Vacuum filter belt - 2	VFB-2


NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
TOWNSHIP OF
WEST WHEATFIELD,
PENNSYLVANIA
INDIANA COUNTY
PANEL 14 OF 20
(SEE MAP INDEX FOR PANELS NOT PRINTED)
PANEL LOCATION
COMMUNITY-PANEL NUMBER
421724 0014 B
EFFECTIVE DATE:
APRIL 2, 1990
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
APPROXIMATE SCALE
400 0 400 FEET
ZONE X
ZONE AE
CONRAIL
L.R. 32008
CONEMAUGH RIVER
COUNTY BOUNDARY
1073
1074
1075
1080
1082
APPROXIMATE POND LOCATION
Bottom Ash Filter Ponds

Conemaugh Generating Station
Approximately Property Boundary

APPENDIX A

Document 4

System Description "Ash Water Recycle" Conemaugh Station

Raytheon Engineers & Constructors, Inc.

Atlanta Regional Office

FOR: PENNSYLVANIA ELECTRIC COMPANY
GENERATION DIVISION DESIGN ENGINEERING
JOHNSTOWN, PENNSYLVANIA

SYSTEM DESCRIPTION

TITLE: ASH WATER RECYCLE

NUMBER: SD46 Revision 0

STATION: Conemaugh **PROJ. NO.:** 421026 **W.O. SERIAL:** 61188

ORIGINATOR: RE&C/Atlanta **DATE:** May 5, 1995

Raytheon Engineers and Constructors, Inc.

Prepared By:	Cindy K Khalaf	Date:	5/5/95
Reviewed By:	[signature]	Date:	5/8/95
Approved By:	John Stehly	Date:	5/8/95

PENELEC REVIEW

Project Engr.	Date
[signature]	5-17-95

Support Reviews:

Name	Date	Name	Date

SYSTEM DESCRIPTION

ASH WATER RECYCLE

CONEMAUGH STATION

Revision 0

ASH WATER RECYCLE
SYSTEM DESCRIPTION
TABLE OF EFFECTIVE PAGES

Page	Date	Rev.
i	05/05/95	0
ii	05/05/95	0
1	05/05/95	0
2	05/05/95	0
3	05/05/95	0
4	05/05/95	0
5	05/05/95	0
6	05/05/95	0
7	05/05/95	0
8	05/05/95	0
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18	05/05/95	0
19	05/05/95	0
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23	05/05/95	0
24	05/05/95	0

TABLE OF CONTENTS

46.1.0 INTRODUCTION

The handling of bottom ash requires a large quantity of water. The Ash Water Recycle System recovers as much of this ash water as possible, as well as non-hazardous waste water from other locations. This recycled ash water is returned to the bottom ash handling system forming a closed system. No ash water is routinely discharged out of the closed system. This system description describes the collection and distribution of this water.

46.2.0 FUNCTION

The ash water recycle system supplies water to the following ash handling system users:

1) Units 1 and 2 Bottom Ash Sluice Pumps

2) Units 1 and 2 Bottom Ash Hopper Refractory Cooling Water Supply Header

The ash water storage ponds are used to settle ash particles carried over from the dewatering bins during ash sluicing. These ponds are also used as storage when a dewatering bin is drained or filled. Additional information concerning the bottom ash handling system is contained in SD-32, Bottom Ash System Description.

The ash water filter ponds are used to settle the sludge generated by the Plate Separator, sometimes referred to as the Intake Clarifier. The plate separator treats river water for use as cooling tower makeup. Additional information on this system can be found in SD-01, Cooling Tower Makeup System Description.

The ash water filter ponds also collect waste water from miscellaneous sumps as described below.

46.3.0 DESCRIPTION

46.3.1 Overview

The complete ash water recycle system is shown on sketch 1942-SK-M-175. Design flow diagrams for the system are B-352-4317, Ash Water Recycle System, and C-739-203, Waste Neutralizing Systems. The system consists of the following major components:

a) Four (4) Ash Filter Ponds, sometimes referred to as Ash Storage Ponds

b) One (1) Ash Water Recycle Sump

c) Three (3) Ash Water Recycle Pumps

d) Two (2) Ash Water Recycle Sump Level Control Pumps

46.3.2 Detailed Description

The Ash Water Recycle System is common to both Units 1 and 2.

During bottom ash sluicing, water is drained from the ash water storage ponds via an overflow weir into the ash water recycle sump and pumped to the suction of the high pressure, bottom ash sluice pumps, which provide water to the bottom ash hoppers.

Bottom ash is transferred from the hoppers to the dewatering bins. In the bins, ash settles and water overflows to two of the four ash storage ponds.

Water from the ponds is drained to manhole No. 4 which contains a weir. The overflow weir discharges to the ash recycle water sump.

During normal operation, two ponds are valved to settle ash particles carried over from the dewatering bins; one pond is valved for storage of ash water that is drained from a dewatering bin during ash truck loading; and the remaining pond is valved out of service for cleaning or maintenance.

The ash water recycle sump contains three ash recycle pumps, one per Unit and one spare. These sump pumps provide water to both Units' bottom ash sluice pumps as described above and to both Units' bottom ash hopper refractory cooling water supply headers.

The ash water recycle sump also contains two level control pumps, one operating and one spare. These pumps are used to transfer excess water to the cooling tower desilting basin for temporary storage and use as makeup water to the FGDS.

Water can enter the ash water filter ponds from a variety of sources, including the following:

a) Ash Valley Water Transfer Pumps*

b) Limestone Pile Runoff Pumps*

c) Floodwater Backup Valve Box Sump

d) Plate Separator (Intake Clarifier) Sludge Pumps

e) Desilting Basin Pumps*

f) Ash Silo Area Drainage Pumps*

g) Dewatering Bins Drains

h) Ash Recycle Pumps minimum flow

i) Air Preheating Water (Circulating Water)

j) FGDS Service Building Collection Sump Pumps*

k) FGDS Start-Up/Standby Transformer Collection Sump Pumps*

A description of the miscellaneous sumps notated with an asterisk (*) is located in SD-47, Miscellaneous Sumps and Pump Stations System Description.

If an empty ash filter pond is being put in service or if insufficient makeup is provided from plant drains or rainfall, water must be supplied from other sources: either from the Ash Valley Water Transfer Sump or from Air Preheating Water, both via normally closed plug valves to each pond.

Items c through g above enter the Ash Water Storage Ponds via an Ash Filter Pond Receiver Box. Flow from the receiver box may be directed to any of the four ponds by use of slide gates dedicated to each pond.

The Ash Recycle Pumps continuously recirculate the minimum flow required by the pump manufacturer to prevent pump overheating. Recirculation occurs to the two ponds normally dedicated to ash water storage service, pond Nos. 1 and 2, via a flow restricting orifice.

Waste water also enters the system from two other sources. The FGDS Service Building Floor Drains Collection Sump and the FGDS Start-up/Stand-by Transformer Rainfall Collection Sump discharge to manhole No. 4 via the Area 3 Oil/Water Separator. Additional information concerning these sumps is located in SD-47, Miscellaneous Sumps and Pump Stations System Description.

An emergency drain and overflow are provided from manhole No. 4 (the weir) to a drainage ditch.

46.4.0 MAJOR COMPONENTS

46.4.1 Ash Water Recycle Sump

46.4.1.1 Function

The function of the ash water recycle sump is to provide a location for mounting of the ash recycle and level control pumps and to provide surge capacity for ash water storage pond level changes.

46.4.1.2 Design Criteria

Construction	Reinforced concrete
Dimensions	50 feet square
Depth	18'-3" from top of concrete to sump floor
Total Capacity	340,000 gallons (approximate)

46.4.1.3 Detailed Description

The ash water sump receives discharge from manhole No. 4 and is evacuated by the ash water recycle pumps and level control pumps described below.

The sump is constructed of reinforced concrete. The top of the sump is at grade elevation. The pumps are located on the north end of the sump, mounted on a reinforced concrete top. The ash water recycle pump intake is separated from the level control pump intake by a wall extending vertically from the top to the bottom of the sump and horizontally from the north sump wall to the edge of the pump mounting slab. The concrete top is as large as required for pump mounting; the remainder of the sump is open to the atmosphere and surrounded by handrail for personnel protection.

For piping in the sump area, reference drawing D-354-3906 sh. 3, FGDS Project Waste Water Sumps Plans and Sections. For sump construction, reference drawing D-421-1060 sh. 2, Waste Water Treatment Sumps Foundations Plan, Sections, and Details.

46.4.2 Ash Water Recycle Pumps

46.4.2.1 Function

The function of the ash water recycle pumps is to supply water above a minimum pressure to the suction of the bottom ash sluice pumps, and to the bottom ash hopper refractory cooling supply header.

46.4.2.2 Design Criteria

Manufacturer	Floway, Inc.
Model No.	27 FKH
Type	Vertical turbine
Primary Material of Construction	Stainless steel
Speed	1190 rpm
Design Capacity	8000 gpm
Design Total Dynamic Head	107 ft
Minimum Submergence Required	54" above bottom of bell
At Design Conditions:	
Pump Efficiency	86%
Brake Horsepower	256
Motor:	
Manufacturer	G.E.
Enclosure	TEFC
Type	VSS
Frame	5011VP
Power Requirements	460 VAC/3 ph/60 hz
Horsepower	300
Speed	1190 rpm

46.4.2.3 Detailed Description

Ash recycle water is pumped by the three ash recycle pumps from the ash recycle sump to various bottom ash handling system users.

The pumps are single stage, vertical turbine type, with a 20" diameter column and 24" diameter discharge. The overall pump length beneath the mounting plate is approximately 18'-6", including the inlet strainer.

Fire protection water with city water as a backup is used for seal and bearing cooling. Cooling water enters the each enclosed line shaft through a dedicated solenoid valve (SV-7207, SV-7208, and SV-7209 for pumps A,B, and C, respectively) which must be open for the pump to be allowed to start. The line supplying each pump branches to provide water for motor bearing lubrication cooling, also. Each motor bearing cooling line contains a pressure reducing valve, pressure gauge, and flow meter (rotameter) in a heated enclosure. The regulator and rotameter are provided to maintain the flow through the motor bearing within the specified range of 2 to 3.5 gpm.

Each pumps' discharge consists of 24" diameter pipe containing a check valve and a butterfly valve. The three pump discharge pipes join into a 30" diameter manifold. A 16" diameter pump minimum recirculation pipe, containing a butterfly valve and a flow restricting orifice, branches off this manifold and returns to two of the ash water storage ponds. The pump manufacturer requires a minimum flow through the pump to prevent overheating. This pipe allows flow through the pumps even if all downstream users are isolated.

Ash recycle system makeup lines from air preheating water and the limestone pile runoff sump discharge into the minimum recirculation line. The limestone pile runoff sump discharge pipe is 6" diameter, containing a normally closed butterfly valve. The air preheating water makeup line is also 6" diameter and contains normally closed ball and butterfly valves as well as a flow measuring orifice (FE 7163).

The 30" diameter ash recycle manifold branches off into two 20" diameter lines, one dedicated to each Unit. These lines supply bottom ash hopper refractory cooling and bottom ash sluice pumps suction.

46.4.3 Ash Water Recycle Sump Level Control Pumps

46.4.3.1 Function

The function of the ash water recycle sump level control pumps is to discharge excess ash water from the ash water recycle system to the desilting basin.

wpA0254m

46.4.3.2 Design Criteria

Manufacturer	Floway, Inc.
Model No.	19 FKM
Type	Vertical turbine
Primary Material of Construction	Stainless steel
Speed	1785 rpm
Design Capacity	5000 gpm
Design Total Dynamic Head	95 ft
Minimum Submergence Required	42" above bottom of bell
At Design Conditions:	
Pump Efficiency	81%
Brake Horsepower	150
Motor:	
Manufacturer	G.E.
Enclosure	TEFC
Type	VSS
Frame	445VP
Power Requirements	460 VAC/3 ph/60 hz
Horsepower	150
Speed	1785 rpm

46.4.3.3 Detailed Description

Ash recycle water is pumped by the two ash water recycle sump level control pumps from the ash recycle sump to the desilting basin.

The pumps are single stage, vertical turbine type, with a 16" diameter column and 18" diameter discharge. The overall pump length beneath the mounting plate is 18'-8", including the inlet strainer.

The same water line supplying ash recycle pump seal and bearing cooling water also supplies bearing cooling water to the level control pumps. Cooling water enters each enclosed line shaft through a dedicated solenoid valve (SV-7210 for pump A, SV-7211 for pump B) which must be open for the pump to be allowed to start.

Each pump's discharge consists of 18" diameter pipe containing a check valve and a butterfly valve. The two pump discharge pipes join into a 20" diameter manifold which contains a restricting orifice.

Two 20" diameter connections, one per unit, are provided in the manifold for future cooling tower drains.

46.5.0 CONTROLS

46.5.1 Recycle Sump Level Controls

46.5.1.1 Purpose

The purpose of the recycle sump level controls is to maintain the water level in the sump between a minimum required for proper sump pump operation and a maximum to prevent overflow of the system. The sump is also the mechanism by which level is maintained in the four ash water storage ponds, thus in maintaining sump level, storage pond level is also maintained.

46.5.1.2 Description

Sump level transmitters LT-7006 and LT-7007 provide the control signal which regulates recycle sump level by modulating the storage pond outlet valves LV-7013 or LV-7023.

For Pond 1 to function as a storage pond, inlet valve BN-346 must be closed and valve BN-393 (HV-7077) must be open. Valve open position switch ZS-7143, located on HV-7077, activates the controls for Pond 1 outlet valve BN-361 (LV-7013) so that the ash recycle sump level transmitters LT-7006 and LT-7007 will control the release of water from Pond 1 into the recycle sump.

Storage pond outlet valve LV-7013 is a slide gate valve located on the pond discharge structure. Using LV-7013, the level in the pond can be changed by up to 5 feet, 3 inches, or approximately 1,200,000 gallons of storage. The water level can drop from the pond outlet overflow weir level, elevation

1090 ft., to the bottom of the slide gate valve, elevation 1084.7 ft. See Gilbert drawing D-782-010 for details of the pond discharge structure. The slide gate valve is equipped with a motor operator with position feedback for automatic control.

Similarly, for Pond 2 to function as a storage pond, inlet valve BN-346 must be closed and valve BN-393 (HV-7078) must be open. Valve open position switch ZS-7145, located on HV-7078, activates the controls for Pond 2 outlet valve BN-361 (LV-7023) so that the ash recycle sump level transmitters LT-7006 and LT-7007 will control the release of water from Pond 2 into the recycle sump.

If inlet valves HV-7077 and HV-7078 are both open, Pond Outlet Valves LV-7013 and LV-7023 will both modulate to control the release of water from the ponds into the recycle sump.

If the water flow into the ash water recycle sump from the storage ponds is equal to the flow of water pumped to the bottom ash sluice pumps, no water storage is necessary. However, the minimum pump flow from the ash water recycle pumps will always be entering the storage pond (approximately 1800 gpm). This will cause pond outlet valve LV-7013 to open slightly to return the pump minimum water flow to the recycle sump.

If the water flow into the ash water recycle sump from the storage ponds is less than the flow of water pumped to the bottom ash sluice pumps, additional water from the storage pond is required. As level in the ash recycle sump begins to drop, LT-7006 and LT-7007 signal to increase the opening of pond outlet valve LV-7013 to admit more water to the recycle sump. Control action of the level controller is proportional to level only.

If the water flow into the ash water recycle sump from the storage ponds is greater than the flow of water pumped to the bottom ash sluice water pumps, water storage in the pond is required. As level in the ash recycle sump begins to rise, LT-7006 and LT-7007 signal to decrease the opening of pond outlet valve LV-7013 to retain more of this water in the storage pond.

Ash Recycle Sump Level settings are as follows:

	Elevation (ft)
Emergency overflow from sump	1078.67
Overflow imminent, high level alarm	1078.33
Start level control pump	1071.50
Stop level control pump	1069.67
LV-7013 fully closed	1069.11
LV-7013 fully open	1065.50
Stop all pumps, low level alarm	1065.00

46.5.2 Control Philosophy for Ash Water Recycle Sump Level Control Pumps

46.5.2.1 Purpose

The purpose of the these controls is to start the level control pumps in order to remove excess water from the system, thereby preventing overflow of the sump.

46.5.2.2 Description

Once the ash water storage pond is full, the discharge structure weir will overflow into the ash water recycle sump, and the sump level will begin to rise. On high level, LT-7006 and LT-7007 will initiate the start of a recycle sump level control pump to discharge excess water to the desilting basin for temporary storage and reuse.

Two 100% capacity level control pumps are provided. Sump high level starts the lead level control pump. When level returns to the "STOP LEVEL CONTROL PUMP" level, the pump will stop.

If level continues to rise, the lag pump will start at the "HI-HI ALARM" level. Both pumps will stop at the "STOP LEVEL CONTROL PUMP" level.

Each level control pump is provided with a three position ON-OFF-AUTO switch. In the ON position, a pump will run if the start permissive "recycle sump level not low" is met. In the AUTO position, the pumps respond to the recycle sump level controls.

Normally these pumps are both placed in the AUTO mode. With both pumps in the AUTO mode, an automatic lead-lag switch will alternate the pump selected as the lead pump. Tripping of the lead pump will automatically start the standby pump.

46.5.3 Ash Water Recycle Pump Controls

46.5.3.1 Purpose

The purpose of the ash water recycle pump controls is to insure that ash water recycle pumps are running as required whenever a unit is sluicing ash or has fire in the boiler, in order to supply cooling and seal water to the boiler ash hopper.

46.5.3.2 Description

Three pumps are provided: one full capacity for each Unit, and one common spare. Each pump has a three position control switch, ON-OFF-AUTO. Normally all three pumps will be placed in the AUTO mode. A sump low water level switch will stop all pumps in ON or AUTO mode. Manual reset of the low level switch trip is required. This protects the pumps from cavitation due to low net positive suction head.

The ON mode starts the pump selected. In AUTO mode a pump starts on low discharge header pressure (35 psig from PS-7104). The order in which the three pumps start is controlled by one common three position sequencing switch.

The pump starting order is selected as follows: ABC, BCA, and CAB. Time delays will retard the automatic start of pumps not selected to be the lead pump. The delay time is adjustable from 0-60 seconds for each pump.

A trip of a running pump will start, without time delay, the next sequential pump in AUTO mode. In AUTO mode, all pumps except the lead pump, will be automatically shutoff on high discharge pressure (48.7 psig from PS-7119). Once started in AUTO, the lead pump will run until manually switched to the OFF position, or until a low level trip occurs.

46.6.0 ALARMS

The following alarms are provided to FGDS control room to assist the operations personnel in monitoring and operating the system.

	Alarm	Monitoring Equipment	Corrective Action
1.	Ash Recycle Sump Low-Low Level	LT-7006 LT-7007	Verify position of all valves on pipes leading to and from sump. Check no. of recycle and level control pumps running. Verify accuracy of transmitters.
2.	Ash Recycle Sump High Level - Overflow Eminent	LT-7006 LT-7007	Same corrective action as for Low-Low Sump Level.
3.	Ash Recycle Sump High-High Level	LT-7006 LT-7007	Same corrective action as for Low-Low Sump Level.
4.	Ash Recycle Pumps Discharge Header High Pressure	PS-7119	Verify the number of recycle pumps running. Check for blockage in the discharge line, including closed valves.
5.	Ash Recycle Pumps Discharge Header Low Pressure	PS-7104	Verify the number of recycle pumps running. Check for recycle pump malfunction. Check for malfunction of end users causing excessive water usage (i.e. pipe break)

	Alarm	Monitoring Equipment	Corrective Action
6.	Ash Recycle Pumps Seal Water/Bearing Lube Pressure Low	PS-7226	Determine if other alarms have been generated indicating a problem with the fire protection water system (source of seal/brg wtr). Check for blockage in the water supply line including closed valves. Check for malfunction of pressure switch.

46.7.0 PRINCIPAL MODES OF OPERATION

The following section will provide general information on the major operating modes. For detailed operating information, the operating procedure for the system should be consulted.

46.7.1 Startup Operation

When placing an ash storage pond in service, close the underdrain valve on the empty pond and fill the empty pond with water from the ash valley water transfer sump pumps or the air preheating water supply, if ash valley water is not available. Reference drawings B-352-4318 and C-302-311 for information concerning water supplies.

The time to fill one pond will be approximately two days at the design flowrate of 1000 gpm. The ash valley area clarifier flow should be adjusted as necessary to provide the additional water required.

After filling, open the inlet valve HV-7077 or HV-7078 on the pond being placed in service.

To start any pump manually, select pump HAND control from the CRT and actuate pump START.

Normally, all pumps will be in AUTO. To place pumps in AUTO, select Lead Pump Sequence from the CRT then select pump AUTO control.

46.7.2 Normal Operation

Each Unit has two bottom ash dewatering bins. One of the two bins will be in service while the other is draining. Two bins, one from each Unit, are drained to a storage pond approximately once per day. After a bin has been dewatered and emptied of ash, it will be refilled from the storage ponds.

During normal operation, two ponds will be valved to settle ash particles carried over from the dewatering bins during ash sluicing. One pond will be valved for storage of ash sluice water that is drained from a dewatering bin. The remaining pond will be out of service for cleaning or maintenance.

For filling or draining dewatering bins, a water holding volume must be available to supply or receive the large volumes required, up to 300,000 gallons per bin. The A and B Ash Water Storage Ponds have been modified to provide this water storage function. These ponds also have the capability to function as ash filter ponds, but not concurrently with the water storage function.

Only one water storage pond is required. The other water storage pond can be valved for settling ash if required. The storage pond prevents unnecessary discharge of ash water from the closed system, and provides the large volume of water required to fill a bin.

The two ash water ponds which operate as filters do so by draining the water entering the pond through a filter bed and underdrain system in the bottom of the pond. As the filtering media in the bottom of a pond plugs with ash and dirt, the pond water level rises until it reaches the overflow weir on the discharge structure. When this occurs, the pond functions primarily as a settling basin.

The ash water ponds should be operated continuously in the settling mode, with the pond full and overflowing the discharge structure weir. This will insure that uncontrolled level changes in the recycle sump will not occur.

The only time when ash pond level must change is when ponds are drained and removed from service, or filled and returned to service, as described below under Infrequent Operation. This can be accomplished without creating recycle sump level alarm conditions by following a controlled procedure as described under Startup Operation.

Either Pond A or B must always be valved for water storage service in order to operate an ash water recycle pump.

The pipe connecting the ash water recycle pump discharge header to the selected storage pond provides a minimum flow path for the recycle pumps.

Normal accumulation of rainfall and plant drains should provide sufficient system makeup to compensate for losses from evaporation in the bottom ash hoppers and from water losses associated with wet ash removal from the dewatering bins.

During normal operation, two ash recycle pumps, one per Unit, should return ash water to the bottom ash sluice pumps' suction. The third pump is spare.

Neither of the two Ash Water Recycle Sump Level Control Pumps will normally be pumping.

46.7.3 Shutdown Operation

Close the inlet gate of the pond being removed from service.

If another pond needs to be filled, use the water from the pond to be drained as described under the Startup Operation Section.

Slowly open the drain valve on the pond being removed from service. Verify that the ash recycle level control system starts one level control pump and maintains water level in the recycle sump by discharging to the cooling tower desilting basin. Verify that water is being pumped from the desilting basin to the FGDS at a rate which prevents overflow from the desilting basin.

When removing an ash water storage pond from service, it is important that the water level in the pond be controlled, so that excessive water drainage from a pond to the recycle sump does not overflow at the cooling tower desilting basin emergency overflow.

This can be accomplished by throttling the underdrain valves on the draining pond. Should a high level alarm occur at the cooling tower desilting basin, water flow from a draining ash pond must be stopped until the desilting basin level can be returned to a low condition.

The water in the cooling tower desilting basin is pumped to the FGDS ash pond water tank. The rate at which this makeup tank can accept water is primarily affected by the number of generating units in service, the electric load on the station, and the sulfur content of the coal.

To stop any pump, actuate pump STOP from the CRT.

46.7.4 Abnormal or Infrequent Operation

During normal operation, this is a closed system and no water is discharged or added, therefore, any conditions requiring makeup or discharge are infrequent or abnormal.

Discharge of Water From the Recycle Sump to the Desilting Basin

Infrequently, two operating conditions may occur that require discharge of water from the recycle sump to the desilting basin. These conditions are:

a) Excessive rainfall and plant drains are entering the ash water storage ponds primarily from the ash silo area drainage sump

b) Removing an ash water storage pond from service

One Ash Water Recycle Sump Level Control Pump will operate as necessary and should maintain or reduce the sump level.

As described under the shutdown operation section, when an ash water storage pond is drained, it is important to closely monitor the cooling tower desilting basin level to insure that it does not overflow.

Adding Water to the Ash Water Recycle System

Infrequently, two operating conditions may occur that require adding water to the ash water recycle system:

a) Placing an empty ash water pond into filtering service

b) Insufficient water makeup from plant drains or rainfall. This makeup is required to replace water lost due to evaporation of ash water from the bottom ash hopper, leakage from piping, and water carried with the ash from the truck hauling operation.

Should seasonal conditions cause a lack of rainfall, such that the water loss from the ash water recycle system is greater than the water additions from rain and plant drains, a makeup water supply from the Air Preheating System (cooling tower water) is provided. See Drawing C-302-311. The makeup water flow to each pond is controlled manually. Valves (BN-359) should be throttled open to admit makeup water on a continuous basis as required.

Makeup can also be supplied from the ash valley water transfer sump through a separate pond connection, via a normally closed, manual plug valve. This is the preferred source of makeup if water is available.

Changing the Storage Function From One Pond to the Other

When changing the storage function from the No. 1 to the No. 2 ash water storage pond, water should be manually added to the No. 2 pond until the level is approximately 3 feet below the overflow weir. This insures water is available to fill a dewatering bin. Next, valve HV-7078 must be opened on pond No. 2 and valve HV-7077 closed on pond No. 1.

Pond No. 1 can now be drained as described under shutdown operation. Reverse this procedure when placing the No. 1 pond in storage service.

46.7.5 Emergency Operation

There are no emergency operating conditions associated with this system.

46.8.0 REFERENCES

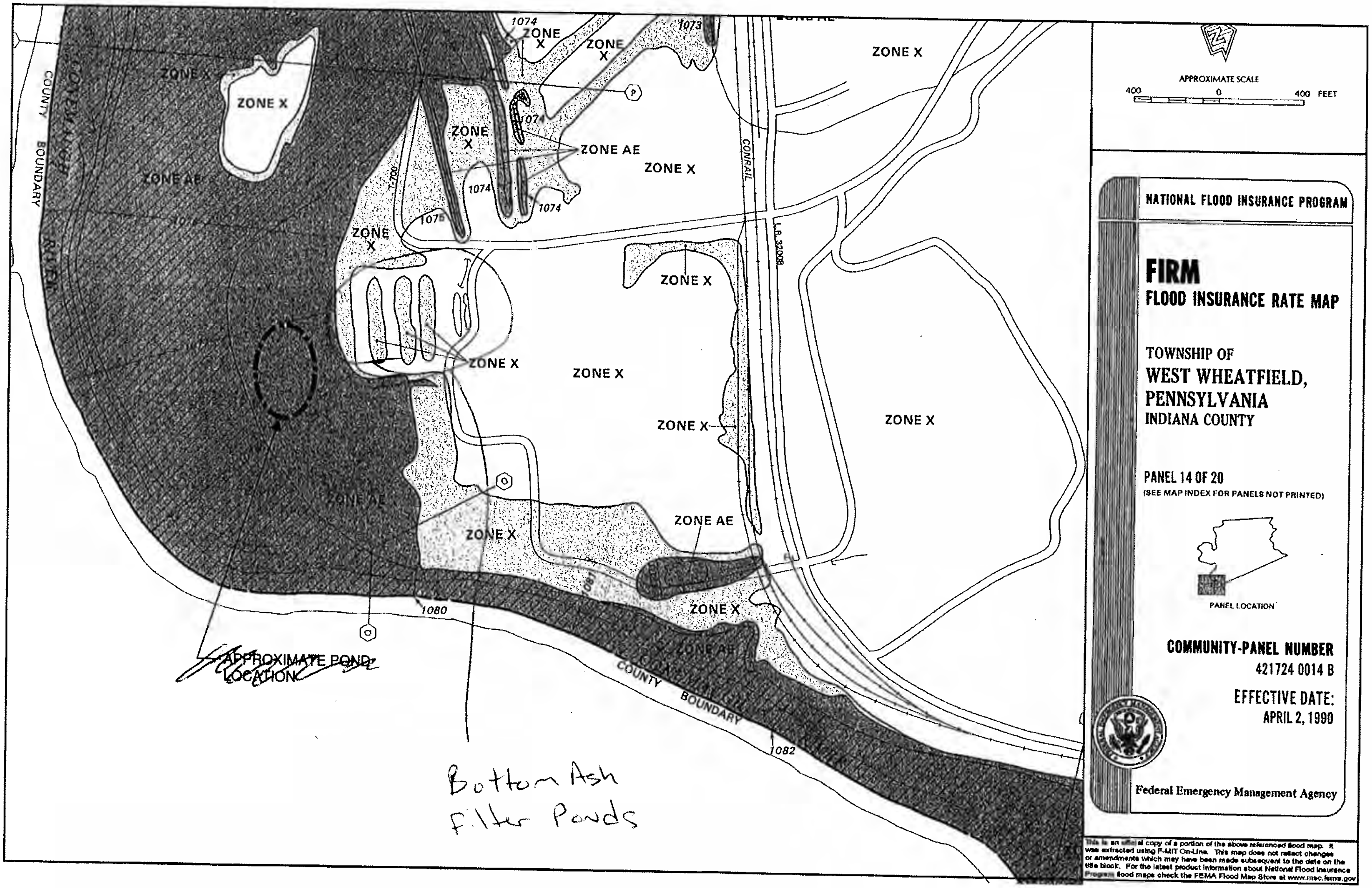
SD-01	Cooling Tower Makeup System Description
SD-32	Bottom Ash System Description
SD-47	Miscellaneous Sumps and Pump Stations System Description
-----	Operating Procedures as applicable
-----	FGDS Control Description, Book II, Section XXII
B-352-4318	FGDS Project Flow Diagram - Ash Valley Water Transfer System
D-354-3906 sh 3	FGDS Project Waste Water Sumps Plans and Sections
D-421-1060 sh 2	Waste Water Treatment Sumps Foundations Plan, Sections, and Details
D-782-010	New Discharge Structure for Pond 4 Plan, Sections, and Details

46.9.0 LIST OF FIGURES

APPENDIX A

Document 5

Flood Insurance Rate Map

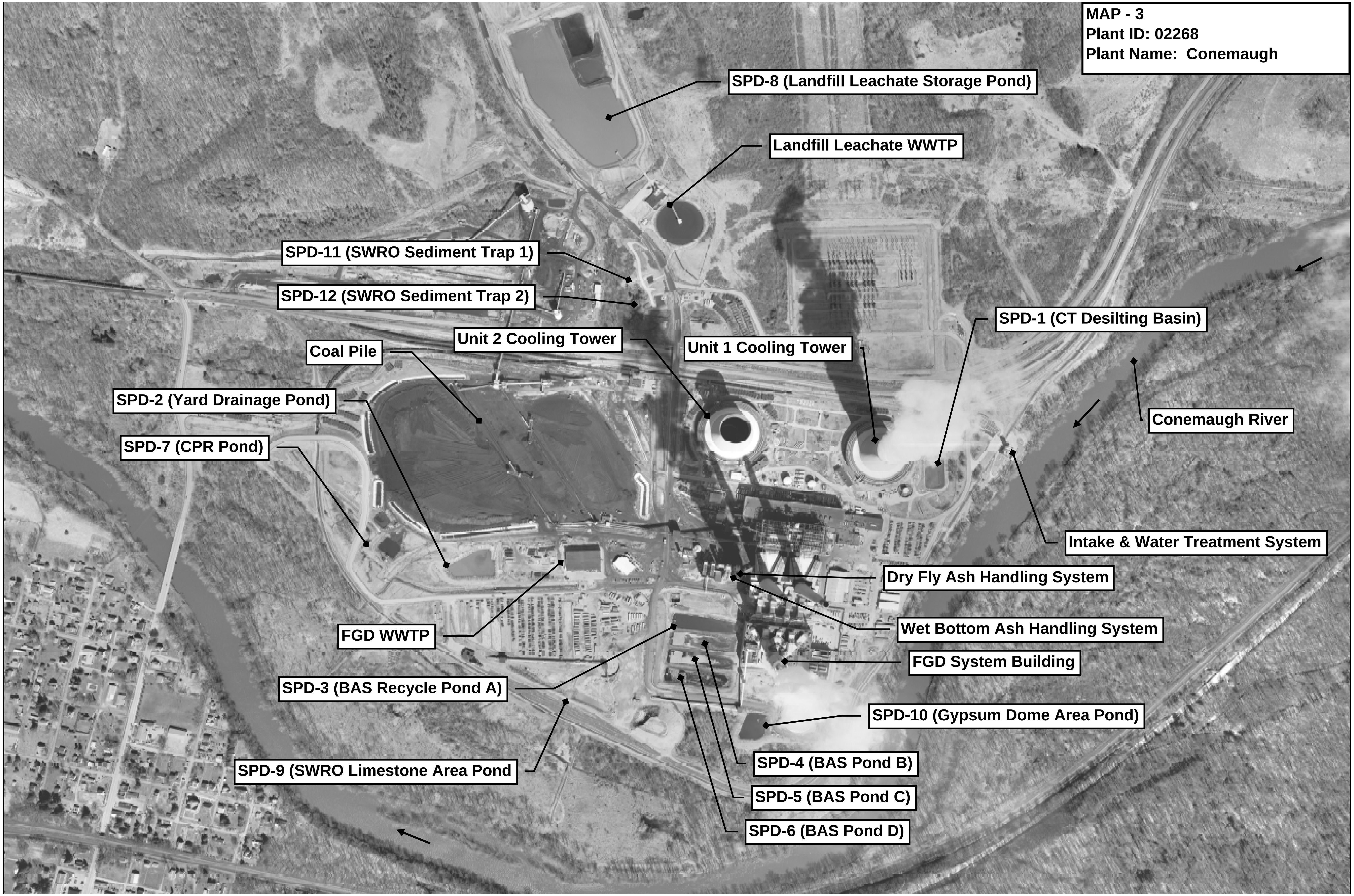


NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
TOWNSHIP OF
WEST WHEATFIELD,
PENNSYLVANIA
INDIANA COUNTY
PANEL 14 OF 20
(SEE MAP INDEX FOR PANELS NOT PRINTED)
PANEL LOCATION
COMMUNITY-PANEL NUMBER
421724 0014 B
EFFECTIVE DATE:
APRIL 2, 1990
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
APPROXIMATE SCALE
400
0
400 FEET
ZONE X
ZONE AE
CONRAIL
L.R. 32008
COUNTY BOUNDARY
1073
1074
1075
1080
1082
APPROXIMATE POND LOCATION
Bottom Ash Filter Ponds

APPENDIX A

Document 6

Map – 1 (Aerial Approximately Property Boundary)

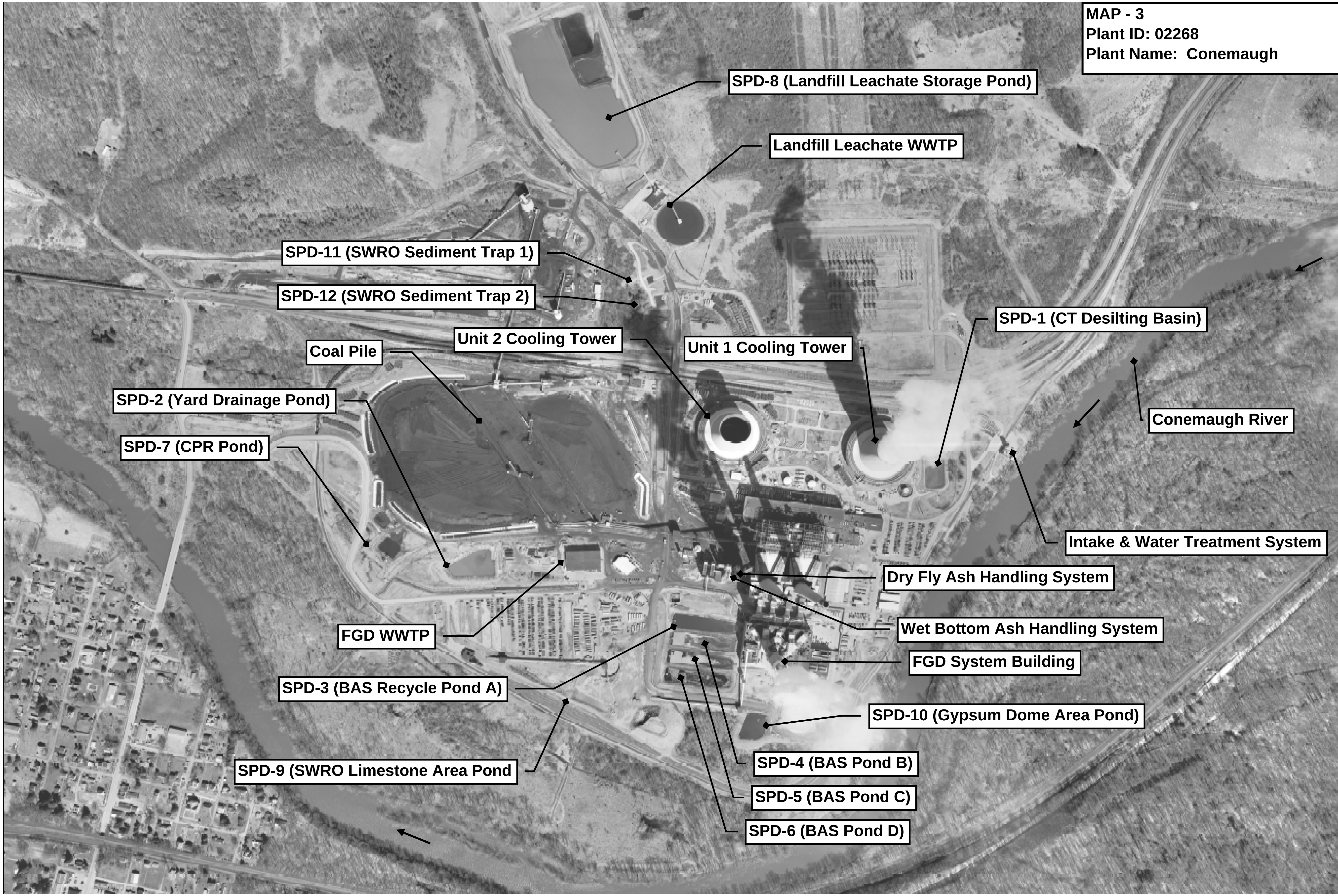


Conemaugh Generating Station
Buildings and Ponds/Impoundments

APPENDIX A

Document 7

Part A – Map – 3 (Buildings and Ponds/Impoundments)



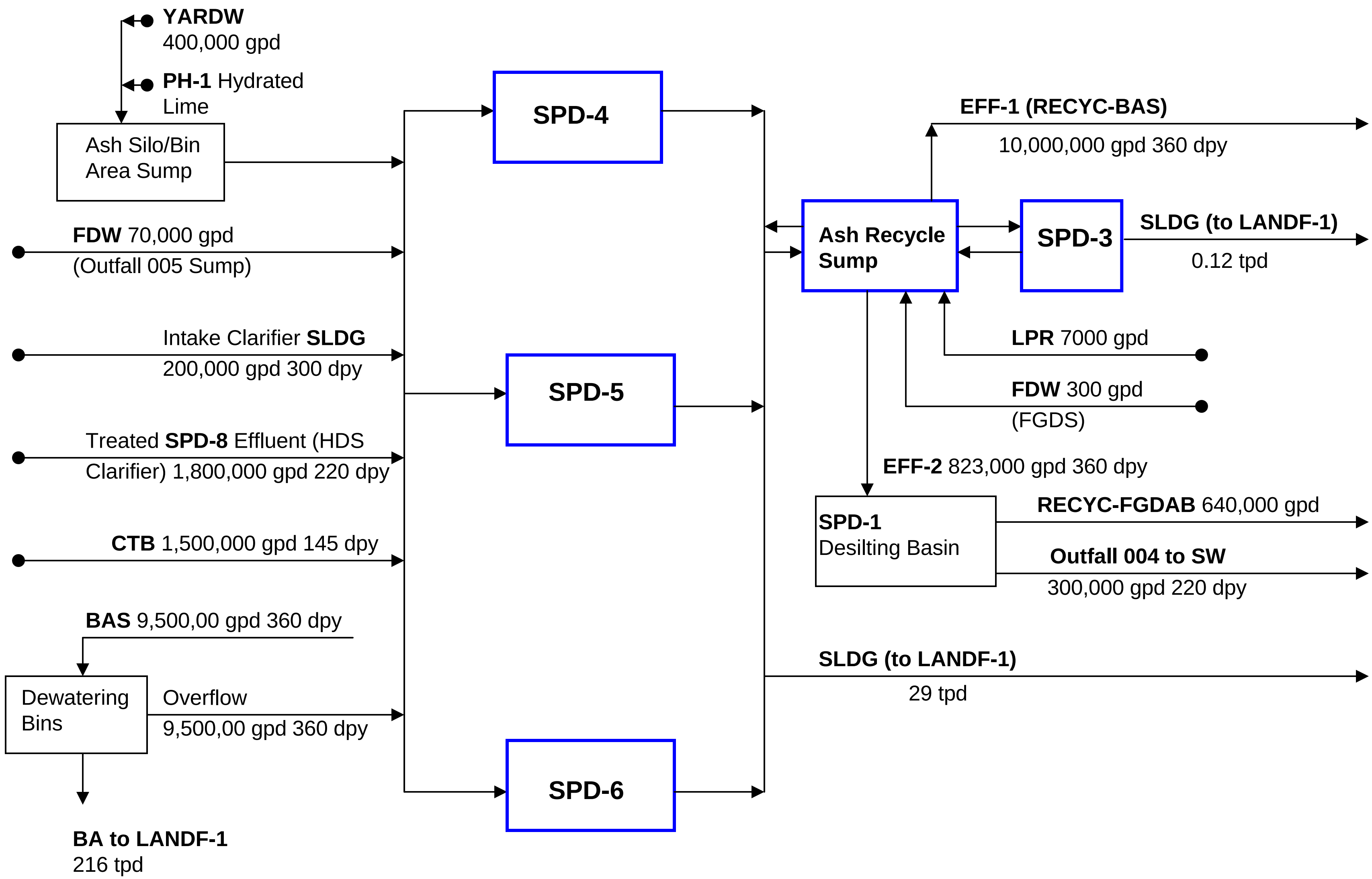
Conemaugh Generating Station
Buildings and Ponds/Impoundments

APPENDIX A

Document 8

Part D Diagram D-1 Conemaugh (Flow Diagram)

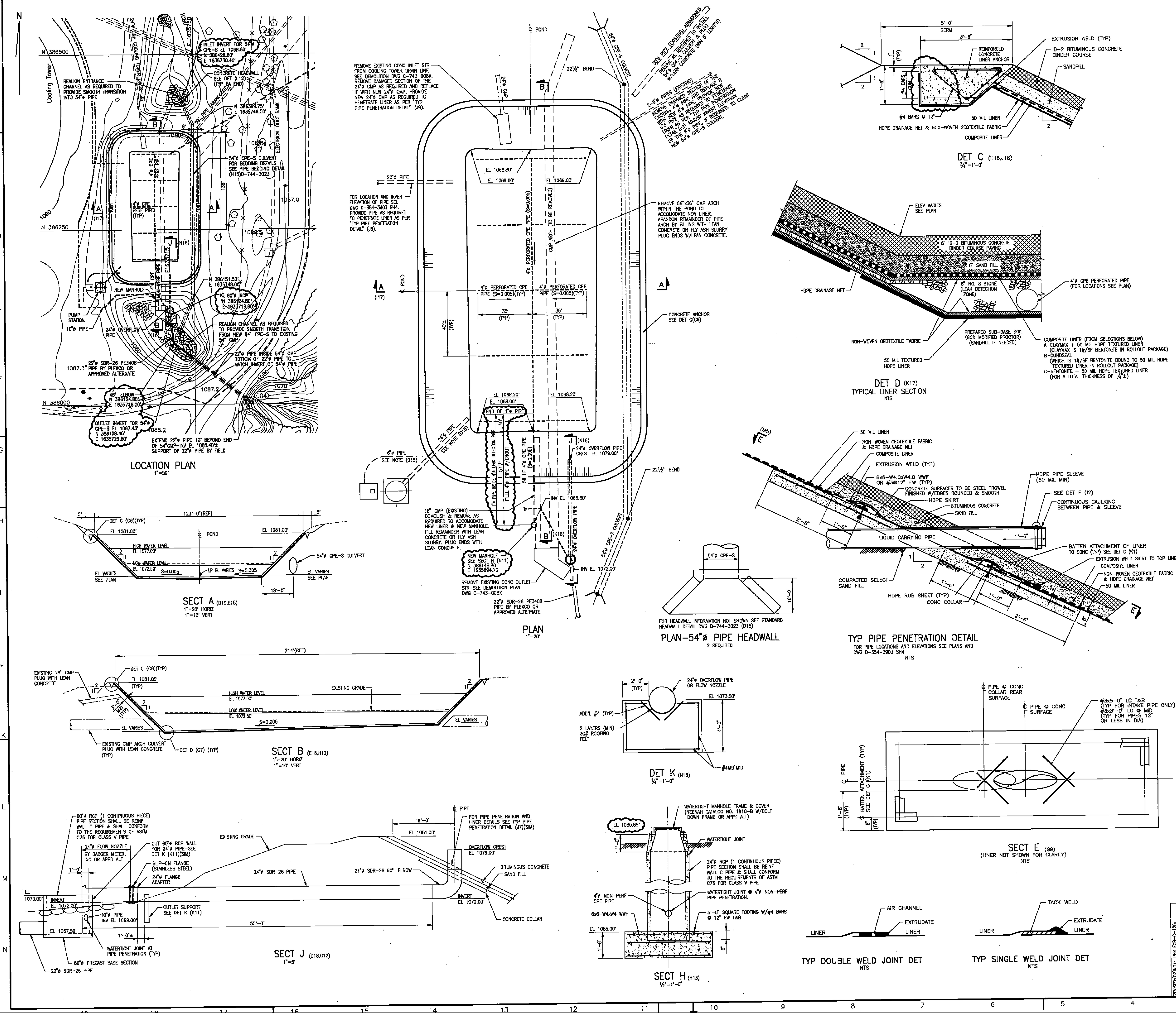
Diagram Number: D-1
Plant ID: 02268
Plant Name: Conemaugh
Pond System ID: POND-1



APPENDIX A

Document 9

Drawing D-739-5009 (Cooling Tower Desilting Basin)

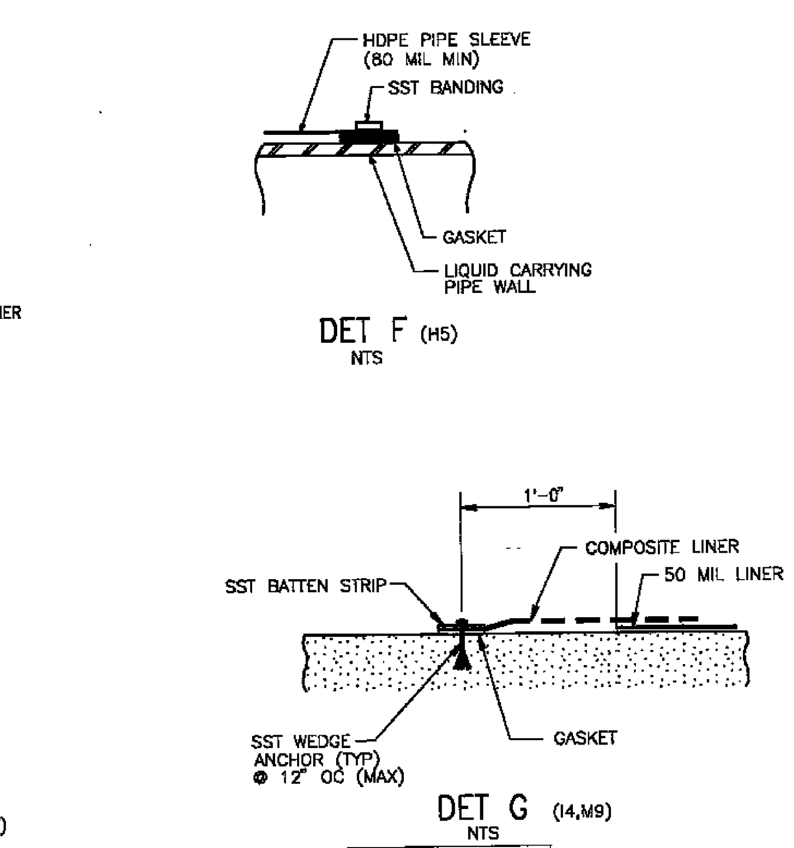


NOTES:

1. CONTRACTOR SHALL CONDUCT HIS WORK ACTIVITIES TO ENSURE MINIMUM INTERFERENCE WITH PLANT ACTIVITIES. CONTRACTOR SHALL NOT CLOSE, BLOCK, OR OTHERWISE OBSTRUCT PLANT ACCESS ROADS OR OTHER FACILITIES WITHOUT PRIOR PERMISSION FROM OWNER.
2. ANY UTILITIES (PIPES, DUCT BANKS, CABLES, CONDUITS, ETC.) OR STRUCTURES DISCOVERED BY THE CONTRACTOR DURING THE EXECUTION OF THE WORK SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF OWNER FOR RESOLUTION.
3. CONTRACTOR SHALL CONTROL EROSION DURING THE EXECUTION OF THE WORK IN ACCORDANCE WITH DRAWING D-744-3017.
4. ALL AREAS RECEIVING LINERS SHALL BE FINISH GRADED TO 90% MOD PROCTOR IN ACCORDANCE WITH SPECIFICATION C-421026-24.
5. PERSONNEL WORKING ON THE LINERS SHALL NOT WEAR DAMAGING SHOES, SHALL NOT SMOKE, AND SHALL NOT ENGAGE IN OTHER ACTIVITIES THAT COULD DAMAGE THE LINERS.
6. LINERS SHALL BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH SPECIFICATION T-421026-35, "IMPERMEABLE LINERS".
7. VENTILATION SYSTEMS UNDER LINERS SHALL BE INSTALLED IF REQUIRED, SO THAT ALL GAS BUILDUP UNDER THE LINERS IS REMOVED.
8. HDPE LINER THICKNESS SHALL BE A MINIMUM OF 50 MILS.
9. PRIOR TO INSTALLATION OF LINERS, CONTRACTOR SHALL ENSURE THAT ALL PIPE PENETRATIONS IN THE LINED AREAS ARE IN PLACE.
10. UPON COMPLETION OF BASIN CONSTRUCTION, CONTRACTOR SHALL RESTORE DISTURBED AREAS, INCLUDING ROADS AND SURFACE DRAINAGE, TO THEIR ORIGINAL CONDITIONS.
11. BITUMINUOUS CONCRETE BINDER COURSE PAVING SHALL MEET THE REQUIREMENTS OF PENNDOT FOR SPECIFICATIONS, LATEST EDITION, PER SECTION 400, "FLEXIBLE PAVEMENTS". APPLY A BITUMINOUS SEAL COAT SUCH AS E-3 CATIONIC EMULSIFIED SEALANT WITHOUT THE AGGREGATE AS PER PENDOT REQUIREMENT.
12. CPE-S PIPE SHALL BE EMBEDDED IN CLASS 1 CRUSHED STONE A MINIMUM OF 6" BELOW THE BOTTOM OF THE PIPE, 12" ABOVE THE TOP OF THE PIPE AND 12" ON EACH SIDE OF THE PIPE. EMBEDMENT MATERIAL SHALL BE IN 6" LIFTS AND MECHANICALLY COMPACTED TO A DENSITY OF 95% MODIFIED PROCTOR PER ASTM D-1557.
13. PIPE INSTALLATION SHALL CONFORM TO ASTM D-2321.
14. FOR GENERAL NOTES, CORRUGATED PIPE NOTES, LEGEND, AND ABBREVIATIONS SEE DRAWING D-744-3014.
15. CONTRACTOR TO VERIFY REFERENCE DIMENSIONS BASED ON EXISTING POND SIZE. ANY DIMENSIONAL DISCREPANCY GREATER THAN 5 FEET IN THE SIZE AND/OR LOCATION OF THE POND SHALL BE BROUGHT TO THE OWNER'S ATTENTION FOR RESOLUTION.

REFERENCE DRAWINGS:

ROADS, GRADING & DRAINAGE PLAN SHEET 1	D-744-3014
ROADS, GRADING & DRAINAGE PLAN SHEET 4	D-744-3017
ROADS, GRADING & DRAINAGE PLAN SHEET 7	D-744-3020
ROADS, GRADING & DRAINAGE-SECTIONS & DETAILS SH1	D-744-3023
FGDS PROJECT UNDERGROUND YARD PIPING	D-354-3903 SH4
INLET & OUTLET STR-COOLING TWR DESILTING BASIN	C-743-008



---ATTENTION---
THIS DRAWING IS AN 'AUTOCAD' SUPPORTED DRAWING AND MUST BE REVISED ELECTRONICALLY.
TO OBTAIN ELECTRONIC FILE CONTACT: PENNSYLVANIA ELECTRIC CO. GENERATION ENGINEERING SERVICES JOHNSTOWN PENNSYLVANIA (814)533-8574

MARK HOLLISTER SOUSA
PROFESSIONAL ENGINEER
JAN 17, 1996

REV	DATE	BY	CH	APPROVED	
1	9-1-94	TN	KKK	M. SOUSA FK	GENERAL REVISION OVERFLOW PIPE CHANGED FROM 10" TO 24" & RELOCATED. ADDED: SECT J & DET K; 22"⌀ PIPE & 60"⌀ MH @ 24"⌀ OVERFLOW PIPE. INCORPORATED FCR-C-125 & DCN-C-56
2	1-17-96	DM	KKF		REVISED:(D2)NOTE PER FCR-C-126; (A17,E17,I13,L11)COORD & ELEV;(B7)DET C PER AS-BUILT INFO FROM FIELD DATED FEB 20, 1995;(G13)LEAK DETECTION SYSTEM PER FSK-C-036. ISSUED FOR RECORD PURPOSES ONLY.

EBASCO SERVICES INCORPORATED

EBASCO SERVICES INCORPORATED

DIV. CIVIL DR. TN/LW
DATE 1-31-94 CH. SM
SCALE AS NOTED

APPROVED
MARK H. SOUSA
KKF | FK

Penelec / GPU — PENNSYLVANIA ELECTRIC COMPANY — JOHNSTOWN PENNSYLVANIA

CONEMAUGH 1&2

DWG TYPE : SITE

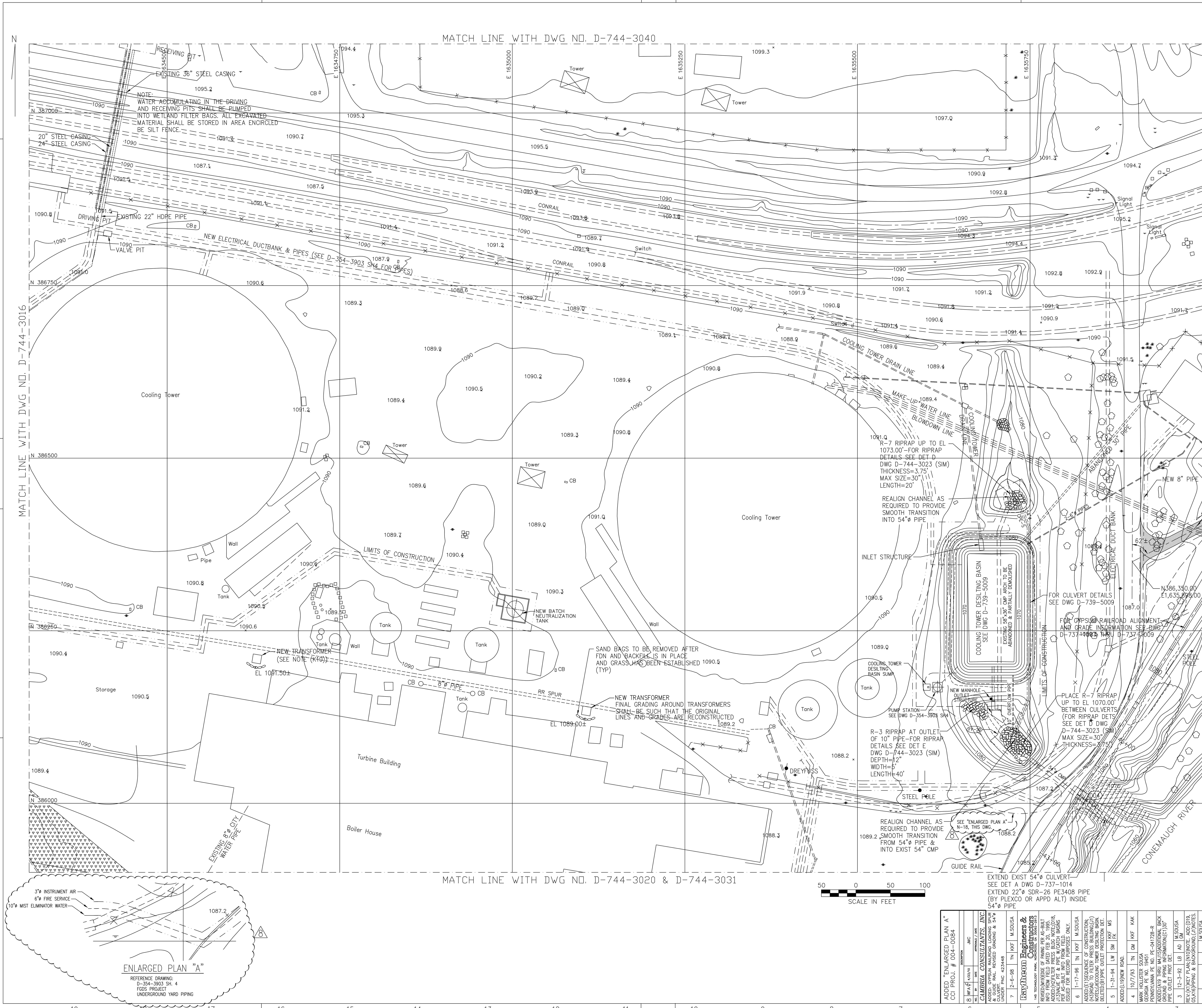
TITLE COOLING TOWER DESILTING BASIN
DIKES, LINERS, AND ROADS
PLAN, SECTIONS, AND DETAILS SH1

PROJECT CONTROL NO.	SCALE	DRAWING NUMBER	REV
421026		D-739-5009	2

APPENDIX A

Document 10

Drawing D-744-3017 (Roads, Grading and Drainage Plan)



EXTEND EXIST 54"ø CULVERT
SEE DET A DWG D-737-1014
EXTEND 22"ø SDR-26 PE3408 PIPE
(BY PLEXCO OR APPD ALT) INSIDE
54"ø PIPE

COOLING TOWER DESILTING BASIN SEQUENCE OF CONSTRUCTION

1. PLACE RIPRAP AT ENTRANCE TO EXISTING 54" CMP (K6), DOWNSTREAM OF NEW CULVERT.
2. INSTALL 54" CPE-S IN ACCORDANCE WITH CULVERT REQUIREMENTS ON DRAWING D-744-3027. CONSTRUCT UPSTREAM AND DOWNSTREAM HEADWALLS, REALIGN CHANNELS AND PLACE REMAINDER OF RIPRAP AT HEADWALLS.
3. AFTER BACKFILLING TRENCH, STABILIZE DISTURBED AREAS WITH GRAVEL OR GRASS AND MULCH.
4. DIVERT FLOW FROM EXISTING 58"x36" CMP ARCH TO NEW 54" CPE-S BY PLUGGING EXISTING PIPE ARCH ENDS.
5. ABANDON EXISTING 18" CMP OVERFLOW PIPE.
6. INSTALL FILTER FENCE DOWNSTREAM OF OUTLET STRUCTURE.
7. DEMOLISH EXISTING INLET AND OUTLET STRUCTURES.
8. SEED AND MULCH DISTURBED AREA AT DEMOLISHED OUTLET STRUCTURE.
9. PREPARE POND FOR LINER INSTALLATION.
10. INSTALL LINER SYSTEM PER DRAWING D-737-5009.

NOTES:

1. FOR GENERAL NOTES & LEGEND SEE DRAWINGS D-744-3014 & D-744-3027.
2. ALL PIPE & DUCTBANK TRENCH CONSTRUCTION SHALL BE IN ACCORDANCE WITH NOTES ON DRAWING D-744-3027 & NARRATIVE PHASE XII.
3. EROSION & SEDIMENT CONTROL MEASURES ARE INCLUDED ON THIS DRAWING.
4. FOR CULVERT TRENCH CONSTRUCTION REQUIREMENTS SEE DRAWING D-744-3027.
5. EXCAVATED MATERIAL SHALL BE PLACED IN AN AREA SURROUNDED BY SILT FENCES.
6. POND SHALL BE DEWATERED BY PUMPING INTO FILTER BAGS PLACED ON THE RIPRAP AT THE INLET OF THE EXISTING 54" CMP. FILTER BAGS SHALL BE CLEANED OUT AND DISPOSED OF PROPERLY, AS DIRECTED BY THE OWNER.

	DWG NO. D-744-3014	DWG NO. D-744-3039	DWG NO. D-744-3040
DWG NO. D-744-3015 D-744-3028	DWG NO. D-744-3016	THIS DRAWING	DWG NO. D-744-3041
DWG NO. D-744-3018	DWG NO. D-744-3019 D-744-3030	DWG NO. D-744-3020 D-744-3031	
	DWG NO. D-744-3021	DWG NO. D-744-3022	

KEY PLAN

Genco
GPU Generation Corporation
Technical Services
"AutoCAD" Supported Drawing

NO.	DATE	DESCRIPTION	BY	CH	APPROVED
8	4/23/10	ADDED "ENLARGED PLAN A" CCI PROJ. # 004-0084 — CAMBRIA CONSULTANTS, INC.	WFA		JMC
7	2-6-98	ADDED: GYPSUN RAILROAD LOADING SPUR & GUIDE RAIL. REVISED GRADING & 54"ø CULVERT. UNDER PNC 423448	TN	KKF	M.SOUSA
6	1-17-96	REVISED:(M19)EDGE OF PAVING PER AS-BUILT INFO FROM FIELD DATED FEB 20, 1995. ADDED:(H2)FILTER PRESS BLDG NOTE;(D18, J13)VALVE PIT & PIPE W/CATCH BASINS PER AS-BUILT INFO FROM FIELD. ISSUED FOR RECORD PURPOSES ONLY. — Raytheon Engineers & Constructors, 145 TECHNOLOGY PARK, NORCROSS, GA 30092-2913	TN	KKF	M.SOUSA
5	1-31-94	ADDED:(E1)SEQUENCE OF CONSTRUCTION;(H3)ROAD TO FILTER PRESS BUILDING;(J1) NOTES;(J6)COOLING TOWER DESILTING BASIN. DELETED:(B1)PIPE OUTLET PROTECTION DET.	LW	SM	KKF FK / MS
4	10/7/93	ADDED:(L19)NEW ROAD.	TN	GM	KKF / KAK
3	12-3-92	ADDED:(A19 THRU M4,I15)ADDITIONAL BACK GROUND & PIPING INFORMATION;(C1)30" PIPE OUTLET PROT DET.	LB	AD	M.SOUSA GM
2	5-18-92	REV:(K1)KEY PLAN;(N10)NOTE. ADD:(D19, G5,K16)PIPING & BACKGROUND;(J1)NOTES.	TN	SM	M.SOUSA GM
1	1-20-92	GENERAL REVISION (REVISIONS NOT CIRCLED)	TN	SM	M.SOUSA GM

MARK HOLLISTER SOUSA
GEORGIA PE NO. 19451
PENNSYLVANIA PE NO. PE-041728-R

EBASCO SERVICES INCORPORATED

DIV. CIVIL DR. TN
DATE 10-9-91 CH. SM
SCALE 1"=50'

APPROVED
MARK SOUSA
GM

Penelec / GPU — PENNSYLVANIA ELECTRIC COMPANY — JOHNSTOWN PENNSYLVANIA

CONEMAUGH 1&2

DWG TYPE : SITE

TITLE

ROADS, GRADING & DRAINAGE PLAN
SHEET 4

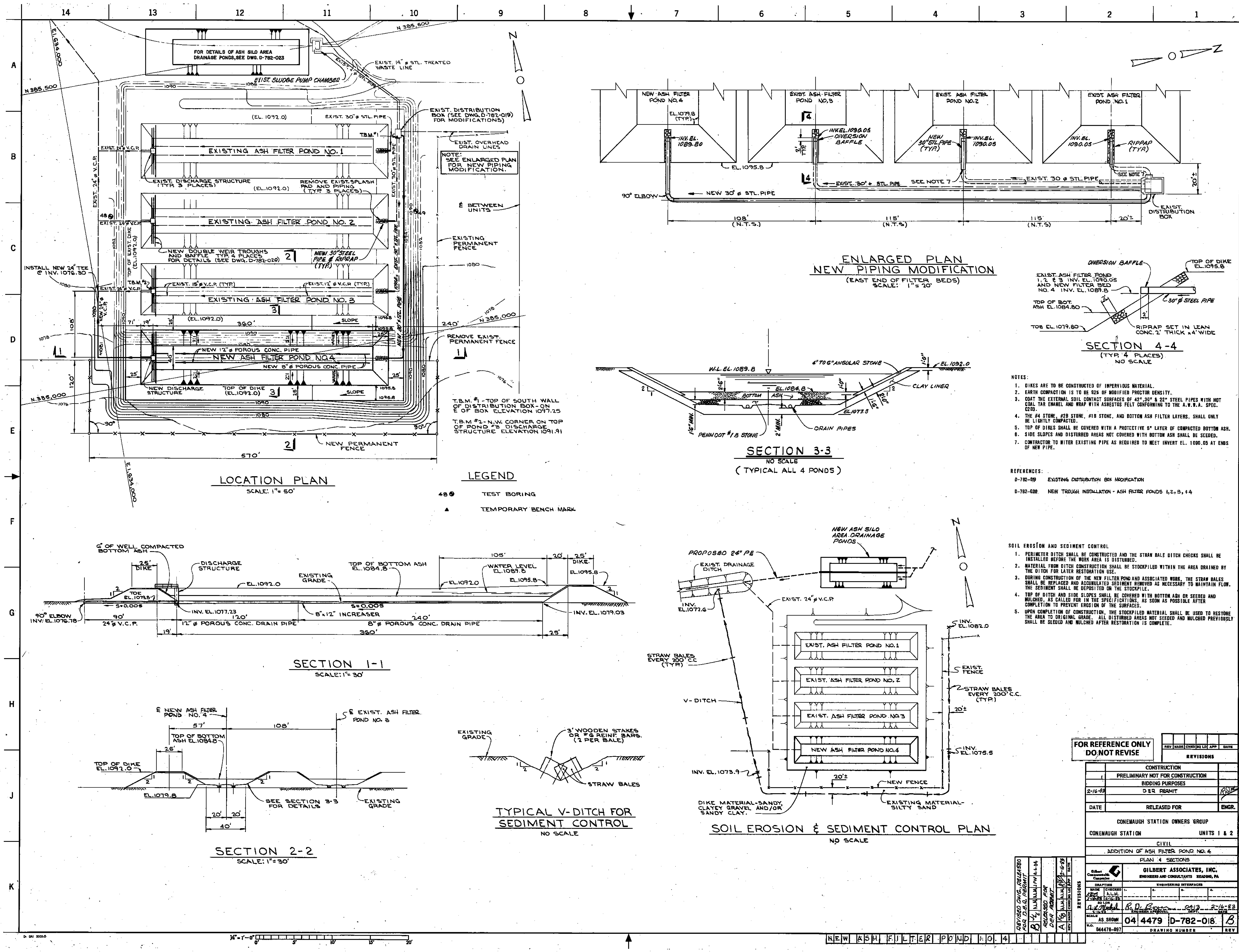
PROJECT CONTROL NO.	SCALE	DRAWING NUMBER	REV
421026		D-744-3017	8

GENCO CAD FILE NAME: W:\42\7443017.DWG

APPENDIX A

Document 11

Drawing D-782-018 (Addition of Ash Filter Pond No. 4)

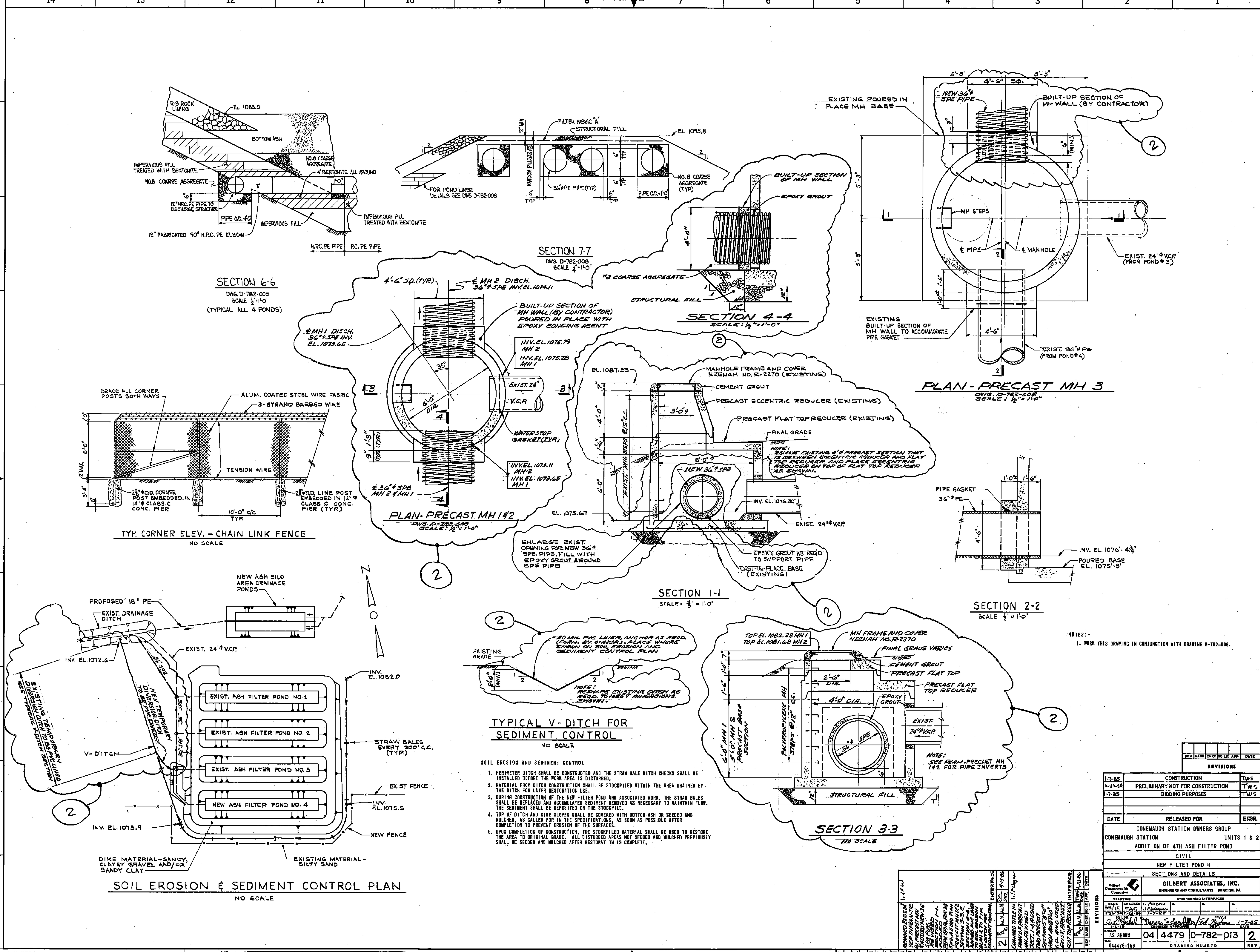


LOCATION PLAN
SCALE: 1"= 50'
LEGEND
TEST BORING
TEMPORARY BENCH MARK
EXISTING ASH FILTER POND NO. 1
EXISTING ASH FILTER POND NO. 2
EXISTING ASH FILTER POND NO. 3
NEW ASH FILTER POND NO.4
NOTE: SEE ENLARGED PLAN FOR NEW PIPING MODIFICATION.
T.B.M. #1 - TOP OF SOUTH WALL OF DISTRIBUTION BOX-ON ℄ OF BOX ELEVATION 1097.25
T.B.M. #2 - N.W. CORNER ON TOP OF POND #3 DISCHARGE STRUCTURE ELEVATION 1091.91
ENLARGED PLAN
NEW PIPING MODIFICATION
(EAST END OF FILTER BEDS)
SCALE: 1"= 20'
SECTION 3-3
NO SCALE
(TYPICAL ALL 4 PONDS)
SECTION 4-4
(TYP. 4 PLACES)
NO SCALE
NOTES:
1. DIKES ARE TO BE CONSTRUCTED OF IMPERVIOUS MATERIAL.
2. EARTH COMPACTION IS TO BE 92% OF MODIFIED PROCTOR DENSITY.
3. COAT THE EXTERNAL SOIL CONTACT SURFACES OF 42",30" & 22" STEEL PIPES WITH HOT COAL TAR ENAMEL AND WRAP WITH ASBESTOS FELT CONFORMING TO THE A.W.W.A. SPEC. C203.
4. THE #4 STONE, #2B STONE, #1B STONE, AND BOTTOM ASH FILTER LAYERS, SHALL ONLY BE LIGHTLY COMPACTED.
5. TOP OF DIKES SHALL BE COVERED WITH A PROTECTIVE 6" LAYER OF COMPACTED BOTTOM ASH.
6. SIDE SLOPES AND DISTURBED AREAS NOT COVERED WITH BOTTOM ASH SHALL BE SEEDED.
7. CONTRACTOR TO MITER EXISTING PIPE AS REQUIRED TO MEET INVERT EL. 1090.05 AT ENDS OF NEW PIPE.
REFERENCES:
D-782-019 EXISTING DISTRIBUTION BOX MODIFICATION
D-782-020 NEW TROUGH INSTALLATION - ASH FILTER PONDS 1,2,3, & 4
SOIL EROSION AND SEDIMENT CONTROL
1. PERIMETER DITCH SHALL BE CONSTRUCTED AND THE STRAW BALE DITCH CHECKS SHALL BE INSTALLED BEFORE THE WORK AREA IS DISTURBED.
2. MATERIAL FROM DITCH CONSTRUCTION SHALL BE STOCKPILED WITHIN THE AREA DRAINED BY THE DITCH FOR LATER RESTORATION USE.
3. DURING CONSTRUCTION OF THE NEW FILTER POND AND ASSOCIATED WORK, THE STRAW BALES SHALL BE REPLACED AND ACCUMULATED SEDIMENT REMOVED AS NECESSARY TO MAINTAIN FLOW. THE SEDIMENT SHALL BE DEPOSITED ON THE STOCKPILE.
4. TOP OF DITCH AND SIDE SLOPES SHALL BE COVERED WITH BOTTOM ASH OR SEEDED AND MULCHED, AS CALLED FOR IN THE SPECIFICATIONS, AS SOON AS POSSIBLE AFTER COMPLETION TO PREVENT EROSION OF THE SURFACES.
5. UPON COMPLETION OF CONSTRUCTION, THE STOCKPILED MATERIAL SHALL BE USED TO RESTORE THE AREA TO ORIGINAL GRADE. ALL DISTURBED AREAS NOT SEEDED AND MULCHED PREVIOUSLY SHALL BE SEEDED AND MULCHED AFTER RESTORATION IS COMPLETE.
SECTION 1-1
SCALE: 1"= 30'
SECTION 2-2
SCALE: 1"= 30'
TYPICAL V-DITCH FOR SEDIMENT CONTROL
NO SCALE
SOIL EROSION & SEDIMENT CONTROL PLAN
NO SCALE
FOR REFERENCE ONLY
DO NOT REVISE
REVISIONS
CONSTRUCTION
PRELIMINARY NOT FOR CONSTRUCTION
BIDDING PURPOSES
2-16-83 DER PERMIT
DATE RELEASED FOR ENGR.
CONEMAUGH STATION OWNERS GROUP
CONEMAUGH STATION UNITS 1 & 2
CIVIL
ADDITION OF ASH FILTER POND NO. 4
PLAN & SECTIONS
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS READING, PA
B REVISED DWG., RELEASED FOR D.E.R. PERMIT 4-6-84
A RELEASED FOR DER PERMIT 2-16-83
SCALE AS SHOWN
W.O. 044479-097
04 4479 D-782-018 B
DRAWING NUMBER REV
NEW ASH FILTER POND NO. 4

APPENDIX A

Document 12

Drawing D-782-013 (New Filter Pond 4 Plan, Sections & Details)



SOIL EROSION AND SEDIMENT CONTROL

1. PERIMETER DITCH SHALL BE CONSTRUCTED AND THE STRAW BALE DITCH CHECKS SHALL BE INSTALLED BEFORE THE WORK AREA IS DISTURBED.
2. MATERIAL FROM DITCH CONSTRUCTION SHALL BE STOCKPILED WITHIN THE AREA DRAINED BY THE DITCH FOR LATER RESTORATION USE.
3. DURING CONSTRUCTION OF THE NEW FILTER POND AND ASSOCIATED WORK, THE STRAW BALES SHALL BE REPLACED AND ACCUMULATED SEDIMENT REMOVED AS NECESSARY TO MAINTAIN FLOW. THE SEDIMENT SHALL BE DEPOSITED ON THE STOCKPILE.
4. TOP OF DITCH AND SIDE SLOPES SHALL BE COVERED WITH BOTTOM ASH OR SEEDED AND MULCHED, AS CALLED FOR IN THE SPECIFICATIONS, AS SOON AS POSSIBLE AFTER COMPLETION TO PREVENT EROSION OF THE SURFACES.
5. UPON COMPLETION OF CONSTRUCTION, THE STOCKPILED MATERIAL SHALL BE USED TO RESTORE THE AREA TO ORIGINAL GRADE. ALL DISTURBED AREAS NOT SEEDED AND MULCHED PREVIOUSLY SHALL BE SEEDED AND MULCHED AFTER RESTORATION IS COMPLETE.

NOTES:-

1. WORK THIS DRAWING IN CONJUNCTION WITH DRAWING D-782-008.

DATE	RELEASED FOR	ENGR.
1-7-85	CONSTRUCTION	TWS
11-30-84	PRELIMINARY NOT FOR CONSTRUCTION	TWS
1-7-85	BIDDING PURPOSES	TWS

CONEMAUGH STATION OWNERS GROUP
CONEMAUGH STATION UNITS 1 & 2
ADDITION OF 4TH ASH FILTER POND
CIVIL
NEW FILTER POND 4
SECTIONS AND DETAILS

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS READING, PA

SCALE AS SHOWN
W.O. 044479-158
DRAWING NUMBER 04 4479 D-782-013 REV 2

APPENDIX B

Document 13

Dam Inspection Check List Form

Site Name:	Conemaugh Station	Date:	September 14, 2012
Unit Name:	Ash Filter Ponds	Operator's Name:	GenOn
Unit I.D.:	02268	Hazard Potential Classification:	High ☐ Significant ☐ Low ☒
	Inspector's Name:	Fred Tucker, P.E. and Edward Farquhar	

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?		√	18. Sloughing or bulging on slopes?		√
2. Pool elevation (operator records)?	√		19. Major erosion or slope deterioration?		√
3. Decant inlet elevation (operator records)?	1090.0		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	1092.0		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	N/A		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)?	N/A		From underdrain?		N/A
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?	N/A		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?		√	Around the outside of the decant pipe?		√
15. Are spillway or ditch linings deteriorated?		√	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.

Issue #	Comments
1	No formal records or protocol is in place for inspections. However, maintenance Contractor of the ponds does inspect the ponds on a daily basic.
20	Overflow from each pond (4 cells) is through "saw tooth" weirs into a weir trough to concrete riser with bottom discharge through 36" Dia SPE pipe to ash water recycle sump during normal operation. Only overflow into weir trough is visible.
21	Underdrain is associated with dewatering of settled ash and not associated with the dikes. The underdrain pipes discharge into the outlet structure. Any seepage from the underdrain pipes in the pond bottom is not visible.

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit PA0005011 **INSPECTOR** Tucker/Farquhar

Date September 14, 2012
Impoundment Name Ash Filter Ponds

Impoundment Company GenOn (part owner) et al.
EPA Region 3

State Agency (Field Office) Address
Pennsylvania Department of Environmental Protection
Bureau of Waste Management
286 Industrial Park Road
Ebensburg, PA 15931

Name of Impoundment Ash Filter Ponds: BAS Recycle Pond A (SPD-3); BAS Pond B (SPD-4); BAS Pond C (SPD-5); BAS Pond D (SPD-6)

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

New ☐ **Update** ☒

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

IMPOUNDMENT FUNCTION:

Nearest Downstream Town Name: New Florence, PA

Distance from the impoundment: <0.5 Miles

Location:

Latitude	40	Degrees	22	Minutes	59.63	Seconds	**N**
Longitude	-79	Degrees	3	Minutes	45.19	Seconds	**W**

State Pennsylvania **County** Indiana

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency?	Department of Environmental Resources - Bureau of Waste Management; (water quality only) not regulated for dam safety

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

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

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

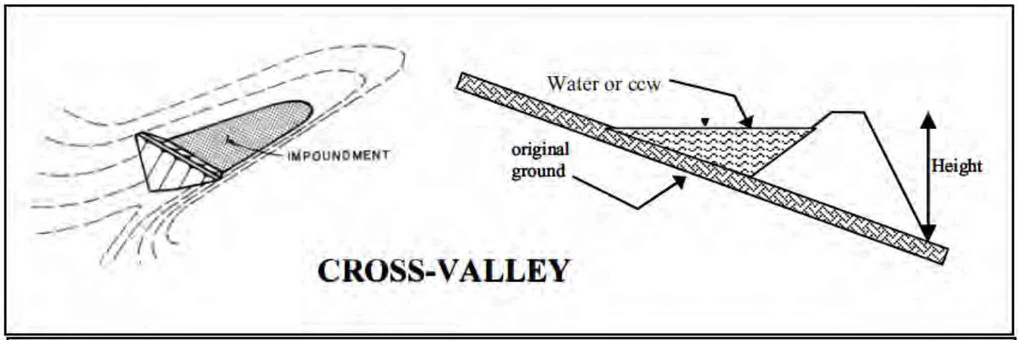
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

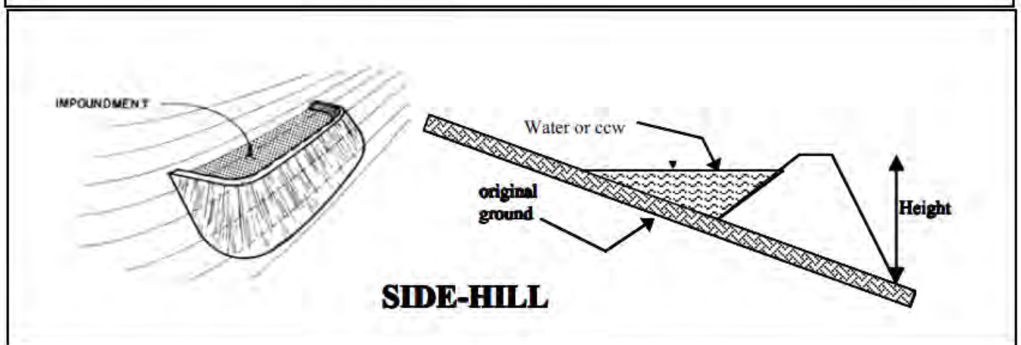
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

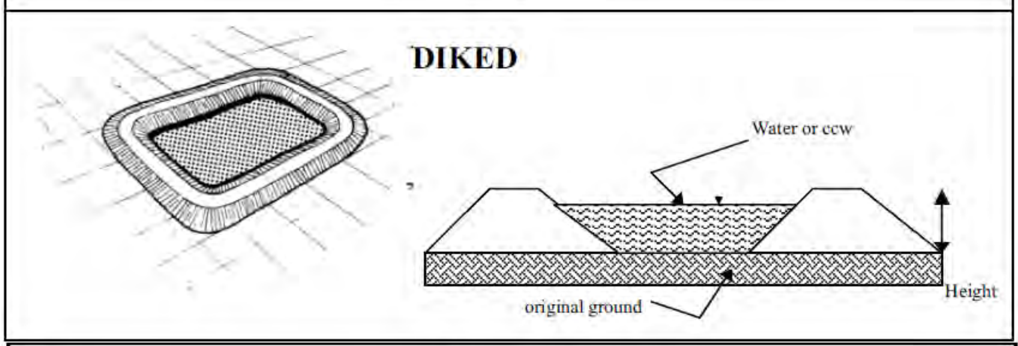
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

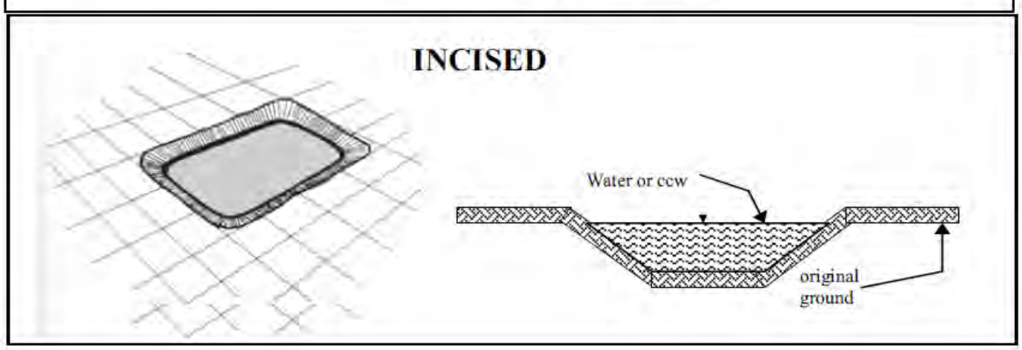
Low hazard potential classification for failure or release of some bottom ash into the immediately surrounding environment. There would be no significant risk of loss of human life. If failure occurred, ash would remain on GenOn property.

CONFIGURATION:









☐ Cross-Valley ☐ Side-Hill ☐ Diked

☐ Incised (form completion optional) ☒ Combination Incised/Diked

Embankment Height (ft) Varies from 5 to 13 feet

Embankment Material Sandy clayey gravel and/or sandy clay

Pool Area (ac) 3.3

Liner Side Slopes 1.5 ft R-3 Rock lining over 2 ft impervious fill

			and impervious fill treated with bentonite. Bottom: 2.5 ft bottom ash over 1.5 ft #8 coarse aggregate over 1.5 ft of impervious fill over 8 inches of impervious fill treated with bentonite over 1 ft 4 inches of impervious fill over prepared subgrade.
Current Freeboard (ft)	2.0 (except Pond C dewatered at time of inspection for excavation and removal of settled ash)	**Liner Permeability**	0.0000001 cm/sec

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

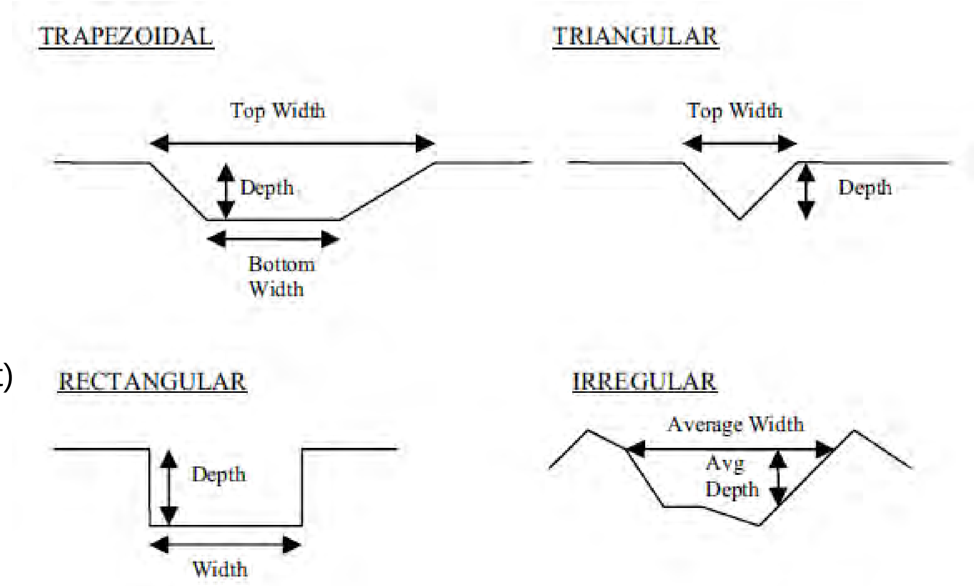
☐ Rectangular

☐ Irregular

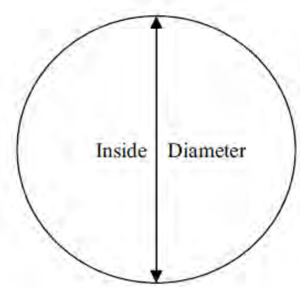
depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☒ plastic (hdpe, pvc, etc.) 36 inch Dia. spe

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒ (Except in Pond C)	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Not Known at this time.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

Question	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	Date:
Unit Name:	Operator's Name:
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name:	

Inspection Issue #	Comments

Site Name:	**Conemaugh Station**	**Date:**	**September 14, 2012**
Unit Name:	**Cooling Tower Desilting basin**	**Operator's Name:**	**GenOn**
Unit I.D.:	**02268**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Fred Tucker, P.E. and Edward Farquhar	

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?		√	18. Sloughing or bulging on slopes?		√
2. Pool elevation (operator records)?	√		19. Major erosion or slope deterioration?		√
3. Decant inlet elevation (operator records)?	1079.0		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	√		Is water entering inlet, but not exiting outlet?		√
5. Lowest dam crest elevation (operator records)?	1081.0		Is water exiting outlet, but not entering inlet?		√
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	√	
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)?	N/A		From underdrain?		N/A
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?	N/A		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?		√	Around the outside of the decant pipe?		√
15. Are spillway or ditch linings deteriorated?		√	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.

Issue #	Comments

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit PA0005011 **INSPECTOR** Tucker/Farquhar

Date September 14, 2012
Impoundment Name Cooling Tower Desilting Basin

Impoundment Company GenOn (part owner) et al.
EPA Region 3

State Agency (Field Office) Address
Pennsylvania Department of Environmental Protection
Bureau of Waste Management
286 Industrial Park Road
Ebensburg, PA 15931

Name of Impoundment Cooling Tower Desilting Basin (SPD-1)

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

New ☐ **Update** ☒

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☐	☒

IMPOUNDMENT FUNCTION:

Nearest Downstream Town Name: New Florence

Distance from the impoundment: <0.5 Miles

Location:

Latitude	40	Degrees	23	Minutes	10.95	Seconds	**N**
Longitude	-79	Degrees	3	Minutes	27.32	Seconds	**W**

State Pennsylvania **County** Indiana

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Department of Environmental Resources - Bureau of Waste Management; (water quality only) not regulated for dam safety.

<u>HAZARD POTENTIAL</u> *(In the event the impoundment should fail, the following would occur):*

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

☒ **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.

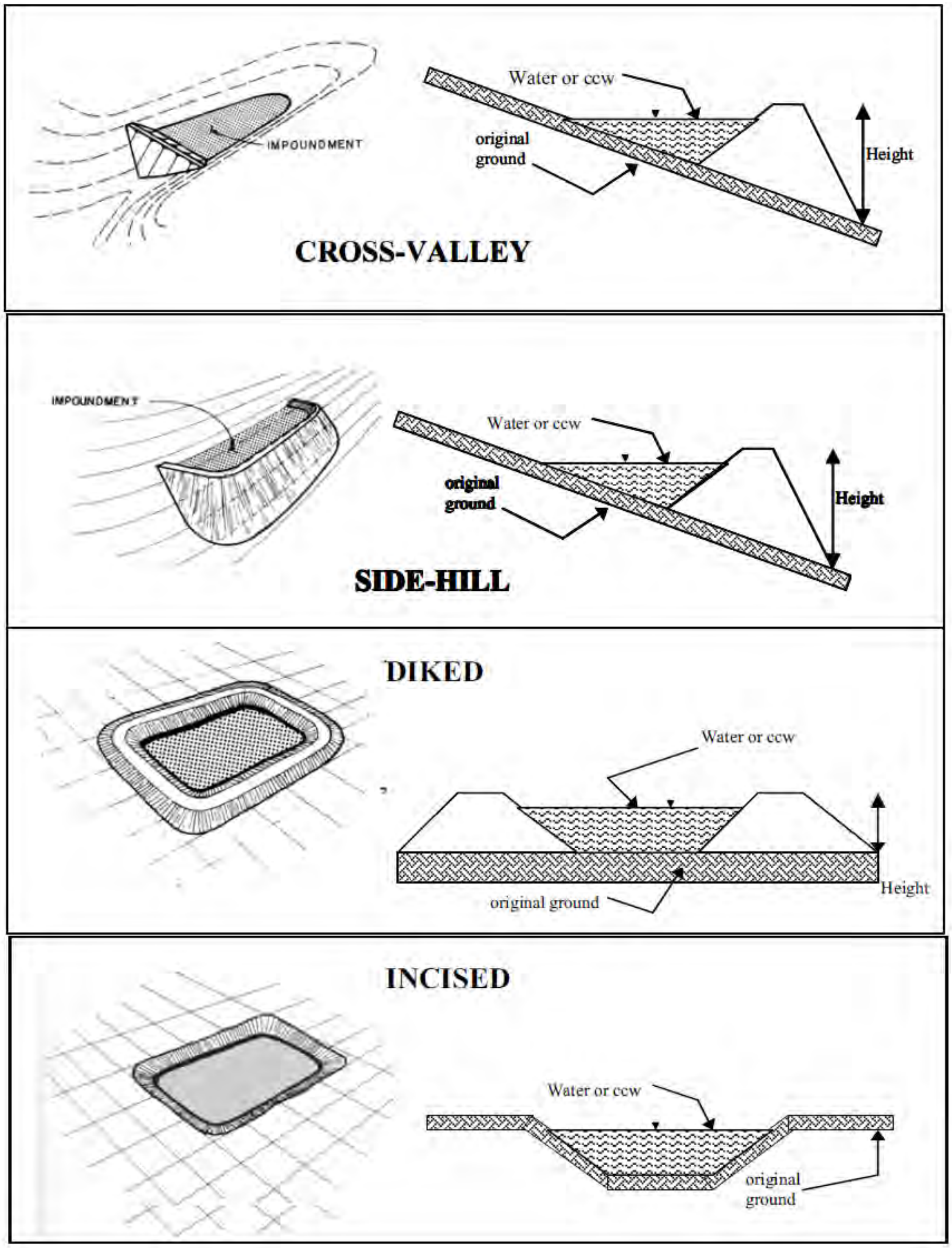
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

<u>DESCRIBE REASONING FOR HAZARD RATING CHOSEN:</u>

Low hazard potential classification for failure or release of very little bottom ash that potentially could reach the Conemaugh River. The basin is used as an over flow if needed for the ash filter ponds. There would be no significant risk of loss of human life. If failure occurred, minimum ash would be released since very little ash accumulates in the basin and would principally remain on-site. An intervening embankment with culvert would attenuate flow to the river.

CONFIGURATION:



☒ Cross-Valley ☐ Side-Hill ☐ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft) 8 feet **Embankment Material** Native soils

Pool Area (ac) 3.3 **Liner** Side Slopes 6 inch #ID-2 bituminous concrete over 6 inches of sand fill over

			composite liner (calymax plus 50 mil HDPE) over non-woven Geotextile fabric over HDPE Drainage net over 50 mil textured HDPE liner. Bottom: 6 inch #ID-2 bituminous concrete over 6 inches of sand fill over composite liner (calymax plus 50 mil HDPE) over non-woven Geotextile fabric over 6 inch no. 8 stone (leak detection zone) over non-woven Geotextile fabric over 50 mil textured HDPE liner.
Current Freeboard (ft)	2.0	**Liner Permeability**	N/A

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

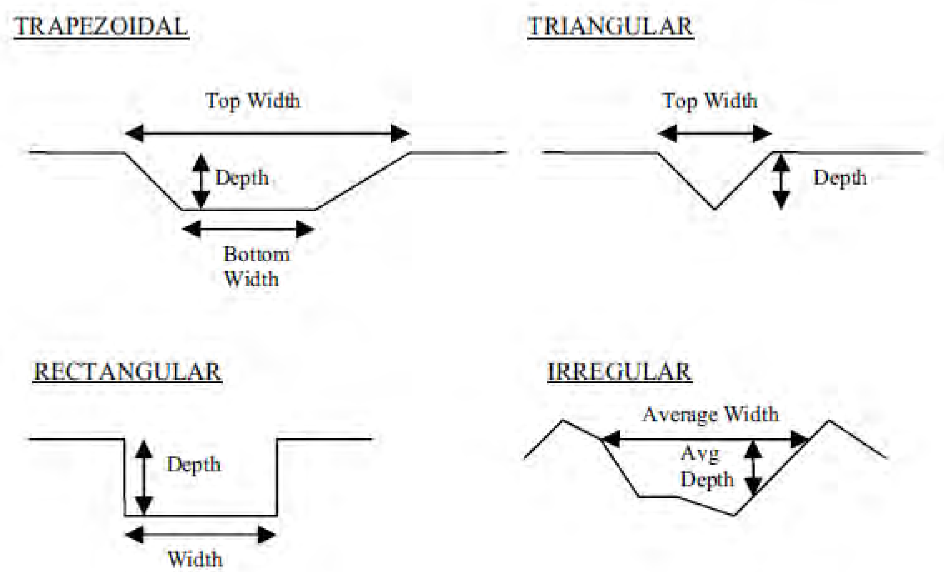
☐ Rectangular

☐ Irregular

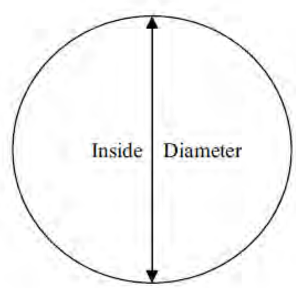
depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☒ plastic (hdpe, pvc, etc.) High Density Polyethylene 24-inch SDR-26 pipe

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Not Known at this time.

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	Date:
Unit Name:	Operator's Name:
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name:	

Inspection Issue #	Comments

APPENDIX C

Document 14

Memorandum from Frank Stephen to Stephen Hoffman, Jana Englander, November 27, 2013

From:	Frank, Stephen
To:	Hoffman, Stephen; Englander, Jana
Subject:	Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Conemaugh Generating Station
Date:	Wednesday, November 27, 2013 9:45:52 AM
Attachments:	Conemaugh - Desilting Basin Ponds Inspection Report.pdf Conemaugh - Ash Recycle Ponds Inspection Report.pdf Con Desilting Basin Post Construction Certification 11-1-13.pdf Desilting Basin DER.PDF Desilting Basin Design Drawings.pdf Final MD13352_Conemaugh 11.22.13.pdf Conemaugh Ownership and other minor text revisions.pdf Desilting Basin Photos 2013 prnt.pdf

Dear Mr. Hoffman and Ms. Englander,

As requested, NRG has reviewed and is providing the following comments on the Draft Report for Conemaugh Generating Station:

- The station operator is GenOn Northeast Management Company (GenOn), a subsidiary of NRG Energy, Inc. (NRG).
- Since the site inspection by Dewberry personnel on September 14, 2012, the Cooling Tower Desilting Basin at the Conemaugh Generating Station was reconstructed in its entirety. As a result, a fair portion of the Draft Report will need to be updated to reflect this new construction. Construction was completed on November 1, 2013 (See attached Post Construction Certification). Copies of portions of the Design Engineer's Report, Design Drawings, and photographs are also attached for reference. Copies of the Hydraulics and Hydrology calculations referenced in the Design Engineer's Report can be provided if requested.
- Although the conclusions appear correct regarding hydrologic/hydraulic safety, the conclusions for the Ash Filters Ponds did not reflect the presence of a gravity emergency overflow outfall from the ponds that would also prevent overtopping of the embankments. Additional information regarding this outfall is included in the Geosyntec report, which is attached to this e-mail.
- Revised text reflecting the ownership in Section 2.1 and other minor changes are attached.
- The surveillance program has been formalized and expanded to include the Ash Filter Ponds by using a checklist format (Example Inspection Reports attached).
- Based on the assessment conducted by Geosyntec (attached), the embankments for the Ash Filter Ponds and Desilting Basin are sufficiently stable, and it is appropriate for the EPA to report a condition of "Satisfactory," instead of "Poor," for continued safe and

reliable operations of the impoundments at the Conemaugh Generating Station.

Please do not hesitate to contact me with any questions or comments.

Thank you, Steve

NRG Energy

Stephen M. Frank, PE
Senior Environmental Specialist
NRG Energy Southpointe Operations Center
121 Champion Way, Suite 300
Canonsburg, PA 15317
P 724.597.8310
M 724.249.3610

APPENDIX C

Document 15

Letter from Geosyntec Consultants, November 22, 2013, Geotechnical and Hydraulic Assessment Report

Geosyntec consultants

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22 November 2013

NRG Energy Southpointe Operations Center
121 Champion Way, Suite 300
Canonsburg, PA 15317

Attention: Mr. Stephen Frank, P.E.
Senior Environmental Specialist

Subject: Geotechnical and Hydraulic Assessment Report
Conemaugh Generating Station – Filter Ash Ponds and Desilting Basin
New Florence, Pennsylvania

Dear Mr. Frank:

Geosyntec Consultants (Geosyntec) is pleased to submit this letter report presenting the findings of an assessment of the coal combustion waste (CCW) impoundments at the Conemaugh Generating Station (Site). The assessment was performed to address the recommendations of the draft report issued by the United States Environmental Protection Agency (EPA) regarding the condition of the impoundments. This report presents the results of the following activities: (i) field investigation of soil properties; (ii) general assessment of the geotechnical stability of pond embankments; and (iii) hydrologic/hydraulic evaluation of these ponds. This letter report was prepared by Dr. Chunling Li, P.E. and Mr. Wade Tyner, P.E., and it was reviewed by Dr. Lucas de Melo, P.E. and Mr. Michael Houlihan, P.E., in accordance with Geosyntec's peer review policy

1. BACKGROUND

The CCW management system at the site includes a cluster of four contiguous Filter Ash Ponds and a separate Cooling Tower Desilting Basin (Desilting Basin). These ponds were recently evaluated by the United States Environmental Protection Agency (EPA) as part of its ongoing national effort to assess the management of CCW. The draft EPA report dated November 2012, prepared by Dewberry & Davis, LLC (Dewberry) of Fairfax, Virginia, provided a Condition Assessment for each of the impoundments. According to EPA's guidelines, the Condition Assessment result can be "Satisfactory", "Fair", "Poor", or "Unsatisfactory" based on the availability of data, analysis, loading condition, and several other factors. The EPA draft report for Conemaugh site [Dewberry, 2012] provides a Condition Assessment result of "Poor" to both the Filter Ash Ponds and the Desilting Pond. The report states that the "rating is influenced by the lack of any formal documentation of hydrologic/hydraulic safety and slope stability for the Ash Filter Ponds and Desilting Basin dikes."

Section 1.2.3 of the EPA draft report provides the following recommendations for both the Filter Ash Ponds and Desilting Basin:

Recommendation 1: "Prepare and maintain on file formal documentation of slope stability analyses and safety factors."

Recommendation 2: "Prepare and maintain on file formal documentation of hydrologic/hydraulic safety showing the impoundments ability to hold design floods and precipitation."

After the draft report of the EPA inspection of the impoundments at Conemaugh was made available, NRG had thirty days from the receipt of this report to comment on the EPA's conclusions. On October 2013, NRG requested and was granted by EPA a 30-day extension to present EPA with responses to the EPA draft report; this extension postponed the due date of NRG's response to 30 November 2013. To support responding to comments presented in the EPA draft report, NRG retained Geosyntec to perform an assessment of the site's CCW impoundments. The purpose of this assessment is to:

- Evaluate the conditions that led to the assessment outcome of "Poor"; and
- Address the recommendations provided in the EPA report.

The findings of the assessment are presented in this letter report.

2. SUMMARY OF WORK

Geosyntec's work conducted in this assessment in response to EPA's comments is summarized in the following table.

TABLE 1
SUMMARY OF WORK

Conemaugh Generating Station
New Florence, Pennsylvania

Impoundment	EPA Recommendation	Work Conducted	Where Addressed in this Report
Ash Filter Ponds/ Desilting Basin	1	• Field investigation and laboratory tests • Slope stability analyses. • Liquefaction potential evaluation	Section 3, Appendices B and C Section 4, Appendix D Section 5
	2	• Hydrologic/hydraulic analysis	Section 6

3. GEOTECHNICAL FIELD INVESTIGATION

On 15 October 2013, Geosyntec conducted a geotechnical field investigation at the Filter Ash Pond and Desilting Basin to collect the data needed to assess the characteristics and properties of the stratigraphy.

The geotechnical field investigation consisted of drilling six test borings, identified as B-1 through B-4 (located in the Filter Ash Ponds area), and NE-1/SE-1 (located in the Desilting Pond area). Boring locations are shown in Figure 1. These borings were advanced near the crest of the exterior slope of the Filter Ash Pond and Desilting Basin embankments. Borings were drilled to an approximate depth of 26 feet below the existing ground surface (ft-bgs) at the Filter Ash Pond and 10 to 16 ft-bgs at the Desilting Basin. Boring investigation has been previously conducted at the Desilting Basin area and the boring logs have been presented in the Permit Application for reconstructing the Desilting Basin [GAI, 2011].

A track-mounted hollow-stem auger was used to advance the test borings. The drill bit has an internal diameter of 3.25 inches and outside diameter of 6 inches. Soil samples were obtained using a split-spoon sampler in accordance with ASTM D 1586 [ASTM, 2009]. At each boring location, soil samples were obtained every 2 ft. Sampling was conducted continuously at each of the borings. The soil penetration resistance was measured at all sampling locations using the Standard Penetration Test (SPT) and recording blow counts (i.e., N-values). The N-value is the number of blows required for a 140-pound (lb.) hammer dropping 30 inches (in.) to drive the sampler through a 12-in. interval. Boring logs obtained as part of this work are included in Appendix B of this report. After completion, the geotechnical boreholes were backfilled to ground surface using a cement grout.

Based on the boring logs, the Filter Ash Ponds' embankments were constructed using clay or silt with varying amount of gravel. The SPT N-values varied between 8 and 40 blows/ft. The soils below the original ground surface prior to pond construction have similar appearance and generally higher SPT-N value; thus, they are considered to have similar physical properties as the fill material used for embankment construction. Indication of weathered rock formation was encountered at approximately near the bottom of the boring at B-1 through B-4. No sound bedrock was encountered at these boring locations.

The Desilting Basin was constructed through excavation. The soils at the Desilting Basin were also identified as clay or silt with varying amount of gravel based on boring logs for SE-1 and NE-1. The SPT-N values varied from 3 to 27 blows/ft.

Laboratory test results were conducted to classify the soil samples collected during field investigation. The tests conducted include:

- Water content tests (ASTM D2216)
- Grain size distribution tests (ASTM D1140)
- Atterberg Limit tests (ASTM D4318)

The results of laboratory tests are shown in Appendix C.

Shear strength properties for the embankment and foundations soils were derived from data collected during the field investigation and from laboratory results. The soil properties derived from the field and laboratory tests are presented in Appendix D (i.e., Stability Analysis).

The groundwater table was not identified during drilling or after completion of the borings.

4. STABILITY EVALUATION

Geosyntec performed a stability analysis for both Filter Ash Ponds and Desilting Basin. Three representative cross sections, denoted as A-A, B-B, and C-C, were selected for the analysis based on review of subsurface conditions, visual inspection, and pond geometry. Cross Sections A-A and B-B are located at the Desilting Basin, and Cross Section C-C is at the Filter Ash Pond's Cell D. The locations of the selected cross sections are shown in Figures 1 and 2. These sections were selected either because the embankment height at this location is the highest or the slope is steepest. The weakest foundation condition identified by the boring investigation was conservatively assumed for the analyses of all analyzed cross sections. Thus, the selected cross sections represent the critical cross section and analysis results will likely represent the lowest expected factor of safety against failure for each evaluated impoundment.

The geometry of the embankment was obtained from the design plans, including design drawings of the Desilting Basin prepared by GAI dated August 2011 and design drawing of Filter Ash Ponds by Gilbert dated February 1980. Stability was analyzed under both static and seismic loading conditions. Both impoundments were considered to be at its high water elevation. No rapid drawdown analysis was found to be necessary because both the Filter Ash Ponds and the Desilting Basin are lined, and also because under this loading condition, the inner slope of the empty pond would represent the critical failure condition, which would not cause ash release or result in a hazard of the type that is contemplated in the EPA assessment. The major static load applied to the foundation soils is the gravity load exerted by the weight of the berm. A surcharge load of 250 psf was applied to the top of the embankment to model traffic loading on top of the embankment. This is a conservative assumption, because traffic loads are not permanent loads.

Based on the 2008 USGS Seismic Hazard Maps for Central and Eastern United States, the peak (horizontal) ground acceleration (PGA) with a 2-percent probability of exceedance in 50 years at this site is anticipated to be 0.050g (g is the gravitational acceleration). Seismic loading was modeled considering the maximum horizontal acceleration in bedrock for the Conemaugh site of 0.05g and seismic coefficient of 0.039. Details on the derivation of these parameters are included in Appendix D (i.e., Stability Analysis).

No phreatic surface would be expected to develop in the dike embankments if the liners at both the Ash Filter Ponds and the Desilting Basin perform as designed. To model the water pressure acting on the embankment, material inside the impoundments were represented by a no-shear strength material with unit weight of 62.4 lbs/ft^3. Based on the historical groundwater monitoring well results and Natural Resources Conservation Service (NRCS) Web Soil Survey [Dewberry, 2013], the groundwater level at the Ash Filter Ponds site is assumed to be at the bottom of both impoundments.

Geosyntec conducted the slope stability analyses using the computer program SLIDE version 6.0 [Rocscience, 2012]. Both circular and non-circular (block) slip surfaces were analyzed. The factors of safety are all above the minimum recommended values. A summary of stability analyses results are presented in Table 2. Complete analyses are included in Appendix C (i.e., Stability Analysis).

TABLE 2
RESULTING FACTOR OF SAFETY – SLOPE STABILITY ANALYSIS

Conemaugh Generating Station
New Florence, Pennsylvania

Cross Sections	Loading Conditions	Failure Mode	Calculated F.S.	Target F.S.
A-A (Desilting Basin)	Static (undrained)	Block	1.30	1.30
		Circular	1.30	1.30
	Static (drained)	Block	1.62	1.50
		Circular	1.59	1.50
	Seismic	Block	1.21	1.20
		Circular	1.20	1.20
B-B (Desilting Basin)	Static (undrained)	Block	1.63	1.30
		Circular	1.56	1.30
	Static (drained)	Block	1.83	1.50
		Circular	1.82	1.50
	Seismic	Block	1.40	1.20
		Circular	1.33	1.20
C-C (Filter Ash Pond)	Static (undrained)	Block	2.57	1.30
		Circular	2.61	1.30
	Static (drained)	Block	1.50	1.50
		Circular	1.50	1.50
	Seismic	Block	2.30	1.20
		Circular	2.29	1.20

5. LIQUEFACTION POTENTIAL

Liquefaction is a phenomenon where soil substantially loses strength and stiffness in response to cyclic loads (e.g., earthquake) or change in stress state. Generally, liquefiable soils are saturated or nearly saturated loose sand with relatively low fines content. According to the boring logs, the soils present at the site are either cohesive or contains primarily relatively large gravel-size particles. Therefore, the soils at the site are not considered liquefiable. Additionally, the site is located in an area with low seismic activity. The potential for liquefaction in this site is considered negligible.

6. HYDROLOGIC/HYDRAULIC EVALUATION

Section 1.2.3 of the EPA report recommends the following with regard to the hydrologic/hydraulic evaluation of the impoundments: "Prepare and maintain on file formal documentation of hydrologic/hydraulic safety showing the impoundments [sic] ability to hold design floods and precipitation."

In response to this recommendation, Geosyntec has performed an evaluation of the hydrologic/hydraulic performance of these impoundments.

Desilting Basin

Stormwater from the area north of the offices and adjacent to the cooling towers flows by gravity to the Desilting Basin. GAI Consultants [2011] conducted a hydraulics and hydrology calculation as a part of the water quality management permit application. Their analysis assumed that the cooling tower yard area discharged to the basin, and both the FGD pumps and Cooling Tower Blowdown Treatment System are not operational, and that the Ash Valley Treatment System is operating. Considering that the pre-storm water surface elevation in the basin is at the crest of the riser (i.e., 1077.75 ft), the results of the modeling for 25-year and 100-year storm are summarized in Table 3 below:

TABLE 3
SUMMARY OF HYDRAULIC AND HYDROLOGY MODELING RESULTS – DESILTING BASIN

Conemaugh Generating Station
New Florence, Pennsylvania

Peak Inflow (cfs)		Riser Discharge (cfs)		Peak Water Elevation (ft-msl)		Freeboard (ft)	
25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	100-yr
70.5	89.8	36.9	38.9	1079.32	1079.87	2.18	1.63

As demonstrated by GAI [2011] and summarized in Table 3, a freeboard greater than 1 ft can be maintained during a 100-year storm event at the Desilting Basin. All influent pipes to the basin can be valved off; therefore the stormwater management system is equipped with means to by-pass stormwater away from the Desilting Basin and reduce the risk of embankment overtopping during an extreme storm event (i.e., larger than the 100-yr storm event).

Ash Filter Ponds

The Ash Filter Ponds currently are designed to receive outflow from Ash Water Recycle Sump (AWRS). The AWRS receives water from the following sources: (1) stormwater collected by the Ash Silo Sump at the Ash Silo Complex Area; (2) a small vegetated area located to the north of the four Ash Ponds, Limestone Pond (limestone pile drainage area), and FGD Building & Gypsum Area; (3) process water, and (4) Ash Filter Ponds Drainage area. These sources of stormwater could be pumped to the Desilting Basin, returned to the Ash Filter Ponds, or overflow through the NPDES permitted Internal Monitoring Point (IMP) 707 (i.e., Manhole #4) to the final Outfall 007. The delineated stormwater drainage area and hydraulic/hydrologic model prepared by GAI are shown in Figures 3 and 4, respectively.

Other than direct precipitations, flow into the Ash Filter Ponds can be controlled by pump during a storm event and the normal water elevation is maintained at 2 ft below the crest of the embankment. The design precipitation depth at the high end of the design range (100-year frequency) is 5.77 inches or 0.48 ft, which is considerably less than the available freeboard. Considering that water inflow into the Ash Filter Ponds can be controlled by the existing water management system installed at the site and/or diverted towards the Desilting Basin or Overflow through Manhole #4 during large storm events, the Ash Filter Ponds are considered to be sufficiently safe to avoid embankment overtopping in a 100-year design storm.

7. CONDITION ASSESSMENT

Condition Assessment definitions, as accepted by EPA, are as follows:

- *Satisfactory:* *No existing or 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 a 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."*

Based on the assessment conducted in this analysis, the embankments at the site is sufficiently stable. The Ash Filter Pond and Desilting Basin can safely contain a 100-year precipitation. It is our opinion that, with the additional information that is now available in this report, it would be appropriate for the EPA to report a condition of "Satisfactory", instead of "Poor", for both CCW impoundments at the site.

8. CONCLUSIONS

Based on the assessment described in this letter, Geosyntec believes that the appropriate Condition Assessment result is "Satisfactory". Other than routine maintenance, no other action is recommended at this time.

Geosyntec is confident that the findings discussed in this report address each of the EPA's comments provided in the Condition Assessment draft report for the Conemaugh facility. If EPA has additional comments or requests, we would be happy to address those.

Geosyntec appreciates the opportunity to be of assistance to NRG on this project. Please call any of the undersigned if you have any questions.

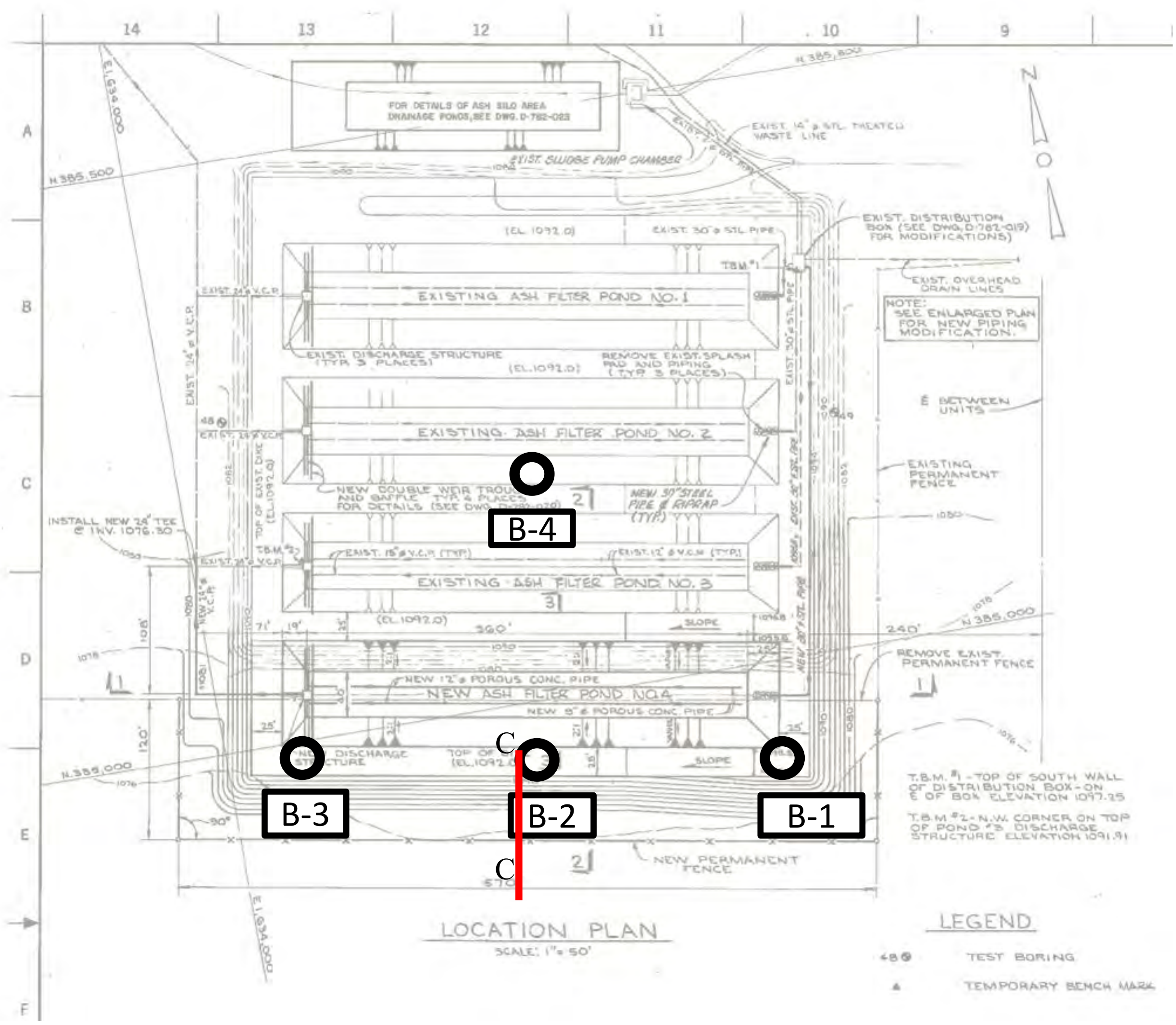
Sincerely,

Lucas de Melo, Ph.D., P.E.
Senior Engineer

Mike Houlihan, P.E.,
Principal

Attachments: Appendix A – References
Appendix B – Boring Logs
Appendix C – Laboratory Test Results
Appendix D – Stability Analysis

FIGURES



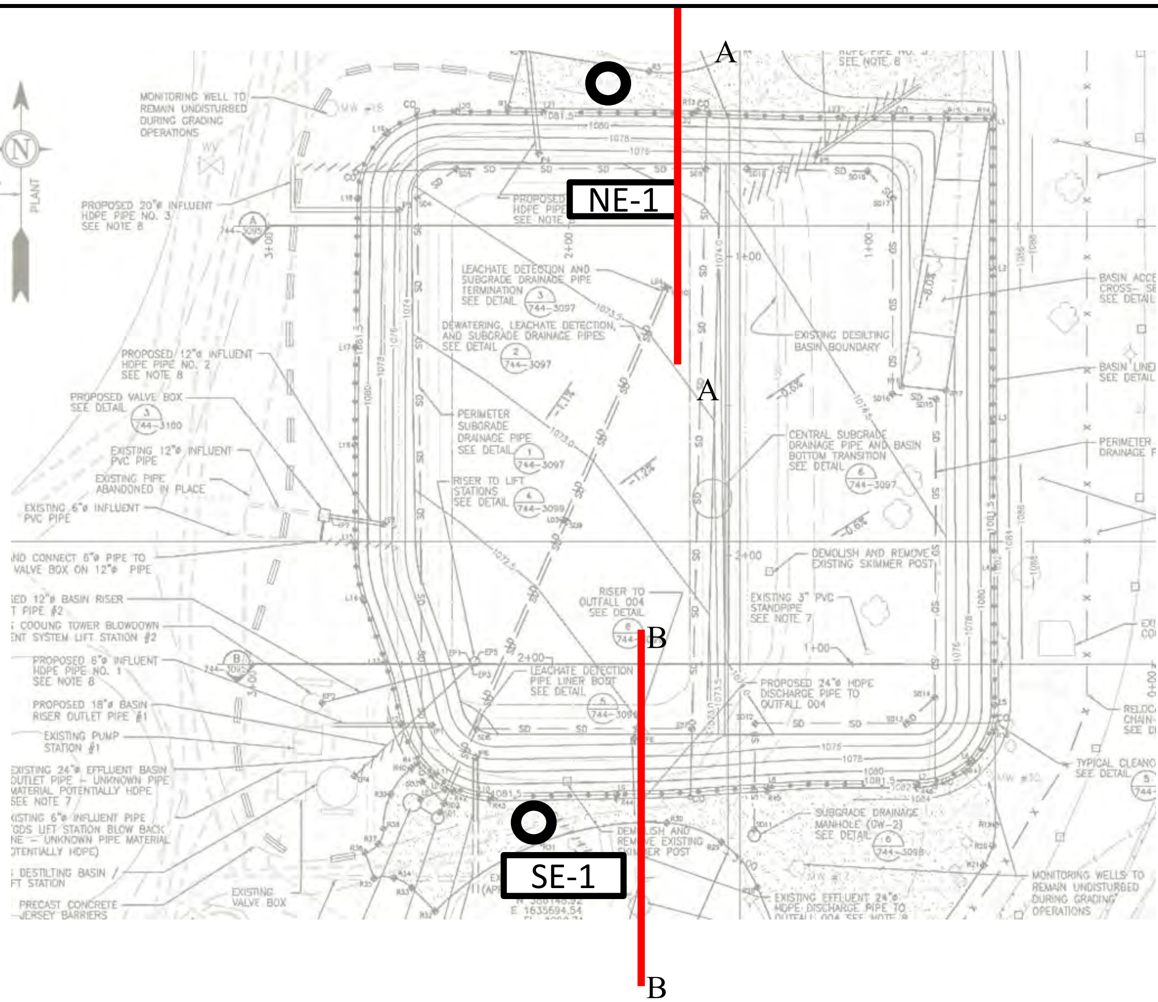
Legend

Approximate Boring Location (symbol: B-1)

FIGURE 1 - SOIL BORING LOCATION
Conemaugh Power Station – Ash Filter Pond
New Florence, PA

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	Oct 2013
PROJECT NO.	ME1001
DOCUMENT NO.	
FIGURE NO:	1



Legend

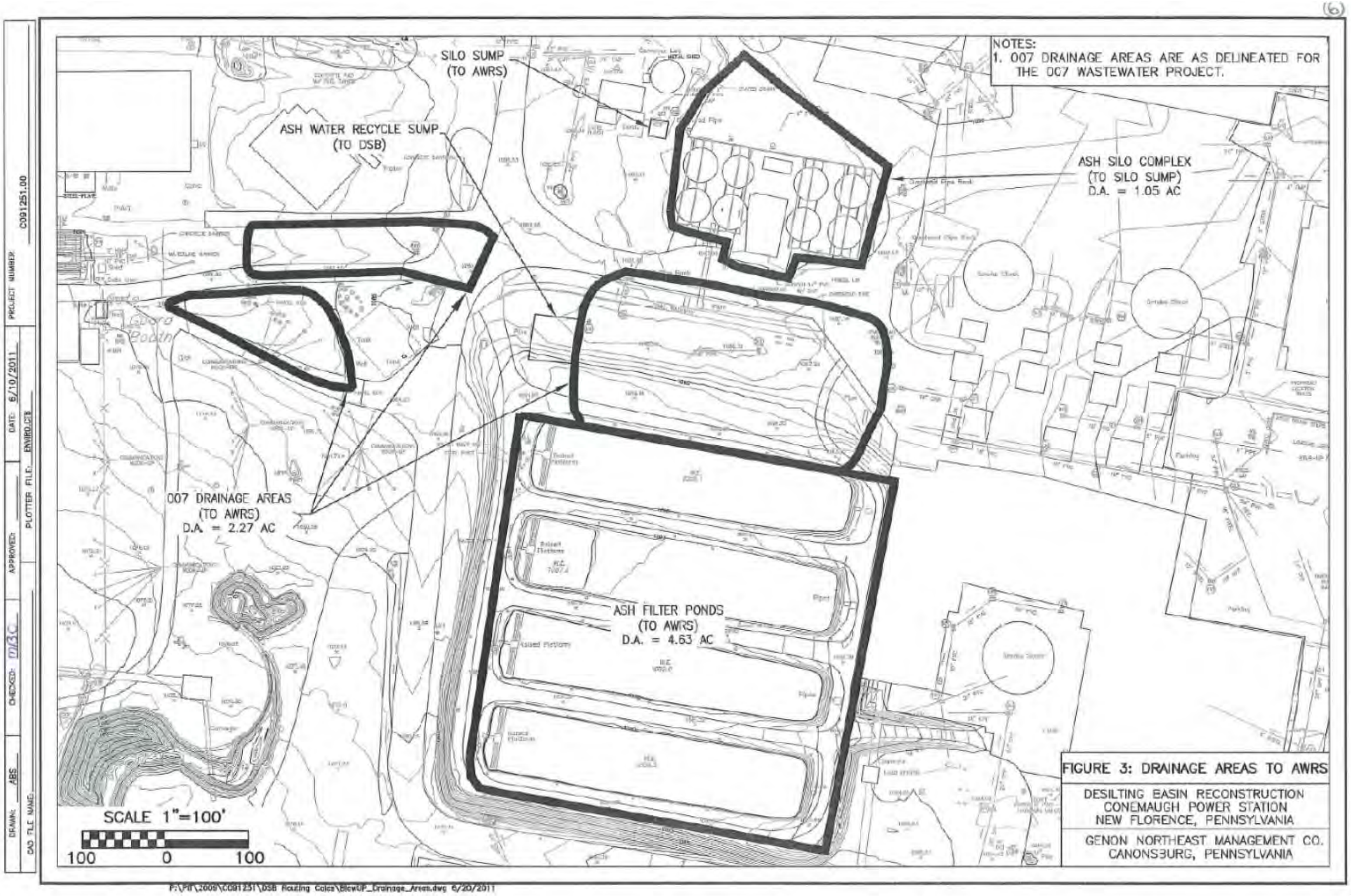
O B-1 Approximate Boring Location

FIGURE 2 - SOIL BORING LOCATION
Conemaugh Power Station – Desilting Basin
New Florence, PA

Geosyntec consultants

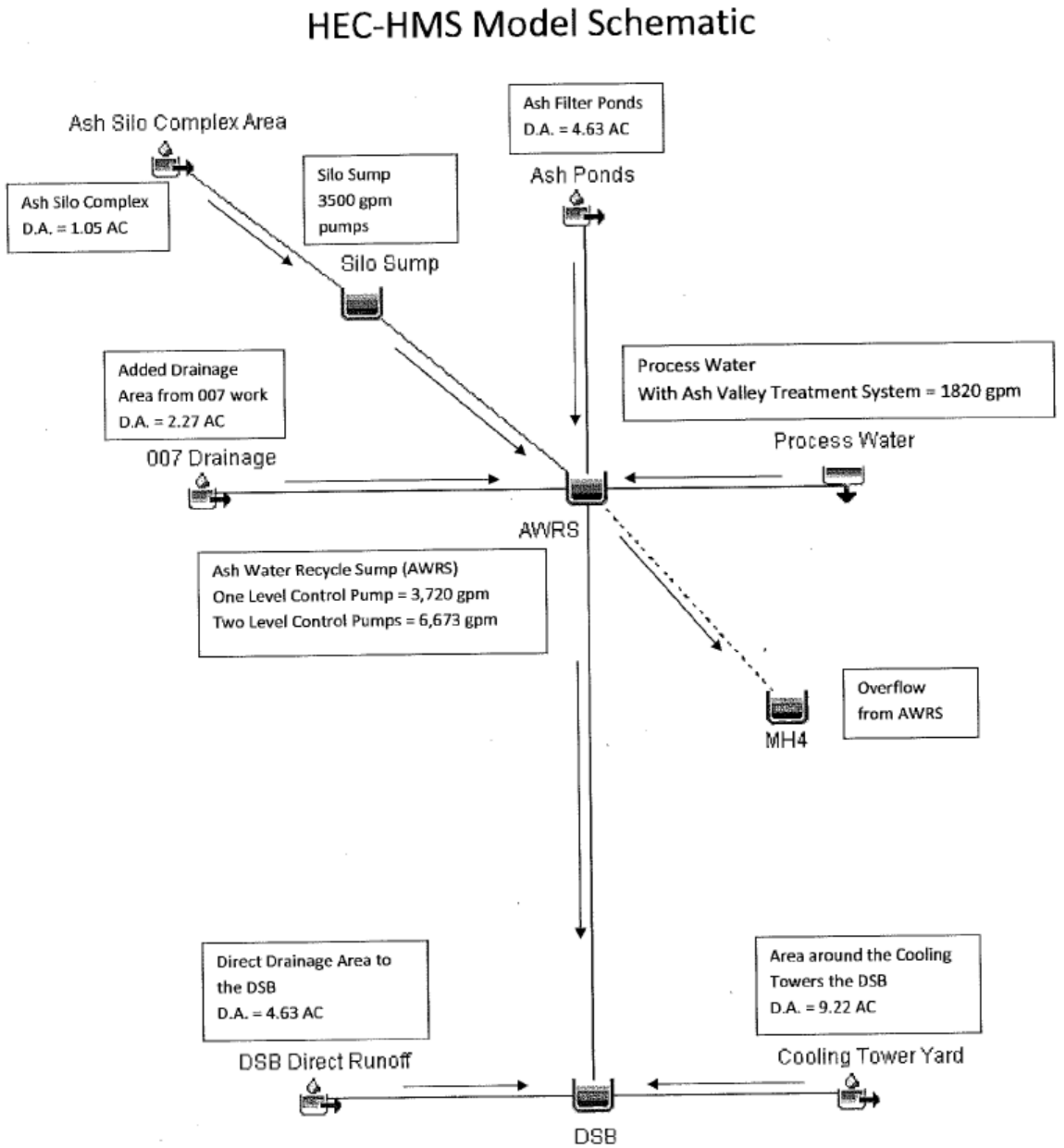
COLUMBIA, MARYLAND

DATE:	Oct 2013
PROJECT NO.	ME1001
DOCUMENT NO.	
FIGURE NO:	2



Source: GAI [2011]

Figure 3. Drainage Area to Ash Water Recycling Sump



Source: GAI [2011]

Figure 4. Site Hydraulic/Hydrologic Model

APPENDIX A

REFERENCES

List of References:

Dewberry & Davis, Inc. (2012)., "Coal Combustion Residue Impoundment Round 12 - Dam Assessment Report, Conemaugh Generating Station Filter Ash Ponds & CT Desilting Basin, GenOn Energy New Florence, PA." prepared for United States Environmental Protection Agency, November, 2012 (draft).

GAI Consultants (2011). " Chapter 105/Chapter 106 Permit Application, Reconstruction of Existing Desilting Basin, Caunemaugh Power Plant, New Florence, Indiana County, Pennsylvania." Prepared for Genon Northeast Management Company, August, 2011.

Rocscience. (2012). "Slide (Version 6.0): A 2D Slope Stability Analysis for Soil and Rock Slopes", Toronto, Canada.

USGS (2008). "2008 United States National Seismic Hazard Maps", United States Geological Survey, http://earthquake.usgs.gov/research/hazmaps/products_data/2008/

APPENDIX B

BORING LOG

BORING LOG

Geosyntec consultants
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Boring ID	B-1		
Logged By	L. Chai	Elevation	N/A
Date	10/15/2013	Northing	N/A
Project No.	ME1001	Easting	N/A
Project Name	Conemaugh Power Plant		
		Drilling Method	HSA
Drilling Co.	Eichelbergers, Inc.	Bore Hole Diameter	6 inches
Driller(s)	Tom Growden	Cave Depth	N/A
Rig Type	Track Mounted HSA	Depth to Water	Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description	USCS	Sample No.	Recovery
	0-2	11	9	11	10	20	Top 5" black top soil with vegetation. Coarse gravel with yellowish orange clay	GC	1	95%
	2-4	8	8	9	7	17	Yellowish orange clay with little fine gravel	CL	2	100%
	4-6	6	7	7	6	14	Subangular gravel with yellowish orange clay	GC	3	100%
	6-8	6	8	9	9	17	Subangular gravel with yellowish orange clay	GC	4	100%
	8-10	7	10	10	10	20	Top 1' light gray clay, bottom 1' Subangular gravel with yellowish orange clay	CL GC	5	100%
	10-12	5	7	5	7	12	Yellowish orange clay with little coarse gravel	CL	6	100%
	12-14	7	7	7	7	14	Yellowish orange clay with little coarse gravel	CL	7	100%
	14-16	4	6	9	12	15	Yellowish orange clay with little coarse gravel	CL	8	100%
	16-18	9	11	11	10	22	Yellowish orange clay with little coarse gravel	CL	9	40%
	18-20	6	6	8	7	14	Yellowish orange clay with little coarse gravel	CL	10	95%
	20-22	5	8	9	12	17	Sandy clay with gravel	CL	11	70%
	22-24	15	16	32	20	48	Light brown clayey sand	SC	12	65%
	24-26	15	14	15	22	29	Light brown clayey sand	SC	13	95%
							BORING COMPELETE AT 26 FEET - BACKFILLED WITH CEMENT GROUT			

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BORING LOG

Boring ID	B-2		
Logged By	L. Chai	Elevation	N/A
Date	10/14/2013	Northing	N/A
Project No.	ME1001	Easting	N/A
Project Name	Conemaugh Power Plant		
		Drilling Method	HSA
Drilling Co.	Eichelbergers, Inc.	Bore Hole Diameter	6 inches
Driller(s)	Tom Growden	Cave Depth	N/A
Rig Type	Track Mounted HSA	Depth to Water	Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description	USCS	Sample No.	Recovery
	0-2	15	23	15	17	38	Fine (0.5") gravel with sand	GP	1	90%
	2-4	12	12	16	14	28	Light gray silt with few subrounded coarse gravel	ML	2	100%
	4-6	9	7	9	8	16	Light gray silt with few subrounded coarse gravel	ML	3	85%
	6-8	7	8	9	9	17	Olive gray clayey sand with few sub angular gravel	SC	4	85%
	8-10	5	8	10	10	18	Olive gray clayey sand with few sub angular gravel	SC	5	90%
	10-12	3	5	7	8	12	Olive gray clayey sand with little angular gravel, fine to coarse	SC	6	80%
	12-14	3	5	6	6	11	Olive gray clayey sand with little angular gravel, fine to coarse	SC	7	75%
	14-16	5	6	7	10	13	Olive gray clayey sand with little angular gravel, fine to coarse	SC	8	100%
	16-18	6	16	12	21	28	Olive gray clayey sand with little angular gravel, fine to coarse	SC	9	100%
	18-20	11	11	16	16	27	top 1': same clayey sand continue bottom 1': light brown clayey sand	SC SC	10	100%
	20-22	7	8	8	8	16	light brown clayey sand	SC	11	100%
	22-24	10	11	10	10	21	light brown clayey sand	SC	12	100%
	24-26	9	9	12	15	21	light brown clayey sand, wet clayey sand at 24.5' to 25' bottom 1': yellowish orange silty clay	SC CL	13	100%
							BORING COMPLETE AT 26 FEET - BACKFILLED WITH CEMENT GROUT			

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BORING LOG

Boring ID	B-3		
Logged By	L. Chai	Elevation	N/A
Date	10/14/2013	Northing	N/A
Project No.	ME1001	Easting	N/A
Project Name	Conemaugh Power Plant		
		Drilling Method	HSA
Drilling Co.	Eichelbergers, Inc.	Bore Hole Diameter	6 inches
Driller(s)	Tom Growden	Cave Depth	N/A
Rig Type	Track Mounted HSA	Depth to Water	Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description	USCS	Sample No.	Recovery
	0-2	18	17	17	18	34	Light gray gravel with sand	SP	1	55%
	2-4	18	13	12	11	25	Gray, fine to coarse, sub rounded gravel with yellowish orange clay	GC	2	90%
	4-6	10	6	6	6	12	Gray, fine to coarse, sub rounded gravel with yellowish orange clay	GC	3	95%
	6-8	4	4	4	4	8	Gray, fine to coarse, sub rounded gravel with yellowish orange clay	GC	4	90%
	8-10	6	8	9	11	17	Gray coarse sub angular gravel width olive gray clay	GC	5	95%
	10-12	3	8	11	8	19	Light brown clay with some coarse gravel	GC	6	95%
	12-14	9	9	12	14	21	Gray, fine to coarse, sub rounded gravel with yellowish orange clay	GC	7	85%
	14-16	4	4	7	10	11	Fine to coarse gravel with some clay	GC	8	100%
	16-18	12	14	20	17	34	Gray, fine to coarse, sub rounded gravel with yellowish orange clay	GC	9	100%
	18-20	7	12	13	18	25	Light brown clay with few fine gravel	CL	10	60%
	20-22	10	12	12	11	24	Clayey sand with few fine gravel	SC	11	100%
	22-24	11	19	19	13	38	Light brown clayey sand	SC	12	100%
	24-26	12	17	34	31	51	Coarse gravel with light brown sand, wet clayey sand at 24.5'	GC	13	80%
							BORING COMPLETE AT 26 FEET - BACKFILLED WITH CEMENT GROUT			

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BORING LOG

Boring ID	B-4		
Logged By	L. Chai	Elevation	N/A
Date	10/15/2013	Northing	N/A
Project No.	ME1001	Easting	N/A
Project Name	Conemaugh Power Plant		
		Drilling Method	HSA
Drilling Co.	Eichelbergers, Inc.	Bore Hole Diameter	6 inches
Driller(s)	Tom Growden	Cave Depth	N/A
Rig Type	Track Mounted HSA	Depth to Water	Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description		Sample No.	Recovery
	0-2	12	10	16	15	26	Top 0.1': black surface soil. Fine gravel with some yellowish orange clay and trace sand.	GC	1	100%
	2-4	12	17	17	20	34	Fine gravel with some yellowish orange clay and trace sand.	GC	2	85%
	4-6	10	17	11	10	28	Yellowish orange clay with trace coarse gravel	CL	3	80%
	6-8	8	5	9	9	14	Shale type gravel with some yellowish orange clay	GC	4	85%
	8-10	9	8	13	10	21	Shale type gravel with some yellowish orange clay	GC	5	95%
	10-12	7	8	6	7	14	Shale type gravel with some yellowish orange clay	GC	6	85%
	12-14	6	21	19	16	40	Olive gray clay with trace poor grade gravel	CL	7	70%
	14-16	5	8	12	11	20	Variegated light brown and light gray silty clay	CL	8	100%
	16-18	10	14	22	28	36	Mottled light brown and black (spot) silty clay	CL	9	100%
	18-20	31	34	25	19	59	Coarse gravel with sandy clay	GC	10	100%
	20-22	8	9	9	9	18	Light brown clayey sand with subrounded gravel	SC	11	90%
	22-24	7	10	16	14	26	Light brown clayey sand with subrounded gravel	SC	12	100%
	24-26	10	11	12	12	23	Light brown clayey sand with subrounded gravel, bottom 0.5' black sandy clay	SC	13	90%
							BORING COMPLETE AT 26 FEET - BACKFILLED WITH CEMENT GROUT			

BORING LOG

Geosyntec consultants
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Boring ID	NE-1 (North Embankment)		
Logged By	L. Chai	Elevation	N/A
Date	10/14/2013	Northing	N/A
Project No.	ME1001	Easting	N/A
Project Name	Conemaugh Power Plant		
		Drilling Method	HSA
Drilling Co.	Eichelbergers, Inc.	Bore Hole Diameter	6 inches
Driller(s)	Tom Growden	Cave Depth	N/A
Rig Type	Track Mounted HSA	Depth to Water	Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description	USCS	Sample No.	Recovery
	0-2	10	16	10	14	26	Yellowish orange silty clay with little coarse gravel	CL	1	80%
	2-4	9	6	6	7	12	Yellowish orange silty clay with little coarse gravel, with gray sand at 3'	CL	2	60%
	4-6	4	4	3	4	7	Yellowish orange silty clay with little coarse gravel, with gray sand at 3'	CL	3	100%
	6-8	3	4	5	6	9	Silty clay with trace fine gravel	CL	4	85%
	8-10	5	6	5	5	11	Silty clay	CL	5	90%
							BORING COMPLETE AT 10 FEET			

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BORING LOG

Boring ID SE-1 (South Embankment)
Logged By L. Chai
Date 10/15/2013
Elevation N/A
Northing N/A
Easting N/A
Project No. ME1001
Project Name Conemaugh Power Plant
Drilling Method HSA
Drilling Co. Eichelbergers, Inc.
Bore Hole Diameter 6 inches
Driller(s) Tom Growden
Cave Depth N/A
Rig Type Track Mounted HSA
Depth to Water Not Encountered

Elevation	Depth (ft)	Blow Counts				N- Value	Material Description	USCS	Sample No.	Recovery
	0-2	6	7	4	5	11	Yellowish orange silty clay with little coarse gravel	CL	1	95%
	2-4	5	9	18	6	27	Yellowish orange silty clay with little coarse gravel and grey sand Soil sample inclued a piece of black pipe edge	CL	2	75%
	4-6	7	3	4	4	7	Yellowish orange silty clay with little coarse gravel	CL	3	85%
	6-8	3	3	2	3	5	Greenish gray silty clay with little gravel	CL	4	10%
	8-10	2	1	2	2	3	Greenish gray silty clay with little gravel	CL	5	5%
	10-12	2	2	2	3	4	No recovery	N/A	6	0%
	12-14	3	6	5	5	11	No recovery	N/A	7	0%
	14-16	8	9	8	24	17	Wet silty clay from 14' to 14.5', below 14.5': moist sility clay	CL	8	80%
							BORING COMPLETE AT 16 FEET - BACKFILLED WITH CEMENT GROUT			

APPENDIX C

LABORATORY TEST RESULTS

TRI/ENVIRONMENTAL, INC.

A Texas Research International Company

Client: Geosyntec Consultant
Project: NRG (Conemaugh): ME 1001

TRI Log No.: E2377-48-09
Test Methods: As-Noted

Jeffrey A. Kuhn, Ph.D., P.E., 10/25/13
Quality Review/Date

Tested by: Tierra Jackson and Kahlil Hart

	ASTM Standard							
	D2216			D1140	D4318			
Sample ID	w (%)	γ total (pcf)	γ dry (pcf)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	USCS**
NE-1 (4-6)*	18.2	-	-	-	37	20	17	-
SE-1 (4-6)*	15.4	-	-	-	28	17	11	-
B-1 (12-14, 24-26)	14.3	-	-	24.3	27	17	10	SC
B-2 (10-12, 24-26)	9.8	-	-	47.9	23	16	7	SC-SM
B-3 (6-8)*	20.1	-	-	-	33	20	13	-
B-4 (6-8, 20-22)	13.6	-	-	37.3	31	20	11	SC

*As per clients instructions, grain size analsis was not performed due to limited sample quantity.

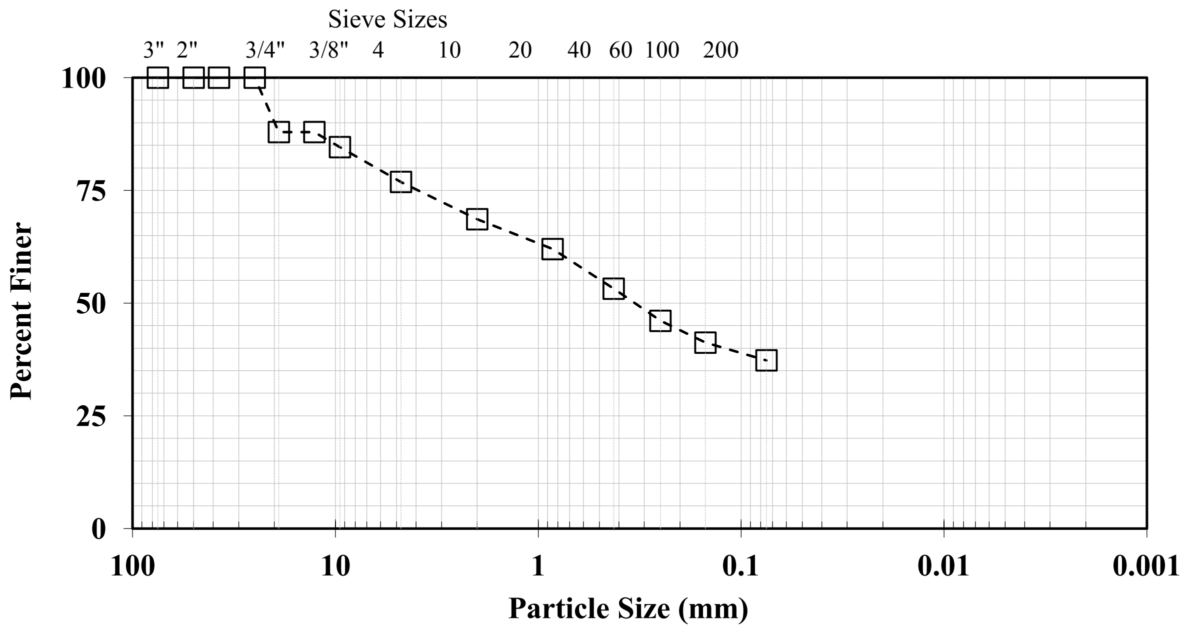
**For full USCS classification/description, please refer to D422-D2216-D4318 reports.

9063 Bee Caves Road □ Austin, TX 78733-6201 □ (512) 263-2101 □ (512) 263-2558 □ 1-800-880-TEST

Particle Size Analysis for Soils

Client: Geosyntec Consultant
Project: NRG (Conemaugh): ME 1001
Sample: B-4 (6-8, 20-22)

TRI Log#: E2377-48-09
Test Method: D422
Test Date: 10/22/13



Sieve Analysis	
Sieve Size	Percent Passing
3 in.	100.0
2 in.	100.0
1.5 in.	100.0
1 in.	100.0
3/4 in.	87.9
1/2 in.	87.9
3/8 in.	84.6
No. 4 (4.75 mm)	76.9
No. 10 (2.00 mm)	68.6
No. 20 (850 µm)	62.0
No. 40 (425 µm)	53.2
No. 60 (250 µm)	46.1
No. 100 (150 µm)	41.2
No. 200 (75 µm)	37.3
Hydrometer Analysis	
Particle Size	Percent Passing
0.074 mm	- -
0.005 mm	- -
0.001 mm	- -

USCS Classification (ASTM D2487)	Clayey Sand (SC)	
As-Received Moisture Content (%)	(ASTM D2216)	13.6
Atterberg Limits (ASTM D 4318, Method A : Multipoint)	Liquid Limit (3 pt)	31
	Plastic Limit	20
	Plastic Index	11
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	- -
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM 4373)	- -

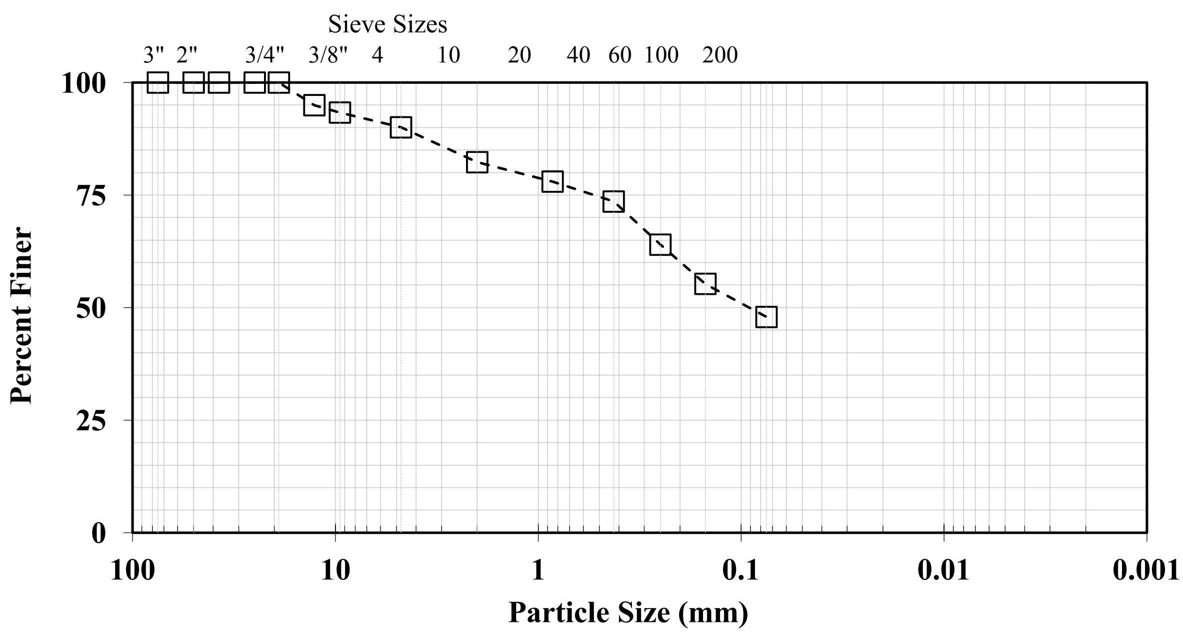
Jeffrey A. Kuhn, Ph.D., P.E., 10/25/2013
Quality Review/Date
Tested by: Kahlil Hart & Tierra Jackson

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

Particle Size Analysis for Soils

Client: Geosyntec Consultant
Project: NRG (Conemaugh): ME 1001
Sample: B-2 (10-12, 24-26)

TRI Log#: E2377-48-09
Test Method: D422
Test Date: 10/22/13



Sieve Analysis	
Sieve Size	Percent Passing
3 in.	100.0
2 in.	100.0
1.5 in.	100.0
1 in.	100.0
3/4 in.	100.0
1/2 in.	95.0
3/8 in.	93.3
No. 4 (4.75 mm)	90.0
No. 10 (2.00 mm)	82.3
No. 20 (850 µm)	78.0
No. 40 (425 µm)	73.6
No. 60 (250 µm)	64.0
No. 100 (150 µm)	55.3
No. 200 (75 µm)	47.9
Hydrometer Analysis	
Particle Size	Percent Passing
0.074 mm	- -
0.005 mm	- -
0.001 mm	- -

USCS Classification (ASTM D2487)	Silty, Clayey Sand (SC-SM)	
As-Received Moisture Content (%)	(ASTM D2216)	9.8
Atterberg Limits (ASTM D 4318, Method A : Multipoint)	Liquid Limit (3 pt)	23
	Plastic Limit	16
	Plastic Index	7
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	- -
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM 4373)	- -

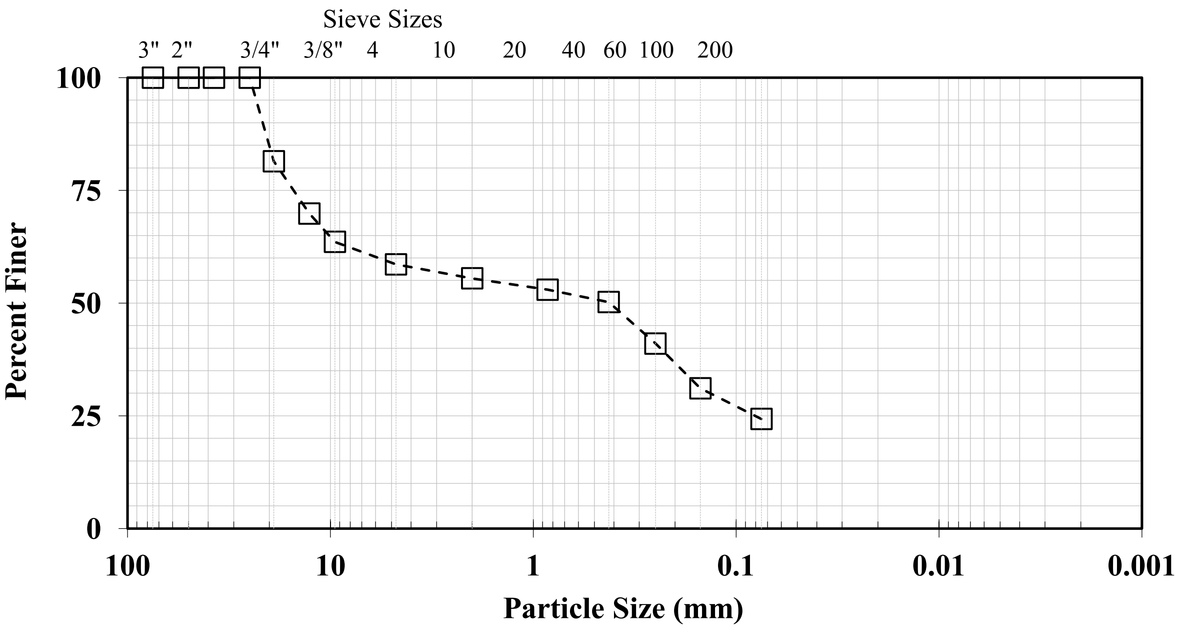
Jeffrey A. Kuhn, Ph.D., P.E., 10/25/2013
Quality Review/Date
Tested by: Kahlil Hart & Tierra Jackson

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

Particle Size Analysis for Soils

Client: Geosyntec Consultant
Project: NRG (Conemaugh): ME 1001
Sample: B-1 (12-14, 24-26)

TRI Log#: E2377-48-09
Test Method: D422
Test Date: 10/22/13



Sieve Analysis	
Sieve Size	**Percent Passing**
3 in.	100.0
2 in.	100.0
1.5 in.	100.0
1 in.	100.0
3/4 in.	81.5
1/2 in.	69.9
3/8 in.	63.6
No. 4 (4.75 mm)	58.6
No. 10 (2.00 mm)	55.5
No. 20 (850 µm)	53.0
No. 40 (425 µm)	50.2
No. 60 (250 µm)	41.0
No. 100 (150 µm)	31.1
No. 200 (75 µm)	24.3
Hydrometer Analysis	
Particle Size	Percent Passing
0.074 mm	- -
0.005 mm	- -
0.001 mm	- -

USCS Classification (ASTM D2487)	Clayey Sand (SC)	
As-Received Moisture Content (%)	(ASTM D2216)	14.3
Atterberg Limits (ASTM D 4318, Method A : Multipoint)	Liquid Limit (3 pt)	27
	Plastic Limit	17
	Plastic Index	10
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	- -
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM 4373)	- -

Jeffrey A. Kuhn, Ph.D., P.E., 10/25/2013
Quality Review/Date
Tested by: Kahlil Hart & Tierra Jackson

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APPENDIX D

STABILITY ANALYSIS

Geosyntec consultants

COMPUTATION COVER SHEET

Client: NRG **Project:** Conemaugh Impoundment Evaluation **Project/Proposal #:** ME1001 **Task #:** ____

TITLE OF COMPUTATIONS Stability Analysis for CCW Impoundments at Conemaugh Power Station

COMPUTATIONS BY: Signature [signature] DATE 11/1/2013
Printed Name and Title: Chunling Li, Project Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY: (Peer Reviewer) Signature [signature] DATE 11/1/2013
Printed Name and Title: Lucas de Melo, Senior Engineer

COMPUTATIONS CHECKED BY: Signature [signature] DATE 11/1/2013
Printed Name and Title: Lin Chai, Staff Engineer

COMPUTATIONS BACKCHECKED BY: (Originator) Signature [signature] DATE 11/1/2013
Printed Name and Title: Chunling Li, Project Engineer

APPROVED BY: (PM or Designate) Signature [signature] DATE 11/1/2013
Printed Name and Title: Michael Houlihan, Principal

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

STABILITY ANALYSIS FOR CCW IMPOUNDMENTS AT CONEMAUGH POWER STATION

1. PURPOSE

As an ongoing national effort by the United States Environmental Protection Agency (EPA) to assess the management of coal combustion waste (CCW), the stability of CCW impoundment at the Conemaugh Power Station in New Florence, Pennsylvania was recently reviewed by EPA. The review was documented in a draft report by Dewberry & Davis, LLC dated November 2012. In response to the comments and recommendation in the report, Geosyntec was engaged by NRG Energy, Inc. (NRG) to review the stability condition of the CCW impounds at the Conemaugh Power Station. This calculation package presents the details of the slope stability analysis.

2. BACKGROUND

Currently, the Conemaugh has a CCW management complex known as the Ash Filter Ponds, which consists of four individual cells (Ponds A, B, C and D). The Ash Filter Ponds has a maximum capacity of 24.8 acre-ft and maximum embankment height of 13 ft. The Desilting Basin, which is part of cooling tower operations, has a maximum capacity of 4.2 acre-ft with a maximum height of 8 ft. Both the Ash Filter Ponds and the Desilting Basin have liner system installed. As a part of this impoundment stability assessment project, Geosyntec drilled six borings at the site, as shown in Figure 1 and 2. Additionally, historical borings are also available at the site. The geometry of the Desilting Basin was obtained from design drawing prepared by GAI dated August, 2011 and the geometry for the Ash Filter ponds were obtained from design drawings by Gilbert Associates, Inc. dated August 1980.

3. CROSS SECTIONS ANALYSED

Three critical cross sections, one at Filter Ash Pond D (C-C) and two at the Desilting Basin (A-A and B-B), were selected for the analysis based on review of subsurface condition and impoundment geometry. The locations of the selected cross sections are also shown in Figures 1 and 2.

These cross-sections were selected because the embankment height at these locations are the highest. As a conservative approach, the weakest foundation soil layer as identified from the subsurface investigation and review of construction data, was assumed to be present at these locations.

4. STABILITY CRITERIA

According to the US Corps of Engineers [2003], the minimum recommended factor of safety (FS) against global slope stability failure for permanent conditions under static loading is 1.5 (EM 110-2-1902). For seismic condition, the minimum acceptable FS is selected to be 1.2, based on recommendation of presented by the Mine Safety and Health Administration document entitled Engineering and Design Manual: Coal Refuse Disposal Facilities [2009].

5. LOADING CONDITIONS

5.1 Static Loads

The major static load applied to the foundation soils is the gravity load exerted by the weight of the berm. A surcharge load of 250 pound per square feet (psf) is applied to the top of the embankment to represent traffic loading on top of the embankment.

5.2 Seismic Loads

The maximum horizontal acceleration in bedrock for the Conemaugh facility site is estimated to be 0.0488g (g is the gravitational acceleration), based on a seismic hazard map with contours of peak acceleration with 2% probability of exceedance in 50 years as indicated in Figure 3 [USGS, 2008]. This represents the peak ground acceleration in bedrock.

The peak ground acceleration at a soil site should be adjusted to account for the stiffness of soil material overlying the bedrock, which is represented by a site classification in the International Building Code. Using the International Building Code (IBC) 2006 soil classification table, the lithology at the Conemaugh facility site classifies as a site classification D (stiff soil profile). This classification is selected based on the average standard penetration resistance (N-value) within a upper 100 foot soil profile. An IBC 2006 site classification of D pertains to a soil profile with an average N-value between 15 and 50. This site classification table is attached as Figure 4. The bedrock at the site is located at approximately 20 to 30 ft below ground surface. Considering that the bedrock has high SPT blow counts, the average blow counts for the upper 100 ft shall be greater than 15. Using the site coefficient chart for site Class D the value of 1.6 is obtained as shown in Figure 5. Based on the site coefficient and the PGA in rock, the PGA in soil site is estimated to be 0.078g.

In slope stability analysis, the horizontal seismic loading is typically considered as the weight of the soil mass multiplied by seismic coefficient, *k*. Because the peak ground acceleration will only occur for a short duration, the seismic coefficient *k* used in the design analysis will be smaller than the PGA. A seismic design guidance provided by USEPA [Richardson et. al.,1995] recommends to use approximately half of PGA as seismic coefficient. For a design PGA of 0.078g, a seismic coefficient of 0.039 was used in this analysis.

6. STRATIGRAPHY

Desilting Basin

The Desilting Basin was constructed through excavating existing ground. Based on the log of borings conducted as part of this assessment, and historical boring logs, the soils at the Desilting Basin are generally medium stiff to stiff sandy silt or silty clay. The lowest SPT blow counts observed is approximately 3 blows/ft. The bedrock underlying the site was identified as Shale in the historical boring logs and as silt stone or sandstone in the MW-30 well log installed during the Desilting Basin reconstruction. This well log is included as Attachment I. The bedrock is generally located at approximately 20 to 30 ft below ground surface (ft-bgs). For this analysis, the bedrock is conservatively assumed to be located at 30 ft-bgs.

Filter Ash Pond

The borings conducted at the Filter Ash Ponds (B-1 through B-4) shows that the embankment soils are lean clays with varying amount of gravels. The lower bound of the SPT blow counts is 8 blows/ft. No bedrock was encountered during this boring investigation. The depth to bedrock is assumed to be 30 ft, based on historical boring results.

7. MATERIAL PARAMETERS

The selection for material parameters used for the slope stability analysis is described below:

Embankment Fill (Filter Ash Pond)

The embankment at the Filter Ash Pond was constructed using fill material. Based on the boring logs, the material used for the embankment construction is silt and clay mixed with varying amount of gravel or sand. For this analysis, the materials are conservatively assumed to have a clay type of behavior.

For temporary undrained condition analysis, the undrained shear strength is selected based on the empirical correlation of the Standard Penetration Test blow counts (SPT-N) by Kulhawy and Mayne [1990]:

$$S_u/P_a = 0.06\ \mathrm{N} \qquad (1)$$

where: S_u = undrained shear strength;
P_a = atmospheric pressure (= 2,116 psf)
N = SPT-N value (blows/ft)

The lower bound of the SPT-N is 8 blows/ft at the Filter Ash Pond. Using the empirical correlations in equation (1), the undrained shear strength of the embankment material at the Filter Ash Pond is assumed to be 1000 psf.

The drained shear strength of the embankment soil at the Filter Ash Pond is assumed based on the empirical correlations between friction angle and plasticity index (PI) for normally consolidated clay (see Figure 6). Laboratory test results shows that the upper bound of PI for soil samples collected within this area is 13, which yields to a friction angle of 34 degrees.

Foundation Soil (Filter Ash Pond)

The foundation soil at the filter ash pond was found to be similar to the soil used for the embankment construction. The undrained and drained shear strength was conservatively assumed to be the same as the embankment soil (i.e., undrained shear strength of 1000 psf and drained friction angle of 34 degrees).

Foundation Soil (Desilting Basin)

The Desilting Basin was constructed through excavation; Thus, the embankment and the foundation soils are considered to be the same material.

The undrained shear strength used for the analysis was 375 psf, assumed based on the lower bound of SPT-N of 3 blows/ft using Equation (1).

The drained shear strength used for the analysis was 32 degrees, conservatively assumed based on the upper bound value of PI for all soil samples collected (i.e., 17) using the empirical correlations shown in Figure 6. .

Bedrock

The weathered bedrock (shale or sandstone/siltstone) present at the site was estimated to have high shear strength. For this analysis, the weathered bedrock was conservatively assumed to have a shear strength of 8000 psf.

Table 1 summaries the material properties used in the slope stability analysis.

Table 1. Material Properties Used in Slope Stability Analyses

Material	Moist Unit Weight (lb/ft^3)	Saturated Unit Weight (lb/ft^3)	Drained Shear Strength		Undrained Shear Strength (psf)
			Cohesion (psf)	Friction Angle (deg)	
Embankment Soil (Filter Ash Pond)	120	-	0	34	1000
Foundation Soil (Filter Ash Pond)	135	135	0	34	1000
Foundation Soil (Desilting Basin)	135	135	0	32	375
Weathered rock	145	145	8000	0	-

8. GROUNDWATER CONDITION

Based on the information from Natural Resources Conservation Service (NRCS) Web Soil Survey and also confirmed by the groundwater monitoring well results, the groundwater table in the area is shallow. Monitoring well results for the two wells (MW-17 and MW-18) located near the Desilting Basin showed a high groundwater elevation of 1075.3 ft-msl, based on the information presented in the Water Quality Management Permit Application for the Desilting Basin reconstruction [GAI, 2011].

For this analysis, the water level in the CCW impoundments area is assumed to be those of the high water table shown in the design drawings (Desilting basin drawing prepared by GAI Consultants[2011], and filter ash pond drawing by Gilbert [1980]). Therefore, the elevations of the groundwater table are assumed to be, respectively, 1076 ft-msl in the Desilting Basin area, and 1090 ft-msl in the Filter Ash Pond area. The material in the lined pond is modeled as material with no shear strength in the analysis.

9. METHOD OF SLOPE STABILITY ANALYSIS

The stability of the selected cross section was evaluated using the limit equilibrium method. The analyses were conducted using SLIDE [Rocscience, 2002], a two-dimensional (2D) slope stability computer program. The factors of safety for both circular and non-circular potential slip surface were evaluated. The Spencer's Method [Spencer, 1967], was used in the analysis. The interslice force assumption made in the Spencer's Method satisfies force equilibrium in horizontal and vertical directions as well as moment equilibrium. Therefore, Spencer's method is considered as a rigorous methods, which generally provide more precise results for factor of safety than non-rigorous method. The factors of safety reported herein are from Spencer's method.

Thousands of potential failure surfaces were analyzed to find the critical failure surface resulting in the minimum factor of safety for the slope. For the circular slip surface search, a search grid with 25 horizontal increments and 25 vertical increments was used. For the block failure analysis, two search windows were used for searching the most critical failure surface. SLIDE provides results graphically and as output text files. SLIDE graphical provides both the minimum factor of safety and contours of the calculated factors of safety. For each case analyzed, a figure and text are generated and presented in Attachment II of this calculation package.

10. RESULTS OF SLOPE STABILITY

The results of the SLIDE analyses using the material properties listed in Table 1 are summarized in Table 2.

Table 2. Summary of Slope Stability Results

Cross Sections	Loading Conditions	Failure Mode	Calculated F.S.	Target F.S.
A-A	Static (undrained)	Block	1.30	1.30
		Circular	1.30	1.30
	Static (drained)	Block	1.62	1.50
		Circular	1.59	1.50
	Seismic	Block	1.21	1.20
		Circular	1.20	1.20
B-B	Static (undrained)	Block	1.63	1.30
		Circular	1.56	1.30
	Static (drained)	Block	1.83	1.50
		Circular	1.82	1.50
	Seismic	Block	1.40	1.20
		Circular	1.33	1.20
C-C	Static (undrained)	Block	2.57	1.30
		Circular	2.61	1.30
	Static (drained)	Block	1.50	1.50
		Circular	1.50	1.50
	Seismic	Block	2.30	1.20
		Circular	2.29	1.20

11. SUMMARY

The stability of the both the Filter Ash Ponds and Desilting Basin of the Conemaugh facility was evaluated for several scenarios. The results of these analyses show factors of safety exceeding the minimum recommended factors of safety. Thus, the CCW impoundments at the Conemaugh facility are considered to be stable.

12. REFERENCES

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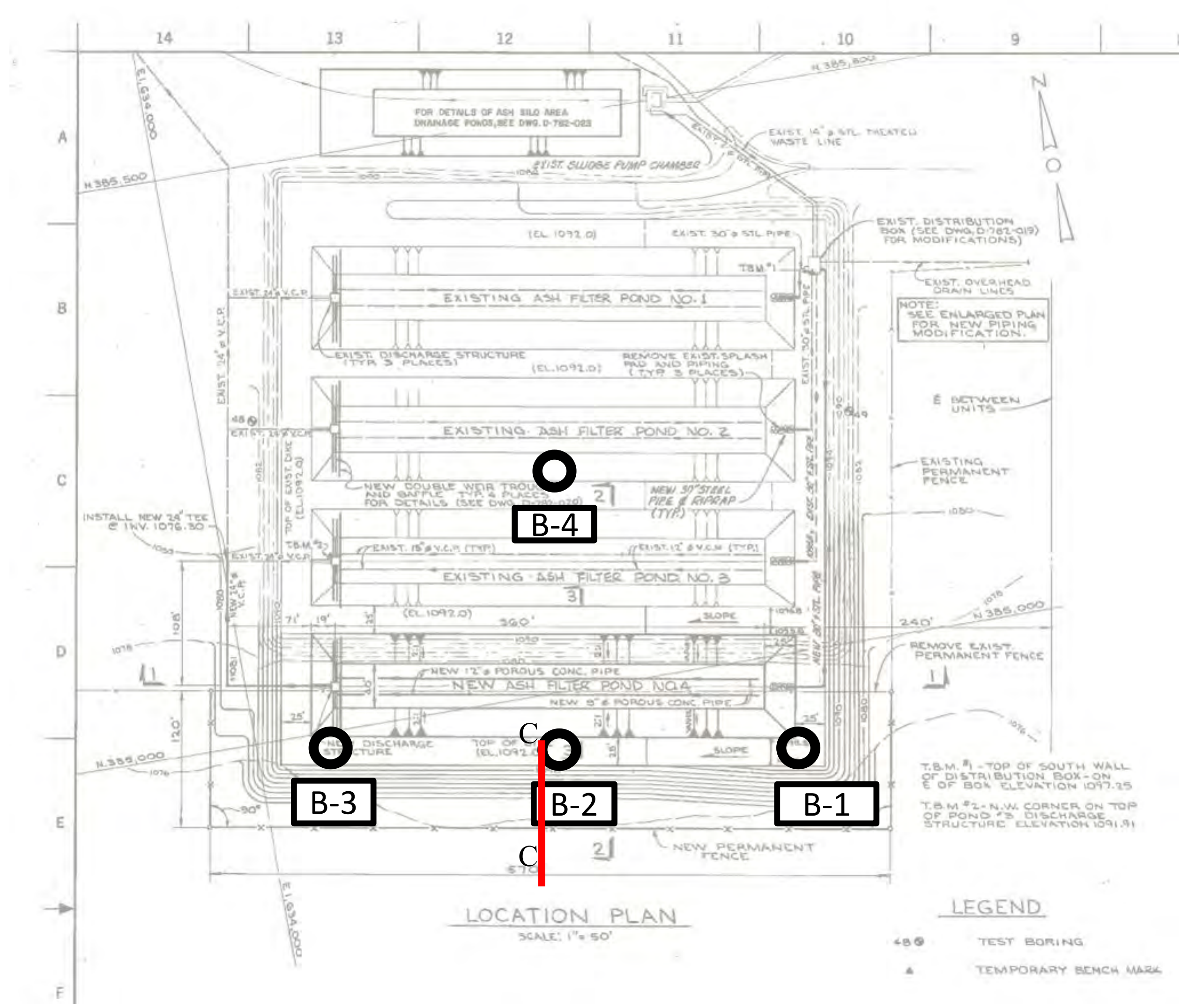
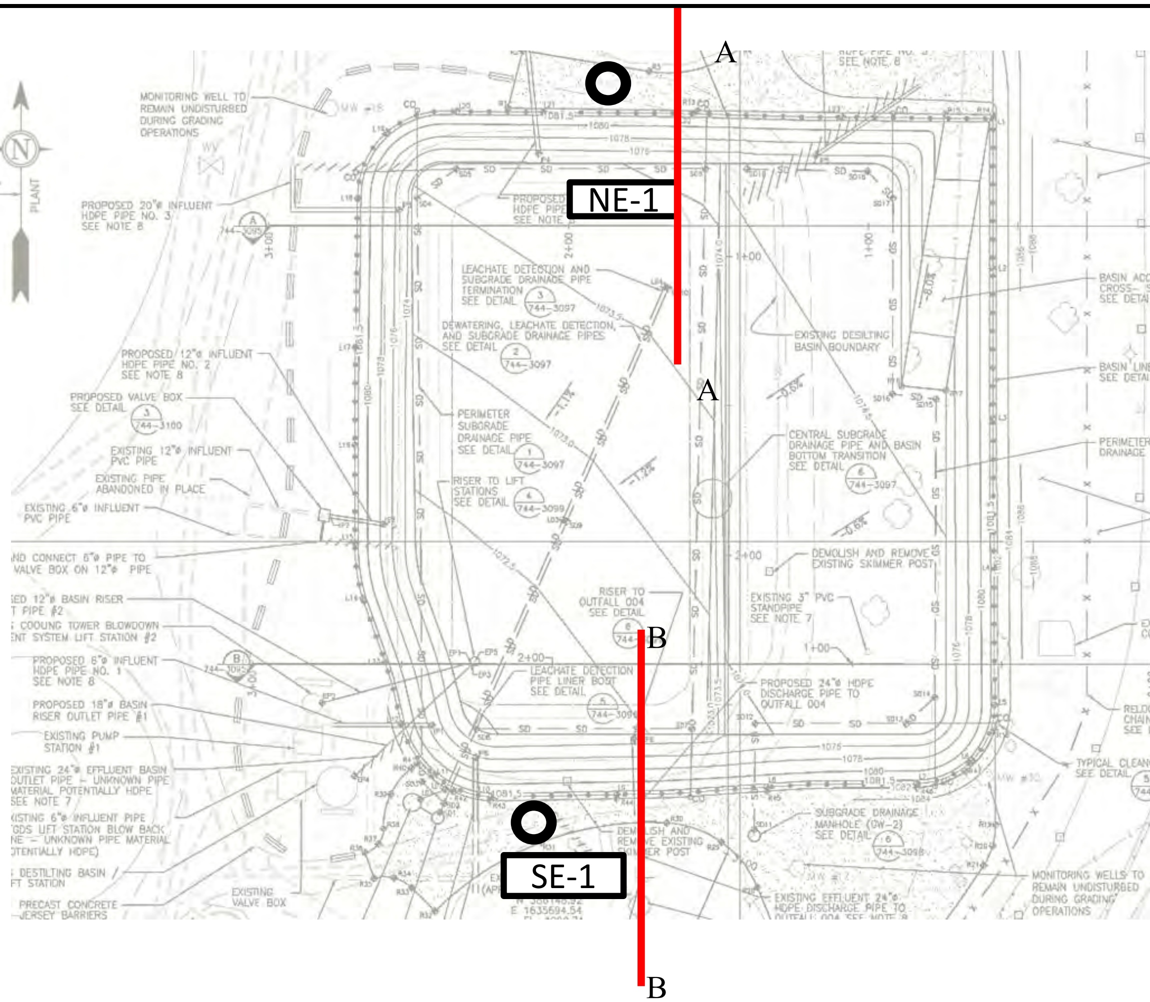
FIGURES



Legend

B-1 Approximate Boring Location

FIGURE 1 - SOIL BORING LOCATION **Conemaugh Power Station – Ash Filter Pond** New Florence, PA			
Geosyntec consultants	DATE:	Oct 2013	
	PROJECT NO.	ME1001	
	DOCUMENT NO.		
COLUMBIA, MARYLAND	FIGURE NO:	1	



Legend

○ B-1 Approximate Boring Location

FIGURE 2 - SOIL BORING LOCATION

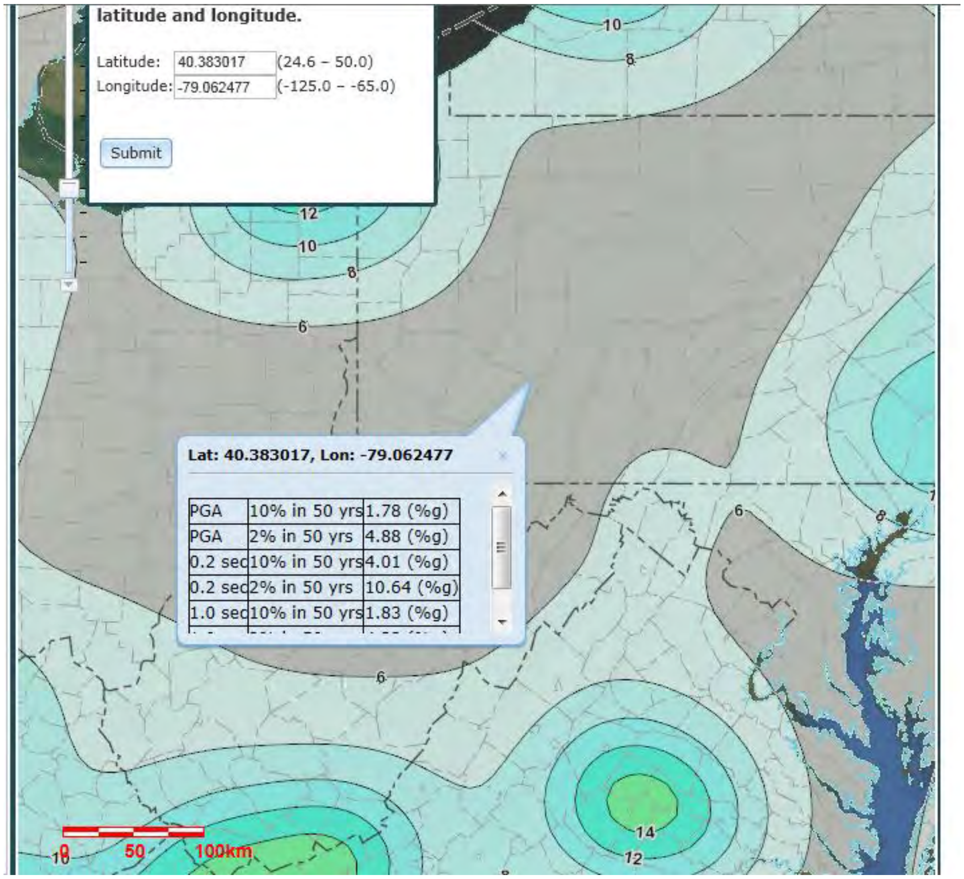
Conemaugh Power Station – Desilting Basin

New Florence, PA

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	Oct 2013
PROJECT NO.	ME1001
DOCUMENT NO.	
FIGURE NO:	2



Source: USGS [2008]

Figure 3. USGS Seismic Hazard Map

TABLE 1613.5.2
SITE CLASS DEFINITIONS

SITE CLASS	SOIL PROFILE NAME	AVERAGE PROPERTIES IN TOP 100 feet, SEE SECTION 1613.5.5		
		Soil shear wave velocity, $\bar{v}_s$, (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$, (psf)
A	Hard rock	$\bar{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \bar{v}_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \bar{v}_s \leq 2{,}500$	$\bar{N} > 50$	$\bar{s}_u \geq 2{,}000$
D	Stiff soil profile	$600 \leq \bar{v}_s \leq 1{,}200$	$15 \leq \bar{N} \leq 50$	$1{,}000 \leq \bar{s}_u \leq 2{,}000$
E	Soft soil profile	$\bar{v}_s < 600$	$\bar{N} < 15$	$\bar{s}_u < 1{,}000$
E	—	Any profile with more than 10 feet of soil having the following characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$, and 3. Undrained shear strength $\bar{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kPa. N/A = Not applicable

Source: International Building Code 2006

Figure 4. Site Classification

TABLE 1613.5.3(1)
VALUES OF SITE COEFFICIENT F_a [a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIOD				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

Source: International Building Code 2006

Figure 5. Site Coefficient

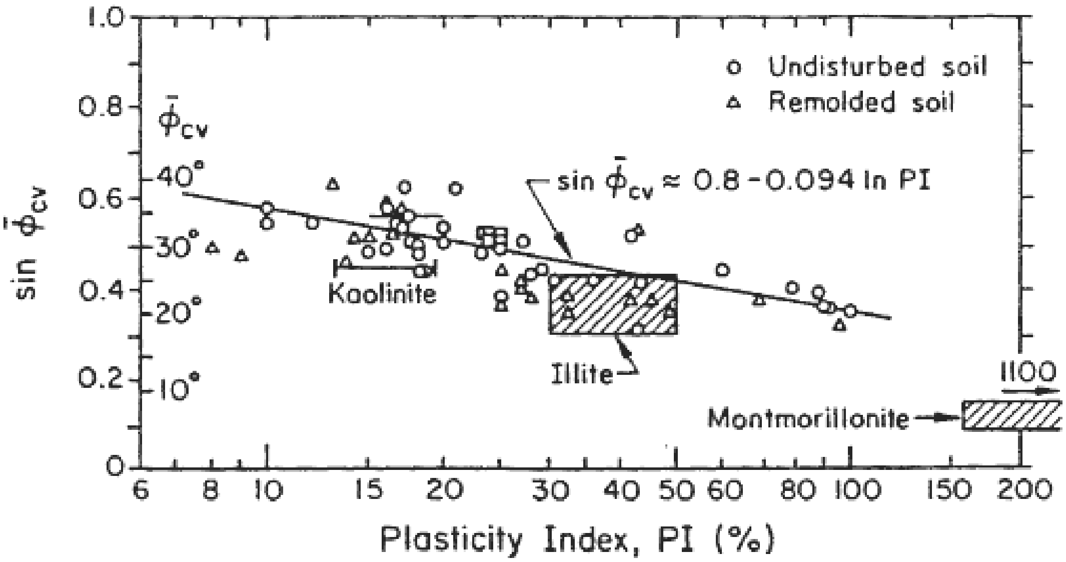


Figure 4-20. $\bar{\phi}_{cv}$ for NC Clays versus PI

Source: Mitchell (22), p. 284.

Reproduced from Kulhawy and Mayne [1990]

Figure 6. Empirical Correlations between Critical Void Ratio Friction Angle and Plasticity Index

Attachment I

Boring Logs for Well MW-30

4. Describe below the proposed groundwater quality monitoring points for approval. (Monitoring point proposals are subject to final approval of the Engineering Design Plans. No wells are to be drilled until final approval of the Engineering Design Plans.) Use numbers only and number all monitoring points consecutively.

   a. Wells (check one). For multiple wells indicate with monitoring point number (a) for existing and (b) for proposed.

      ☒ For existing wells complete the table below.

      ☒ For proposed new well construction, complete the table from your specifications.

MONITORING POINT NUMBER	DRILLING METHOD	DEPTH	DIAMETER	CASING		LOCATION		SURFACE ELEVATION
				SIZE & DEPTH	ZONES[1] PERFORATED	LATITUDE	LONGITUDE	
MW-30 (Existing)	***Air knife, hollow-stem auger, and air hammer***	***39'***	***8" nominal***	***4" I.D., 18'***	***18' to 38'***	***40º23'09.96N***	***79º03'25.42W***	***1087.04***
MW-17 (Existing)	Hollow-stem auger/tricone roller bit with air	37.5'	10" soil	4" I.D., 35'	17.5' to 37.5'	40º23'09.4N	79º03'27.1W	1083.52
MW-18 (Existing)	Hollow-stem auger/tricone roller bit with air	37'	10" soil	4" I.D., 35'	17' to 37'	40º23'11.9N	79º88'29.1W	1088.76
*Note: All depths measured from top of PVC								

[1] *What zones or at what depth is the casing perforated?*

   b. Springs

MONITORING POINT NUMBER	ELEVATION	RATE OF FLOW (gpm)	DATE OF MEASUREMENT	LOCATION	
				LATITUDE	LONGITUDE
NOT APPLICABLE					

5. Do all springs listed have a continuous year-round flow? ☐ Yes ☐ No

   If not, explain. NOT APPLICABLE

6. If there is a discharge or a potential discharge to groundwater, background water quality must be determined. Describe how background water quality was determined?

   Existing background (crossgradient) wells are installed and have been monitored since October 1998

7. What is the background water quality? **(See Appendix V-J)**

a.	Temperature	Degrees C
b.	pH	
c.	Alkalinity	mg/L
d.	Total solids	mg/L
e.	Suspended solids	mg/L
f.	Settleable solids	mg/L
g.	MBAS	mg/L
h.	BOD 5-day	mg/L
i.	COD .25 w $K_2Cr_2O_8$	mg/L
j.	Specific conductance	Micromhos/cm (Microsiemens/cm)
k.	Total iron	mg/L
l.	Manganese	mg/L
m.	Aluminum	mg/L
n.	Copper	mg/L
o.	Zinc	mg/L
p.	Nickel	mg/L

ENGINEERS FIELD BORING LOG

BORING NO. MW-30
SHEET 1 OF 2
DATE: START 11/22/11
END 11/29/11
O.G. ELEV. 1087.0

PROJECT NAME GenOn - Conemaugh Desilting Exp. COUNTY C091251.01
STATE RT. NO. ______ SECT. ______ SEGMENT ______ OFFSET ______
STATION ______ OFFSET FROM CENTERLINE ______
INSPECTOR (SIGNED) Raymond D. Glenn DRILLERS NAME/COMPANY Terra Testing
EQUIPMENT USED Diedrich D-50 Track
DRILLING METHODS Air Knife & 8 1/4" HSA & 7 7/8" Air Hammer
CASING: SIZE: ______ ; DEPTH: ______ ; WATER: DEPTH: 24.6' TIME: 0 DATE: ______
CHECKED BY: RJT ; DATE: 12/5/2011 DEPTH: 24.6' TIME: 12 DATE: ______

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
								Sandy SILT with Sandstone Cobbles, moist, stiff, light brown	0' - 9' Air Knife Alluvium
								5.0 Sandy SILT with Sandstone Cobbles and Gravels, moist, very stiff, gray/brown	
								9.0 SANDSTONE BOULDER, medium hard, gray	
10.0–11.5	S-1	11 13 26	1.5'	-		SM	-	10.0 Sandy SILT with Sandstone Cobbles, moist, very dense, light brown	12.5 - 13.5 Boulder
15.0–16.5	S-2	6 7 5	1.5'	-		SM	-	15.0 Sandy SILT with Sandstone Cobbles and Gravels, moist, round and angular, dense, orange/brown	
								18.5 SANDSTONE GRAVEL, medium hard, light brown	Grinding on Rock at 18.5'
20.0–20.4	S-3	50/0.4	0.4'	-		GP	-	-W/ Cobbles	
								23.0 SANDSTONE, hard, light brown	Top of Rock at 23.0' Air Hammer

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL AND ROCK TYPES FOR THIS BORING

ENGINEERS FIELD BORING LOG

BORING NO. MW-30
SHEET 2 OF 2
DATE: START 11/22/11
END 11/29/11
O.G. ELEV. 1087.0

PROJECT NAME GenOn - Conemaugh Desilting Exp. COUNTY C091251.01
STATE RT. NO. ______ SECT. ______ SEGMENT ______ OFFSET ______
STATION ______ OFFSET FROM CENTERLINE ______
INSPECTOR (SIGNED) Raymond D. Glenn DRILLERS NAME/COMPANY Terra Testing
EQUIPMENT USED Diedrich D-50 Track
DRILLING METHODS Air Knife & 8 1/4" HSA & 7 7/8" Air Hammer
CASING: SIZE: ______ ; DEPTH: ______ ; WATER: DEPTH: 24.6' TIME: 0 DATE: ______
CHECKED BY: RJT ; DATE: 12/5/2011 DEPTH: 24.6' TIME: 12 DATE: ______

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
								SANDSTONE, hard, light brown *(continued)*	Air Hammer Continued
								28.0 SANDSTONE with Claystone Seams, medium hard, gray	
								35.0 SILTSTONE, very hard, gray	
								37.0 SANDSTONE, medium hard, gray	
								39.0 END OF BORING AT 39.0'	
								Well Construction: 1.70' PCV Stick Up 0' - 3' Cement 3' - 12' Bentonite Chips 12' - 15' Bentonite Pellets 15' - 38' Sand 18' - 38' Screen (0.010' Slot) 38' - 39' Sand and Gravel 4" Thick, 4' Diameter Well Pad Lock - Masterlock #2126 Development: Purge for 2 hours Brown to Clear	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL AND ROCK TYPES FOR THIS BORING

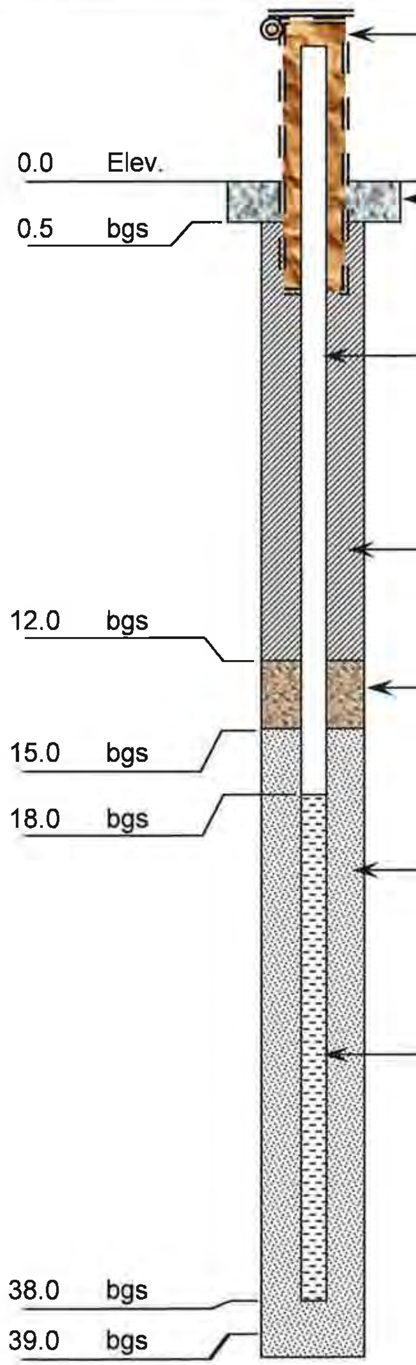
TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

Geotechnical & Environmental Drilling

Well No: MW-30
Well Tag:
Date Installed: 11/29/11
GPS Location: **Latitude:** 40.386086

Project: Conemaugh Power Plant, Fairfield, Westmoreland County, PA
TTI Proj. No: 11700
Client: GAI Consultants
Longitude: 79.057081



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'	
Riser Stick-up:	2.5	feet

CONCRETE PAD

Size:	4' round	
No. of Bags:	10	
Bags Size:	50	

Riser:

Type:	Sch. 40 PVC	
Size:	4	inches I.D.
Length	20	feet

Grout Backfill

Cement:	3	No. of Bags
Bags Size:	94	lbs.
Gran. Bentonite	-	lbs.
Bentonite Chips	15	lbs.

Bentonite	100	lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	21	

Screen

Type:	Sch. 40 PVC	
Size:	4	inches I.D.
Slot Size:	.010	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	N
PVC Slip Cap	N
PVC Threaded Cap	Y
PVC Bottom Plug	N
Auger Plugs	N
No. of 55-gallon Drums Used	N
No of Guard Posts Used	N

DEPARTMENT OF CONSERVATION & NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
WATER WELL LICENSING/WATER WELL INVENTORY SECTION
3240 Schoolhouse Rd
Middletown, PA 17057
717-702-2017

WATER WELL COMPLETION REPORT

Well Driller:	**TERRA TESTING, INC.**	Driller Well ID:	**11700 - MW - 30**
Driller License:	**2309**	Local Permit #:	
Type of Activity:	**New Well**	Original Well By:	**Current Driller**
Date Drilled:	**11/29/2011**	Drilling Method:	**BORED OR AUGERED**

Owner:	**Conemaugh Power Plant**		
Address of Well:		Zipcode:	
County:	**WESTMORELAND**		
Municipality:	**FAIRFIELD**	Municipality Type:	**T**
Coordinate Method:	**GPS - Global Positioning System**		
Quadrangle:	Latitude: **40.386086**	Longitude:	**-79.057081**

Well Depth (*ft*):	**38**	Well Finish:	**PERFORATED OR SLOTTED**
Depth to Bedrock (*ft*):		Did Not Encounter Bedrock:	
Well Yield (*gpm*):		Yield Measure Method:	
Static Water Level: (*ft below land surface*)	**24**	Water level after yield test: (*ft below land surface*)	
Length of Yield Test: (*minutes*)		Saltwater Zone (*ft*):	
Use of Well:	**MONITORING**	Use of Water:	

DRILLER'S LOG

UNIT TOP	UNIT BOTTOM	DESCRIPTION OF UNITS PENETRATED

Unit Top 1:	**0**	Unit Bottom 1:	**10**	Unit 1:	**0.0 - 0.5 - Topsoil; 0.5 to 10.0 - Silty sand, light brown sandstone fragments, moist**
Unit Top 2:	**10**	Unit Bottom 2:	**23**	Unit 2:	**Medium course silty sand, sandstone fragments, wet**
Unit Top 3:	**23**	Unit Bottom 3:	**25**	Unit 3:	**Large gravel and cobbles**
Unit Top 4:	**25**	Unit Bottom 4:	**32**	Unit 4:	**Fractured sandstone, light brown, wet**
Unit Top 5:	**32**	Unit Bottom 5:	**39**	Unit 5:	**Hard gray siltstone**

BOREHOLE

Section 1: Top: **0** Bottom: **39** Diameter: **12**

CASING

Casing 1:

Top: **0** Bottom: **18** Diameter: **4** Material: **PVC OR OTHER PLASTIC**

Seal(Grout) 1:

Top: **12** Bottom: **15** Type: **BENTONITE CHIPS/PELLETS**

SCREEN/SLOT

Screen 1: Top: **18** Bottom: **38** Diameter: **4**

Type: **PERFORATED, POROUS, OR SLOTTED CASING**

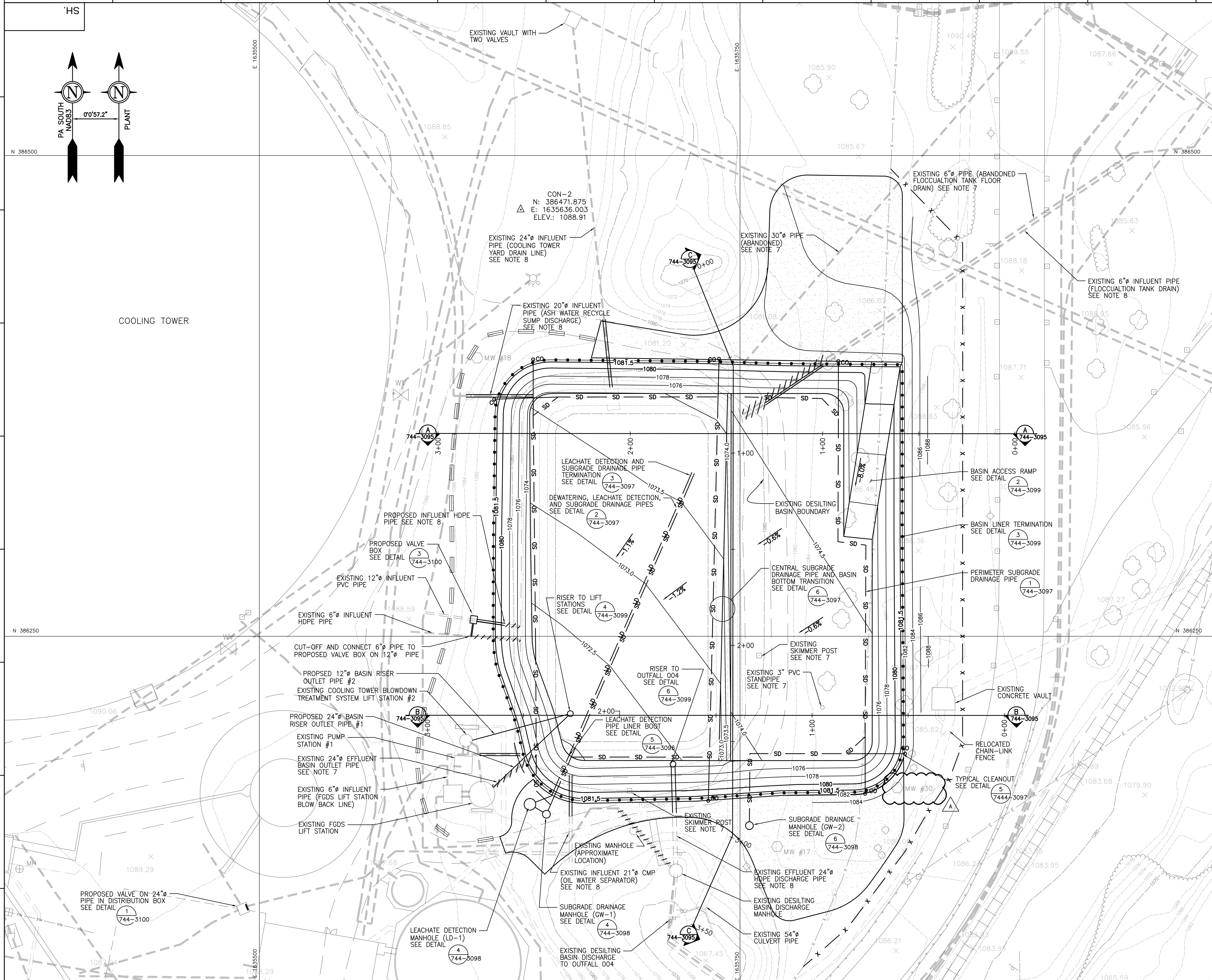
Material: **PLASTIC** Slot Size: **10**

Packing: **Screened Sand**

I hereby certify that the above information is true and complete to the best of my knowledge and belief.

Charlotte S. Stiytel 12-14-11

Driller's Signature (required) Date



GENERAL LEGEND

EXISTING FEATURES	PROPOSED FEATURES	
		MONITORING WELL LOCATION
	SF	SILT FENCE
	MH	MANHOLE
1200	1200	CONTOUR
	SD	SUBGRADE DRAINAGE PIPE
	LD	LEACHATE DETECTION PIPE
		BURIED PIPE/CULVERT
		PIPE (TO BE ABANDONED)
		EXISTING DESILTING BASIN BOUNDARY
x	x	CHAIN LINK FENCE
		TREE LINE
		RAILROAD LINE
		DECIDUOUS TREE
		SHRUB
		SURVEY CONTROL POINT
	CO	CLEANOUT

NOTES:

1. EROSION AND SEDIMENTATION CONTROL MEASURES ARE TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. FOR GENERAL NOTES, SEE DRAWING D-744-3096.
3. CONTOUR ELEVATIONS SHOWN IN THE POND REPRESENT TOP OF FABRICFORM. THE TOP OF EMBANKMENT ELEVATIONS SHOWN REPRESENT THE PERIMETER ACCESS SUBGRADE.
4. SUBGRADE DRAINAGE PIPES SHALL BE SOLID WALL FROM THE BASIN BOTTOM PERIMETER TO MANHOLES GW-1 AND GW-2.
5. 8" THICK UNIFORM SECTION MAT SHALL BE INSTALLED ON THE BASIN FLOOR, ACCESS RAMP, AND THE LOWER SIDE SLOPES. TRANSITION FROM 8" UNIFORM SECTION MAT TO 4" UNIFORM SECTION MAT ON BASIN SIDESLOPES AT ELEVATION 1076.0. UNIFORM SECTION MAT IN ANCHOR TRENCH SHALL BE FILLED WITH GROUT FIRST AND BACKFILLED BEFORE FILLING UNIFORM SECTION MAT WITH GROUT ON SIDE SLOPES TO PREVENT PULL OUT AND ADD STABILITY, SEE DRAWING D-744-3099
6. FOR AN ENLARGED PLAN VIEW OF THE BASIN OUTLET PIPING, SEE DETAIL 1 744-3099
7. PIPE TO BE CUT OFF, GROUTED SHUT, OR REMOVED.
8. EXISTING PIPE TO BE CUT OFF MINIMUM 20'-0 OUTSIDE EDGE OF LINER AND EXTENDED WITH SMOOTH INTERIOR AND EXTERIOR SDR 17 HDPE PIPE TO PENETRATE THE NEW BASIN SYNTHETIC LINER SYSTEM. THE EXISTING PIPE AND NEW HDPE PIPE SHALL BE CONNECTED WITH A MECHANICAL WATERTIGHT CONNECTION.
9. FOR CROSS-SECTIONS A-A, B-B, AND C-C, SEE DRAWING D-744-3095.
10. MONITORING WELL MW#30 LOCATION WAS INSTALLED 11/29/2011, SURVEYED LOCATION BY GenOn.

gai consultants

REFERENCES:

1. EXISTING TOPOGRAPHY AND FEATURES BASED ON AERIAL MAPPING PROVIDED BY GenOn – CONEMAUGH STATION BASE MAPPING. (DRAWING NO. E-744-3093-0, SHEETS 1 THROUGH 16) – DATE OF AERIAL PHOTOGRAPHY 3-17-2010.

   HORIZONTAL AND VERTICAL CONTROL IS BY A SURVEY TIE TO THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (1927 DATUM).

2. SUBSURFACE UTILITIES ARE BASED ON EXISTING DRAWINGS, SITE SPECIFIC SURVEYS, REMOTE SENSING SURVEYS, AND SITE OBSERVATIONS. THE INFORMATION SHOWN IS INTENDED TO PROVIDE GENERAL LOCATIONS OF UNDERGROUND UTILITIES AT THE CONEMAUGH POWER STATION. (DRAWING NO. C100963-001-00-E-E001, SHEETS 1 THROUGH 11 – DATED 10-29-2010).

PLAN VIEW

SCALE: 1" = 20'

20 0 20 40

NO.	DATE	REVISION	BY	CHK	APP.
A	06/26/2012	MW #30 RECORD LOCATION PER PaDEP COMMENT	EJM	MAG	KCC

GenOn

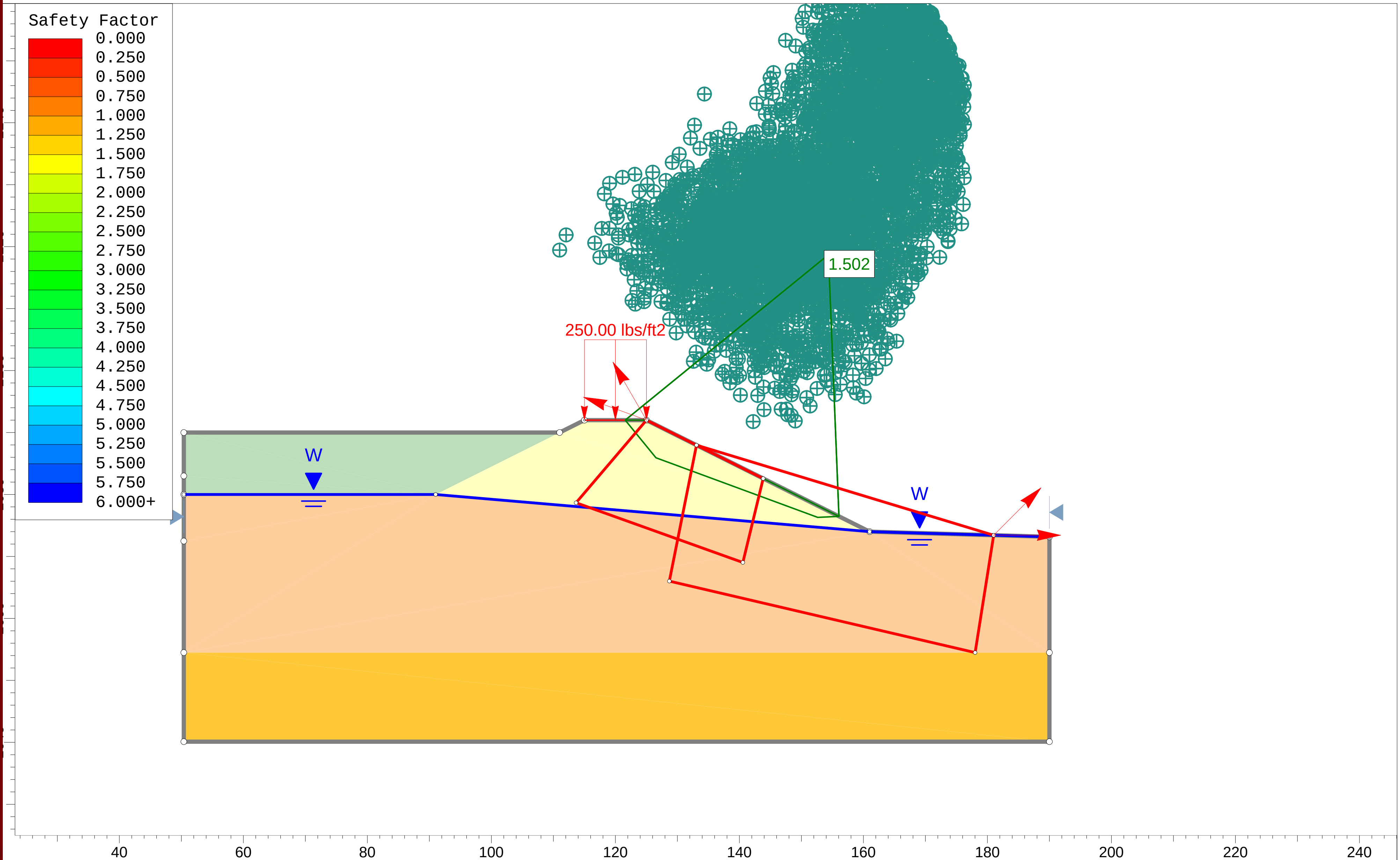
CONEMAUGH
UNIT NO. 1 AND 2

DESILTING BASIN RECONSTRUCTION
PLAN VIEW

DRAWN: 5-25-2011	BY: DMM	DRAWING NUMBER
CHECKED 08-12-2011	CHK BY: MSG	D-744-3094
APPROVED 08-12-2011	APP BY: KCC	SHEET: -
SIZE: 30x42		REV: A
DISCIPLINE: CIVIL	SCALE: AS NOTED	C091251-01-002-00-E-F009

Attachment II

SLIDE Output



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By	Scale 1:259	Company	
Date 10/16/2013, 3:13:47 PM		File Name C-C_Conemaugh_drained block.slim	

SLIDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_drained block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: 5

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Mohr-Coulomb	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]	120		135	145
Saturated Unit Weight [lbs/ft3]	120		135	145
Cohesion [psf]	0		0	
Friction Angle [deg]	34		34	
Cohesion Type				8000
Water Surface	Water Table	None	Water Table	None
Hu Value	1		0	
Ru Value		0		0

Global Minimums

Method: spencer

FS: 1.502210
Axis Location: 154.349, 1118.706
Left Slip Surface Endpoint: 121.586, 1092.000
Right Slip Surface Endpoint: 156.056, 1076.472
Resisting Moment=363782 lb-ft

Driving Moment=242165 lb-ft
Resisting Horizontal Force=7958.72 lb
Driving Horizontal Force=5298.02 lb
Total Slice Area=111.069 ft2

Global Minimum Coordinates

Method: spencer

X	Y
121.586	1092
126.542	1085.94
152.62	1076.32
156.056	1076.47

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3761
Number of Invalid Surfaces: 1239

Error Codes:

Error Code -105 reported for 140 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 503 surfaces
Error Code -111 reported for 397 surfaces
Error Code -112 reported for 176 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.50221

Slice	Width	Weight	Base	Base	Base Friction	Shear	Shear	Base Normal	Pore	Effective Normal

Number	[ft]	[lbs]	Material	[psf]	Angle [degrees]	[psf]	[psf]	Stress [psf]	[psf]	Stress [psf]
1	1.23891	112.705	embankment soil	0	34	80.2331	120.527	178.688	0	178.688
2	1.23891	338.115	embankment soil	0	34	123.045	184.839	274.036	0	274.036
3	1.23891	560.778	embankment soil	0	34	150.966	226.783	336.219	0	336.219
4	1.23891	720.392	embankment soil	0	34	136.824	205.539	304.724	0	304.724
5	1.37255	857.112	embankment soil	0	34	248.431	373.196	553.287	0	553.287
6	1.37255	827.437	embankment soil	0	34	239.831	360.276	534.131	0	534.131
7	1.37255	797.762	embankment soil	0	34	231.229	347.355	514.975	0	514.975
8	1.37255	768.087	embankment soil	0	34	222.628	334.434	495.819	0	495.819
9	1.37255	738.412	embankment soil	0	34	214.027	321.513	476.663	0	476.663
10	1.37255	708.737	embankment soil	0	34	205.425	308.592	457.506	0	457.506
11	1.37255	679.062	embankment soil	0	34	196.824	295.671	438.35	0	438.35
12	1.37255	649.386	embankment soil	0	34	188.223	282.75	419.194	0	419.194
13	1.37255	619.711	embankment soil	0	34	179.622	269.83	400.039	0	400.039
14	1.37255	590.036	embankment soil	0	34	171.021	256.909	380.883	0	380.883
15	1.37255	560.361	embankment soil	0	34	162.419	243.988	361.727	0	361.727
16	1.37255	530.686	embankment soil	0	34	153.818	231.067	342.571	0	342.571
17	1.37255	501.011	embankment soil	0	34	145.217	218.146	323.415	0	323.415
18	1.37255	471.336	embankment soil	0	34	136.615	205.225	304.259	0	304.259
19	1.37255	441.661	embankment soil	0	34	128.014	192.304	285.103	0	285.103
20	1.37255	411.986	embankment soil	0	34	119.413	179.383	265.947	0	265.947
21	1.37255	382.311	embankment soil	0	34	110.812	166.463	246.791	0	246.791
22	1.37255	352.636	embankment soil	0	34	102.211	153.542	227.635	0	227.635
23	1.37255	322.961	embankment soil	0	34	93.6094	140.621	208.479	0	208.479
24	1.71785	289.23	embankment soil	0	34	100.087	150.352	222.906	0	222.906
			embankment							

soil

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.50221

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	121.586	1092	0	0	0
2	122.825	1090.48	171.368	78.632	24.648
3	124.064	1088.97	434.177	199.222	24.648
4	125.303	1087.45	756.623	347.176	24.648
5	126.542	1085.94	1048.86	481.271	24.6481
6	127.914	1085.43	987.37	453.054	24.648
7	129.287	1084.92	928.005	425.815	24.648
8	130.659	1084.42	870.77	399.552	24.648
9	132.032	1083.91	815.664	374.267	24.648
10	133.404	1083.4	762.686	349.958	24.648
11	134.777	1082.9	711.838	326.627	24.648
12	136.149	1082.39	663.119	304.272	24.648
13	137.522	1081.89	616.529	282.894	24.648
14	138.895	1081.38	572.068	262.493	24.648
15	140.267	1080.87	529.735	243.069	24.648
16	141.64	1080.37	489.532	224.622	24.648
17	143.012	1079.86	451.458	207.151	24.648
18	144.385	1079.36	415.513	190.658	24.648
19	145.757	1078.85	381.697	175.142	24.6481
20	147.13	1078.34	350.01	160.602	24.648
21	148.502	1077.84	320.452	147.039	24.648
22	149.875	1077.33	293.023	134.454	24.6481
23	151.247	1076.83	267.724	122.845	24.648
24	152.62	1076.32	244.553	112.213	24.648
25	154.338	1076.4	55.3102	25.3791	24.648
26	156.056	1076.47	0	0	0

List Of Coordinates

Water Table

X	Y
50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
125	1092
115	1092

Block Search Window

X	Y
125	1092
113.647	1078.68
140.549	1069.03
143.841	1082.58

Block Search Window

X	Y
133.074	1087.96
128.69	1066.02
178.01	1054.48
181.003	1073.44

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

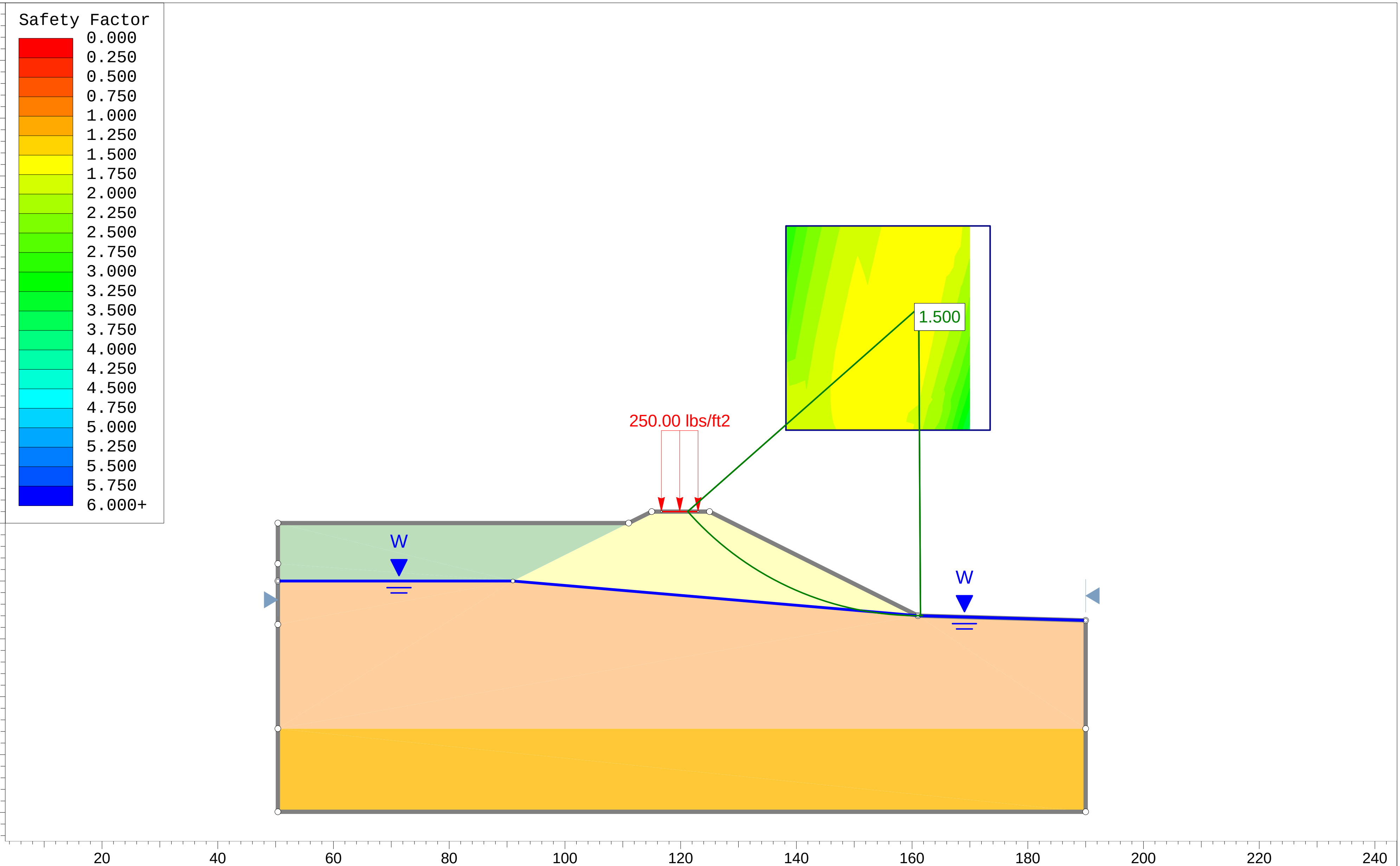
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		*Scale* 1:280	*Company*
Date 10/16/2013, 3:13:47 PM		*File Name* C-C_Conemaugh_drained circular.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_drained circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 6

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Mohr-Coulomb	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]	120		135	145
Saturated Unit Weight [lbs/ft3]	120		135	145
Cohesion [psf]	0		0	
Friction Angle [deg]	34		32	
Cohesion Type				8000
Water Surface	Water Table	None	Water Table	None
Hu Value	1		0	
Ru Value		0		0

Global Minimums

Method: spencer

FS: 1.499510
Center: 161.143, 1127.255
Radius: 53.269
Left Slip Surface Endpoint: 121.210, 1092.000
Right Slip Surface Endpoint: 161.464, 1073.987
Resisting Moment=697287 lb-ft
Driving Moment=465009 lb-ft
Resisting Horizontal Force=11731.6 lb

Driving Horizontal Force=7823.61 lb
Total Slice Area=171.737 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2909
Number of Invalid Surfaces: 1942

Error Codes:

Error Code -108 reported for 1 surface
Error Code -115 reported for 1941 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.49951

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.62358	171.239	embankment soil	0	34	90.8623	136.249	201.997	0	201.997
2	1.62358	499.302	embankment soil	0	34	89.4139	134.077	198.777	0	198.777
3	1.62358	765.246	embankment soil	0	34	131.492	197.174	292.323	0	292.323
4	1.62358	892.903	embankment soil	0	34	159.618	239.349	354.85	0	354.85
5	1.62358	990.155	embankment soil	0	34	183.756	275.544	408.511	0	408.511
6	1.62358	1067.81	embankment soil	0	34	205.371	307.956	456.564	0	456.564
7	1.62358	1127.49	embankment soil	0	34	224.405	336.498	498.879	0	498.879
8	1.62358	1170.5	embankment soil	0	34	240.797	361.078	535.321	0	535.321
9	1.62358	1197.98	embankment soil	0	34	254.48	381.596	565.741	0	565.741
10	1.62358	1210.86	embankment soil	0	34	265.379	397.938	589.968	0	589.968

11	1.62358	1209.93	embankment soil	0	34	273.409	409.979	607.82	0	607.82
12	1.62358	1195.9	embankment soil	0	34	278.476	417.578	619.087	0	619.087
13	1.62358	1169.34	embankment soil	0	34	280.475	420.575	623.526	0	623.526
14	1.62358	1130.76	embankment soil	0	34	279.286	418.792	620.884	0	620.884
15	1.62358	1080.6	embankment soil	0	34	274.773	412.025	610.854	0	610.854
16	1.62358	1019.24	embankment soil	0	34	266.785	400.047	593.093	0	593.093
17	1.62358	946.995	embankment soil	0	34	255.151	382.601	567.229	0	567.229
18	1.62358	864.15	embankment soil	0	34	239.674	359.394	532.824	0	532.824
19	1.62358	770.938	embankment soil	0	34	220.137	330.098	489.391	0	489.391
20	1.56776	647.812	Foundation soil	0	32	180.915	271.284	434.145	0	434.145
21	1.56776	544.501	Foundation soil	0	32	156.28	234.344	375.028	0	375.028
22	1.56776	431.179	Foundation soil	0	32	127.228	190.779	305.309	0	305.309
23	1.56776	307.947	Foundation soil	0	32	93.4512	140.131	224.256	0	224.256
24	1.56776	174.876	Foundation soil	0	32	54.6046	81.8801	131.036	0	131.036
25	1.56776	38.2132	Foundation soil	0	32	14.0667	21.0931	33.756	0	33.756

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.49951

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	121.21	1092	0	0	0
2	122.833	1090.24	207.623	92.0754	23.916
3	124.457	1088.63	382.524	169.639	23.916
4	126.081	1087.15	601.688	266.833	23.916
5	127.704	1085.79	826.494	366.528	23.916
6	129.328	1084.53	1042.37	462.262	23.9159
7	130.951	1083.37	1239.78	549.811	23.9161
8	132.575	1082.29	1411.3	625.874	23.916
9	134.198	1081.3	1551.24	687.935	23.9161
10	135.822	1080.39	1655.49	734.165	23.916
11	137.446	1079.55	1721.3	763.349	23.916
12	139.069	1078.77	1747.2	774.836	23.916
13	140.693	1078.07	1732.92	768.503	23.916
14	142.316	1077.42	1679.32	744.735	23.916
15	143.94	1076.84	1588.4	704.415	23.9161
16	145.564	1076.32	1463.28	648.926	23.916

17	147.187	1075.85	1308.22	580.161	23.916
18	148.811	1075.43	1128.68	500.541	23.9161
19	150.434	1075.07	931.388	413.046	23.916
20	152.058	1074.77	724.405	321.254	23.916
21	153.626	1074.52	548.3	243.157	23.9161
22	155.193	1074.32	378.337	167.782	23.916
23	156.761	1074.17	225.611	100.053	23.9161
24	158.329	1074.06	102.976	45.6671	23.916
25	159.897	1074	25.2456	11.1958	23.9161
26	161.464	1073.99	0	0	0

List Of Coordinates

Water Table

X	Y
50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
123.007	1092
116.679	1092

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

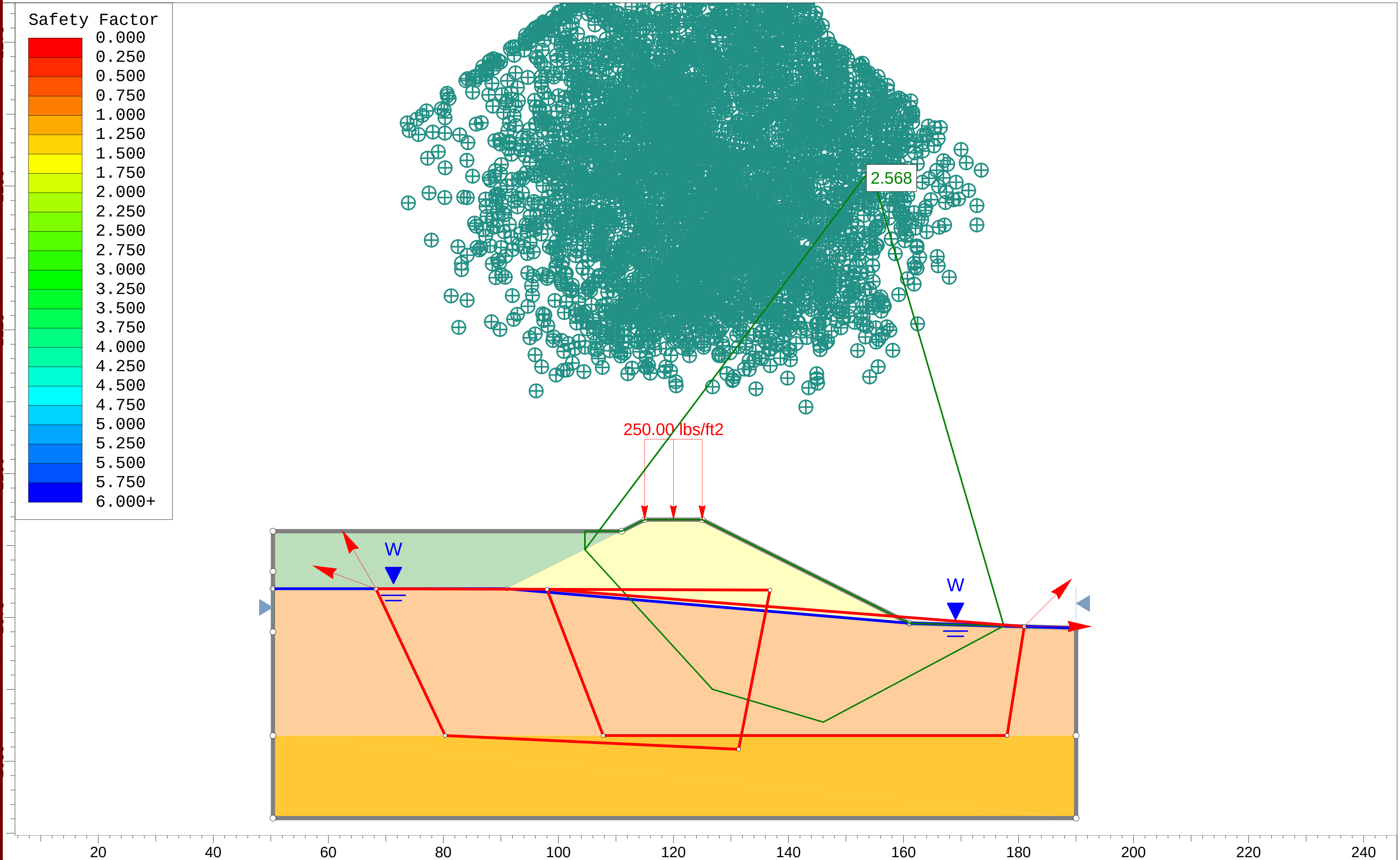
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By	Scale 1:280	Company	
Date 10/16/2013, 3:13:47 PM		File Name C-C_Conemaugh_undrained block.slim	

rocscience

SLIDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_undrained block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Undrained	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]			135	145
Saturated Unit Weight [lbs/ft3]			135	145
Cohesion Type	1000		1000	8000
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS: 2.568500
Axis Location: 154.285, 1153.016
Left Slip Surface Endpoint: 104.600, 1086.800
Right Slip Surface Endpoint: 177.447, 1073.538
Left Slope Intercept: 104.600 1090.004
Right Slope Intercept: 177.447 1073.538
Resisting Moment=7.46031e+006 lb-ft
Driving Moment=2.90453e+006 lb-ft
Resisting Horizontal Force=72846.8 lb

Driving Horizontal Force=28361.6 lb
Total Slice Area=1209.32 ft2

Global Minimum Coordinates

Method: spencer

X	Y
104.6	1086.8
126.782	1062.52
146.057	1056.81
177.447	1073.54

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3113
Number of Invalid Surfaces: 1887

Error Codes:

Error Code -105 reported for 9 surfaces
Error Code -107 reported for 656 surfaces
Error Code -108 reported for 1163 surfaces
Error Code -111 reported for 22 surfaces
Error Code -112 reported for 37 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.5685

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]

1	2.6321	1080.89	embankment soil	1000	0	389.332	1000	11.8204	0	11.8204
2	2.6321	2190.35	embankment soil	1000	0	389.332	1000	395.902	0	395.902
3	2.6321	3334.4	embankment soil	1000	0	389.332	1000	791.26	0	791.26
4	2.85701	5155.56	Foundation soil	1000	0	389.332	1000	1304.82	0	1304.82
5	2.85701	6539.19	Foundation soil	1000	0	389.332	1000	1939.62	0	1939.62
6	2.85701	7734.78	Foundation soil	1000	0	389.332	1000	2317.31	0	2317.31
7	2.85701	8930.37	Foundation soil	1000	0	389.332	1000	2694.99	0	2694.99
8	2.85701	10030.8	Foundation soil	1000	0	389.332	1000	2901.9	0	2901.9
9	3.21251	11605	Foundation soil	1000	0	389.332	1000	3433.89	0	3433.89
10	3.21251	11385.5	Foundation soil	1000	0	389.332	1000	3367.52	0	3367.52
11	3.21251	11165.9	Foundation soil	1000	0	389.332	1000	3301.17	0	3301.17
12	3.21251	10946.4	Foundation soil	1000	0	389.332	1000	3234.8	0	3234.8
13	3.21251	10726.9	Foundation soil	1000	0	389.332	1000	3168.42	0	3168.42
14	3.21251	10507.4	Foundation soil	1000	0	389.332	1000	3102.05	0	3102.05
15	2.85367	8693.73	Foundation soil	1000	0	389.332	1000	3478.21	0	3478.21
16	2.85367	7608.75	Foundation soil	1000	0	389.332	1000	3076.65	0	3076.65
17	2.85367	6523.77	Foundation soil	1000	0	389.332	1000	2675.11	0	2675.11
18	2.85367	5438.79	Foundation soil	1000	0	389.332	1000	2273.56	0	2273.56
19	2.85367	4353.81	Foundation soil	1000	0	389.332	1000	1872.01	0	1872.01
20	2.85367	3405.28	Foundation soil	1000	0	389.332	1000	1520.96	0	1520.96
21	2.85367	2775.42	Foundation soil	1000	0	389.332	1000	1287.85	0	1287.85
22	2.85367	2158.66	Foundation soil	1000	0	389.332	1000	1059.59	0	1059.59
23	2.85367	1541.9	Foundation soil	1000	0	389.332	1000	831.332	0	831.332
24	2.85367	925.139	Foundation soil	1000	0	389.332	1000	603.072	0	603.072
25	2.85367	308.38	Foundation soil	1000	0	389.332	1000	374.868	0	374.868

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.5685

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	104.6	1086.8	320.196	0	0
2	107.232	1083.92	-782.766	-78.2766	5.71059
3	109.864	1081.04	-567.119	-56.7119	5.71059
4	112.496	1078.16	696.73	69.673	5.71059
5	115.353	1075.03	3663.43	366.343	5.71059
6	118.21	1071.9	8615.19	861.519	5.71059
7	121.067	1068.78	14748	1474.8	5.71059
8	123.924	1065.65	22061.8	2206.18	5.71059
9	126.782	1062.52	30022.7	3002.27	5.71059
10	129.994	1061.57	32040.4	3204.04	5.71059
11	133.207	1060.62	33995	3399.5	5.71059

12	136.419	1059.67	35886.3	3588.63	5.71059
13	139.632	1058.71	37714.4	3771.44	5.71059
14	142.844	1057.76	39479.4	3947.94	5.71059
15	146.057	1056.81	41181.1	4118.11	5.71059
16	148.91	1058.33	34779.1	3477.91	5.71059
17	151.764	1059.85	28987.7	2898.77	5.71059
18	154.618	1061.37	23807.1	2380.71	5.71059
19	157.471	1062.89	19237.1	1923.71	5.71059
20	160.325	1064.41	15277.8	1527.78	5.71059
21	163.179	1065.93	11852.4	1185.24	5.71059
22	166.032	1067.45	8781.57	878.157	5.71059
23	168.886	1068.98	6057.86	605.786	5.71059
24	171.74	1070.5	3681.31	368.131	5.71059
25	174.593	1072.02	1651.91	165.191	5.71059
26	177.447	1073.54	0	0	0

List Of Coordinates

Water Table

X	Y
50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
125	1092
115	1092

Block Search Window

X	Y
68.264	1080
80.3115	1054.48
131.325	1052.09
136.785	1079.76

Block Search Window

X	Y
98.0043	1079.9
107.795	1054.48
178.01	1054.48

181.003	1073.44

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

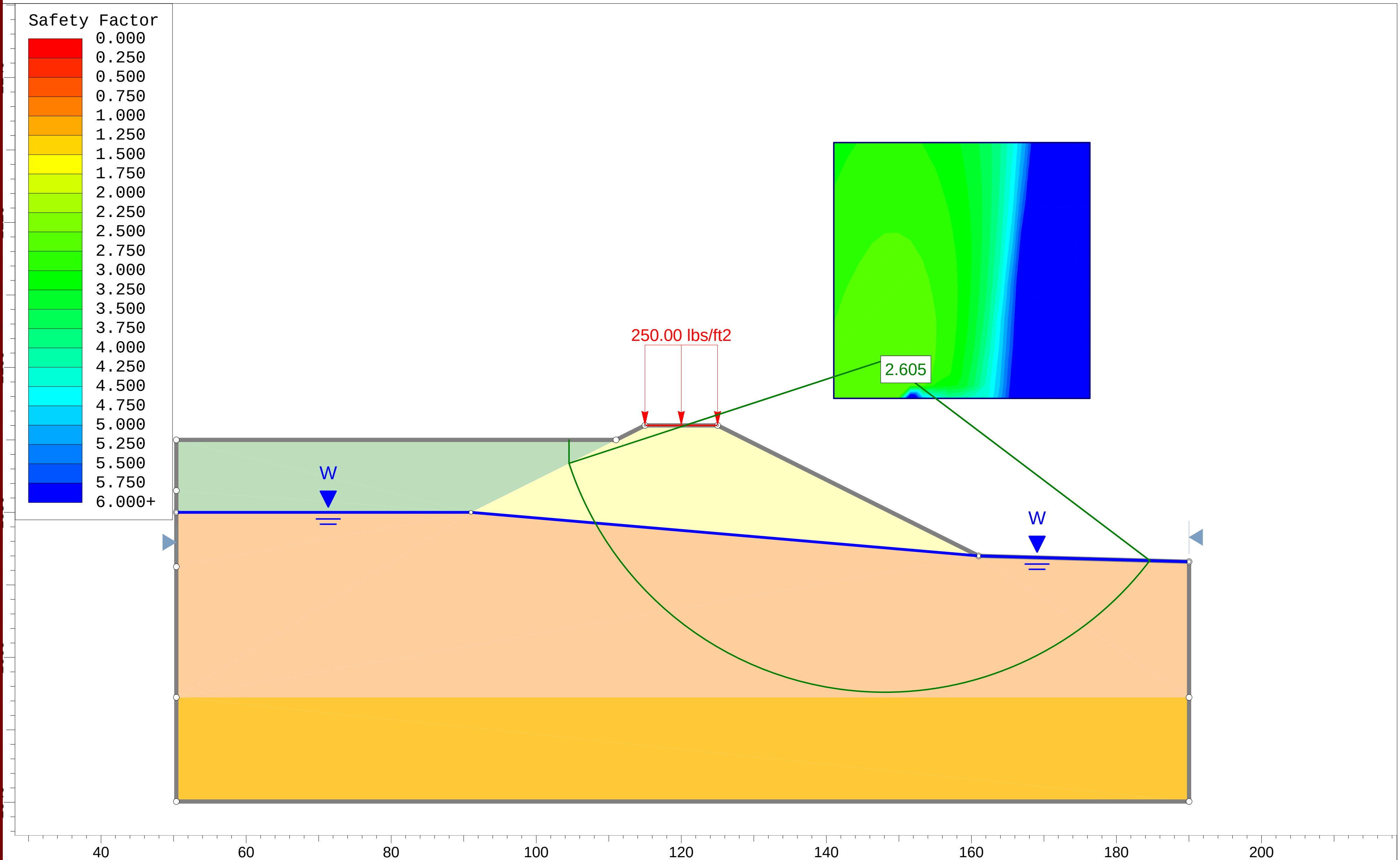
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	
Drawn By	Scale 1:222
Company	
Date 10/16/2013, 3:13:47 PM	File Name C-C_Conemaugh_undrained circular.slim

rocscience

SLIDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_undrained circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Undrained	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]			135	145
Saturated Unit Weight [lbs/ft3]			135	145
Cohesion Type	1000		1000	8000
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS: 2.605340
Center: 148.084, 1101.017
Radius: 45.845
Left Slip Surface Endpoint: 104.513, 1086.756
Right Slip Surface Endpoint: 184.629, 1073.337
Left Slope Intercept: 104.513 1090.004
Right Slope Intercept: 184.629 1073.337
Resisting Moment=4.56855e+006 lb-ft
Driving Moment=1.75353e+006 lb-ft
Resisting Horizontal Force=80115.9 lb
Driving Horizontal Force=30750.6 lb
Total Slice Area=1603.82 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4656
Number of Invalid Surfaces: 195

Error Codes:

Error Code -108 reported for 186 surfaces
Error Code -111 reported for 9 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.60534

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	3.61861	2707.53	embankment soil	1000	0	383.827	1000	-94.3353	0	-94.3353
2	3.18739	5320.04	Foundation soil	1000	0	383.827	1000	1012.42	0	1012.42
3	3.18739	7665.5	Foundation soil	1000	0	383.827	1000	1841.95	0	1841.95
4	3.18739	9536.76	Foundation soil	1000	0	383.827	1000	2702.06	0	2702.06
5	3.18739	10754.8	Foundation soil	1000	0	383.827	1000	3190.25	0	3190.25
6	3.18739	11758.6	Foundation soil	1000	0	383.827	1000	3566.43	0	3566.43
7	3.18739	12440.2	Foundation soil	1000	0	383.827	1000	3666.23	0	3666.23
8	3.18739	12545.8	Foundation soil	1000	0	383.827	1000	3684.09	0	3684.09
9	3.18739	12496.8	Foundation soil	1000	0	383.827	1000	3720.41	0	3720.41
10	3.18739	12331.2	Foundation soil	1000	0	383.827	1000	3716.88	0	3716.88
11	3.18739	12057.2	Foundation soil	1000	0	383.827	1000	3676.81	0	3676.81
12	3.18739	11680.7	Foundation soil	1000	0	383.827	1000	3602.46	0	3602.46
13	3.18739	11205.6	Foundation soil	1000	0	383.827	1000	3495.45	0	3495.45
14	3.18739	10634.1	Foundation soil	1000	0	383.827	1000	3356.69	0	3356.69
15	3.18739	9966.93	Foundation soil	1000	0	383.827	1000	3186.69	0	3186.69
16	3.18739	9203.47	Foundation soil	1000	0	383.827	1000	2985.46	0	2985.46
17	3.18739	8341.59	Foundation soil	1000	0	383.827	1000	2752.49	0	2752.49
18	3.18739	7427.41	Foundation soil	1000	0	383.827	1000	2502.68	0	2502.68
19	3.18739	6839.06	Foundation soil	1000	0	383.827	1000	2357.64	0	2357.64

20	3.18739	6235.26	Foundation soil	1000	0	383.827	1000	2209.89	0	2209.89
21	3.18739	5503.93	Foundation soil	1000	0	383.827	1000	2024.36	0	2024.36
22	3.18739	4628.76	Foundation soil	1000	0	383.827	1000	1796.88	0	1796.88
23	3.18739	3586.04	Foundation soil	1000	0	383.827	1000	1521.51	0	1521.51
24	3.18739	2339.59	Foundation soil	1000	0	383.827	1000	1189.58	0	1189.58
25	3.18739	829.963	Foundation soil	1000	0	383.827	1000	787.823	0	787.823

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.60534

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	104.513	1086.76	328.973	0	0
2	108.132	1078.53	-1897.85	-107.491	3.24167
3	111.319	1073.63	1909.17	108.132	3.24167
4	114.506	1069.8	7735.01	438.099	3.24168
5	117.694	1066.69	14919.7	845.026	3.24167
6	120.881	1064.11	21920.4	1241.54	3.24169
7	124.068	1061.97	28364.6	1606.52	3.24167
8	127.256	1060.18	33702.4	1908.85	3.24168
9	130.443	1058.7	37913.3	2147.35	3.24168
10	133.631	1057.51	41126.5	2329.34	3.24168
11	136.818	1056.58	43369.8	2456.39	3.24167
12	140.005	1055.89	44679.6	2530.58	3.24168
13	143.193	1055.43	45100	2554.39	3.24168
14	146.38	1055.2	44682.6	2530.75	3.24168
15	149.568	1055.2	43487	2463.04	3.24169
16	152.755	1055.41	41582	2355.14	3.24168
17	155.942	1055.85	39047.2	2211.57	3.24168
18	159.13	1056.52	35976.2	2037.63	3.24167
19	162.317	1057.44	32465.3	1838.78	3.24167
20	165.504	1058.61	28477.7	1612.93	3.24168
21	168.692	1060.07	24043	1361.76	3.24168
22	171.879	1061.83	19246.5	1090.09	3.24168
23	175.067	1063.95	14211.1	804.896	3.24169
24	178.254	1066.5	9117.78	516.417	3.24168
25	181.441	1069.57	4245.09	240.435	3.24168
26	184.629	1073.34	0	0	0

List Of Coordinates

Water Table

X	Y

50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
125	1092
115	1092

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

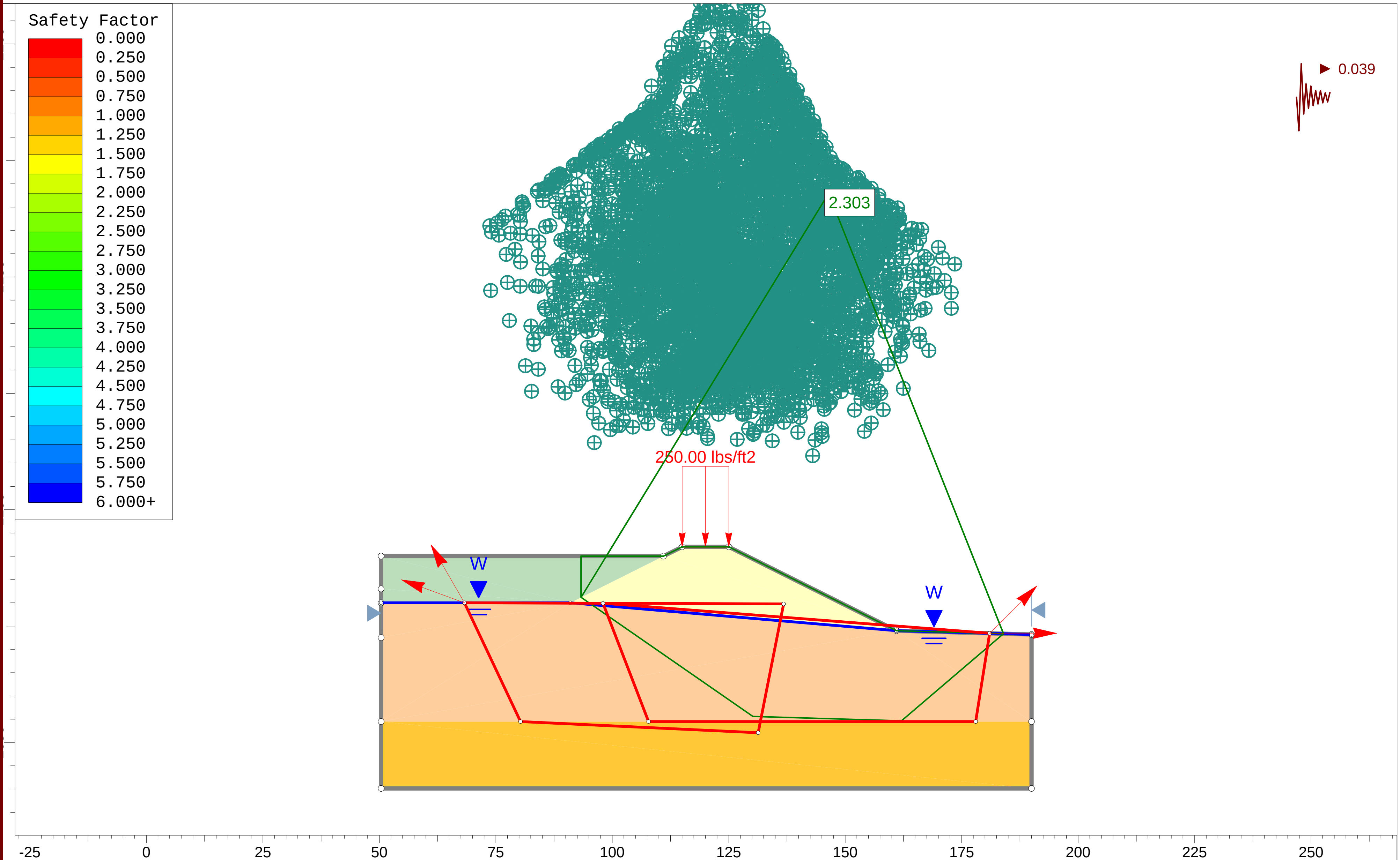
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:345	Company
Date 10/16/2013, 3:13:47 PM		File Name C-C_Conemaugh_undrained block-seismic.slim	

SLIDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_undrained block-seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Undrained	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]			135	145
Saturated Unit Weight [lbs/ft3]			135	145
Cohesion Type	1000		1000	8000
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS: 2.302960
Axis Location: 146.448, 1167.927
Left Slip Surface Endpoint: 93.311, 1081.156
Right Slip Surface Endpoint: 183.983, 1073.355
Left Slope Intercept: 93.311 1090.004
Right Slope Intercept: 183.983 1073.355
Resisting Moment=1.09143e+007 lb-ft
Driving Moment=4.73923e+006 lb-ft

Resisting Horizontal Force=90672.1 lb
Driving Horizontal Force=39372.1 lb
Total Slice Area=1877.14 ft2

Global Minimum Coordinates

Method: spencer

X	Y
93.3112	1081.16
130.178	1055.57
162.075	1054.65
183.983	1073.35

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3384
Number of Invalid Surfaces: 1616

Error Codes:

Error Code -105 reported for 9 surfaces
Error Code -107 reported for 410 surfaces
Error Code -108 reported for 1093 surfaces
Error Code -111 reported for 62 surfaces
Error Code -112 reported for 42 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.30296

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion	Base Friction Angle	Shear Stress	Shear Strength	Base Normal Stress	Pore Pressure	Effective Normal Stress

					[degrees]			[psf]		[psf]
1	2.22548	1506.27	embankment soil	1000	0	434.224	1000	366.379	0	366.379
2	3.84908	3983.05	Foundation soil	1000	0	434.224	1000	703.102	0	703.102
3	3.84908	5778.73	Foundation soil	1000	0	434.224	1000	1141.77	0	1141.77
4	3.84908	7574.41	Foundation soil	1000	0	434.224	1000	1580.45	0	1580.45
5	3.84908	9370.09	Foundation soil	1000	0	434.224	1000	2019.12	0	2019.12
6	3.84908	11388.1	Foundation soil	1000	0	434.224	1000	2508.85	0	2508.85
7	3.84908	13250.3	Foundation soil	1000	0	434.224	1000	3178.15	0	3178.15
8	3.84908	14620.8	Foundation soil	1000	0	434.224	1000	3522.02	0	3522.02
9	3.84908	15936.7	Foundation soil	1000	0	434.224	1000	3759.04	0	3759.04
10	3.84908	16607.3	Foundation soil	1000	0	434.224	1000	3768.22	0	3768.22
11	3.54406	15151.9	Foundation soil	1000	0	434.224	1000	4277.91	0	4277.91
12	3.54406	14431.2	Foundation soil	1000	0	434.224	1000	4075.99	0	4075.99
13	3.54406	13710.5	Foundation soil	1000	0	434.224	1000	3874.1	0	3874.1
14	3.54406	12989.8	Foundation soil	1000	0	434.224	1000	3672.19	0	3672.19
15	3.54406	12269.1	Foundation soil	1000	0	434.224	1000	3470.27	0	3470.27
16	3.54406	11548.5	Foundation soil	1000	0	434.224	1000	3268.36	0	3268.36
17	3.54406	10827.8	Foundation soil	1000	0	434.224	1000	3066.44	0	3066.44
18	3.54406	10107.1	Foundation soil	1000	0	434.224	1000	2864.55	0	2864.55
19	3.54406	9419.59	Foundation soil	1000	0	434.224	1000	2671.94	0	2671.94
20	3.65141	8731.33	Foundation soil	1000	0	434.224	1000	3071.12	0	3071.12
21	3.65141	7143.82	Foundation soil	1000	0	434.224	1000	2595.9	0	2595.9
22	3.65141	5556.3	Foundation soil	1000	0	434.224	1000	2120.67	0	2120.67
23	3.65141	3968.79	Foundation soil	1000	0	434.224	1000	1645.45	0	1645.45
24	3.65141	2381.27	Foundation soil	1000	0	434.224	1000	1170.23	0	1170.23
25	3.65141	793.757	Foundation soil	1000	0	434.224	1000	693.357	0	693.357

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.30296

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	93.3112	1081.16	2442.56	0	0
2	95.5367	1079.61	189.92	19.9028	5.98252
3	99.3858	1076.94	1303.45	136.596	5.98252
4	103.235	1074.27	3445.72	361.097	5.98252
5	107.084	1071.6	6616.73	693.406	5.98252
6	110.933	1068.93	10816.5	1133.52	5.9825
7	114.782	1066.25	16292.5	1707.38	5.9825
8	118.631	1063.58	23628.9	2476.22	5.98255
9	122.48	1060.91	31937.4	3346.91	5.98253
10	126.329	1058.24	40930.4	4289.34	5.98253
11	130.178	1055.57	49974	5237.07	5.98253
12	133.722	1055.47	49466.2	5183.85	5.98252

13	137.267	1055.36	48909.5	5125.52	5.98253
14	140.811	1055.26	48304.1	5062.07	5.98252
15	144.355	1055.16	47649.8	4993.5	5.98252
16	147.899	1055.06	46946.7	4919.82	5.98252
17	151.443	1054.95	46194.7	4841.02	5.98253
18	154.987	1054.85	45394	4757.1	5.98252
19	158.531	1054.75	44544.4	4668.07	5.98253
20	162.075	1054.65	43648.3	4574.16	5.98252
21	165.726	1057.76	32828.9	3440.33	5.98252
22	169.378	1060.88	23429.3	2455.3	5.98254
23	173.029	1064	15449.6	1619.06	5.98255
24	176.681	1067.12	8889.71	931.605	5.98253
25	180.332	1070.24	3749.64	392.947	5.98253
26	183.983	1073.35	0	0	0

List Of Coordinates

Water Table

X	Y
50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
125	1092
115	1092

Block Search Window

X	Y
68.264	1080
80.3115	1054.48
131.325	1052.09
136.785	1079.76

Block Search Window

X	Y
98.0043	1079.9
107.795	1054.48
178.01	1054.48
181.003	1073.44

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

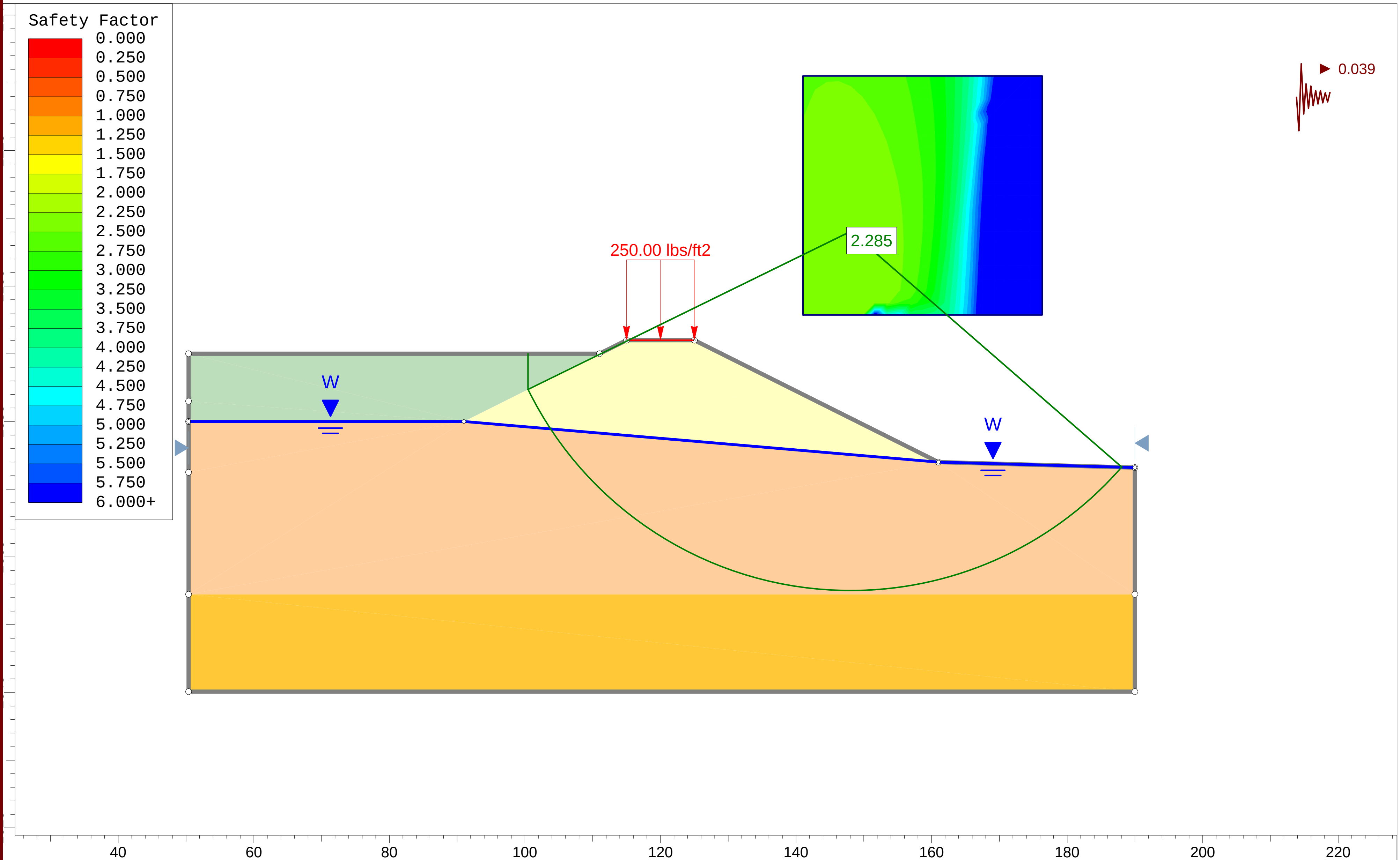
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	
Drawn By	
Scale	1:237
Company	
Date	10/16/2013, 3:13:47 PM
File Name	C-C_Conemaugh_undrained circular-seismic.slim

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: C-C_Conemaugh_undrained circular-seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	embankment soil	water	Foundation soil	bedrock
Color				
Strength Type	Undrained	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]			135	145
Saturated Unit Weight [lbs/ft3]			135	145
Cohesion Type	1000		1000	8000
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS: 2.285320
Center: 148.084, 1108.077
Radius: 53.046
Left Slip Surface Endpoint: 100.453, 1084.727
Right Slip Surface Endpoint: 188.087, 1073.240
Left Slope Intercept: 100.453 1090.004
Right Slope Intercept: 188.087 1073.240
Resisting Moment=5.53309e+006 lb-ft
Driving Moment=2.42115e+006 lb-ft
Resisting Horizontal Force=87633.3 lb
Driving Horizontal Force=38346.3 lb

Total Slice Area=1764.58 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4721
Number of Invalid Surfaces: 130

Error Codes:

Error Code -108 reported for 116 surfaces
Error Code -111 reported for 14 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.28532

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	3.32613	2416.44	embankment soil	1000	0	437.575	1000	-16.0147	0	-16.0147
2	3.5128	5240.75	Foundation soil	1000	0	437.575	1000	828.087	0	828.087
3	3.5128	7611.43	Foundation soil	1000	0	437.575	1000	1566.75	0	1566.75
4	3.5128	9781.9	Foundation soil	1000	0	437.575	1000	2238.61	0	2238.61
5	3.5128	11649	Foundation soil	1000	0	437.575	1000	3010.37	0	3010.37
6	3.5128	12809.3	Foundation soil	1000	0	437.575	1000	3447.93	0	3447.93
7	3.5128	13769.6	Foundation soil	1000	0	437.575	1000	3781.27	0	3781.27
8	3.5128	14227.3	Foundation soil	1000	0	437.575	1000	3743.55	0	3743.55
9	3.5128	14140.6	Foundation soil	1000	0	437.575	1000	3771.76	0	3771.76
10	3.5128	13920.1	Foundation soil	1000	0	437.575	1000	3768.75	0	3768.75
11	3.5128	13575.2	Foundation soil	1000	0	437.575	1000	3727.79	0	3727.79
12	3.5128	13112.3	Foundation soil	1000	0	437.575	1000	3650.89	0	3650.89
13	3.5128	12535.3	Foundation soil	1000	0	437.575	1000	3539.46	0	3539.46
14	3.5128	11846.8	Foundation soil	1000	0	437.575	1000	3394.32	0	3394.32
15	3.5128	11047.6	Foundation soil	1000	0	437.575	1000	3215.84	0	3215.84
16	3.5128	10137.3	Foundation soil	1000	0	437.575	1000	3003.89	0	3003.89
17	3.5128	9113.65	Foundation soil	1000	0	437.575	1000	2757.86	0	2757.86
18	3.5128	8152.2	Foundation soil	1000	0	437.575	1000	2528.67	0	2528.67

19	3.5128	7568.58	Foundation soil	1000	0	437.575	1000	2409.71	0	2409.71
20	3.5128	6883.74	Foundation soil	1000	0	437.575	1000	2263.02	0	2263.02
21	3.5128	6056.74	Foundation soil	1000	0	437.575	1000	2076.97	0	2076.97
22	3.5128	5071.94	Foundation soil	1000	0	437.575	1000	1847.45	0	1847.45
23	3.5128	3907.26	Foundation soil	1000	0	437.575	1000	1568.65	0	1568.65
24	3.5128	2530.51	Foundation soil	1000	0	437.575	1000	1232.26	0	1232.26
25	3.5128	892.152	Foundation soil	1000	0	437.575	1000	824.657	0	824.657

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.28532

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	100.453	1084.73	868.803	0	0
2	103.779	1078.9	-1031.43	-91.8793	5.09045
3	107.292	1074.17	1833.78	163.352	5.09044
4	110.805	1070.34	6686.91	595.666	5.09044
5	114.318	1067.17	12632.4	1125.29	5.09045
6	117.831	1064.5	19560.3	1742.42	5.09044
7	121.343	1062.26	26242.8	2337.69	5.09043
8	124.856	1060.39	32338.5	2880.69	5.09043
9	128.369	1058.83	37179.2	3311.9	5.09044
10	131.882	1057.57	40961.4	3648.82	5.09044
11	135.395	1056.57	43713.8	3894	5.09044
12	138.907	1055.83	45463.3	4049.85	5.09045
13	142.42	1055.33	46247.8	4119.73	5.09044
14	145.933	1055.07	46115.8	4107.97	5.09044
15	149.446	1055.05	45126.9	4019.88	5.09044
16	152.959	1055.26	43352.5	3861.82	5.09044
17	156.471	1055.7	40877.9	3641.38	5.09044
18	159.984	1056.38	37805.2	3367.66	5.09043
19	163.497	1057.32	34215.3	3047.88	5.09044
20	167.01	1058.52	30073.1	2678.9	5.09045
21	170.523	1060.01	25433.5	2265.6	5.09044
22	174.035	1061.81	20387.3	1816.09	5.09044
23	177.548	1063.97	15066.1	1342.08	5.09044
24	181.061	1066.53	9662.02	860.687	5.09044
25	184.574	1069.58	4464.66	397.709	5.09043
26	188.087	1073.24	0	0	0

List Of Coordinates

Water Table

X	Y
50.38	1080
91	1080
161	1074
190	1073.19

Line Load

X	Y
125	1092
115	1092

External Boundary

X	Y
50.3799	1040.12
190	1040.12
190	1054.48
190	1073.19
161	1074
125	1092
115	1092
111.007	1090
50.3799	1090
50.3799	1083
50.38	1080
50.3799	1072.5
50.3799	1054.48

Material Boundary

X	Y
91	1080
111.007	1090

Material Boundary

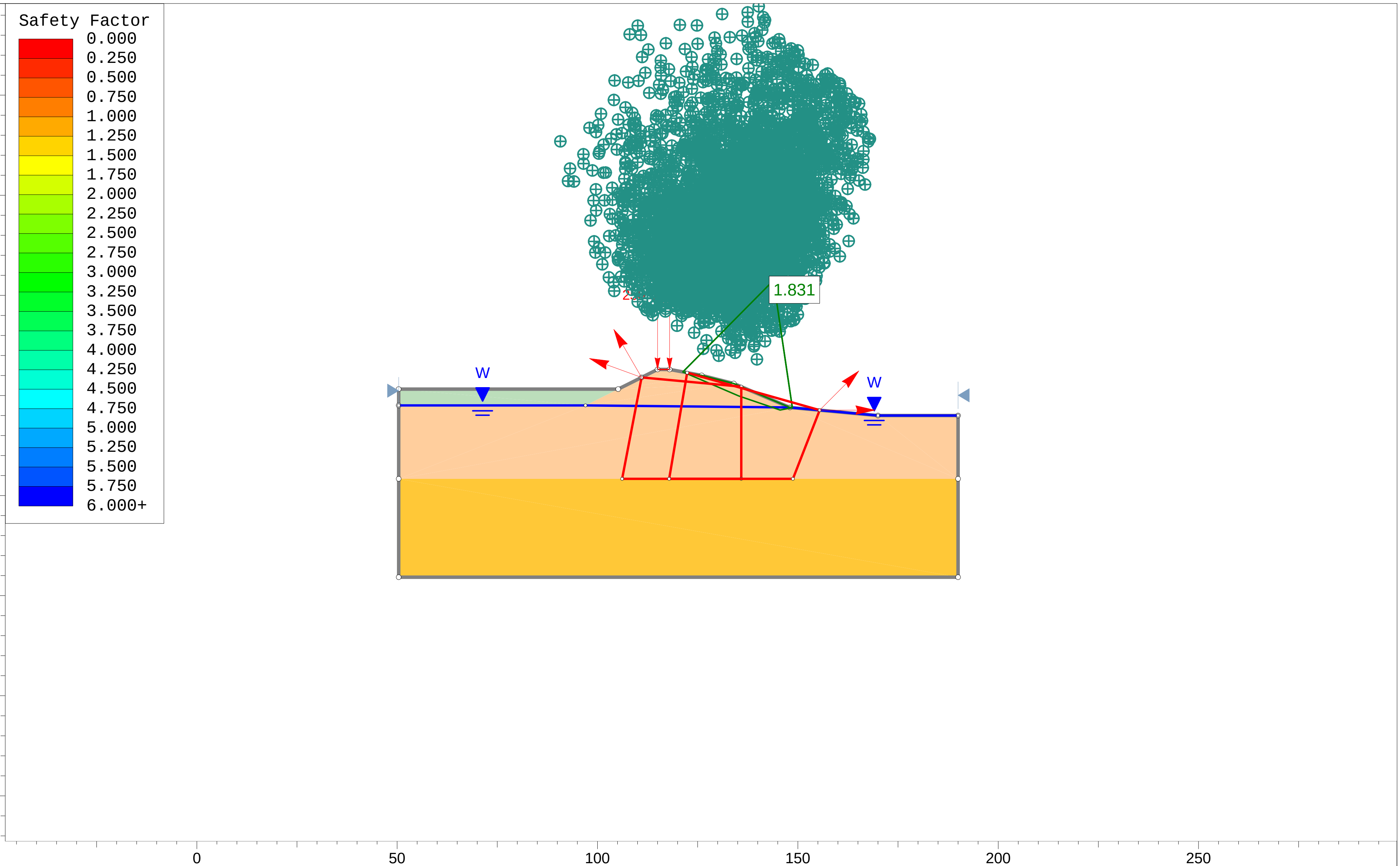
X	Y
50.38	1080
91	1080

Material Boundary

X	Y
91	1080
161	1074

Material Boundary

X	Y
50.3799	1054.48
190	1054.48



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:404	Company
Date 10/16/2013, 3:13:47 PM		File Name B-B_Conemaugh_drained block.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_drained block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion [psf]		0	
Friction Angle [deg]		32	
Cohesion Type			8000
Water Surface	None	Water Table	None
Hu Value		0	
Ru Value	0		0

Global Minimums

Method: spencer

FS: 1.830950
Axis Location: 143.898, 1103.734
Left Slip Surface Endpoint: 121.299, 1080.881
Right Slip Surface Endpoint: 148.621, 1071.944
Resisting Moment=109697 lb-ft

Driving Moment=59912.3 lb-ft
Resisting Horizontal Force=3412.97 lb
Driving Horizontal Force=1864.04 lb
Total Slice Area=45.183 ft2

Global Minimum Coordinates

Method: spencer

X	Y
121.299	1080.88
135.27	1074.86
145.58	1071.37
148.621	1071.94

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3043
Number of Invalid Surfaces: 1957

Error Codes:

Error Code -105 reported for 6 surfaces
Error Code -107 reported for 576 surfaces
Error Code -108 reported for 1016 surfaces
Error Code -111 reported for 213 surfaces
Error Code -112 reported for 146 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.83095

Slice	Width	Weight	Base	Base	Base Friction	Shear	Shear	Base Normal	Pore	Effective Normal

Number	[ft]	[lbs]	Material	[psf]	Angle [degrees]	[psf]	[psf]	Stress [psf]	[psf]	Stress [psf]
1	1.07468	18.9856	Foundation soil	0	32	5.13645	9.40459	15.0505	0	15.0505
2	1.07468	56.9568	Foundation soil	0	32	15.4094	28.2138	45.1514	0	45.1514
3	1.07468	94.928	Foundation soil	0	32	25.6823	47.023	75.2525	0	75.2525
4	1.07468	132.899	Foundation soil	0	32	35.9552	65.8321	105.354	0	105.354
5	1.07468	168.963	Foundation soil	0	32	45.712	83.6963	133.942	0	133.942
6	1.07468	197.872	Foundation soil	0	32	53.5331	98.0165	156.859	0	156.859
7	1.07468	226.098	Foundation soil	0	32	61.1699	111.999	179.235	0	179.235
8	1.07468	254.324	Foundation soil	0	32	68.8064	125.981	201.611	0	201.611
9	1.07468	282.551	Foundation soil	0	32	76.4428	139.963	223.987	0	223.987
10	1.07468	310.777	Foundation soil	0	32	84.0793	153.945	246.363	0	246.363
11	1.07468	339.003	Foundation soil	0	32	91.7158	167.927	268.739	0	268.739
12	1.07468	366.77	Foundation soil	0	32	99.2277	181.681	290.75	0	290.75
13	1.07468	376.477	Foundation soil	0	32	101.854	186.489	298.445	0	298.445
14	1.14557	393.512	Foundation soil	0	32	105.177	192.574	308.184	0	308.184
15	1.14557	377.511	Foundation soil	0	32	100.901	184.744	295.653	0	295.653
16	1.14557	361.511	Foundation soil	0	32	96.6242	176.914	283.121	0	283.121
17	1.14557	345.51	Foundation soil	0	32	92.3477	169.084	270.59	0	270.59
18	1.14557	329.509	Foundation soil	0	32	88.0707	161.253	258.059	0	258.059
19	1.14557	313.509	Foundation soil	0	32	83.7942	153.423	245.528	0	245.528
20	1.14557	297.508	Foundation soil	0	32	79.5177	145.593	232.997	0	232.997
21	1.14557	281.507	Foundation soil	0	32	75.2407	137.762	220.466	0	220.466
22	1.14557	265.507	Foundation soil	0	32	70.9643	129.932	207.935	0	207.935
23	1.01361	185.09	Foundation soil	0	32	79.6264	145.792	233.316	0	233.316
24	1.01361	99.5793	Foundation soil	0	32	42.8396	78.4371	125.526	0	125.526
			Foundation							

soil

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.83095

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	121.299	1080.88	0	0	0
2	122.374	1080.42	1.4373	0.424352	16.4488
3	123.448	1079.95	5.7492	1.69741	16.4489
4	124.523	1079.49	12.9357	3.81917	16.4488
5	125.598	1079.03	22.9968	6.78963	16.4488
6	126.672	1078.57	35.7881	10.5662	16.4489
7	127.747	1078.1	50.7679	14.9888	16.4488
8	128.822	1077.64	67.8846	20.0424	16.4488
9	129.897	1077.18	87.1381	25.7269	16.4489
10	130.971	1076.71	108.529	32.0422	16.4488
11	132.046	1076.25	132.056	38.9885	16.4488
12	133.121	1075.79	157.72	46.5656	16.4488
13	134.195	1075.32	185.486	54.7634	16.4489
14	135.27	1074.86	213.987	63.1782	16.4489
15	136.415	1074.47	212.605	62.77	16.4488
16	137.561	1074.08	211.279	62.3784	16.4488
17	138.707	1073.7	210.008	62.0034	16.4489
18	139.852	1073.31	208.795	61.645	16.4488
19	140.998	1072.92	207.637	61.3032	16.4488
20	142.143	1072.53	206.535	60.978	16.4489
21	143.289	1072.15	205.49	60.6695	16.4489
22	144.434	1071.76	204.501	60.3775	16.4489
23	145.58	1071.37	203.568	60.1021	16.4489
24	146.594	1071.56	78.2009	23.0882	16.4488
25	147.607	1071.75	10.7524	3.17456	16.4488
26	148.621	1071.94	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
170	1070
190	1070

Line Load

X	Y
118	1081.5
115	1081.5

Block Search Window

X	Y
111.007	1079.5
106.138	1054.17
135.877	1054.17
135.877	1077.2

Block Search Window

X	Y
122.363	1080.68
117.871	1054.17
148.772	1054.17
155.453	1071.32

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070
148	1072
134	1078
126	1080
118	1081.5
115	1081.5
111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5

105.176	1076.59

Material Boundary

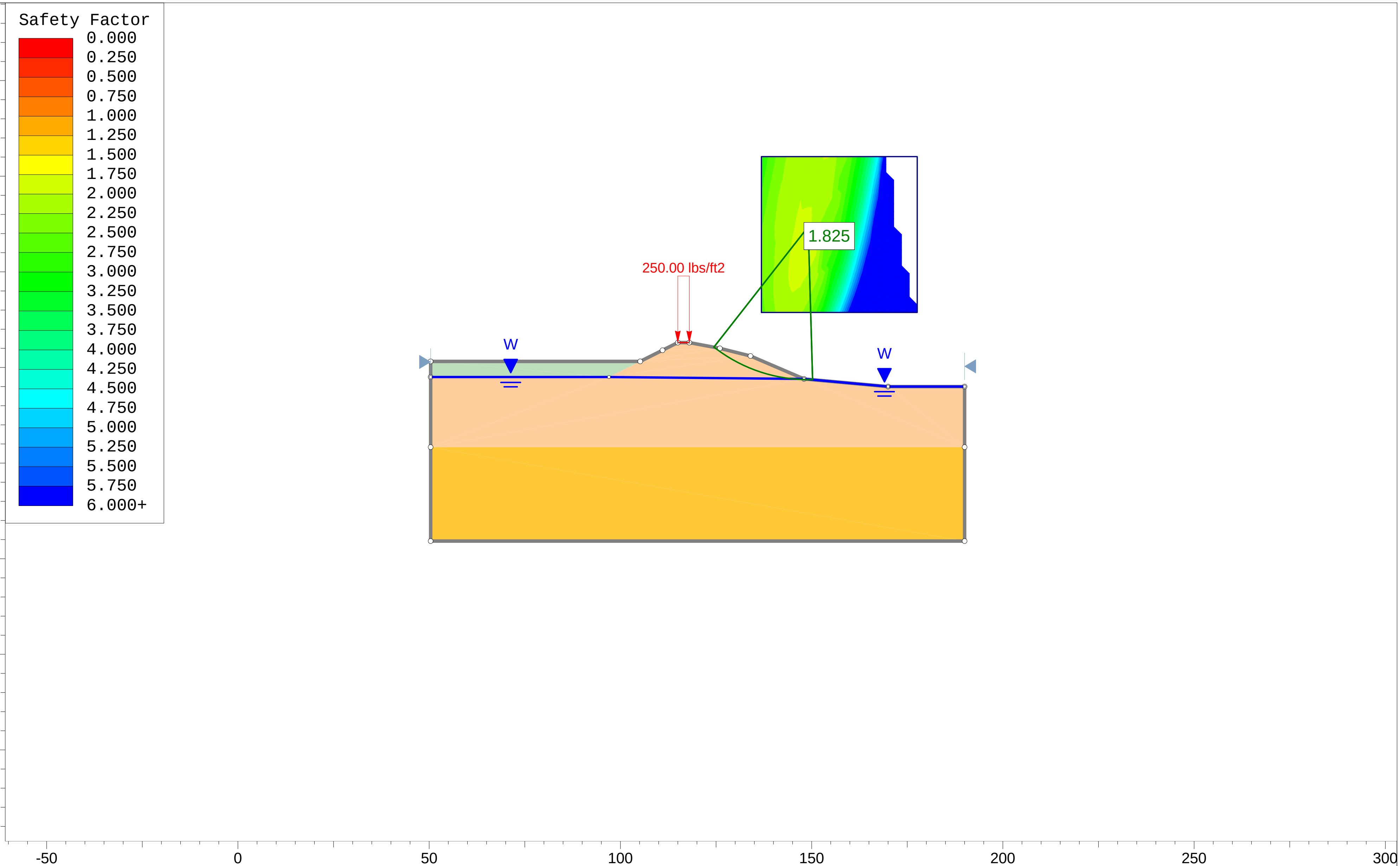
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



Project SLIDE - An Interactive Slope Stability Program			
Analysis Description			
Drawn By	*Scale* 1:424	*Company*	
Date 10/16/2013, 3:13:47 PM		*File Name* B-B_Conemaugh_drained circular.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_drained circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 3

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion [psf]		0	
Friction Angle [deg]		32	
Cohesion Type			8000
Water Surface	None	Water Table	None
Hu Value		0	
Ru Value	0		0

Global Minimums

Method: spencer

FS: 1.825170
Center: 149.098, 1111.785
Radius: 40.007
Left Slip Surface Endpoint: 124.420, 1080.296
Right Slip Surface Endpoint: 150.254, 1071.795
Resisting Moment=159413 lb-ft
Driving Moment=87341.3 lb-ft
Resisting Horizontal Force=3738.07 lb

Driving Horizontal Force=2048.06 lb
Total Slice Area=49.5063 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3195
Number of Invalid Surfaces: 1656

Error Codes:

Error Code -108 reported for 8 surfaces
Error Code -115 reported for 1648 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.82517

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.03334	41.1096	Foundation soil	0	32	9.81295	17.9103	28.6625	0	28.6625
2	1.03334	118.78	Foundation soil	0	32	29.0183	52.9634	84.7595	0	84.7595
3	1.03334	182.831	Foundation soil	0	32	45.6713	83.3579	133.4	0	133.4
4	1.03334	239.184	Foundation soil	0	32	61.0425	111.413	178.298	0	178.298
5	1.03334	289.468	Foundation soil	0	32	75.4226	137.659	220.301	0	220.301
6	1.03334	334.004	Foundation soil	0	32	88.795	162.066	259.361	0	259.361
7	1.03334	373.071	Foundation soil	0	32	101.144	184.605	295.43	0	295.43
8	1.03334	406.913	Foundation soil	0	32	112.452	205.244	328.459	0	328.459
9	1.03334	435.744	Foundation soil	0	32	122.7	223.949	358.394	0	358.394
10	1.03334	452.911	Foundation soil	0	32	129.908	237.105	379.447	0	379.447

11	1.03334	447.467	Foundation soil	0	32	130.7	238.55	381.76	0	381.76
12	1.03334	436.568	Foundation soil	0	32	129.826	236.955	379.208	0	379.208
13	1.03334	421.289	Foundation soil	0	32	127.529	232.763	372.498	0	372.498
14	1.03334	401.743	Foundation soil	0	32	123.777	225.914	361.537	0	361.537
15	1.03334	378.03	Foundation soil	0	32	118.533	216.342	346.221	0	346.221
16	1.03334	350.238	Foundation soil	0	32	111.756	203.974	326.427	0	326.427
17	1.03334	318.442	Foundation soil	0	32	103.402	188.727	302.026	0	302.026
18	1.03334	282.708	Foundation soil	0	32	93.4192	170.506	272.866	0	272.866
19	1.03334	243.091	Foundation soil	0	32	81.7507	149.209	238.784	0	238.784
20	1.03334	199.639	Foundation soil	0	32	68.3334	124.72	199.593	0	199.593
21	1.03334	152.39	Foundation soil	0	32	53.0957	96.9087	155.086	0	155.086
22	1.03334	101.372	Foundation soil	0	32	35.9594	65.632	105.033	0	105.033
23	1.03334	47.4037	Foundation soil	0	32	17.1233	31.2529	50.0151	0	50.0151
24	1.03334	21.2508	Foundation soil	0	32	7.81872	14.2705	22.8375	0	22.8375
25	1.03334	7.70428	Foundation soil	0	32	2.99102	5.45912	8.73642	0	8.73642

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.82517

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	124.42	1080.3	0	0	0
2	125.453	1079.51	12.3062	3.83893	17.3254
3	126.487	1078.78	44.3836	13.8455	17.3254
4	127.52	1078.1	88.5226	27.6146	17.3253
5	128.553	1077.46	139.542	43.5299	17.3252
6	129.587	1076.86	193.267	60.2895	17.3253
7	130.62	1076.3	246.108	76.7734	17.3253
8	131.653	1075.78	294.992	92.0226	17.3253
9	132.687	1075.3	337.307	105.223	17.3253
10	133.72	1074.85	370.862	115.69	17.3253
11	134.753	1074.44	393.512	122.756	17.3253

12	135.787	1074.06	403.771	125.956	17.3253
13	136.82	1073.71	401.888	125.369	17.3253
14	137.853	1073.39	388.504	121.194	17.3253
15	138.887	1073.1	364.593	113.735	17.3253
16	139.92	1072.85	331.469	103.402	17.3253
17	140.953	1072.62	290.788	90.7113	17.3253
18	141.987	1072.42	244.557	76.2896	17.3253
19	143.02	1072.24	195.146	60.8757	17.3253
20	144.053	1072.1	145.305	45.3278	17.3253
21	145.087	1071.98	98.186	30.6291	17.3253
22	146.12	1071.89	57.3709	17.8968	17.3253
23	147.154	1071.83	26.9013	8.39183	17.3253
24	148.187	1071.79	11.0522	3.44774	17.3253
25	149.22	1071.78	3.20525	0.999876	17.3253
26	150.254	1071.8	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
170	1070
190	1070

Line Load

X	Y
118	1081.5
115	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070
148	1072
134	1078
126	1080
118	1081.5
115	1081.5

111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5
105.176	1076.59

Material Boundary

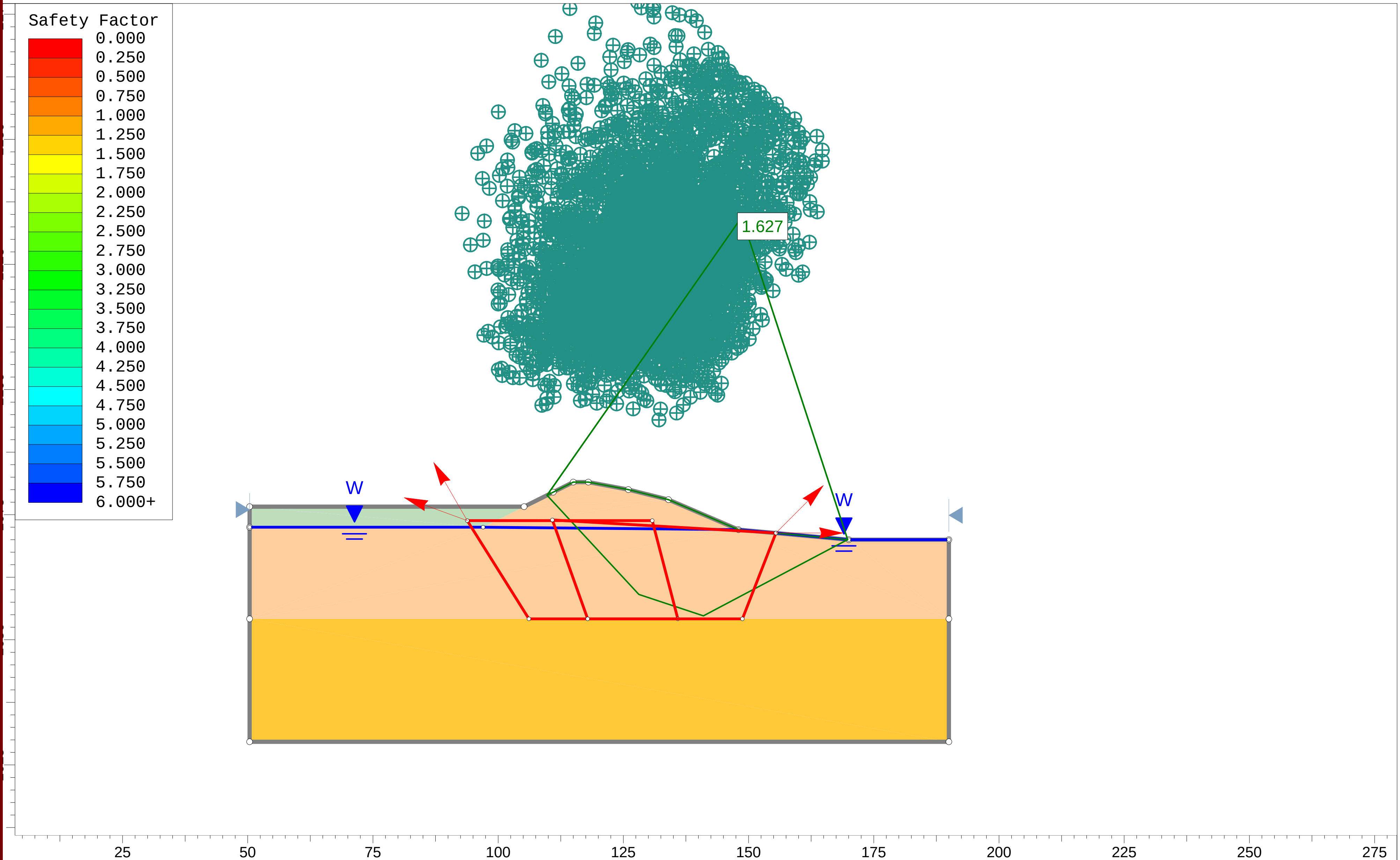
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



rocscience

SLIDEINTERPRET 6.019

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By	*Scale* 1:321	*Company*	
Date 10/16/2013, 3:13:47 PM		*File Name* B-B_Conemaugh_undrained block.slim	

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_undrained block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.626850
Axis Location: 148.633, 1134.468
Left Slip Surface Endpoint: 109.763, 1078.881
Right Slip Surface Endpoint: 169.781, 1070.020
Resisting Moment=1.8801e+006 lb-ft
Driving Moment=1.15567e+006 lb-ft
Resisting Horizontal Force=22506.6 lb
Driving Horizontal Force=13834.5 lb
Total Slice Area=743.897 ft2

Global Minimum Coordinates

Method: spencer

X	Y
109.763	1078.88
128.098	1059.07
140.994	1054.79
169.781	1070.02

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3026
Number of Invalid Surfaces: 1974

Error Codes:

Error Code -107 reported for 776 surfaces
Error Code -108 reported for 1105 surfaces
Error Code -111 reported for 42 surfaces
Error Code -112 reported for 51 surfaces

Error Codes

The following errors were encountered during the computation:

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.62685

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.29193	560.47	Foundation soil	375	0	230.507	375	12.2057	0	12.2057
2	2.29193	1681.41	Foundation soil	375	0	230.507	375	463.504	0	463.504
3	2.29193	2711.71	Foundation soil	375	0	230.507	375	878.309	0	878.309
4	2.29193	3481.51	Foundation soil	375	0	230.507	375	1188.24	0	1188.24
5	2.29193	4138.36	Foundation soil	375	0	230.507	375	1452.69	0	1452.69
6	2.29193	4771.76	Foundation soil	375	0	230.507	375	1707.7	0	1707.7
7	2.29193	5405.16	Foundation soil	375	0	230.507	375	1962.71	0	1962.71
8	2.29193	6019.99	Foundation soil	375	0	230.507	375	2210.24	0	2210.24

9	2.57907	7142.49	Foundation soil	375	0	230.507	375	2642.57	0	2642.57
10	2.57907	7215.87	Foundation soil	375	0	230.507	375	2670.3	0	2670.3
11	2.57907	7248.63	Foundation soil	375	0	230.507	375	2682.69	0	2682.69
12	2.57907	7168.31	Foundation soil	375	0	230.507	375	2652.33	0	2652.33
13	2.57907	7081.34	Foundation soil	375	0	230.507	375	2619.46	0	2619.46
14	2.3989	6174.2	Foundation soil	375	0	230.507	375	2830.26	0	2830.26
15	2.3989	5430.2	Foundation soil	375	0	230.507	375	2506.78	0	2506.78
16	2.3989	4687.03	Foundation soil	375	0	230.507	375	2183.65	0	2183.65
17	2.3989	4094.2	Foundation soil	375	0	230.507	375	1925.9	0	1925.9
18	2.3989	3612.53	Foundation soil	375	0	230.507	375	1716.48	0	1716.48
19	2.3989	3130.86	Foundation soil	375	0	230.507	375	1507.05	0	1507.05
20	2.3989	2649.19	Foundation soil	375	0	230.507	375	1297.63	0	1297.63
21	2.3989	2167.52	Foundation soil	375	0	230.507	375	1088.2	0	1088.2
22	2.3989	1685.85	Foundation soil	375	0	230.507	375	878.779	0	878.779
23	2.3989	1204.18	Foundation soil	375	0	230.507	375	669.352	0	669.352
24	2.3989	722.507	Foundation soil	375	0	230.507	375	459.929	0	459.929
25	2.3989	240.836	Foundation soil	375	0	230.507	375	250.529	0	250.529

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.62685

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	109.763	1078.88	0	0	0
2	112.055	1076.4	-497.01	-38.8032	4.46421
3	114.347	1073.93	123.778	9.66376	4.46422
4	116.639	1071.45	1771.98	138.344	4.4642
5	118.931	1068.97	4187.82	326.957	4.46422
6	121.223	1066.5	7258.67	566.708	4.46421
7	123.515	1064.02	10961.1	855.773	4.46423
8	125.807	1061.54	15295.2	1194.15	4.46423

9	128.098	1059.07	20242.4	1580.39	4.46421
10	130.678	1058.21	21909.9	1710.58	4.46422
11	133.257	1057.36	23601.1	1842.61	4.4642
12	135.836	1056.5	25302.9	1975.48	4.46421
13	138.415	1055.64	26978.7	2106.31	4.4642
14	140.994	1054.79	28626.3	2234.95	4.46422
15	143.393	1056.06	24482.2	1911.41	4.46422
16	145.792	1057.33	20748.7	1619.92	4.46422
17	148.191	1058.6	17425.3	1360.45	4.46421
18	150.589	1059.87	14429	1126.52	4.46422
19	152.988	1061.14	11698.5	913.342	4.46422
20	155.387	1062.4	9233.87	720.918	4.46421
21	157.786	1063.67	7035.02	549.247	4.46421
22	160.185	1064.94	5101.99	398.329	4.46421
23	162.584	1066.21	3434.76	268.163	4.46421
24	164.983	1067.48	2033.35	158.75	4.46421
25	167.382	1068.75	897.738	70.0893	4.46421
26	169.781	1070.02	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
155.453	1071.32
170	1070
190	1070

Block Search Window

X	Y
93.824	1073.8
106.138	1054.17
135.877	1054.17
130.766	1073.8

Block Search Window

X	Y
110.824	1073.95
117.871	1054.17
148.772	1054.17
155.453	1071.32

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070
148	1072
134	1078
126	1080
118	1081.5
115	1081.5
111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5
105.176	1076.59

Material Boundary

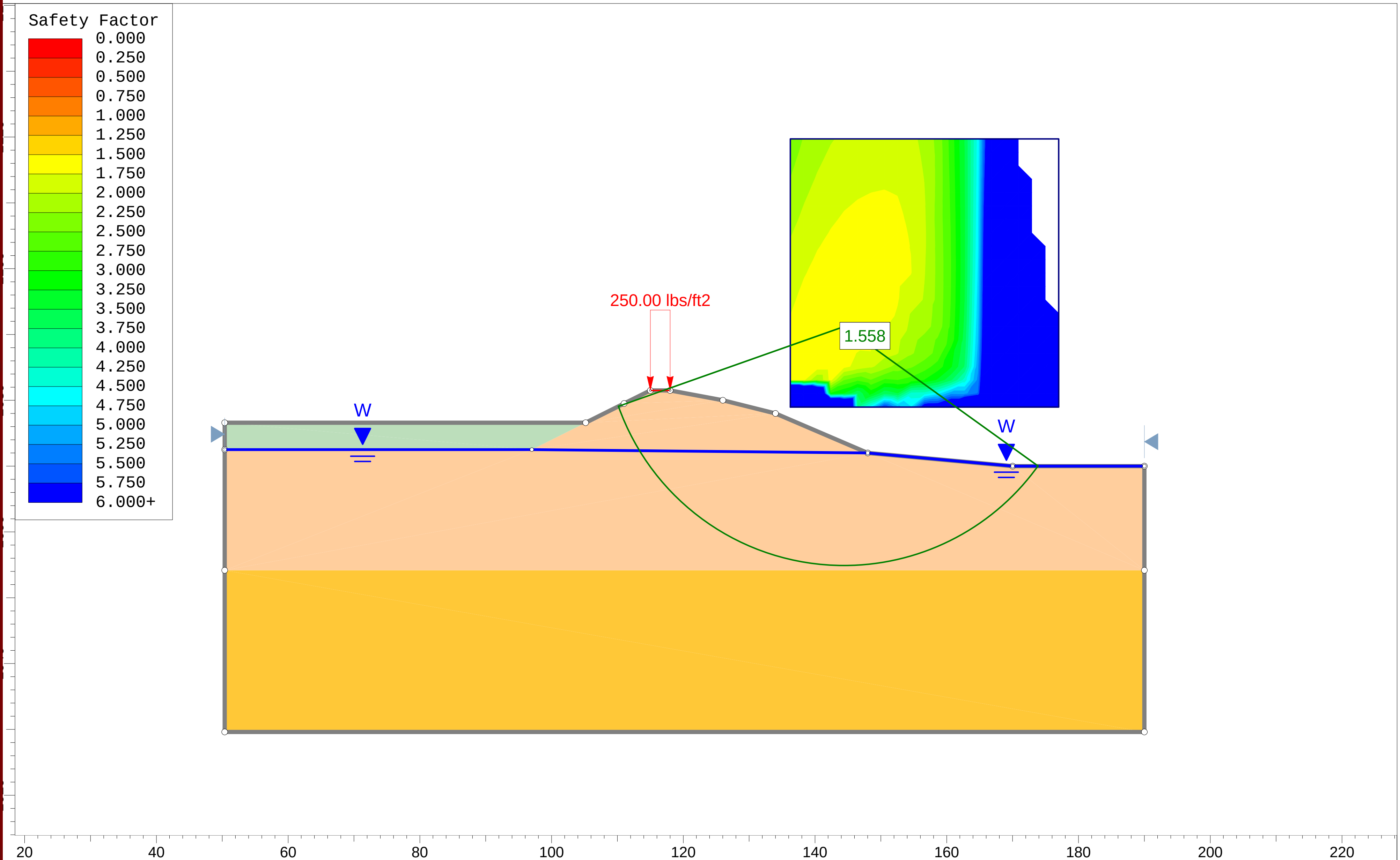
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By	*Scale* 1:244	*Company*	
Date 10/16/2013, 3:13:47 PM		*File Name*	B-B_Conemaugh_undrained circular.slim

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_undrained circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 3

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.558120
Center: 144.399, 1091.196
Radius: 36.321
Left Slip Surface Endpoint: 110.159, 1079.079
Right Slip Surface Endpoint: 173.895, 1070.000
Resisting Moment=1.07835e+006 lb-ft
Driving Moment=692082 lb-ft
Resisting Horizontal Force=23900.9 lb
Driving Horizontal Force=15339.5 lb
Total Slice Area=938.017 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3360
Number of Invalid Surfaces: 1491

Error Codes:

Error Code -103 reported for 3 surfaces
Error Code -108 reported for 86 surfaces
Error Code -111 reported for 1 surface
Error Code -112 reported for 68 surfaces
Error Code -115 reported for 1333 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.55812

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.54943	1188	Foundation soil	375	0	240.675	375	-47.7241	0	-47.7241
2	2.54943	3270.06	Foundation soil	375	0	240.675	375	869.907	0	869.907
3	2.54943	4651.03	Foundation soil	375	0	240.675	375	1678.88	0	1678.88
4	2.54943	5535	Foundation soil	375	0	240.675	375	1861.06	0	1861.06
5	2.54943	6152.01	Foundation soil	375	0	240.675	375	2130.53	0	2130.53
6	2.54943	6635.42	Foundation soil	375	0	240.675	375	2360.61	0	2360.61
7	2.54943	6992.85	Foundation soil	375	0	240.675	375	2538.29	0	2538.29

8	2.54943	7220.32	Foundation soil	375	0	240.675	375	2663.04	0	2663.04
9	2.54943	7363.97	Foundation soil	375	0	240.675	375	2753.06	0	2753.06
10	2.54943	7399.66	Foundation soil	375	0	240.675	375	2799.51	0	2799.51
11	2.54943	7251.61	Foundation soil	375	0	240.675	375	2773.19	0	2773.19
12	2.54943	7027.89	Foundation soil	375	0	240.675	375	2715.82	0	2715.82
13	2.54943	6740.63	Foundation soil	375	0	240.675	375	2632.28	0	2632.28
14	2.54943	6391.18	Foundation soil	375	0	240.675	375	2523.24	0	2523.24
15	2.54943	5983.61	Foundation soil	375	0	240.675	375	2390.4	0	2390.4
16	2.54943	5701.08	Foundation soil	375	0	240.675	375	2306.34	0	2306.34
17	2.54943	5460.01	Foundation soil	375	0	240.675	375	2238.9	0	2238.9
18	2.54943	5152.53	Foundation soil	375	0	240.675	375	2145.7	0	2145.7
19	2.54943	4774.74	Foundation soil	375	0	240.675	375	2025.36	0	2025.36
20	2.54943	4321.03	Foundation soil	375	0	240.675	375	1875.89	0	1875.89
21	2.54943	3783.47	Foundation soil	375	0	240.675	375	1694.45	0	1694.45
22	2.54943	3150.78	Foundation soil	375	0	240.675	375	1477.08	0	1477.08
23	2.54943	2406.32	Foundation soil	375	0	240.675	375	1217.96	0	1217.96
24	2.54943	1535.5	Foundation soil	375	0	240.675	375	912.983	0	912.983
25	2.54943	543.602	Foundation soil	375	0	240.675	375	568.673	0	568.673

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.55812

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	110.159	1079.08	0	0	0
2	112.708	1073.45	-883.97	-52.8115	3.41899
3	115.258	1069.52	1922.72	114.87	3.41899
4	117.807	1066.46	6446.41	385.131	3.41899
5	120.357	1063.97	10454.3	624.577	3.41899
6	122.906	1061.92	14216.3	849.333	3.41899

7	125.455	1060.21	17638.9	1053.81	3.41899
8	128.005	1058.79	20630.6	1232.54	3.41897
9	130.554	1057.62	23126.4	1381.65	3.41898
10	133.104	1056.68	25102.2	1499.7	3.419
11	135.653	1055.94	26537	1585.42	3.419
12	138.203	1055.41	27408.8	1637.5	3.41899
13	140.752	1055.06	27741.2	1657.35	3.41897
14	143.301	1054.89	27565.4	1646.85	3.41898
15	145.851	1054.9	26918.8	1608.22	3.41898
16	148.4	1055.1	25844.5	1544.04	3.41898
17	150.95	1055.47	24365.4	1455.67	3.41898
18	153.499	1056.03	22489.9	1343.63	3.419
19	156.049	1056.79	20243	1209.39	3.41899
20	158.598	1057.77	17660.1	1055.08	3.419
21	161.147	1058.97	14790.8	883.654	3.41899
22	163.697	1060.43	11703.9	699.229	3.41897
23	166.246	1062.18	8497.06	507.644	3.41899
24	168.796	1064.29	5314.18	317.488	3.41899
25	171.345	1066.84	2367.7	141.455	3.41899
26	173.895	1070	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
170	1070
190	1070

Line Load

X	Y
118	1081.5
115	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070

148	1072
134	1078
126	1080
118	1081.5
115	1081.5
111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5
105.176	1076.59

Material Boundary

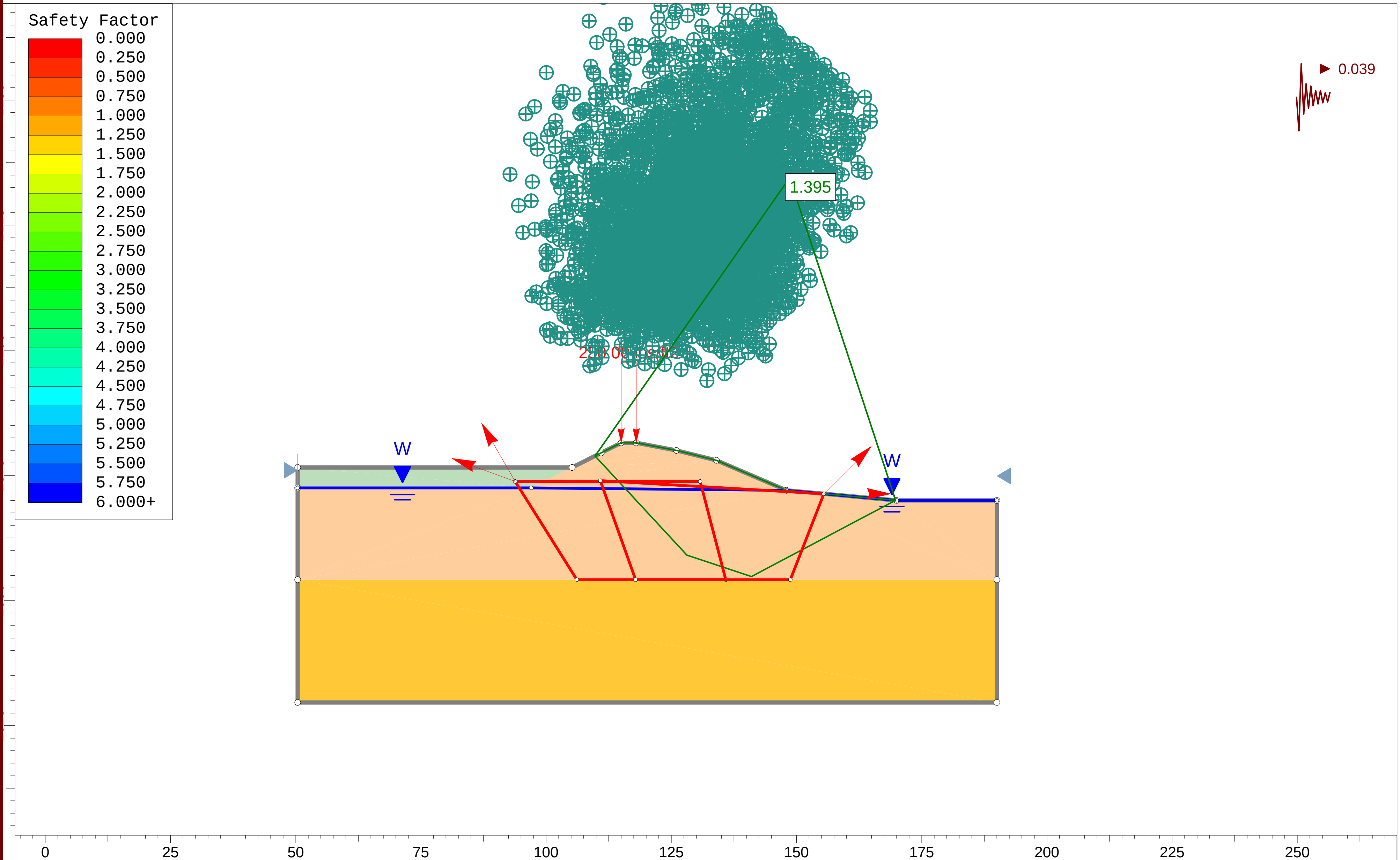
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By	*Scale* 1:321	*Company*	
Date 10/16/2013, 3:13:47 PM		*File Name* B-B_Conemaugh_undrained block_seismic.slim	

DEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_undrained block_seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.395060
Axis Location: 148.633, 1134.468
Left Slip Surface Endpoint: 109.763, 1078.881
Right Slip Surface Endpoint: 169.781, 1070.020
Resisting Moment=1.88007e+006 lb-ft
Driving Moment=1.34766e+006 lb-ft
Resisting Horizontal Force=22506.6 lb
Driving Horizontal Force=16133.1 lb

Total Slice Area=743.897 ft2

Global Minimum Coordinates

Method: spencer

X	Y
109.763	1078.88
128.098	1059.07
140.994	1054.79
169.781	1070.02

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3321
Number of Invalid Surfaces: 1679

Error Codes:

Error Code -107 reported for 448 surfaces
Error Code -108 reported for 1083 surfaces
Error Code -111 reported for 83 surfaces
Error Code -112 reported for 65 surfaces

Error Codes

The following errors were encountered during the computation:

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.39506

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.29193	560.47	Foundation soil	375	0	268.806	375	-16.8927	0	-16.8927
			Foundation							

			soil							
3	2.29193	2711.71	Foundation soil	375	0	268.806	375	980.849	0	980.849
4	2.29193	3481.51	Foundation soil	375	0	268.806	375	1253.43	0	1253.43
5	2.29193	4138.36	Foundation soil	375	0	268.806	375	1376.12	0	1376.12
6	2.29193	4771.76	Foundation soil	375	0	268.806	375	1622.72	0	1622.72
7	2.29193	5405.16	Foundation soil	375	0	268.806	375	1869.33	0	1869.33
8	2.29193	6019.99	Foundation soil	375	0	268.806	375	2108.7	0	2108.7
9	2.57907	7142.49	Foundation soil	375	0	268.806	375	2603.69	0	2603.69
10	2.57907	7215.87	Foundation soil	375	0	268.806	375	2631.03	0	2631.03
11	2.57907	7248.63	Foundation soil	375	0	268.806	375	2643.24	0	2643.24
12	2.57907	7168.31	Foundation soil	375	0	268.806	375	2613.31	0	2613.31
13	2.57907	7081.34	Foundation soil	375	0	268.806	375	2580.9	0	2580.9
14	2.3989	6174.2	Foundation soil	375	0	268.806	375	2900.89	0	2900.89
15	2.3989	5430.2	Foundation soil	375	0	268.806	375	2573.23	0	2573.23
16	2.3989	4687.03	Foundation soil	375	0	268.806	375	2245.93	0	2245.93
17	2.3989	4094.2	Foundation soil	375	0	268.806	375	1984.85	0	1984.85
18	2.3989	3612.53	Foundation soil	375	0	268.806	375	1772.72	0	1772.72
19	2.3989	3130.86	Foundation soil	375	0	268.806	375	1560.58	0	1560.58
20	2.3989	2649.19	Foundation soil	375	0	268.806	375	1348.45	0	1348.45
21	2.3989	2167.52	Foundation soil	375	0	268.806	375	1136.32	0	1136.32
22	2.3989	1685.85	Foundation soil	375	0	268.806	375	924.188	0	924.188
23	2.3989	1204.18	Foundation soil	375	0	268.806	375	712.053	0	712.053
24	2.3989	722.507	Foundation soil	375	0	268.806	375	499.922	0	499.922
25	2.3989	240.836	Foundation soil	375	0	268.806	375	287.815	0	287.815

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.39506

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	109.763	1078.88	0	0	0
2	112.055	1076.4	-634.209	-69.1247	6.22032
3	114.347	1073.93	-143.742	-15.667	6.22034
4	116.639	1071.45	1777.2	193.704	6.22034
5	118.931	1068.97	4403.32	479.933	6.22031
6	121.223	1066.5	7358.92	802.075	6.22032
7	123.515	1064.02	10950	1193.48	6.22032
8	125.807	1061.54	15176.7	1654.16	6.22031
9	128.098	1059.07	20020.2	2182.07	6.22031
10	130.678	1058.21	21835	2379.88	6.22033
11	133.257	1057.36	23676.2	2580.55	6.22031
12	135.836	1056.5	25529	2782.5	6.22032
13	138.415	1055.64	27353.1	2981.31	6.22031
14	140.994	1054.79	29146.1	3176.73	6.2203
15	143.393	1056.06	25062.1	2731.6	6.2203
16	145.792	1057.33	21364.9	2328.64	6.22033
17	148.191	1058.6	18054.2	1967.79	6.22031
18	150.589	1059.87	15051.7	1640.54	6.22032
19	152.988	1061.14	12299.7	1340.59	6.22033
20	155.387	1062.4	9798.2	1067.94	6.22031
21	157.786	1063.67	7547.12	822.587	6.22031
22	160.185	1064.94	5546.5	604.533	6.22032
23	162.584	1066.21	3796.35	413.777	6.22031
24	164.983	1067.48	2296.65	250.32	6.22032
25	167.382	1068.75	1047.41	114.161	6.22032
26	169.781	1070.02	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
155.453	1071.32
170	1070
190	1070

Line Load

X	Y

118	1081.5
115	1081.5

Block Search Window

X	Y
93.824	1073.8
106.138	1054.17
135.877	1054.17
130.766	1073.8

Block Search Window

X	Y
110.824	1073.95
117.871	1054.17
148.772	1054.17
155.453	1071.32

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070
148	1072
134	1078
126	1080
118	1081.5
115	1081.5
111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5
105.176	1076.59

Material Boundary

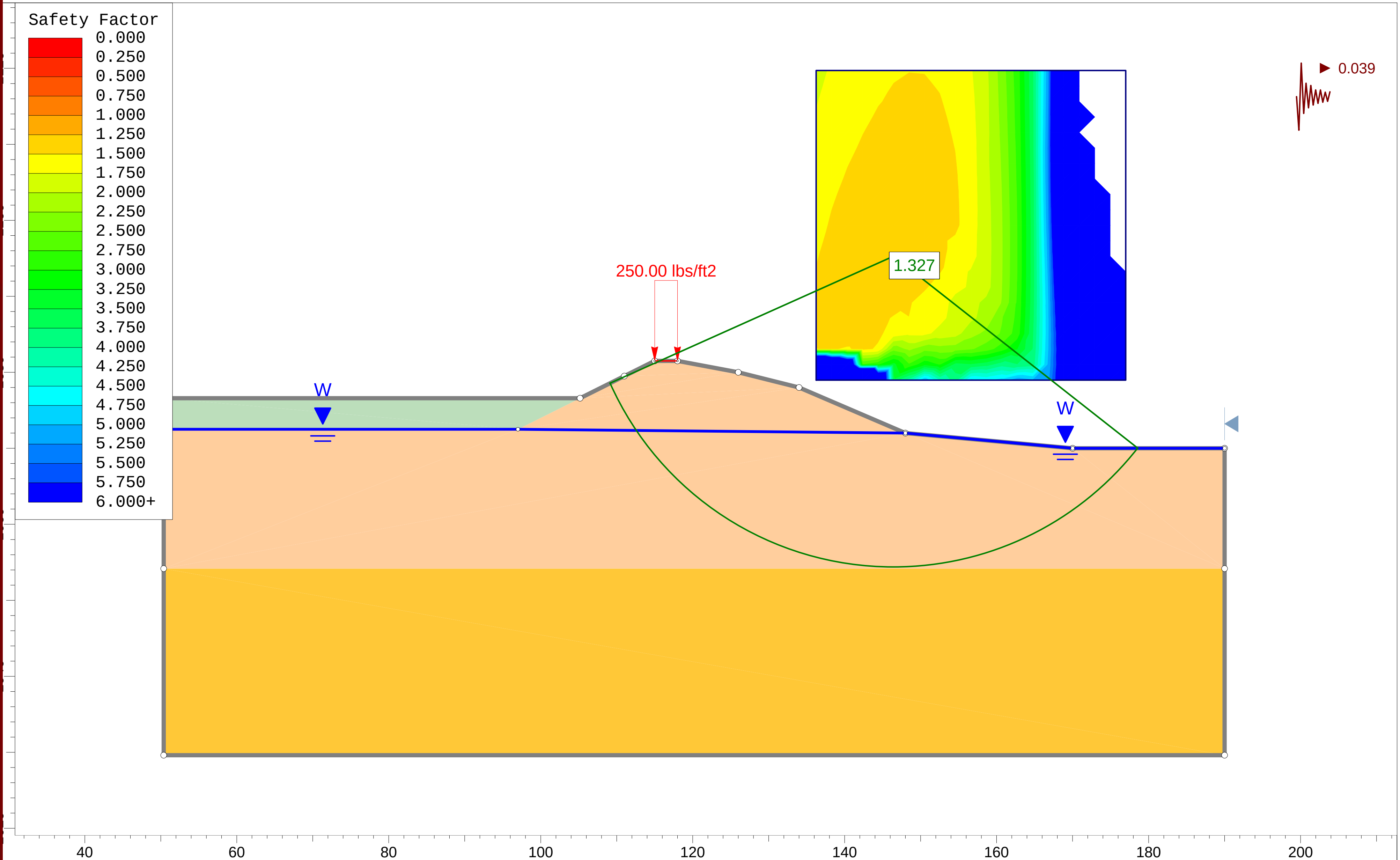
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		*Scale* 1:212	*Company*
Date 10/16/2013, 3:13:47 PM		*File Name* B-B_Conemaugh_undrained circular_seismic.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: B-B_Conemaugh_undrained circular_seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 3

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.327350
Center: 146.436, 1095.269
Radius: 40.893
Left Slip Surface Endpoint: 109.114, 1078.557
Right Slip Surface Endpoint: 178.588, 1070.000
Resisting Moment=1.28887e+006 lb-ft
Driving Moment=971005 lb-ft
Resisting Horizontal Force=26052.7 lb
Driving Horizontal Force=19627.5 lb
Total Slice Area=1021.63 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3362
Number of Invalid Surfaces: 1489

Error Codes:

Error Code -103 reported for 3 surfaces
Error Code -108 reported for 83 surfaces
Error Code -111 reported for 2 surfaces
Error Code -112 reported for 68 surfaces
Error Code -115 reported for 1333 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.32735

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.77896	1231.17	Foundation soil	375	0	282.518	375	-56.3558	0	-56.3558
2	2.77896	3448.51	Foundation soil	375	0	282.518	375	779.725	0	779.725
3	2.77896	5072.61	Foundation soil	375	0	282.518	375	1606.32	0	1606.32
4	2.77896	6070.93	Foundation soil	375	0	282.518	375	1855.66	0	1855.66
5	2.77896	6755.47	Foundation soil	375	0	282.518	375	2101.91	0	2101.91
6	2.77896	7292.47	Foundation soil	375	0	282.518	375	2338.29	0	2338.29
7	2.77896	7681.65	Foundation soil	375	0	282.518	375	2519.88	0	2519.88

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
8	2.77896	7929.49	Foundation soil	375	0	282.518	375	2649.48	0	2649.48
9	2.77896	8083.9	Foundation soil	375	0	282.518	375	2744.07	0	2744.07
10	2.77896	8052.11	Foundation soil	375	0	282.518	375	2771.42	0	2771.42
11	2.77896	7855.87	Foundation soil	375	0	282.518	375	2738.81	0	2738.81
12	2.77896	7584.07	Foundation soil	375	0	282.518	375	2677.5	0	2677.5
13	2.77896	7239.32	Foundation soil	375	0	282.518	375	2588.53	0	2588.53
14	2.77896	6823.1	Foundation soil	375	0	282.518	375	2472.49	0	2472.49
15	2.77896	6514.23	Foundation soil	375	0	282.518	375	2393.96	0	2393.96
16	2.77896	6307.35	Foundation soil	375	0	282.518	375	2352.06	0	2352.06
17	2.77896	6027.22	Foundation soil	375	0	282.518	375	2283.93	0	2283.93
18	2.77896	5671.07	Foundation soil	375	0	282.518	375	2188.63	0	2188.63
19	2.77896	5234.74	Foundation soil	375	0	282.518	375	2064.71	0	2064.71
20	2.77896	4712.3	Foundation soil	375	0	282.518	375	1910.13	0	1910.13
21	2.77896	4095.47	Foundation soil	375	0	282.518	375	1722.01	0	1722.01
22	2.77896	3373	Foundation soil	375	0	282.518	375	1496.47	0	1496.47
23	2.77896	2582.93	Foundation soil	375	0	282.518	375	1248.72	0	1248.72
24	2.77896	1684.15	Foundation soil	375	0	282.518	375	964.839	0	964.839
25	2.77896	596.989	Foundation soil	375	0	282.518	375	615.711	0	615.711

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.32735

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	109.114	1078.56	0	0	0
2	111.893	1073.38	-1029.8	-81.9903	4.55216
3	114.672	1069.52	1334.3	106.234	4.55216
4	117.451	1066.42	5712.54	454.821	4.55217
5	120.23	1063.88	9887.83	787.249	4.55217
6	123.008	1061.75	13831.6	1101.24	4.55215

7	125.787	1059.97	17491.7	1392.66	4.55219
8	128.566	1058.49	20747.2	1651.85	4.55217
9	131.345	1057.26	23515.1	1872.22	4.55216
10	134.124	1056.27	25757.8	2050.78	4.55216
11	136.903	1055.5	27421.6	2183.25	4.55217
12	139.682	1054.94	28489.3	2268.26	4.55217
13	142.461	1054.57	28984	2307.65	4.55218
14	145.24	1054.39	28936.1	2303.83	4.55216
15	148.019	1054.41	28383.4	2259.83	4.55217
16	150.798	1054.61	27366.1	2178.83	4.55216
17	153.577	1055	25896.8	2061.85	4.55217
18	156.356	1055.6	23991	1910.11	4.55216
19	159.135	1056.4	21674.4	1725.67	4.55217
20	161.914	1057.42	18985.1	1511.56	4.55219
21	164.693	1058.68	15977.2	1272.08	4.5522
22	167.472	1060.2	12726.8	1013.28	4.55216
23	170.251	1062.03	9341.76	743.772	4.55217
24	173.03	1064.2	5936.2	472.628	4.55217
25	175.809	1066.82	2694.37	214.52	4.55217
26	178.588	1070	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1072.5
97.0003	1072.5
148	1072
170	1070
190	1070

Line Load

X	Y
118	1081.5
115	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.17
190	1070
170	1070

148	1072
134	1078
126	1080
118	1081.5
115	1081.5
111.007	1079.5
105.176	1076.59
50.3799	1076.59
50.3799	1072.5
50.3799	1054.17

Material Boundary

X	Y
97.0003	1072.5
105.176	1076.59

Material Boundary

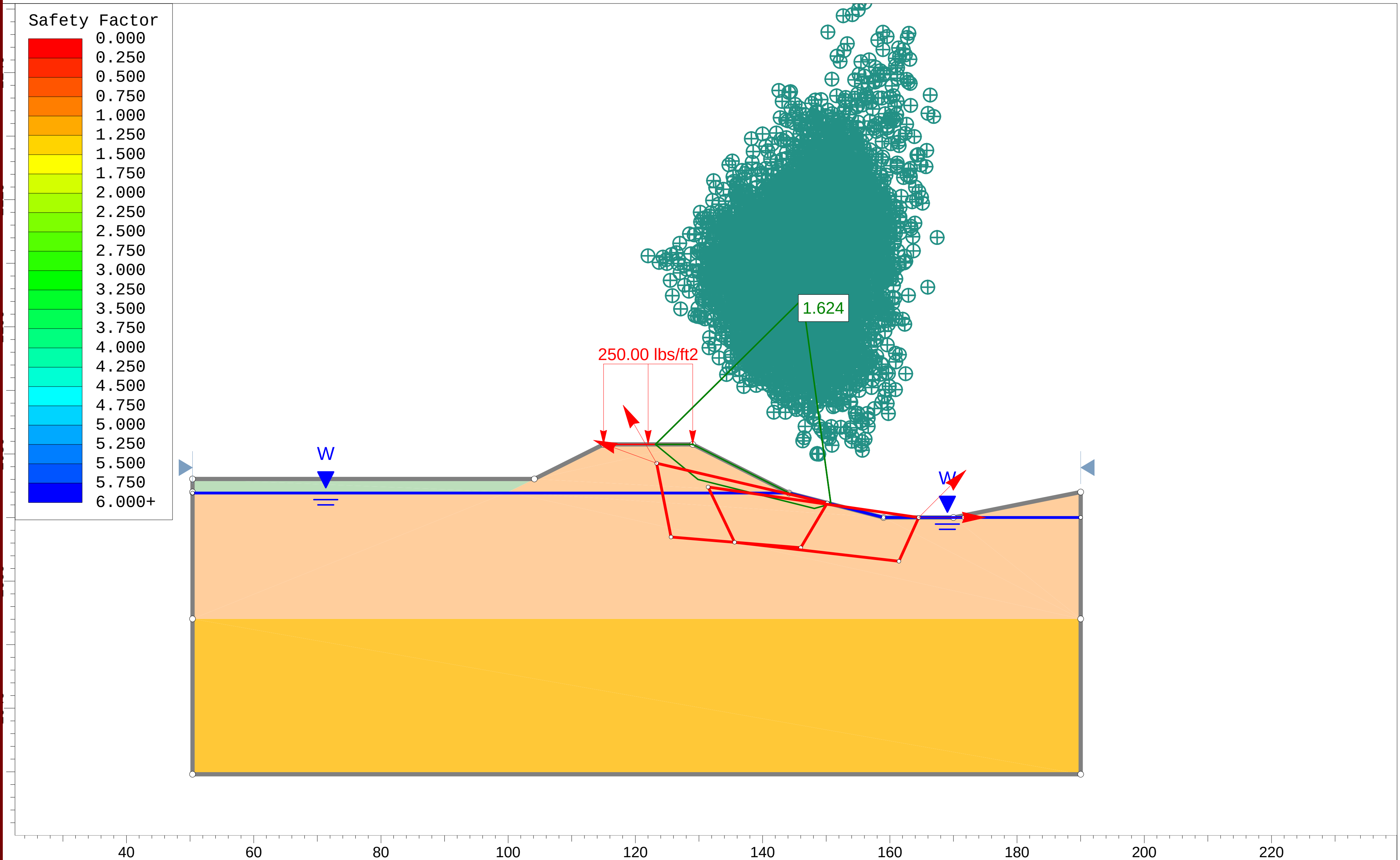
X	Y
50.3799	1072.5
97.0003	1072.5

Material Boundary

X	Y
50.3799	1054.17
190	1054.17

Material Boundary

X	Y
97.0003	1072.5
148	1072



rocscience	*Project* SLIDE - An Interactive Slope Stability Program
	Analysis Description
	Drawn By / *Scale* 1:253 / *Company*
SLIDEINTERPRET 6.019	*Date* 10/16/2013, 3:13:47 PM / *File Name* A-A_Conemaugh_Drained_Block.slim

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_Drained_Block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: 5

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion [psf]		0	
Friction Angle [deg]		32	
Cohesion Type			8000
Water Surface	None	Water Table	None
Hu Value		0	
Ru Value	0		0

Global Minimums

Method: spencer

FS: 1.624100
Axis Location: 146.289, 1104.410
Left Slip Surface Endpoint: 123.144, 1081.500
Right Slip Surface Endpoint: 150.730, 1072.148
Resisting Moment=214481 lb-ft

Driving Moment=132061 lb-ft
Resisting Horizontal Force=6107.31 lb
Driving Horizontal Force=3760.42 lb
Total Slice Area=72.2684 ft2

Global Minimum Coordinates

Method: spencer

X	Y
123.144	1081.5
129.831	1076
148.141	1071.43
150.73	1072.15

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4359
Number of Invalid Surfaces: 641

Error Codes:

Error Code -105 reported for 21 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 243 surfaces
Error Code -111 reported for 237 surfaces
Error Code -112 reported for 139 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.6241

Slice	Width	Weight	Base	Base	Base Friction	Shear	Shear	Base Normal	Pore	Effective Normal

Number	[ft]	[lbs]	Material	[psf]	Angle [degrees]	[psf]	[psf]	Stress [psf]	[psf]	Stress [psf]
1	1.11456	68.9796	Foundation soil	0	32	80.9722	131.507	210.456	0	210.456
2	1.11456	206.939	Foundation soil	0	32	113.108	183.698	293.979	0	293.979
3	1.11456	344.898	Foundation soil	0	32	145.244	235.89	377.502	0	377.502
4	1.11456	482.857	Foundation soil	0	32	177.379	288.081	461.025	0	461.025
5	1.11456	620.816	Foundation soil	0	32	209.514	340.272	544.549	0	544.549
6	1.11456	735.251	Foundation soil	0	32	187.764	304.948	488.019	0	488.019
7	1.07702	718.953	Foundation soil	0	32	245.963	399.468	639.283	0	639.283
8	1.07702	679.023	Foundation soil	0	32	232.303	377.283	603.778	0	603.778
9	1.07702	639.094	Foundation soil	0	32	218.642	355.097	568.273	0	568.273
10	1.07702	599.164	Foundation soil	0	32	204.982	332.911	532.768	0	532.768
11	1.07702	559.235	Foundation soil	0	32	191.321	310.725	497.264	0	497.264
12	1.07702	519.305	Foundation soil	0	32	177.661	288.539	461.759	0	461.759
13	1.07702	479.376	Foundation soil	0	32	164	266.353	426.255	0	426.255
14	1.07702	439.447	Foundation soil	0	32	150.34	244.168	390.75	0	390.75
15	1.07702	399.517	Foundation soil	0	32	136.68	221.982	355.245	0	355.245
16	1.07702	359.588	Foundation soil	0	32	123.02	199.796	319.741	0	319.741
17	1.07702	319.658	Foundation soil	0	32	109.359	177.61	284.236	0	284.236
18	1.07702	279.729	Foundation soil	0	32	95.6985	155.424	248.731	0	248.731
19	1.07702	239.799	Foundation soil	0	32	82.0381	133.238	213.226	0	213.226
20	1.07702	209.223	Foundation soil	0	32	71.5781	116.25	186.038	0	186.038
21	1.07702	205.869	Foundation soil	0	32	70.4304	114.386	183.056	0	183.056
22	1.07702	204.254	Foundation soil	0	32	69.8781	113.489	181.62	0	181.62
23	1.07702	202.639	Foundation soil	0	32	69.3252	112.591	180.184	0	180.184
24	1.29465	181.961	Foundation soil	0	32	82.5485	134.067	214.553	0	214.553
			Foundation							

soil

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.6241

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	123.144	1081.5	0	0	0
2	124.258	1080.58	102.733	39.0902	20.832
3	125.373	1079.67	246.237	93.6941	20.832
4	126.488	1078.75	430.513	163.812	20.832
5	127.602	1077.83	655.561	249.443	20.832
6	128.717	1076.92	921.38	350.588	20.832
7	129.831	1076	1159.6	441.233	20.832
8	130.908	1075.73	1066.47	405.796	20.832
9	131.985	1075.46	978.511	372.327	20.832
10	133.062	1075.19	895.724	340.826	20.832
11	134.139	1074.92	818.109	311.293	20.832
12	135.216	1074.66	745.666	283.728	20.832
13	136.293	1074.39	678.396	258.132	20.832
14	137.37	1074.12	616.298	234.503	20.832
15	138.447	1073.85	559.373	212.843	20.832
16	139.524	1073.58	507.62	193.151	20.832
17	140.601	1073.31	461.039	175.427	20.832
18	141.678	1073.04	419.631	159.671	20.832
19	142.756	1072.78	383.396	145.883	20.8319
20	143.833	1072.51	352.332	134.064	20.8321
21	144.91	1072.24	325.23	123.751	20.832
22	145.987	1071.97	298.562	113.604	20.832
23	147.064	1071.7	272.103	103.536	20.832
24	148.141	1071.43	245.853	93.548	20.832
25	149.435	1071.79	62.2322	23.6795	20.8319
26	150.73	1072.15	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
129	1081.5
115	1081.5

Block Search Window

X	Y
123.336	1078.54
125.602	1066.93
145.991	1065.23
150.176	1072.29

Block Search Window

X	Y
131.427	1074.8
135.597	1066.1
161.425	1063.11
164.54	1070

External Boundary

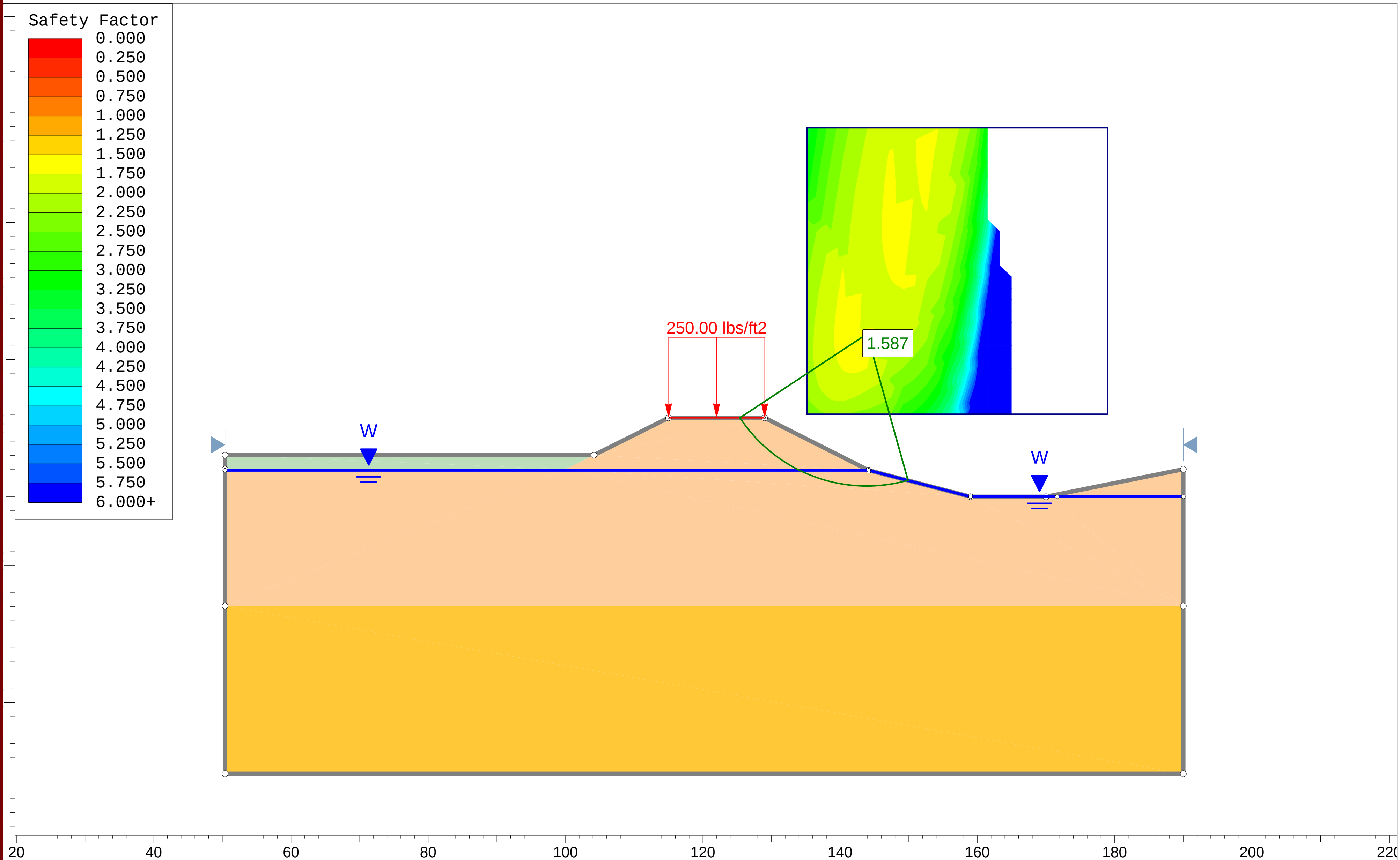
X	Y
50.3799	1029.62
190	1029.62
190	1054.06
190	1074
170	1070
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.06

Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y
50.3799	1054.06
190	1054.06



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		*Scale* 1:234	*Company*
Date 10/16/2013, 3:13:47 PM		*File Name* A-A_Conemaugh_Drained_circular.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_Drained_circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 5

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Mohr-Coulomb	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion [psf]		0	
Friction Angle [deg]		32	
Cohesion Type			8000
Water Surface	None	Water Table	None
Hu Value		0	
Ru Value	0		0

Global Minimums

Method: spencer

FS: 1.586580
Center: 143.913, 1093.724
Radius: 22.181
Left Slip Surface Endpoint: 125.405, 1081.500
Right Slip Surface Endpoint: 149.893, 1072.365
Resisting Moment=160483 lb-ft
Driving Moment=101151 lb-ft
Resisting Horizontal Force=6431.24 lb

Driving Horizontal Force=4053.53 lb
Total Slice Area=81.3942 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3583
Number of Invalid Surfaces: 3853

Error Codes:

Error Code -103 reported for 1 surface
Error Code -107 reported for 119 surfaces
Error Code -108 reported for 3 surfaces
Error Code -111 reported for 2 surfaces
Error Code -115 reported for 3728 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.58658

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	0.979525	90.4034	Foundation soil	0	32	69.6334	110.479	176.803	0	176.803
2	0.979525	258.626	Foundation soil	0	32	112.985	179.259	286.875	0	286.875
3	0.979525	404.497	Foundation soil	0	32	155.692	247.018	395.311	0	395.311
4	0.979525	529.083	Foundation soil	0	32	176.198	279.553	447.378	0	447.378
5	0.979525	591.874	Foundation soil	0	32	158.631	251.68	402.773	0	402.773
6	0.979525	627.454	Foundation soil	0	32	176.57	280.142	448.322	0	448.322
7	0.979525	652.043	Foundation soil	0	32	192.051	304.704	487.628	0	487.628
8	0.979525	666.82	Foundation soil	0	32	205.068	325.357	520.68	0	520.68
9	0.979525	672.694	Foundation soil	0	32	215.599	342.065	547.419	0	547.419
10	0.979525	670.381	Foundation soil	0	32	223.602	354.762	567.738	0	567.738
11	0.979525	660.45	Foundation soil	0	32	229.015	363.351	581.482	0	581.482
12	0.979525	643.362	Foundation soil	0	32	231.755	367.698	588.441	0	588.441
13	0.979525	619.483	Foundation soil	0	32	231.715	367.635	588.339	0	588.339
14	0.979525	589.113	Foundation soil	0	32	228.762	362.95	580.84	0	580.84
15	0.979525	552.488	Foundation soil	0	32	222.73	353.379	565.524	0	565.524
16	0.979525	509.795	Foundation soil	0	32	213.418	338.604	541.879	0	541.879
17	0.979525	461.175	Foundation soil	0	32	200.579	318.234	509.281	0	509.281
18	0.979525	406.73	Foundation soil	0	32	183.915	291.796	466.97	0	466.97
19	0.979525	346.525	Foundation soil	0	32	163.061	258.709	414.022	0	414.022
20	0.979525	292.206	Foundation soil	0	32	143.265	227.301	363.758	0	363.758
21	0.979525	251.901	Foundation soil	0	32	128.877	204.473	327.225	0	327.225
22	0.979525	206.154	Foundation soil	0	32	110.264	174.942	279.965	0	279.965
23	0.979525	154.563	Foundation soil	0	32	86.619	137.428	219.931	0	219.931
24	0.979525	97.0191	Foundation soil	0	32	57.1225	90.6294	145.038	0	145.038
25	0.979525	33.3713	Foundation soil	0	32	21.1256	33.5175	53.6392	0	53.6392

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.58658

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	125.405	1081.5	0	0	0
2	126.385	1080.13	173.608	70.9145	22.2188
3	127.364	1078.96	400.698	163.675	22.2188
4	128.344	1077.93	655.226	267.644	22.2188

5	129.323	1077.02	889.412	363.303	22.2188
6	130.303	1076.21	1059.31	432.701	22.2188
7	131.282	1075.49	1208.9	493.805	22.2188
8	132.262	1074.85	1333.54	544.717	22.2188
9	133.241	1074.28	1430	584.118	22.2187
10	134.221	1073.77	1496.2	611.162	22.2188
11	135.2	1073.33	1531.08	625.408	22.2188
12	136.18	1072.94	1534.42	626.772	22.2188
13	137.159	1072.6	1506.86	615.513	22.2187
14	138.139	1072.31	1449.82	592.217	22.2188
15	139.119	1072.07	1365.58	557.807	22.2188
16	140.098	1071.87	1257.26	513.561	22.2189
17	141.078	1071.73	1128.94	461.144	22.2188
18	142.057	1071.62	985.743	402.651	22.2188
19	143.037	1071.56	834.017	340.675	22.2188
20	144.016	1071.54	681.535	278.39	22.2188
21	144.996	1071.57	531.822	217.236	22.2188
22	145.975	1071.64	382.932	156.418	22.2188
23	146.955	1071.75	243.27	99.3697	22.2188
24	147.934	1071.91	123.762	50.5539	22.2189
25	148.914	1072.11	38.3509	15.6654	22.2188
26	149.893	1072.37	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
129	1081.5
115	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.06

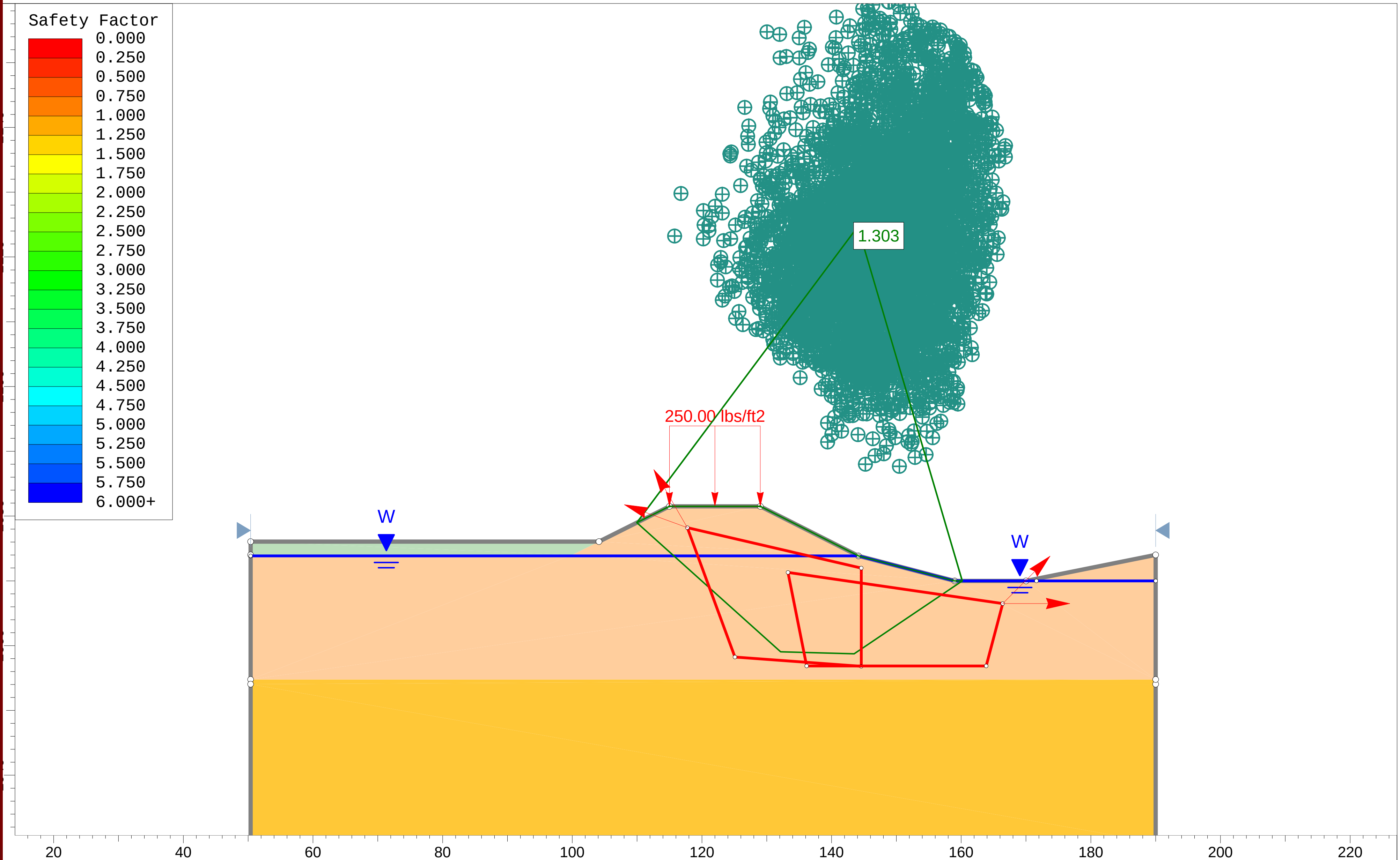
190	1074
170	1070
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.06

Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y
50.3799	1054.06
190	1054.06



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:248	Company
Date 10/16/2013, 3:13:47 PM		File Name A-A_Conemaugh_UnDrained_Block.slim	

rocscience

SLIDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_UnDrained_Block
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 160
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.303400
Axis Location: 144.044, 1124.697
Left Slip Surface Endpoint: 109.960, 1078.980
Right Slip Surface Endpoint: 160.167, 1070.000
Resisting Moment=1.32246e+006 lb-ft
Driving Moment=1.01463e+006 lb-ft
Resisting Horizontal Force=18827.5 lb
Driving Horizontal Force=14445 lb
Total Slice Area=599.437 ft2

Global Minimum Coordinates

Method: spencer

X	Y
109.96	1078.98
132.139	1059.05
143.487	1058.73
160.167	1070

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4280
Number of Invalid Surfaces: 720

Error Codes:

Error Code -107 reported for 18 surfaces
Error Code -108 reported for 459 surfaces
Error Code -111 reported for 164 surfaces
Error Code -112 reported for 79 surfaces

Error Codes

The following errors were encountered during the computation:

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.3034

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.01626	383.789	Foundation soil	375	0	287.709	375	-37.8626	0	-37.8626
2	2.01626	1151.37	Foundation soil	375	0	287.709	375	312.434	0	312.434
3	2.01626	1884.57	Foundation soil	375	0	287.709	375	762.181	0	762.181
4	2.01626	2411.97	Foundation soil	375	0	287.709	375	1117.77	0	1117.77
5	2.01626	2905.14	Foundation soil	375	0	287.709	375	1342.84	0	1342.84
6	2.01626	3398.31	Foundation soil	375	0	287.709	375	1567.9	0	1567.9
7	2.01626	3891.48	Foundation soil	375	0	287.709	375	1792.97	0	1792.97
8	2.01626	4384.65	Foundation soil	375	0	287.709	375	2018.04	0	2018.04
9	2.01626	4877.82	Foundation soil	375	0	287.709	375	2243.1	0	2243.1
10	2.01626	5328.05	Foundation soil	375	0	287.709	375	2320.44	0	2320.44
11	2.01626	5571.56	Foundation soil	375	0	287.709	375	2329.67	0	2329.67
12	1.89121	5212.43	Foundation soil	375	0	287.709	375	2768.59	0	2768.59
13	1.89121	4982.36	Foundation soil	375	0	287.709	375	2647.27	0	2647.27
14	1.89121	4752.29	Foundation soil	375	0	287.709	375	2525.94	0	2525.94
15	1.89121	4522.21	Foundation soil	375	0	287.709	375	2404.62	0	2404.62
16	1.89121	4292.14	Foundation soil	375	0	287.709	375	2283.29	0	2283.29
17	1.89121	4062.06	Foundation soil	375	0	287.709	375	2161.97	0	2161.97
18	2.08507	4038.45	Foundation soil	375	0	287.709	375	2310.82	0	2310.82
19	2.08507	3482.18	Foundation soil	375	0	287.709	375	2025.33	0	2025.33
20	2.08507	2933.33	Foundation soil	375	0	287.709	375	1743.66	0	1743.66
21	2.08507	2384.49	Foundation soil	375	0	287.709	375	1461.98	0	1461.98
22	2.08507	1835.64	Foundation soil	375	0	287.709	375	1180.3	0	1180.3
23	2.08507	1286.79	Foundation soil	375	0	287.709	375	898.624	0	898.624
24	2.08507	737.945	Foundation soil	375	0	287.709	375	616.948	0	616.948
25	2.08507	212.979	Foundation soil	375	0	287.709	375	347.35	0	347.35

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.3034

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	109.96	1078.98	0	0	0
2	111.977	1077.17	-648.734	-63.1701	5.56161
3	113.993	1075.36	-662.795	-64.5393	5.56161
4	116.009	1073.54	138.005	13.4382	5.56163
5	118.025	1071.73	1583.07	154.15	5.56159
6	120.042	1069.92	3435.91	334.57	5.56161
7	122.058	1068.11	5696.53	554.696	5.56161
8	124.074	1066.3	8364.92	814.53	5.56161
9	126.09	1064.49	11441.1	1114.07	5.56161
10	128.107	1062.67	14925.1	1453.32	5.5616
11	130.123	1060.86	18549.1	1806.21	5.56162
12	132.139	1059.05	22189.9	2160.73	5.56161
13	134.03	1059	21791.8	2121.97	5.56163
14	135.922	1058.94	21387.4	2082.58	5.56159
15	137.813	1058.89	20976.5	2042.57	5.5616
16	139.704	1058.84	20559.2	2001.94	5.56161
17	141.595	1058.79	20135.5	1960.68	5.5616
18	143.487	1058.73	19705.4	1918.81	5.56163
19	145.572	1060.14	15851.2	1543.5	5.5616
20	147.657	1061.55	12399	1207.34	5.56158
21	149.742	1062.96	9343.47	909.815	5.56161
22	151.827	1064.37	6684.64	650.913	5.56161
23	153.912	1065.78	4422.49	430.638	5.56162
24	155.997	1067.18	2557.03	248.989	5.5616
25	158.082	1068.59	1088.25	105.968	5.56162
26	160.167	1070	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
129	1081.5
115	1081.5

Block Search Window

X	Y
117.742	1078.22
125.087	1058.24
144.582	1056.81
144.582	1071.97

Block Search Window

X	Y
133.284	1071.3
136.163	1056.86
163.847	1056.86
166.398	1066.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.06
190	1054.77
190	1074
170	1070
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.77
50.3799	1054.06

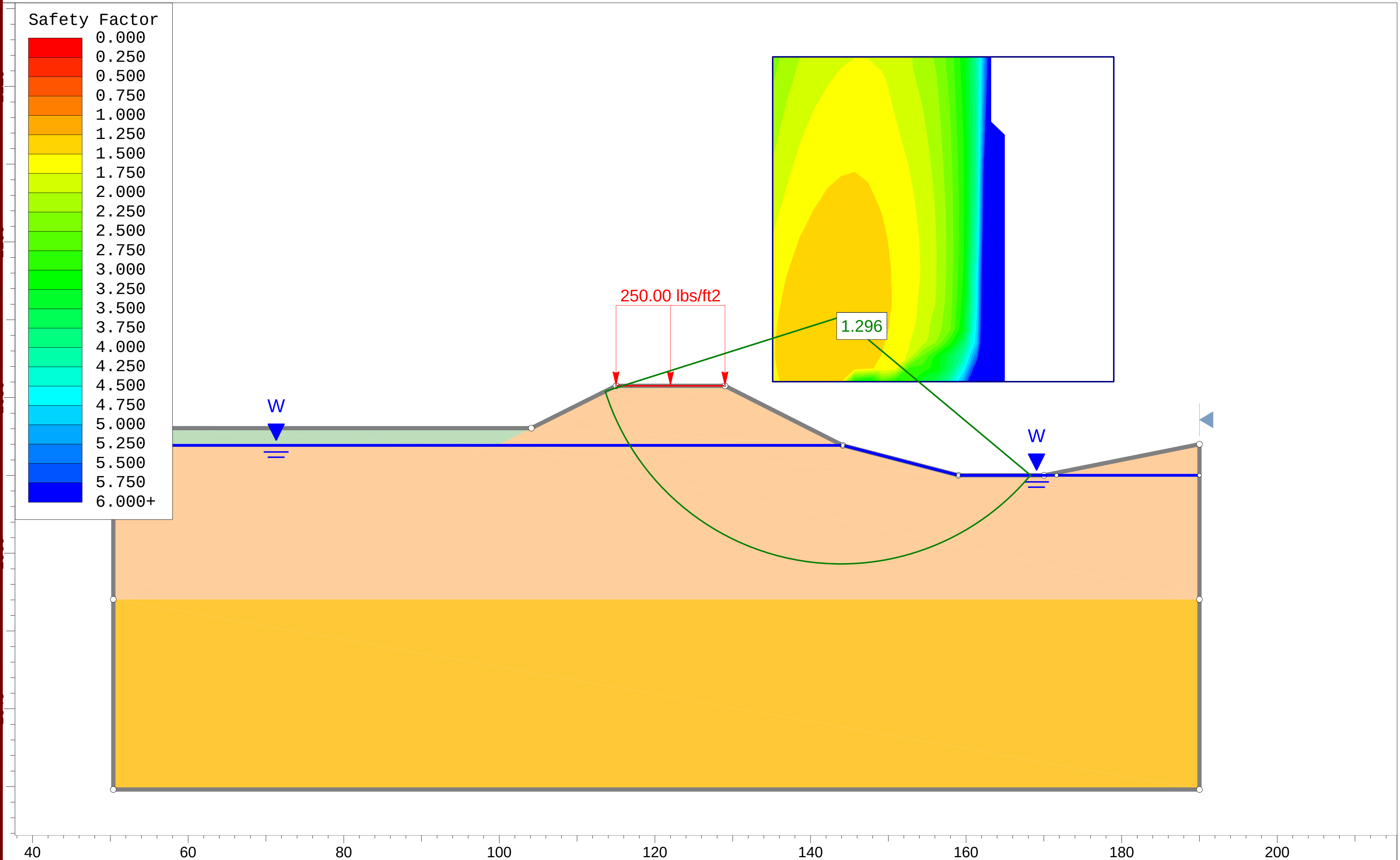
Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y

50.3799	1054.77
190	1054.77



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		*Scale* 1:207	*Company*
Date 10/16/2013, 3:13:47 PM		*File Name* A-A_Conemaugh_UnDrained_Circular.slim	

DEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_UnDrained_Circular
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 3

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.295650
Center: 143.913, 1090.384
Radius: 31.780
Left Slip Surface Endpoint: 113.611, 1080.805
Right Slip Surface Endpoint: 168.295, 1070.000
Resisting Moment=807275 lb-ft
Driving Moment=623065 lb-ft
Resisting Horizontal Force=20506.7 lb
Driving Horizontal Force=15827.3 lb
Total Slice Area=678.943 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4072
Number of Invalid Surfaces: 3364

Error Codes:

Error Code -103 reported for 1 surface
Error Code -107 reported for 323 surfaces
Error Code -108 reported for 85 surfaces
Error Code -112 reported for 2 surfaces
Error Code -115 reported for 2953 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.29565

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.18738	913.363	Foundation soil	375	0	289.43	375	-135.609	0	-135.609
2	2.18738	2277.69	Foundation soil	375	0	289.43	375	749.185	0	749.185
3	2.18738	3209.54	Foundation soil	375	0	289.43	375	1254.93	0	1254.93
4	2.18738	3944.42	Foundation soil	375	0	289.43	375	1652	0	1652
5	2.18738	4545.45	Foundation soil	375	0	289.43	375	1978.63	0	1978.63
6	2.18738	5044.87	Foundation soil	375	0	289.43	375	2253.46	0	2253.46
7	2.18738	5461.84	Foundation soil	375	0	289.43	375	2487.22	0	2487.22

8	2.18738	5657.22	Foundation soil	375	0	289.43	375	2387.52	0	2387.52
9	2.18738	5616.91	Foundation soil	375	0	289.43	375	2402.27	0	2402.27
10	2.18738	5520.72	Foundation soil	375	0	289.43	375	2397.41	0	2397.41
11	2.18738	5373.09	Foundation soil	375	0	289.43	375	2366.86	0	2366.86
12	2.18738	5177	Foundation soil	375	0	289.43	375	2312.31	0	2312.31
13	2.18738	4934.48	Foundation soil	375	0	289.43	375	2234.95	0	2234.95
14	2.18738	4646.87	Foundation soil	375	0	289.43	375	2135.56	0	2135.56
15	2.18738	4399.02	Foundation soil	375	0	289.43	375	2053.18	0	2053.18
16	2.18738	4180	Foundation soil	375	0	289.43	375	1983.51	0	1983.51
17	2.18738	3915.5	Foundation soil	375	0	289.43	375	1892.73	0	1892.73
18	2.18738	3604.07	Foundation soil	375	0	289.43	375	1780.29	0	1780.29
19	2.18738	3243.42	Foundation soil	375	0	289.43	375	1645.26	0	1645.26
20	2.18738	2830.22	Foundation soil	375	0	289.43	375	1486.24	0	1486.24
21	2.18738	2365.03	Foundation soil	375	0	289.43	375	1303.77	0	1303.77
22	2.18738	1951.33	Foundation soil	375	0	289.43	375	1147.97	0	1147.97
23	2.18738	1511.68	Foundation soil	375	0	289.43	375	983.622	0	983.622
24	2.18738	984.855	Foundation soil	375	0	289.43	375	783.031	0	783.031
25	2.18738	348.771	Foundation soil	375	0	289.43	375	538.583	0	538.583

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.29565

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	113.611	1080.81	0	0	0
2	115.798	1075.57	-1342.63	-103.018	4.38762
3	117.985	1072.01	693.06	53.1777	4.38764
4	120.173	1069.26	3511.86	269.461	4.38764
5	122.36	1067.03	6558.93	503.259	4.38764
6	124.548	1065.19	9574.05	734.605	4.38764

7	126.735	1063.65	12410	952.207	4.38765
8	128.922	1062.36	14973.8	1148.92	4.38763
9	131.11	1061.3	16883.1	1295.42	4.38764
10	133.297	1060.43	18335.1	1406.83	4.38764
11	135.484	1059.74	19350.9	1484.77	4.38764
12	137.672	1059.22	19947.5	1530.55	4.38765
13	139.859	1058.86	20145.9	1545.77	4.38764
14	142.047	1058.66	19971.2	1532.37	4.38765
15	144.234	1058.61	19452.6	1492.57	4.38763
16	146.421	1058.7	18620.1	1428.7	4.38765
17	148.609	1058.95	17492.5	1342.18	4.38764
18	150.796	1059.36	16092.7	1234.77	4.38763
19	152.983	1059.93	14450	1108.73	4.38763
20	155.171	1060.66	12602	966.935	4.38763
21	157.358	1061.59	10597.3	813.114	4.38762
22	159.546	1062.71	8496.36	651.915	4.38764
23	161.733	1064.07	6308.01	484.006	4.38764
24	163.92	1065.69	4080.07	313.059	4.38764
25	166.108	1067.64	1924.04	147.629	4.38763
26	168.295	1070	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
129	1081.5
115	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.06
190	1074
170	1070

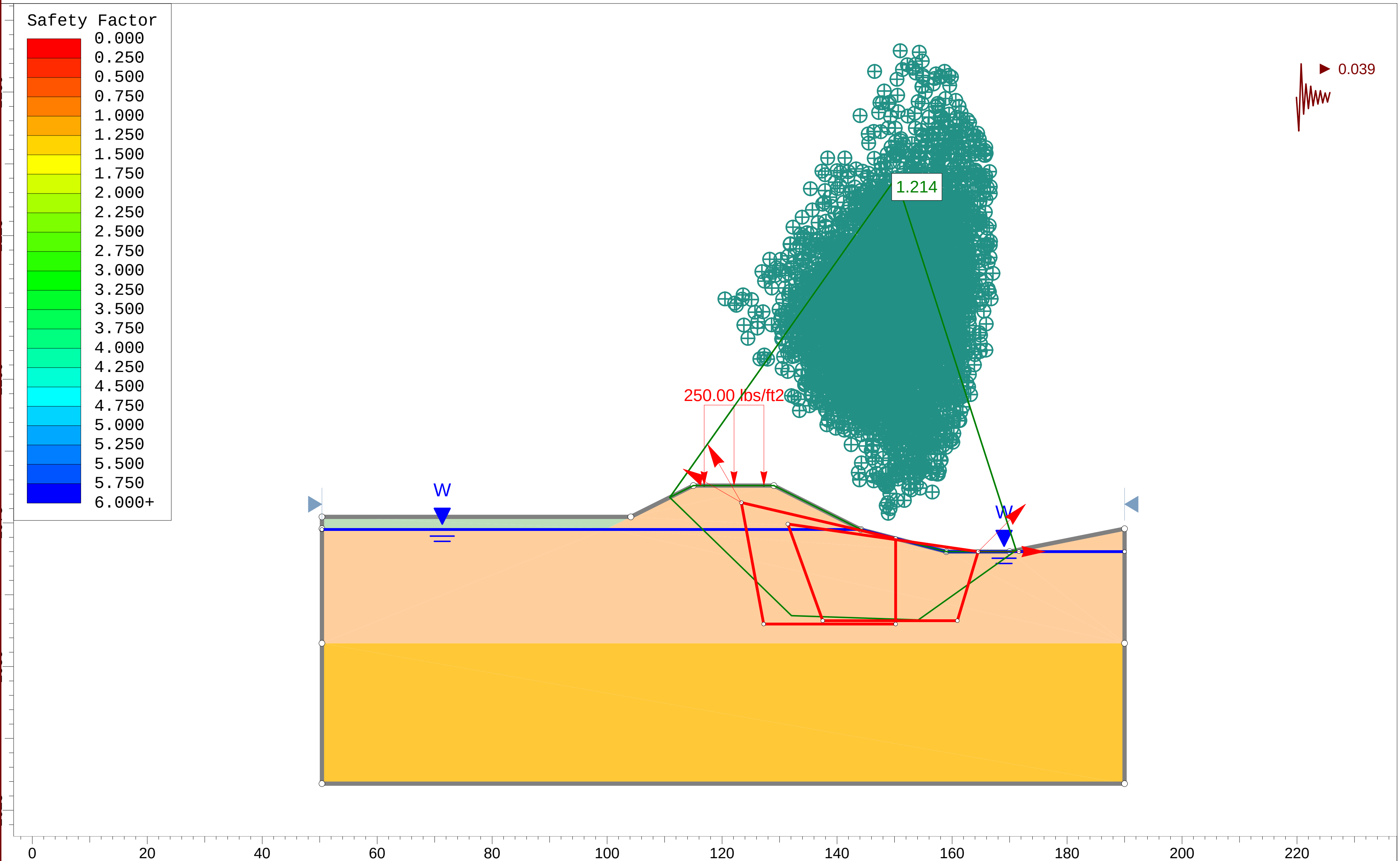
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.06

Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y
50.3799	1054.06
190	1054.06



DEINTERPRET 6.019

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	
Drawn By	
Scale	1:280
Company	
Date	10/16/2013, 3:13:47 PM
File Name	A-A_Conemaugh_UnDrained_Block_seismic.slim

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_UnDrained_Block_seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 120
Left Projection Angle (End Angle): 150
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.214080
Axis Location: 150.240, 1135.107
Left Slip Surface Endpoint: 110.892, 1079.446
Right Slip Surface Endpoint: 171.160, 1070.232
Resisting Moment=1.89245e+006 lb-ft
Driving Moment=1.55876e+006 lb-ft
Resisting Horizontal Force=22600.7 lb
Driving Horizontal Force=18615.5 lb

Total Slice Area=719.897 ft2

Global Minimum Coordinates

Method: spencer

X	Y
110.892	1079.45
132.067	1058.87
154.129	1058.12
171.16	1070.23

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3682
Number of Invalid Surfaces: 1318

Error Codes:

Error Code -105 reported for 19 surfaces
Error Code -108 reported for 939 surfaces
Error Code -111 reported for 292 surfaces
Error Code -112 reported for 68 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.21408

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.35285	549.922	Foundation soil	375	0	308.876	375	-30.0369	0	-30.0369
2	2.35285	1637.72	Foundation soil	375	0	308.876	375	383.338	0	383.338

3	2.35285	2467.91	Foundation soil	375	0	308.876	375	800.236	0	800.236
4	2.35285	3194.08	Foundation soil	375	0	308.876	375	1199.32	0	1199.32
5	2.35285	3920.25	Foundation soil	375	0	308.876	375	1475.27	0	1475.27
6	2.35285	4646.42	Foundation soil	375	0	308.876	375	1751.22	0	1751.22
7	2.35285	5372.59	Foundation soil	375	0	308.876	375	2018.82	0	2018.82
8	2.35285	6081.39	Foundation soil	375	0	308.876	375	2071.97	0	2071.97
9	2.35285	6522	Foundation soil	375	0	308.876	375	2239.41	0	2239.41
10	2.45134	6786.07	Foundation soil	375	0	308.876	375	2770.55	0	2770.55
11	2.45134	6404.33	Foundation soil	375	0	308.876	375	2616.16	0	2616.16
12	2.45134	6022.59	Foundation soil	375	0	308.876	375	2461.77	0	2461.77
13	2.45134	5640.84	Foundation soil	375	0	308.876	375	2307.38	0	2307.38
14	2.45134	5259.56	Foundation soil	375	0	308.876	375	2153.18	0	2153.18
15	2.45134	4990.12	Foundation soil	375	0	308.876	375	2044.21	0	2044.21
16	2.45134	4806.86	Foundation soil	375	0	308.876	375	1970.09	0	1970.09
17	2.45134	4623.6	Foundation soil	375	0	308.876	375	1895.97	0	1895.97
18	2.45134	4440.34	Foundation soil	375	0	308.876	375	1821.86	0	1821.86
19	2.43296	3928.27	Foundation soil	375	0	308.876	375	2034.4	0	2034.4
20	2.43296	3152.61	Foundation soil	375	0	308.876	375	1688.08	0	1688.08
21	2.43296	2480.32	Foundation soil	375	0	308.876	375	1387.93	0	1387.93
22	2.43296	1912.2	Foundation soil	375	0	308.876	375	1134.27	0	1134.27
23	2.43296	1344.09	Foundation soil	375	0	308.876	375	880.625	0	880.625
24	2.43296	775.969	Foundation soil	375	0	308.876	375	626.976	0	626.976
25	2.43296	226.021	Foundation soil	375	0	308.876	375	378.252	0	378.252

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.21408

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	110.892	1079.45	0	0	0
2	113.244	1077.16	-775.589	-91.8284	6.75229
3	115.597	1074.87	-563.701	-66.7413	6.75229
4	117.95	1072.59	633.667	75.0251	6.75229
5	120.303	1070.3	2771.73	328.168	6.75229
6	122.656	1068.01	5568.99	659.358	6.75228
7	125.009	1065.73	9025.44	1068.6	6.75231
8	127.362	1063.44	13122	1553.62	6.75228
9	129.714	1061.16	17367.7	2056.31	6.7523
10	132.067	1058.87	22013.4	2606.35	6.75229
11	134.519	1058.79	21748.9	2575.03	6.75228
12	136.97	1058.7	21456.6	2540.43	6.7523
13	139.421	1058.62	21136.7	2502.55	6.75229
14	141.873	1058.54	20789.1	2461.39	6.75228
15	144.324	1058.46	20413.8	2416.96	6.75229
16	146.775	1058.37	20019	2370.22	6.7523
17	149.227	1058.29	19610.9	2321.9	6.7523
18	151.678	1058.21	19189.6	2272.01	6.75227
19	154.129	1058.12	18754.9	2220.55	6.75229
20	156.562	1059.85	14636	1732.88	6.7523
21	158.995	1061.58	11086	1312.56	6.75227
22	161.428	1063.31	8028.84	950.601	6.75229
23	163.861	1065.04	5388.3	637.966	6.75229
24	166.294	1066.77	3164.35	374.653	6.75228
25	168.727	1068.5	1356.97	160.663	6.75229
26	171.16	1070.23	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
127.274	1081.5
116.887	1081.5

Block Search Window

X	Y
123.336	1078.54
127.23	1057.41
150.176	1057.41
150.176	1072.29

Block Search Window

X	Y
131.427	1074.8
137.502	1057.98
160.929	1057.98
164.54	1070

External Boundary

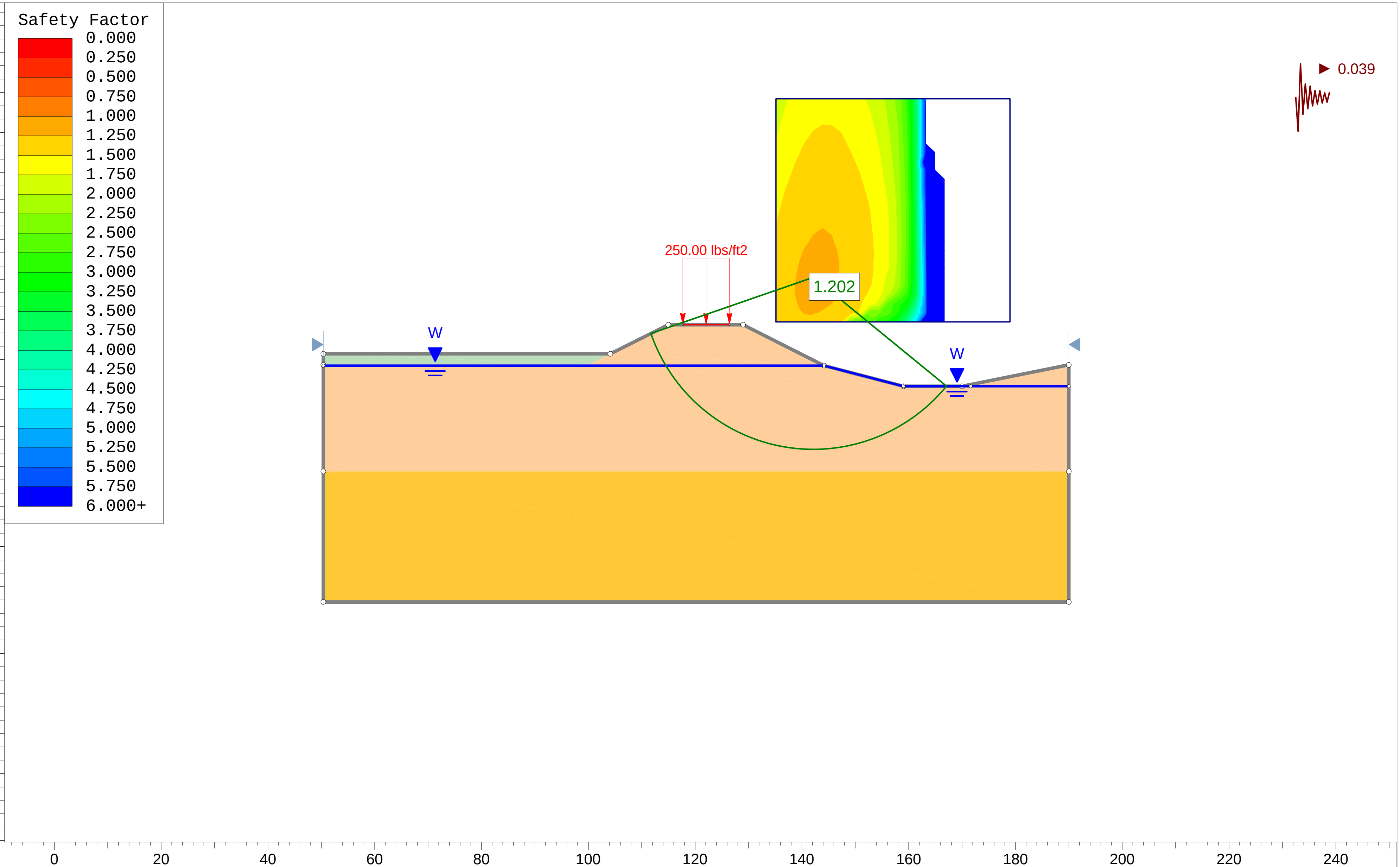
X	Y
50.3799	1029.62
190	1029.62
190	1054.06
190	1074
170	1070
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.06

Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y
50.3799	1054.06
190	1054.06



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:304	Company
Date 10/16/2013, 3:13:47 PM		File Name A-A_Conemaugh_UnDrained_Circular_seismic.slim	

IDEINTERPRET 6.019

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: A-A_Conemaugh_UnDrained_Circular_seismic
Slide Modeler Version: 6.019
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/16/2013, 3:13:47 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 3

Loading

Seismic Load Coefficient (Horizontal): 0.039
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Material Properties

Property	water	Foundation soil	bedrock
Color			
Strength Type	No strength	Undrained	Undrained
Unsaturated Unit Weight [lbs/ft3]		135	145
Saturated Unit Weight [lbs/ft3]		135	145
Cohesion Type		375	8000
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS: 1.201750
Center: 142.160, 1090.384
Radius: 32.213
Left Slip Surface Endpoint: 111.715, 1079.857
Right Slip Surface Endpoint: 167.103, 1070.000
Resisting Moment=824162 lb-ft
Driving Moment=685802 lb-ft
Resisting Horizontal Force=20770.7 lb
Driving Horizontal Force=17283.7 lb
Total Slice Area=726.632 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4142
Number of Invalid Surfaces: 3294

Error Codes:

Error Code -103 reported for 1 surface
Error Code -107 reported for 243 surfaces
Error Code -108 reported for 92 surfaces
Error Code -111 reported for 3 surfaces
Error Code -112 reported for 2 surfaces
Error Code -115 reported for 2953 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-115 = Surface too shallow, below the minimum depth.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.20175

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.21554	912.106	Foundation soil	375	0	312.045	375	-224.108	0	-224.108
2	2.21554	2466.25	Foundation soil	375	0	312.045	375	571.783	0	571.783
3	2.21554	3430.96	Foundation soil	375	0	312.045	375	1145.59	0	1145.59
4	2.21554	4165.94	Foundation soil	375	0	312.045	375	1701.32	0	1701.32
5	2.21554	4768.75	Foundation soil	375	0	312.045	375	2027.21	0	2027.21
6	2.21554	5270.25	Foundation soil	375	0	312.045	375	2302.18	0	2302.18

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
7	2.21554	5689.01	Foundation soil	375	0	312.045	375	2452.46	0	2452.46
8	2.21554	6030.57	Foundation soil	375	0	312.045	375	2493.44	0	2493.44
9	2.21554	6089.55	Foundation soil	375	0	312.045	375	2563.62	0	2563.62
10	2.21554	5984.59	Foundation soil	375	0	312.045	375	2559.04	0	2559.04
11	2.21554	5827.29	Foundation soil	375	0	312.045	375	2528.63	0	2528.63
12	2.21554	5620.61	Foundation soil	375	0	312.045	375	2474.04	0	2474.04
13	2.21554	5366.51	Foundation soil	375	0	312.045	375	2396.44	0	2396.44
14	2.21554	5066.18	Foundation soil	375	0	312.045	375	2296.55	0	2296.55
15	2.21554	4730.46	Foundation soil	375	0	312.045	375	2179.42	0	2179.42
16	2.21554	4467.12	Foundation soil	375	0	312.045	375	2094.21	0	2094.21
17	2.21554	4190.55	Foundation soil	375	0	312.045	375	2002.84	0	2002.84
18	2.21554	3865.66	Foundation soil	375	0	312.045	375	1889.57	0	1889.57
19	2.21554	3489.98	Foundation soil	375	0	312.045	375	1753.45	0	1753.45
20	2.21554	3060	Foundation soil	375	0	312.045	375	1593.05	0	1593.05
21	2.21554	2570.74	Foundation soil	375	0	312.045	375	1406.36	0	1406.36
22	2.21554	2052.42	Foundation soil	375	0	312.045	375	1208.23	0	1208.23
23	2.21554	1582.62	Foundation soil	375	0	312.045	375	1037.22	0	1037.22
24	2.21554	1031.63	Foundation soil	375	0	312.045	375	834.283	0	834.283
25	2.21554	365.529	Foundation soil	375	0	312.045	375	586.913	0	586.913

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.20175

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	111.715	1079.86	0	0	0
2	113.93	1074.87	-1773.53	-145.092	4.67694
3	116.146	1071.38	-377.113	-30.8514	4.67692
4	118.361	1068.67	2171.76	177.671	4.67693

5	120.577	1066.47	5392.93	441.194	4.67694
6	122.792	1064.64	8592.33	702.935	4.67693
7	125.008	1063.12	11621.2	950.729	4.67695
8	127.223	1061.84	14276.6	1167.97	4.67696
9	129.439	1060.79	16449.3	1345.71	4.67693
10	131.655	1059.93	18193.1	1488.37	4.67693
11	133.87	1059.26	19466.4	1592.54	4.67693
12	136.086	1058.75	20285.2	1659.52	4.67692
13	138.301	1058.4	20669.7	1690.98	4.67693
14	140.517	1058.21	20643.7	1688.85	4.67692
15	142.732	1058.18	20235.3	1655.44	4.67692
16	144.948	1058.29	19476.9	1593.4	4.67694
17	147.163	1058.56	18394.9	1504.88	4.67693
18	149.379	1058.99	17009.9	1391.57	4.67692
19	151.594	1059.58	15349.1	1255.7	4.67692
20	153.81	1060.35	13448.1	1100.19	4.67696
21	156.026	1061.31	11353.3	928.812	4.67694
22	158.241	1062.47	9125.69	746.569	4.67693
23	160.457	1063.87	6824.29	558.293	4.67693
24	162.672	1065.55	4458.7	364.765	4.67694
25	164.888	1067.56	2131.63	174.388	4.67693
26	167.103	1070	0	0	0

List Of Coordinates

Water Table

X	Y
50.3799	1073.86
144.157	1073.86
159	1070
171.616	1070
190	1070

Line Load

X	Y
126.443	1081.5
117.718	1081.5

External Boundary

X	Y
50.3799	1029.62
190	1029.62
190	1054.06

190	1074
170	1070
159	1070
144.157	1073.86
129	1081.5
115	1081.5
104.125	1076.06
50.3799	1076.06
50.3799	1074
50.3799	1054.06

Material Boundary

X	Y
50.3799	1074
100	1074
104.125	1076.06

Material Boundary

X	Y
50.3799	1054.06
190	1054.06

APPENDIX C

Document 16

Draft Design Engineer's Report for Desilting Basin Reconstruction, dated 8-12-11

GENON NORTHEAST MANAGEMENT COMPANY
CANONSBURG, PENNSLYLVANIA

DRAFT
DESIGN ENGINEER'S REPORT
AS PART OF THE WATER QUALITY MANAGEMENT PERMIT APPLICATION
DESILTING BASIN RECONSTRUCTION
CONEMAUGH POWER STATION

K. C. Cockley

Date: 8-12-11

Kent C. Cockley
Registered Professional Engineer

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Kent C. Cockley
ENGINEER

GAI CONSULTANTS, INC.
385 EAST WATERFRONT DRIVE
HOMESTEAD, PENNSYLVANIA 15120-5005

GAI PROJECT: C091251.01

AUGUST 2011

Table of Contents

1.0 GENERAL INFORMATION

1.1 Site Description

Conemaugh Power Station is a coal-fired, steam electric generating station located on the Conemaugh River in West Wheatfield Township, Indiana County, Pennsylvania (see Figure 1 for the Site Location Map). The station is operated by the GenOn Northeast Management Company (GenOn). The Station is owned by a group of eight co-owners and GenOn owns a 16.45-percent undivided interest in the station and operates the station on behalf of the owners through its wholly owned subsidiary, GenOn Northeast Management Company. The station commenced operation in 1970. The electric generating capacity of the station is 1,700 megawatts (MW) from two identical 850 MW units. Coal combustion by-products (CCBs) from the Conemaugh Power Station are disposed of in a lined disposal facility located north of the station. The disposal facility is a captive site owned as an undivided interest by the Conemaugh Owners Group and operated by GenOn. The station has flue gas desulfurization (FGD) scrubbers on both generating units, which produce a gypsum by-product that is primarily disposed on-site and also shipped off-site for beneficial use in wallboard production.

1.2 General Facility Description

The desilting basin (basin) was originally built in 1969 to allow for gravity settling of sediment from water discharged from the cooling towers during a complete tower drainage event. Settling of solids and equalization are the forms of treatment that takes place in this basin. Over the years, miscellaneous wastewater streams throughout the plant have been routed to the basin. In response to changing Residual Waste Regulations, in 1994 the basin was rebuilt in-place and lined with a synthetic liner system and an asphalt protective layer. The basin has been operated and reported to the Pennsylvania Department of Environmental Protection (PaDEP) as a residual waste storage impoundment since 1994. The basin is currently permitted to discharge to the Conemaugh River via Outfall 004 in accordance with Permit No. PA0005011. A groundwater monitoring system was added in 1998 to meet regulatory requirements. The basin presently or is planned to collect flows from the following sources:

- storm drains from plant areas around cooling towers and yard drains;
- cooling tower water during maintenance draining events;
- storm drains from an oil/water separator;
- drain from the River Intake Clarifier Flocculation Tank; and
- ash recycle sump discharge.

Currently, the basin water is either recycled as make-up water to the FGD system or is discharged by gravity through NPDES Outfall 004 (NPDES Permit No. PA0005011) to the Conemaugh River. A modification to the existing permit submitted in 2010 will provide treatment of some of the desilting basin water through the Cooling Tower Blowdown Treatment System (CTBTS) which will result in basin discharge through NPDES Outfall 003 (NPDES Permit No. PA0005011). Flow will continue to gravity discharge through NPDES Outfall 004.

In accordance with Residual Waste Regulation, sediment is currently removed from the basin on an annual basis. The basin is not designed to drain by gravity so it is dewatered with a pump through Outfall 004 until suspended solid levels approach the NPDES discharge limits. The remainder of the material is removed via vacuum truck and/or collected using a bobcat lowered into the basin. This sediment removal process results in the basin being off-line for approximately one week.

The current discharge point (outfall 004) is sampled and monitored in accordance with Permit No. PA0005011. The proposed Reconstructed Desilting Basin will be re-graded as described in this Report and shown on the Drawings and will have a dewatering drain to aid in sediment removal. New subsurface drainage facilities and a geosynthetic liner system will be constructed in accordance with PaDEP Solid Waste Regulations as specified within this Report and as shown on the Drawings.

Based on a conceptual study by GAI Consultants, Inc. in 2009/2010 to evaluate the condition of the desilting basin, it was determined that reconstruction of the desilting basin would be the preferred option.

1.3 General Project Description

1.3.1 Facility Reconstruction

The purpose of this project is to reconstruct the existing desilting basin to improve its function with regard to PaDEP regulations. This will be accomplished by reconstructing the existing desilting basin with a Class I double-composite liner system, constructing a shallower bottom elevation to improve vertical separation from the current groundwater table and existing facilities, providing an access ramp and a basin dewatering drain to aid in sediment removal, and improving the protective cover. Storm runoff and process water which are collected in the desilting basin will be discharged in a manner similar to the current basin with the exception of the CTBTS which is currently in the permit review process.

The desilting basin will have a Class I double composite liner system and a subgrade drainage system to manage seasonal levels. Hydrogeologic Data and Information is provided as Appendix V-J of the Form V Narrative. The desilting basin will provide two (2) feet of freeboard for the 25-year, 24-hour storm event when routed through the riser to Outfall 004. The 100-year, 24-hour event was also investigated and will be routed through the riser to Outfall 004 without overtopping the crest of the Reconstructed Desilting Basin as specified in Attachment 2. Discharge from the Reconstructed Desilting Basin will continue to be monitored as NPDES Outfall 004. Storm runoff from local yard drains and process water from the ash pond water recycle sump, oil/water separator, cooling tower drains, and the intake clarifier flocculation tank drain will continue to enter the desilting basin via the existing piping system. During construction, discharge to the desilting basin will be diverted as specified in Attachment 4. See Module 15 attached to this Water Quality Management (WQM) Permit Application for a summary of the wastewater flow information. As with the existing basin, settling of solids and equalization will be the type of treatment occurring in the desilting basin.

There are several advantages of reconstructing the desilting basin which primarily include increased separation from the regional groundwater table, installation of a groundwater drainage system, improvements to maintenance and cleaning operations and a more durable protective cover system.

1.3.2 Construction Sequencing

The existing desilting basin will be taken out of service during reconstruction. Process water and stormwater currently directed to the basin will be rerouted or collected by alternative methods. Reconstruction of the desilting basin has been scheduled to occur in 2012 when no plant outages are scheduled. The desilting basin will be constructed at the approximate location of the existing basin, and will also extend further to the east as shown on the Drawings. After the desilting basin reconstruction is completed, process water and yard drains will again be routed to the basin. The temporary diversion of water during construction is included within this Report in Attachment 4. In general, process water will be diverted to other in plant facilities for re-use or treatment and discharge. As part of the plan, stormwater will also be diverted to other existing permitted NPDES stormwater outfalls or other inplant process facilities for reuse or treatment and discharge.

GenOn also is submitting a request for authorization to test the facilities for the proposed diversion of water included in Attachment 4. GenOn specifically will plan to test the valves associated with Item 1 on Attachment 4 and the connection of the Ash Valley Treatment System discharge and Ash Water Recycle System discharge to the Cooling Towers indicated by Items 5 and 7, respectively in Attachment 4. The test for the diversion of water to the cooling tower will be performed to not only test the connection but also to allow operations to balance the system flows, chemistry, and controls in coordination with the make-up water from the river and blowdown.

1.3.3 Wastewater Characteristics

The chemical composition of the storm runoff to the basin will be the same for the reconstructed desilting basin as it is for the existing basin. The volume of runoff entering the desilting basin under normal operating conditions will be almost identical to the volume entering the existing basin. Any difference in the influent volume will be the result of a larger basin footprint. The chemical composition for process water entering the desilting basin will be the same for the reconstructed basin as it is for the existing basin. As before, discharges from the desilting basin riser will be monitored by NPDES Outfall 004. See Module 15 for a summary of the wastewater characteristics. Representative wastewater sampling data is also attached to Module 15, which was previously reported in the Conemaugh Power Plant NPDES Permit No. PA0005011 Permit Renewal Application, dated 2006.

1.4 Schematics: Wastewater and Sediment Flow Diagrams

A wastewater and sediment flow diagram is included as Figures 3. Figure 3 illustrates the existing and reconstructed facility operation.

1.5 Treatment Facility Size, Capacity and Dimensions

Capacity and size information for the desilting basin is summarized on the following page and in the Attachment 2 calculations.

SECTION E. SEDIMENTATION PONDS

Sedimentation ponds and other impoundments must be constructed in accordance with the requirements of Chapter 102 and this permit before any earthmoving activities start in the drainage area. Each impoundment must be inspected during construction by or under the supervision of a registered professional engineer, licensed in Pennsylvania, and certified by the Department upon completion of construction.

Any enlargement, reduction in size, reconstruction, or other modification that may affect the stability or operation must be approved by the Department. Ponds must be certified and approved by the Department prior to the start of disposal activities.

Identification Proposed Reconstructed Desilting Basin

U.S.G.S. Quadrangle New Florence, PA Location: Latitude 40 deg 23 min 15 sec ; Longitude 79 deg 3 min 27 sec

Or Location from Bottom Right corner of U.S.G.S. Quadrangle; inches North: ________ inches West: ________

HYDROLOGY: Drainage area 21.8 acres acres; Design Storm 25-yr, 24-hr Average Watershed Slope less than 1 %

Land Use Industrial Soil Type C/D Curve Number 84 - 100 Peak Discharge 70.5 cfs (25-yr, 24-hr storm)

Embankment	Top Width (Minimum)	12 feet
	Outside Slope (Maximum)	2H : 1V
	Inside Slope (Maximum)	2H : 1V
	Top Elevation	1081.50 feet
	Upstream Toe Elevation	1074.00 feet
	Liner Material (earthen, synthetic, etc.)	Synthetic
Impoundment Dimensions and Capacities	Length at Bottom	235 feet maximum
	Width at Bottom	98 feet maximum
	Length at Crest of ~~Principal Spillway~~ Riser to Lift Stations	0
	Width at Crest of ~~Principal Spillway~~ Riser to Lift Stations	0
	Depth from Crest of ~~Principal Spillway~~ Riser to Lift Stations	0
	Length at Crest of ~~Emergency Spillway~~ Riser to Outfall 004	0
	Width at Crest of ~~Emergency Spillway~~ Riser to Outfall 004	0
	Volume at Crest of ~~Principle Spillway~~ Riser to Lift Stations	495 cubic yards ,
~~Principal Spillway~~ Riser to Lift Stations	Time of Detention	Not Applicable
	Maximum Sediment Storage Volume	495 cubic yards
	Shape (Circular, semi-circular, trapezoid, etc.)	Circular
	Dimensions (W x H x L)	36" dia. riser, 1-12" & 1-18" dia. outlet pipes
	Inlet Elevation	1073.75 feet
	Slope and Length	+6.4%, 48 feet - 0%, 55 feet
	Discharge Elevation	Not Applicable
	~~Spillway~~ Capacity	Not Applicable
	Construction Material	HDPE
Dewatering Device	Type/Size	4" Perforated HDPE, Lift Stations
	Inlet Elevation	Not Applicable
	Discharge Controls (i.e. self draining or valved)	Valved
	Discharge Capacity (maximum)	1800 gallons per minute
	Time to Dewater Full Pond	9.3 hours (from 1077.75 to 1073.75 feet)
~~Emergency Spillway~~ Riser to Outfall 004	Shape	Circular
	Dimensions (W x H x L)	36 inch dia riser, 24 inch dia. outlet pipe
	Slope	0.7 %
	Discharge Elevation	Inlet = 1077.75 feet
	Type of Lining/Protection	HDPE Pipes to Concrete Manhole
	~~Spillway~~ Capacity (provide design calculations)	36.9 cfs (25-yr storm), 38.9 cfs (100-yr storm)

2.0 DETAILED DESCRIPTION OF THE WASTEWATER TREATMENT FACILITY

2.1 System Parameters and Design Considerations

The design and layout of the reconstructed desilting basin is based on several considerations. These considerations include: setting the bottom elevation of the desilting basin to improve the separation of groundwater and existing facilities; installing a subgrade drainage system; and improving dewatering and cleaning facilities, improving the protective cover, handling the 25-year, 24-hour storm event with two feet of freeboard.

The proposed Reconstructed Desilting Basin will be a double-composite lined Class I storage impoundment. Details of the synthetic and composite liners are comprehensively described on the following page and in Attachment 3, which is a residual waste Form V-Storage Impoundment Application Form. The basin will be mostly excavated on the east side, and have an embankment on the north and south sides, as the existing basin does.

Applicant Name: GenOn Energy Northeast Mangement Company

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

IMPOUNDMENTS
MODULE 20

APPLICANT NAME GenOn Energy Northeast Mangement Company

NOTE: Module 19 must be completed along with this module. The construction inspection plan must be prepared and attached to this module.

TYPE OF WASTE (Check one.)

☐ Sewage ☒ Residual (refer to requirements of Title 25 Pa. Code 299.141) ☐ Manure

GENERAL REQUIREMENTS

1. Is the bottom of the subbase within 4 feet of the seasonal high water table? ☒ Yes (drainage system required) ☐ No
2. Describe the drainage system and how it will prevent seasonal high water table coming within 4 feet of the subbase. Geocomposite Drainage Net and 4" SDR17 HDPE piping

SUBBASE

1. The subbase material is hard, uniform, smooth and free of debris, rock fragments, plant materials and other foreign material. ☐ Yes ☐ No
2. Design Data
   a. Material Enhanced Geocomposite Clay Liner
   b. Depth N/A inches (minimum 6 inches)
   c. Permeability of upper 6 inches 1×10^{-6} cm/sec (maximum 1×10^{-5})
   d. Slope 0.5 percent (2 to 25 percent)
   e. Compaction N/A percent (Standard Proctor Density) (minimum 90 percent)

LEAK DETECTION ZONE

1. Design Data Geocomposite Drainage Net
   a. Thickness N/A inches (minimum 12 inches)
   b. Particle size N/A inches (maximum 0.5 inch)
   c. Permeability N/A cm/sec (minimum 1×10^{-2})
   d. Slope 0.5 percent (minimum 2 percent)
2. Piping System
   a. Slope 0.5 percent (minimum 2 percent)
   b. Diameter 4 inches (minimum 4 inches)
   c. Wall Thickness Schedule SDR 17 (minimum Schedule 40)

LINER

1. Geosynthetic Design Data
   a. Material Textured HDPE Geomembrane
   b. Thickness 60 mils (minimum 30 mils)
   c. Permeability 1×10^{-7} cm/sec (maximum 1×10^{-7})
2. Geotextile material used between leak detection zone and liner. ☒ Yes ☐ No
3. An assurance and quality control program is attached for installation of the liner. ☒ Yes ☐ No

NOTE: Upon completion of construction, a written completion certification that the liner has been adequately constructed and tested in accordance with project specifications shall be submitted by the engineer to DEP.

The desilting basin bottom elevation was designed based on historical regional groundwater levels from the groundwater monitoring wells at the location of the existing basin. See Drawing D-744-3094 for existing monitoring well locations, and in Form V, Appendix V - J for historical groundwater elevations.

A subgrade drainage system consisting of a groundwater underdrain pipe system and geocomposite drainage net (GDN) will be placed underneath the entire desilting basin footprint, including underneath the sideslopes. Any seasonal high groundwater that is intercepted and collected by the GDN layer will be collected in manholes GW-1 and GW-2 and pumped into the desilting basin. The proposed geosynthetic liner system for the reconstructed desilting basin is shown on Drawing D-744-3096 and will consist of a contaminate resistance (enhanced) geosynthetic clay liner (EGCL) which will meet the regulatory subbase permeability requirement of $1x10^{-5}$ cm/sec. Above the subbase will be a 60 mil textured high density polyethylene (HDPE) geomembrane that will function as a secondary liner. Above the secondary liner will be the leachate detection zone (LDZ), which will consist of a GDN and a perforated pipe collection system. The LDZ will drain to leachate detection manhole LD-1. This manhole will be used to monitor the LDZ, and if necessary, used to obtain water samples for analysis. Leachate detection manhole LD-1 will be valved to drain to manhole GW-1, so that any water collected in the leachate detection manhole can also be pumped to the desilting basin pump station and will discharge above the normal pool elevation of the basin. Immediately above the LDZ will be a composite primary liner. The composite primary liner will consist of a 60 mil textured HDPE geomembrane underlain by a GCL. The entire liner system will be protected above with a non-woven geotextile and a fabricform revetment lining, filled with 3,000 psi (compressive strength) grout and anchored at the top of the basin. Eight-inch thick uniform section mat fabricform will cover the bottom of the basin, the lower portion of the sideslopes and the entrance ramp, while four-inch thick uniform section mat fabricform will cover the upper portion of the sideslopes.

Stormwater will enter the desilting basin from various locations similar to existing conditions.

1. from the discharge line from oil/water separator 1;
2. from yard drains around the cooling tower;
3. from areas directly adjacent to the desilting basin; and
4. direct rainfall inside the desilting basin.

If necessary for emergency purposes, all gravity piped stormwater into the basin either presently are valved or are proposed to be valved as part of this reconstruction project. If inlets to the basin are closed, storm runoff will need to be handled as follows:

1. From oil/water separator 1 – stormwater will back up into two existing 20,000 gallon underground concrete tanks. Water would need to either be temporarily stored and rerouted to the desilting basin after the emergency is over or pumped to other plant facilities for reuse or pumped out and transported offsite for disposal at a permitted facility.
2. Water from yard drains would need to be pumped directly to other plant facilities for reuse or treatment such as one of the existing pump stations from the desilting basin or to a cooling tower.

The Reconstructed Desilting Basin is designed to store the anticipated sediment volume for more than five (5) years of operation. The estimated sediment volume for the five (5) year period is approximately 430 tons (360 cubic yards). For a factor of safety, the basin was sized to store approximately 600 tons (495 cubic yards) of sediment. The main source of flow to the desilting basin is from the Ash Pond Water Recycle System that is operated at a total suspended solids level to meet a discharge level of 30 mg/L. The ash water recycle sump does not flow continuously to the desilting basin. For the sediment volume estimate, a continuous annual flow of 1,300 gallons per minute was used. The Waste Filter Pond (Ash Pond) "A" that ash recycle water is routed through also operates under a variance to be cleaned once every five (5) years. The basin will be monitored as part of routine plant operations and will be cleaned out more frequently than once every five years, if needed. For example, the basin will be cleaned out in response to plant operations that are not part of usual basin operation, such as a tower drain event.

The basin will be able to handle the approximately 70 cfs of peak storm discharge from the 25-year, 24-hour storm. For the 25-year storm scenario where no water is being pumped out of the basin, peak discharge will flow through the riser to Outfall 004 with a minimum of two (2) feet of freeboard provided. The desilting basin sizing calculations are included in Attachment 2.

The outlets for the desilting basin will consist of two riser structures located at the south end of the basin. One riser will gravity flow to the existing pump stations located outside the basin embankment on the west and southwest side. The location of the riser to the pump stations, the pump stations, and the riser to Outfall 004 are shown on Drawing D-744-3094. As discussed above, any water collected from the subgrade drainage system and the LDZ will also be pumped to new pump stations GW-1 and GW-2. The pump station will consist of a wet well, pumps, motors, and station housing for the electrical system and pump controls. Specifics of the proposed and existing pumping station equipment and operation are discussed in detail in Section 2.2.

The desilting basin risers will consist of a short section of upright HDPE pipe. The risers will be sealed and connected to each component of the basin's double liner system with an HDPE flange system. The riser will be attached to the pump stations beneath the basin with dual-containment, solid-wall HDPE pipes. At the bottom of the inside of the basin a corrugated polyethylene (PE) sediment dewatering pipe will also be attached to the riser that is connected to the pump station. The perforated corrugated PE pipe within an envelope of bottom ash will be extended along the bottom centerline of the basin for dewatering of accumulated sediments during sediment cleanout operations.

2.2 Pumping Equipment

2.2.1 Subgrade Drainage System Manholes

The Reconstructed Desilting Basin is proposed to have two (2) subgrade concrete drainage manholes identified as GW-1 and GW-2 located at the downstream end of the subgrade drainage system. The manholes GW-1 and GW-2 will each contain an automatic submersible pump that will pump any accumulated ground water into the desilting basin. Leachate detection manhole LD-1 will have a pipe and valve so it can be drained to manhole GW-1 and be pumped as well.

2.2.2 Existing Pump Stations

There are two existing lift stations that can pump water out of the desilting basin. There is an FGDS lift station (also referred to as the existing desilting basin lift station) and the Cooling Tower Blowdown Treatment System lift station. The FGDS lift station can pump water to the flue gas desulfurization system as make up water due to evaporation or water that is blown down from the system for treatment. The FGDS lift station consists of two 77 horsepower, 2000 gallon per minute FLYGT pumps. A recirculation line to prevent pump overheating will direct water back to the desilting basin to prevent damage to the pumps.

The Cooling Tower Blowdown Treatment System (CTBTS) is designed to transfer waters from the desilting basin to the treatment system. The piping to connect the lift station to the treatment system is installed, but is "blanked off," so that no water can be pumped from the desilting basin to the treatment system. If an NPDES Permit amendment under review is granted to allow GenOn to treat water from the desilting basin and discharge the treated effluent through the existing Outfall 003, the "blanks" can be removed, and pumping can occur.

A pair of 30 horsepower, 600 gallon per minute FLYGT submersible centrifugal pumps are installed to transfer water from the lift station to the flocculation tank located within the CTBTS wastewater treatment facility at a maximum rate of approximately 1,000 gallons per minute. A recirculation line from the lift station back to the cooling towers is installed so water can be diverted around the treatment facility during maintenance activities, if the lift station is placed into service.

2.2.3 Pumps for Contingency Procedures

As discussed in Section 2.1, if the inlets to the Reconstructed Desilting Basin are ever closed for maintenance, basin repair, or emergency conditions, stormwater stored in the inlet pipes can be accessed and pumped through the top of the shutoff valve box with a temporary submersible pump to other plant facilities. The station has multiple types of portable pumps, which could be used for this purpose.

2.3 Monitoring of Facility

The desilting basin will be monitored several different ways. The basin has a LDZ to monitor for liner leakage. Any leakage through the liner will be collected by the GDN that comprises the LDZ, and conveyed to LDZ manhole LD-1, where it can be collected and sampled (per 289.435 referenced from 299.144(11)(iv)).

The groundwater around the basin will continue to be sampled on a quarterly basis. Currently, monitoring well MW-17 (upgradient) and MW-18 (downgradient) are positioned around the existing basin. An additional monitoring well (identified as MW-27 (downgradient) will be installed, as described in Form V Appendix V-K.

The 004 Outfall from the Desilting Basin will continue to be monitored according to the existing NPDES permit for the Station. The monitoring will continue through the existing Parshall Flume and sampling or any future sampling, and monitoring equipment.

2.4 Sediment Removal

The current DEP Regulations require sediment removal at least once every 12 months, unless the DEP approves in writing a longer period of time (299.113(2)). Since the existing desilting basin has no dewatering pipe, the history of sediment removal could not be used for design as materials have historically been removed in a high moisture state. Therefore design for sediment removal is based on the water quality from the main source of flow to the basin. As such, this permitting application requests variance regarding the annual frequency of sediment removal based on the provided sediment storage dewatering capacity of the reconstructed desilting basin. The main flow of water to the desilting basin flows through the

"A" pond for the waste filter beds (ash ponds) to the Ash Pond Water Recycle Sump. The "A" pond is approved to be cleaned once per 5 years and this has historically been adequate for the pond operation. Therefore the desilting basin is also requested to be cleaned every five (5) years. A design capacity of approximately 495 cubic yards has been provided for sediment. The sediment will continue to be hauled to the on-site disposal facility. The actual sediment removal frequency will be based on sediment accumulation inside the reconstructed desilting basin at no greater than a five-year frequency. Dewatered sediments will be removed with a front-end loader, tracked skid loader, or backhoe in combination with highway trucks. If the perforated, corrugated PE sediment dewatering pipe begins to drain poorly, it will be removed during basin cleaning and replaced as necessary.

3.0 OPERATIONAL FLEXIBILITY AND RELIABILITY

3.1 Alarms and Sensing Devices

As specified on the Drawings, each subgrade manhole will be constructed with an automated alarm in the event of a power outage. Each structure may be equipped with a combination of float controls and/or pump controls to control pumping. Station personnel will be required to inspect the reservoir depth inside each structure and may be required to manually place submersible pumps with a backup power source inside in order to eliminate the potential for uncontrolled discharge. Any type of uncontrolled discharge is not anticipated for the subgrade and leachate detection manholes. If water is found flowing in the leachate detection manhole, station personnel will immediately notify the PaDEP in writing. The volume of water will be estimated on a weekly basis and sampled on a quarterly basis (per 289.435 by reference from 299.144(11)(iv). During periods of power loss, the pump station will discharge to the desilting basin and flow to Outfall 004 so long that water quality requirements are met.

3.2 Contingency Plan During Wastewater Facility Closure

The procedures to follow in the event that the FGD system and CTBTS can no longer accept discharges from the desilting basin are outlined herein. The basin is operated to meet the discharge requirements of Outfall 004 and will discharge through Outfall 004 when the facilities to pump water out of the desilting basin are off line. If the desilting basin cannot temporarily receive stormwater or process water, then the inlet pipes can be blocked and pumped to other plant facilities as described in Section 2.1 herein.

3.3 Personnel Training

Personnel training for operators of the desilting basin and subgrade manholes will include training in specific procedures and features of the system, as well as training in the emergency response procedures developed for all station personnel under that station's Preparedness, Prevention, and Contingency (PPC) Plan. Operator training will occur prior to system operation and new personnel will be trained prior to receiving operating responsibility. Outside contractor training personnel will be used as required.

Information is continually developed and periodically distributed to emergency coordinators, supervisors, and others as appropriate. Such information includes company directories, procedures, regulations, inventories, and background material. In addition, training seminars are scheduled periodically for supervisory personnel.

The objectives of the training program are to enable employees to understand the materials with which they are working, the practices for preventing spills, and the procedures for responding properly and rapidly to any spills or alarms which occur.

3.4 Operation and Maintenance Instructions

Operating manuals will be available on-site at all times, and will be used extensively in the personnel training program, as well as for a continuing reference source. The operating manual will include a schedule for routine maintenance. Detailed maintenance instructions will be obtained from all equipment vendors and maintained at the site.

3.5 Site Security

The site is wholly within the station grounds, and security measures are addressed in the station's PPC Plan. General site security includes a chain-link fence and locked gate. Entrance to the site by visitors is controlled by the guard at the main gate. All visitors must have a valid business purpose to gain access or be pre-authorized for a visit. Entrance of employees is controlled by the use of proper identification. Proper identification is also required of all visitors, and visitors are not permitted unrestricted movement through the plant.

4.0 SOIL EROSION AND SEDIMENT CONTROL PLAN AND STORMWATER DISCHARGES

Reconstruction of the existing desilting basin with a synthetically lined, replacement basin which will essentially be located in the same location will require specific erosion and sediment (E&S) measures. The anticipated E&S measures and an abbreviated sequence for pre- construction and post-construction are provided below. The finalized Erosion and Sedimentation Control Plan will be coordinated with the Indiana County Conservation District during the Chapter 102 permit process and prior to construction.

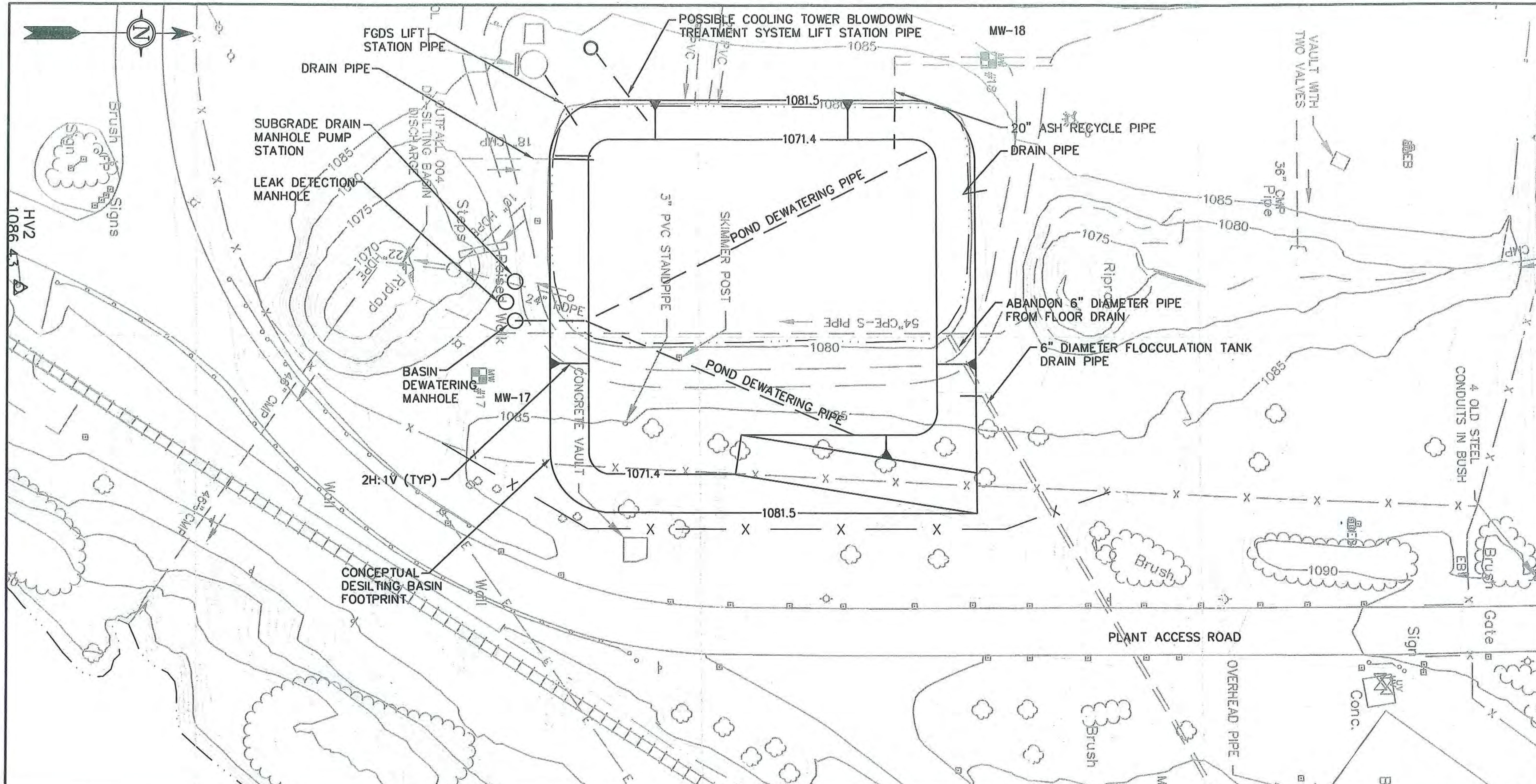
4.1 Erosion and Sediment Control Sequence

- Pre-construction activities:
  - Follow the Temporary Water Control Guidelines, as defined in Attachment 4, prior to earth disturbance.
  - Install rock construction entrances (if needed).
  - Install silt fence (or similar sediment containment product) around contractor staging area.
  - Install silt fence (or similar sediment containment product) along north, south and east sides of the work area.
  - Pump accumulated excavation water to pump water filter bags, as needed.
- Reconstruct desilting basin.
- Post-construction activities:
  - Permanently stabilize outer embankments, and other disturbed areas.
  - Restore/finalize the contractor staging area as desired.
  - Remove the silt fence (or similar sediment containment product, as applicable) from around the former contractor staging area.
  - Remove the rock construction entrances.
  - Restore diverted flows back into the basin.

APPENDIX C

Document 17

Conemaugh Cooling Tower Desilting Basin Conceptual Plan Drawings, undated



PLAN VIEW SCALE 1"=50'

50 0 50 100

NOTE:
1. NEW DOWNGRADIENT GROUNDWATER MONITORING WELL TO BE ADDED.

REFERENCE: EXISTING TOPOGRAPHY AND FEATURES BASED ON AERIAL MAPPING PROVIDED BY GENON ENERGY, INC. - CONEMAUGH STATION BASE MAPPING. (DRAWING NO. E-744-3093-0, SHEETS 1 THROUGH 16)-DATE OF AERIAL PHOTOGRAPHY 3-17-10.

FIGURE 4

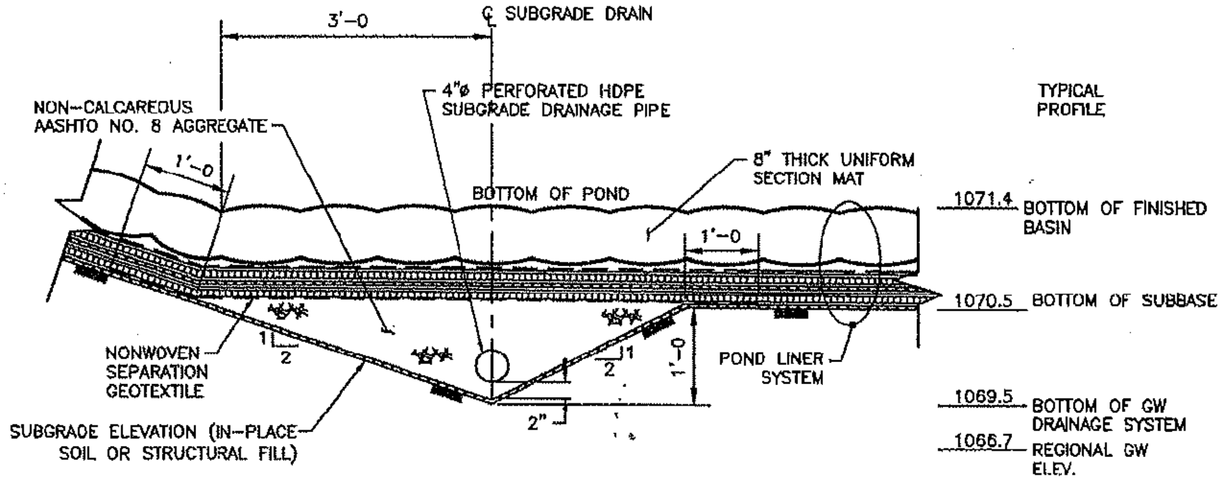
gai consultants Pittsburgh Office 385 East Waterfront Drive Homestead, PA 15120-5005 412-476-2000	CONEMAUGH COOLING TOWER DESILTING BASIN CONCEPTUAL PLAN	DWN. JCN	CHKD. LGL	SCALE:
		APPD.	DATE	AS NOTED
	GENON ENERGY NORTHEAST MANAGEMENT COMPANY CANONSBURG, PENNSYLVANIA	DRAWING NUMBER C091251-00-000-00-E-B002		REV 1

PLOTTER FILE: ENVIRONMENTAL.CTB

GAI CAD FILE: P:\PIT\2009\C091251\CAD DEPARTMENT\PRODUCTION DRAWINGS\PHASE 2\C091251-00-000-00-E-B002.DWG

PLOTTER FILE: ENVIRONMENTAL.CTB

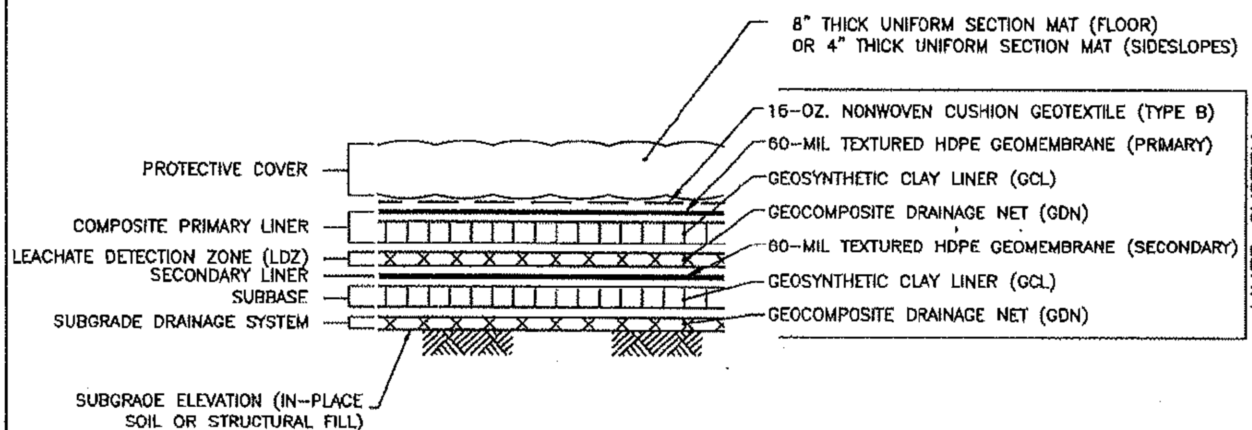
GAI CAD FILE: P:\PIT\2009\C091251\CAD DEPARTMENT\PRODUCTION DRAWINGS\PHASE 2\C091251-00-000-00-E-A003.DWG 2/9/2011



TYPICAL PERIMETER SUBGRADE DRAINAGE PIPE

SCALE: NTS

NOTE: PROFILE ELEVATIONS REPORTED AT DOWN GRADIENT END (SOUTH SIDE) OF BASIN



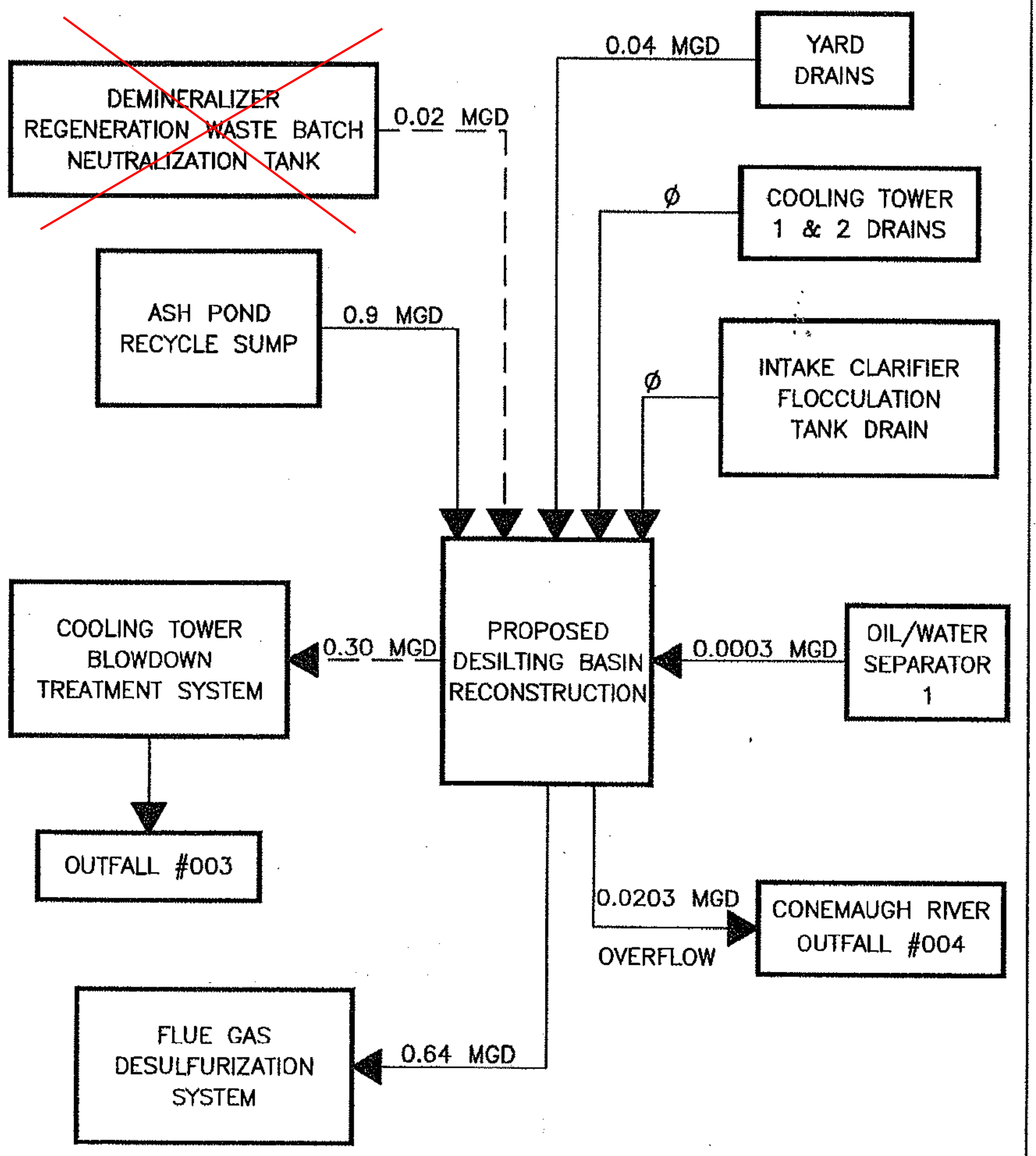
TYPICAL POND LINER SYSTEM

N.T.S.

gai consultants

FIGURE 5

DESILTING BASIN PROPOSED LINER SYSTEM CONEMAUGH POWER STATION NEW FLORENCE, PENNSYLVANIA	DWN. JCN	CHKD. LGL	SCALE:
	APPD.	DATE	AS NOTED
GENON ENERGY, INC. CANONSBURG, PENNSYLVANIA	DRAWING NUMBER C091251-00-000-00-E-A003		REV 0



LEGEND:

EXISTING

~~SUBMITTED IN PERMIT AMENDMENT~~

REFERENCES:

AVERAGE MONTHLY FLOWS FROM WATER BALANCE DIAGRAM, RRI ENERGY DRAWING: 1942-SK-M-113-SH2 REV.11

gai consultants

C091251-00-000-00-E-A001

PROCESS FLOW DIAGRAM
CONEMAUGH POWER STATION
PROPOSED DESILTING BASIN
RECONSTRUCTION

GAI CAD FILE:P:\PIT\2009\C091251\CAD Department\Production Drawings\Phase 1\C091251-00-000-00-E-A001.dwg

DRAWN: JCN CHECKED: LGL APPROVED: - DATE: 02-11-2011 TASK NO. 00

CAD FILE NAME: C091251-00-000-00-E-A001 PLOTTER FILE: ENV COLOR PROJ. NO./DASH NO. C091251.01 DRAWING NO. A-001

APPENDIX C

Document 18

Quarterly Ash Recycle Ponds Inspection Checklist, Conemaugh

QUARTERLY ASH RECYCLE PONDS INSPECTION CHECKLIST
NRG ENERGY - OPERATIONS TECHNICAL SUPPORT
CONEMAUGH STATION

NAME OF IMPOUNDMENT: Ash Recycle Ponds

LOCATION: West Wheatfield Township, Indiana County

PERSONS PRESENT AT INSPECTION:

NAME	TITLE/POSITION	REPRESENTING
		NRG Energy

DATE OF INSPECTION: **TIME:**
WEATHER:
TEMPERATURE:

This is to certify that the above ponds have been inspected and the following are the results of this inspection.

EMBANKMENT				
CREST AND INTERIOR SLOPES		CHECK ( ) ACTION NEEDED		
CONDITION/ITEMS	OBSERVATIONS	Monitor	Investigate	Repair
SURFACE CRACKING				
LOW AREA(S)				
HORIZONTAL ALIGNMENT				
RUTS AND/OR PUDDLES				
VEGETATION GROWTH				
ADDITIONAL COMMENTS:				

EMBANKMENT				
EXTERIOR SLOPES		CHECK ( ) ACTION NEEDED		
CONDITION/ITEMS	OBSERVATIONS	Monitor	Investigate	Repair
WET AREA(S)				
SEEPAGE				
SLIDE, SLOUGH, SCARP				
SINKHOLE, ANIMAL BURROW				
EROSION				
UNUSUAL MOVEMENT				
VEGETATION CONDITION				
ADDITIONAL COMMENTS:				

APPENDIX C

Document 19

Quarterly Desilting Basin Inspection Checklist, Conemaugh

QUARTERLY DESILTING BASIN INSPECTION CHECKLIST
NRG ENERGY - OPERATIONS TECHNICAL SUPPORT
CONEMAUGH STATION

NAME OF IMPOUNDMENT: Desilting Basin

LOCATION: West Wheatfield Township, Indiana County

PERSONS PRESENT AT INSPECTION:

NAME	TITLE/POSITION	REPRESENTING
		NRG Energy

DATE OF INSPECTION: **TIME:**
WEATHER:
TEMPERATURE:

This is to certify that the above ponds have been inspected and the following are the results of this inspection.

EMBANKMENT				
CREST AND INTERIOR SLOPES		CHECK ( ) ACTION NEEDED		
CONDITION/ITEMS	OBSERVATIONS	Monitor	Investigate	Repair
SURFACE CRACKING				
LOW AREA(S)				
HORIZONTAL ALIGNMENT				
RUTS AND/OR PUDDLES				
CONCRETE REVETMENT				
ADDITIONAL COMMENTS:				

EMBANKMENT				
EXTERIOR SLOPES		CHECK ( ) ACTION NEEDED		
CONDITION/ITEMS	OBSERVATIONS	Monitor	Investigate	Repair
WET AREA(S)				
SEEPAGE				
SLIDE, SLOUGH, SCARP				
SINKHOLE, ANIMAL BURROW				
EROSION				
UNUSUAL MOVEMENT				
VEGETATION CONDITION				
ADDITIONAL COMMENTS:				

APPENDIX C

Document 20

Email Adam Rogers, PA DEP, to Stephen Hoffman and Jana Englander, USEPA, October 29, 2013

From:	Adams, Roger
To:	Englander, Jana; Cox, Ken; rogers, rick; Conover, Clark
Cc:	Hoffman, Stephen; Divya, Craig; Kelly, PatrickM; Caylor, Douglas
Subject:	RE: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - GenOn - Conemaugh Generating Station
Date:	Tuesday, October 29, 2013 4:27:13 PM

Dear All,

Pennsylvania DEP Dam Safety has reviewed the draft assessment report for the Conemaugh Generating Station Filter Ash Ponds & Desilting Basin. The Department concurs with the findings of the Dewberry & Davis, LLC report and offers the following additional comments:

Upon review of the information presented in the report, Pennsylvania DEP Dam Safety has determined that the Filter Ash Pond cells collectively comprise a jurisdictional dam under 25 PA Code §105.3(a)(3) - *Dams used for the storage of fluids or semifluids other than water, the escape of which may result in air, water, or land pollution or in danger to persons or property.* The Department will regulate this ring dike structure containing four cells and the appurtenant structures of the dam. The Department has preliminarily designated the structure as class “C-4” dam based on the size and hazard potential and will regulate the dam until it is no longer deemed a jurisdictional dam by the Department. The dam is now identified by the Department as D32-091 – Conemaugh Gen Station WWT Lagoon Dam. The dam will be periodically inspected by the Department and any deficiencies will be reported to the owner.

The Desilting Basin does not receive offsite runoff and is designed to only hold water for temporary storage and use as makeup water to the Flue Gas Desulfurization (FGD) system. Additionally It is noted that as the Desilting Basin has an effective height of only eight feet and a storage volume of less than 50 acre-feet, the Department does not consider it a jurisdictional dam under 25 PA Code §105.

Please let me know if you need additional information.
Roger

Roger P. Adams, P.E. | Chief, Division of Dam Safety
Department of Environmental Protection | Bureau of Waterways Engineering and Wetlands
Rachel Carson State Office Building
400 Market Street | Hbg PA 17101
Phone: 717.772.5951 | Fax: 717.772.0409
www.dep.state.pa.us

From: Englander, Jana [mailto:Englander.Jana@epa.gov]
Sent: Monday, September 30, 2013 3:29 PM
To: Cox, Ken; rogers, rick; Conover, Clark; Adams, Roger; Reisinger, Richard; Berger, James; Maines, Heath; Kreider, Kirk; Hannigan, Lisa
Cc: Hoffman, Stephen; Dufficy, Craig; Kelly, PatrickM; Englander, Jana
Subject: FW: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - GenOn –

Conemaugh Generating Station

Dear All,

We would like to offer Pennsylvania and EPA Region 3 an opportunity to comment on the Draft Assessment Report on the Coal Combustion Residual Impoundment(s) located at the facility below. You can access the report by following the link below. Please let me know if you intend to comment or have any questions. Comments would be appreciated within 30 calendar days of receipt of this email. Thank you!
Regards,

Jana

Jana Englander
Office of Resource Conservation and Recovery,
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
703-308-8711

From: Englander, Jana
Sent: Monday, September 30, 2013 3:10 PM
To: 'dbenson@kcpo.com'; 'amy.trojecki@exeloncorp.com'; 'vicky.will@exeloncorp.com'
Cc: Hoffman, Stephen; Dufficy, Craig; Kelly, PatrickM; Englander, Jana
Subject: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - GenOn – Conemaugh Generating Station

Dear Mr. Benson,

The draft assessment report for GenOn – Conemaugh Generating Station is ready for review. EPA would appreciate it if you would review and submit your comments on this report to us within 30 calendar days of receipt of this email. **Please confirm receipt of this email and send your comments to:**

Mr. Stephen Hoffman
US Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

If you are using overnight of hand delivery mail, please use the following address:

Mr. Stephen Hoffman
US Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
5th Floor, N-5237
Arlington, VA 22202-2733

You may also provide your comments by e-mail to hoffman.stephen@epa.gov and englander.jana@epa.gov.

You may assert a business confidentiality claim covering all or part of the information requested, in the manner described by 40 C. F. R. Part 2, Subpart B. Information covered by such a claim will be disclosed by EPA only to the extent and only by means of the procedures set forth in 40 C.F.R. Part 2, Subpart B. If no such claim accompanies the information when EPA receives it, the information may be made available to the public by EPA without further notice to you. If you wish EPA to treat any of your response as “confidential” you must so advise EPA when you submit your response.

The draft report can be accessed at the secured link below. The secured link will expire on November 15, 2013.

Here is the link for the report:

http://www.hightail.com/download/OGhkeFVSZ1BCMTVESjhUQw

Please let me know if you have trouble accessing the reports or have any questions/requests.

Respectfully,

Jana Englander

Jana Englander
Office of Resource Conservation and Recovery,
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
703-308-8711

APPENDIX C

Document 21

Water Quality Management Post Certification Certificate for Reconstructed Desilting Basin

3800-PM-WSFR0179a 9/2005
Post Construction Certification

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

WATER QUALITY MANAGEMENT
POST CONSTRUCTION CERTIFICATION

PERMITTEE IDENTIFIER	
Permittee	Genon Energy NE Management Co.
Municipality	West Wheatfield Township
County	Indiana
WQM Permit No.	3211201
Facility Type	Industrial Waste

All of the above information should be taken directly from the Water Quality Management Permit.

CERTIFICATION

This certification must be completed and returned to the permits section of the DEP's regional office issuing the WQM permit within 30 days of completion of the project and received by DEP prior to operation, and if requested, as-built drawings, photographs (if available) and a discussion of any DEP-approved deviations from the design plans during construction.

I, being a Registered Professional Engineer in Pennsylvania, do hereby certify to the best of my knowledge and belief, based upon personal observation and interviews, that the above facility approved under the Water Quality Management Permit has been constructed in accordance with the plans, specifications and modifications approved by DEP.

Construction Completion Date (MM/DD/YYYY): 11/01/2013

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Kent C. Cockley
ENGINEER
PE-053618E

Professional Engineer

Name	Kent C. Cockley (Please Print or Type)
Signature	K. C. Cockley
Date	11/01/2013
License Expiration Date	09/30/2015
Firm or Agency	GAI Consultants, Inc.
Telephone	724-387-2170

Permittee or Authorized Representative

Name	John Balog (Please Print or Type)
Signature	John Balog
Title	GENERAL MANAGER CONEMAUGH
Telephone	724-235-4424