Comments on Draft Report Dynegy Midwest Generation- Vermilion Power Station

EPA:

Is there any documentation on the official close-out of the North Ash Pond?

State: None

Company: See letter dated December 22, 2010

Dynegy Midwest Region Operations
A Division of Dynegy Inc.
604 Pierce Boulevard
O'Fallon, IL 62269

DYNEGY

December 22, 2010

Office of Resource Conservation and Recovery (Mail Code 5304P)
United States Environmental Protection Agency
1200 Pennsylvania Avenue NW Washington, D.C. 20460

Attn: Mr. Stephen Hoffman
RCRA Program Manager

RE: Draft Coal Combustion Waste Impoundment Round 6 - Dam Assessment Report Dynegy Midwest Generation, Inc. Vermilion Power Station Fly Ash Dikes (Site 015), dated September 2009

DMG Comments

Mr. Hoffman:

Dynegy Midwest Generation, Inc. (DMG) appreciates the opportunity to review and comment upon the September 2009 draft dam assessment report of the Vermilion Station ash pond systems written by Dewberry & Davis, LLC. ***We are enclosing a marked-up copy of selected pages of the draft report, which includes our consolidated comments.*** These attached revisions are minor and are provided for clarification purposes.

Furthermore and more importantly, DMG recently consulted with URS Corporation (URS) – the east ash pond design engineering firm – in developing responses to the three draft report conclusions that relate to structural stability. Based upon these recent consultations with URS, DMG offers the following responses to the three conclusions regarding structural stability:

1. *The analyses evaluated only long-term stability using long-term, drained soil strength data. A short-term, post construction event can produce short-term increases in soil pore pressure and a corresponding decrease in shear strength. This phenomenon can cause failure of embankments that have otherwise been stable for decades.*

Drained soil properties were originally used because they resulted in lower factors of safety. URS re-ran the rapid drawdown and seismic loading cases using the undrained shear strength values provided in the original calculations for Critical Section 2, which is enclosed for your review. Section 2 controlled the design due to the lowest factor of safety for these cases. The results show that the factor of safety is increased when undrained soil properties are used. The results are presented as follows:

Summary of Results of Original (Drained Soil Properties) and Revised (Undrained Soil Properties) Slope Stability Analyses on Critical Section 2

Case	Original (Drained Soil Properties) Factor of Safety	Revised (Undrained Soil Properties) Factor of Safety
2A: Downstream Slope, Full Pond, Seismic and Gravity Loads	1.4	2.0
2B: Upstream Slope, Full Pond, Seismic and Gravity Loads	1.2	1.2
3: Upstream Slope, 20 ft rapid drawdown, Gravity Loads Only	1.3	1.4

It should be noted that the rapid increase in ash loading case is not a realistic scenario at this site. The plant is currently placing all of its site-generated, non-marketed ash into the pond, which results in a relatively slow increase in the ash level across the pond. In order to have a rapid increase in ash loading, the plant would have to import material from off site. The pond is only used for site-generated ash, therefore, a rapid ash loading case does not appear realistic.

2. *The ground acceleration used in the seismic loading analysis does not meet the current recommended design criteria and should be re-analyzed using current design criteria.*

The calculations performed for the design were based on the standards current at the time. The seismic coefficient was based on US Army Corps of Engineer guidelines as referenced in the calculations.

According to the current USGS website, the peak ground acceleration (PGA) with a 2% probability of exceedance within 50 years is between 0.08 and 0.10 g for this site (refer to the enclosure). It is generally understood in the geotechnical community that sites with a PGA with a 2% probability of exceedance within 50 years of less than 0.10 g are not considered to be within a seismic impact zone.

3. *The embankment geometry, used in the slope stability analysis, does not appear to be consistent with the geometry indicated on the design drawings.*

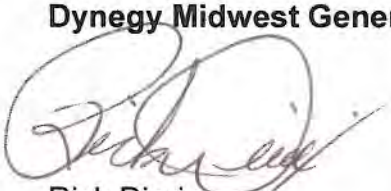
   The draft audit did not include a specific description of the issue. Preliminary calculations were performed for the project early in the design. These were followed by analyses as the design progressed. All checks to the preliminary calculations indicated that the minor adjustments to the design did not have a significant impact to the preliminary calculations. The preliminary calculations and conclusions regarding stability were thus considered to be still valid. The following is what was stated in the July 9, 2002 memorandum by URS provided to USEPA:

   > Several minor changes in dike design have occurred since the preliminary slope stability analyses were performed. Changes were made to improve the performance and constructability of the dike. Changes to the cross section of the dike included modification of sand drain lengths and locations and bottom ash placement limits along with other minor changes. These changes were analyzed. Based on analyses, the dike design changes did not affect the location of the critical sections and had little affect on calculated factors of safety.

   There were minor variations in the final design configuration to the analyzed sections, but the differences were considered to be inconsequential.

If you have any questions regarding our comments on the draft report, please contact Mr. Phil Morris, P.E., a member of my staff, directly at (618) 206-5934.

Sincerely,
Dynegy Midwest Generation, Inc.



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Operations Environmental Compliance
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Enclosures

bcc: A. Leskovsek – Houston Legal
B. Kipp / L. Rainwater – Vermilion Station
T. Davis/S. McVety/P. Morris – O'Fallon OEC USEPA ICR File
Rick Diericx Reading File – O'Fallon Office

(BY THE IDNR)

(NOT) (WITH)

because the North Ash Pond System is ~~no longer~~ permitted or regulated and has not been used for coal combustion waste storage since 1989, little documentation is available for that unit. Note that failure of the dike would not result in any offsite environmental release. Therefore, the North Ash Pond system is not discussed in Sections 3, 7, 8, 9, or 10 of this report.

Table 2.1a summarizes the dimensions of the embankments surrounding the East Ash Pond System[1].

Table 2.1a: Embankment Dimensions East Ash Pond	
Dam Height (ft)	48
Crest Width (ft)	15
Length (ft)	3,660
Side Slopes (upstream) H:V	3:1
Side Slopes (downstream) H:V	3:1

[1] Appendix A—Docs 10-15 and 16

2.2 SIZE AND HAZARD CLASSIFICATION

The East Ash Pond System is an intermediate size impoundment, based on Table 2.2a. It is approximately 48 feet high and has a design storage of 566 acre-feet (Appendix A—Doc 16). The North Ash Pond System was an intermediate size impoundment, based on Table 2.2a.

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

The East Ash Pond System is classified as having ***Significant*** hazard, based on Table 2.2b below. While loss of human life would not be expected if a failure would occur, there would be environmental losses due to the presence of the Middle Fork of the Vermilion River and the Kickapoo State Park in the immediate downstream vicinity.

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4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The Vermilion Power Station was originally constructed in the 1950's. The North Ash Pond System was designed and constructed in the ~~late~~ mid 1970's to replace the original ash pond system (the Old East Ash Pond System). The Old East Ash Pond was not used after the North Ash Pond System began operation.

In 1988 and 1989, the (New) East Ash Pond System was designed and constructed to replace the North Ash Pond System. In 2002, the East Ash Pond System was expanded.

4.1.2 Significant Changes/Modifications in Design since Original Construction

As noted above, the East Ash Pond System, the current operational ash pond system, is the third ash pond system to serve the Vermilion Power Station since its construction in the 1950's.

The East Ash Pond System was expanded to the current layout in 2002. The embankment height was increased and the surface area of the ring dike was expanded (Appendix A-Doc 10-15).

4.1.3 Significant Repairs/Rehabilitation since Original Construction

The North Ash Pond System embankment underwent repairs for erosion in 1988 (Appendix A-Doc 19). No significant repairs have taken place along the East Ash Pond System embankment since original construction.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The North Ash Pond System does not have a written operation and maintenance plan. The North Ash Pond System was originally designed and operated for fly ash sedimentation and control. The pond received plant process waste water, coal combustion waste slurry, and stormwater runoff from the pond embankments. Treated process water was discharged through an overflow outlet structure.

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The East Ash Pond System has an Operation and Maintenance Plan approved by the State of Illinois under the dam safety permit. It is included in Appendix A—Doc20. The East Ash Pond System, which replaced the North Ash Pond System as the operational fly ash sedimentation and control unit, receives plant process waste ~~water, coal combustion waste slurry,~~ and stormwater runoff from the pond embankments. Treated process water is discharged through an overflow outlet structure.

4.2.2 Significant Changes in Operational Procedures and Original Startup

The North Ash Pond System ~~has been used primarily for stormwater collection since the construction of the East Ash Pond System in 1989.~~ ~~Plant process waste water and coal combustion waste slurry~~ are no longer received by or collected in the North Ash Pond System. The North Ash Pond System is ~~no longer~~ permitted by the ~~state.~~ Stormwater flows from the primary cell of the North Ash Pond System to the secondary cell via a portable pump. Pumping is periodic, as needed, typically after significant rainfall events.

No significant changes in the Operations Procedures were reported since original startup for the East Ash Pond System.

4.2.3 Current Operational Procedures

The North Ash Pond System continues to capture stormwater runoff from the Vermilion power station. Stormwater is pumped from the primary cell into the secondary cell as needed. Stormwater is discharged manually, as needed, into the Middle Fork Vermilion River.

Discharge from the primary cell of the East Ash Pond System to the secondary cell is via gravity overflow. Flow from the secondary cell to the Middle Fork Vermilion River is also via gravity overflow.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry concerning notable events impacting the operation of the impoundment.

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5.3.4 Abutments and Groin Areas

The dike is continuous therefore there are no abutments. Descriptions of groin areas are included in the description of the dike crest and slopes.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

The North Ash Pond System overflow structure discharges through a spillway into the Middle Fork Vermilon River, with a metal grate walkway for access. Adjacent to the riser is a depth gauge to show the water level.

The North Ash Pond System overflow structure was observed to be working properly, discharging flow from the pond, and visually appeared to be in satisfactory condition. There was no sign of clogging of the spillway and the water exiting the outlet was flowing clear. Figure 5.4.1-1 shows the main outlet structure.

Figure 5.4.1-1: Photograph of the North Ash Pond System Overflow Structure.

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7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

East Ash Pond System

The Dynegy Calculation Book (Appendix A – Doc 16) includes two sets of slope stability analyses: "East Ash Pond Expansion Slope Stability Analyses by URS" dated April 30, 2002, and "East Ash Pond Expansion – Final Report – Slope Stability Analysis by URS" dated July 9, 2002.

Both reports analyzed the same five load conditions.

- Downstream slope with pond full – gravity loads only
- Upstream slope with pond full – gravity loads only
- Downstream slope with pond full – seismic and gravity loads
- Upstream slope with pond full – seismic and gravity loads
- Upstream slope after 20 ft. rapid drawdown – gravity loads only.

Based on the results of the analyses it was concluded that the embankment has stability safety factors at or above the minimum recommended values.

7.1.2 Design Parameters and Dam Materials

East Ash Pond System

PERFORMED

The Dynegy Calculation Book (Appendix A – Doc 16) includes the results of two sets of slope stability analyses ~~preformed~~ by URS Corp. The first set, dated April 30, 2002, used soil properties based on data provided by others and adjusted based on published literature. The report, dated July 9, 2002, presents the results of soil shear strength tests and discusses minor changes in dike design. The report indicates the changes were analyzed and the previously calculated safety factors were not significantly affected. The July 2002 report concludes that the preliminary slope stability analyses should be considered final.

The documentation provided indicates the preliminary stability analyses assumed nine geologic strata: existing dike – sandy gravelly clay; new

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9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Weekly Inspections

Weekly inspections are conducted by plant personnel.

Quarterly Inspections

Quarterly Inspections are conducted by qualified plant personnel. ~~Inspection reports are submitted to a third party P.E. (employed by URS) responsible for annual inspections for review and appropriate corrective actions.~~

Annual Inspections

Annual inspections are conducted by a licensed professional engineer (employed by URS) in accordance with IDNR regulations. The 2010 Inspection Report was submitted in March of 2010.

Special Inspections

No special inspections have been conducted at the Vermilion Power Station fly ash ponds.

9.2 INSTRUMENTATION MONITORING

The Vermilion Power Station embankments do not have an instrumentation monitoring system.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

The Vermilion Power Station embankments are not instrumented. Based on the size of the embankments, the portion of the impoundment currently used to store wet fly ash and stormwater, the history of satisfactory impoundment performance, and the current inspection program, installation of a dike monitoring system is not needed at this time.

Dynegy - Illinois Power - Vermillion Plant
Section 2 - Case 2A - Seismic loading downstream slope
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Last Saved Time: 7:18:40 PM
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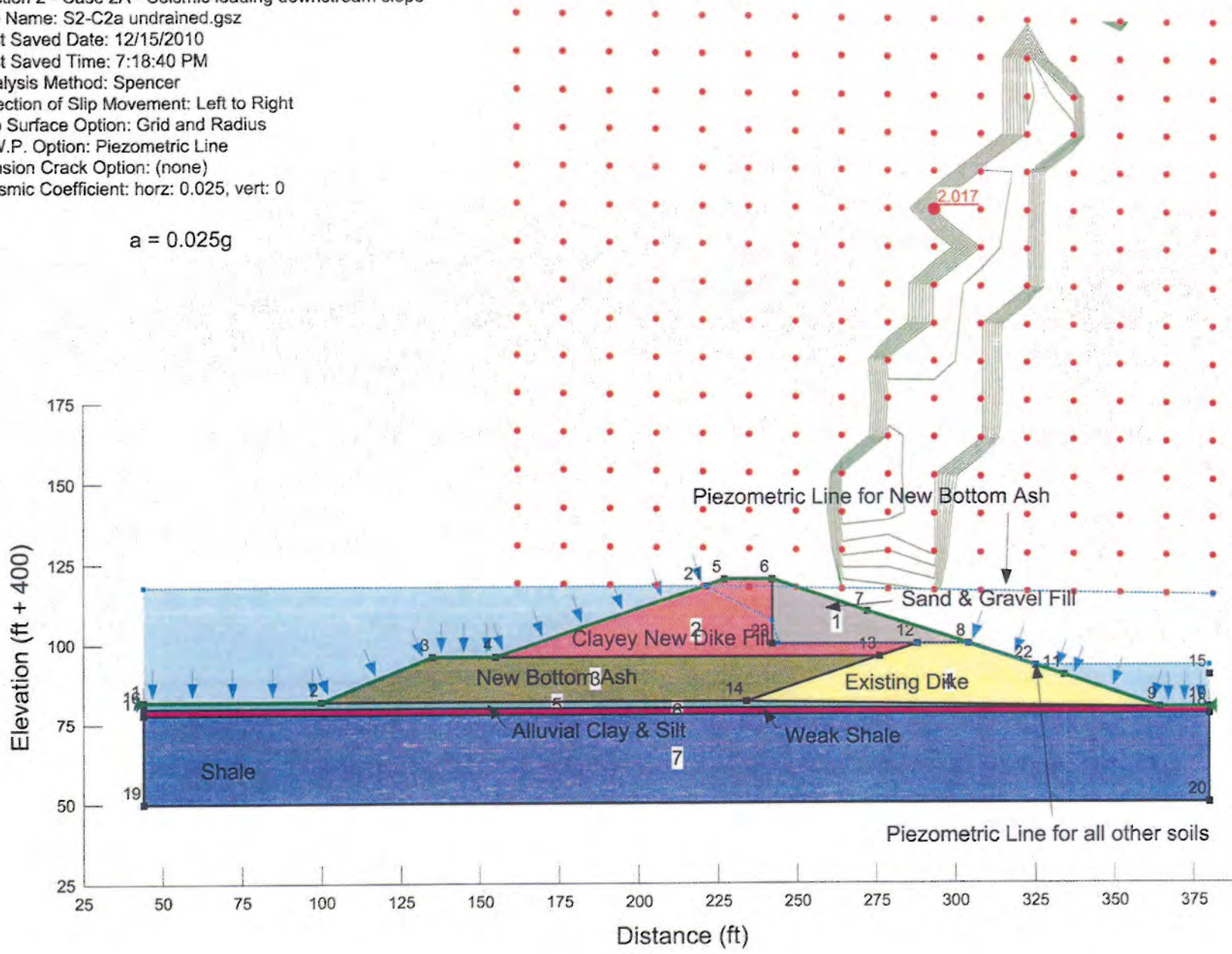
P.W.P. Option: Piezometric Line
Tension Crack Option: (none)
Seismic Coefficient: horz: 0.025, vert: 0

a = 0.025g



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Unit Weight: 137
Cohesion: 2000
Phi 1: 45
Phi 2: 30
Bilinear Normal: 237
Piezometric Line: 1

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Model: Undrained (Phi=0)
Unit Weight: 137
Cohesion: 2000
Phi 1: 45
Phi 2: 30
Bilinear Normal: 237
Piezometric Line: 1

Name: New Bottom Ash
Model: Mohr-Coulomb
Unit Weight: 97
Cohesion: 0
Phi: 30
Piezometric Line: 2

Name: Alluvial Clay & Silt
Model: Undrained (Phi=0)
Unit Weight: 120
Cohesion: 1500
Phi: 0
Piezometric Line: 1

Name: Weak Shale
Model: Undrained (Phi=0)
Unit Weight: 140
Cohesion: 2000
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Piezometric Line: 1

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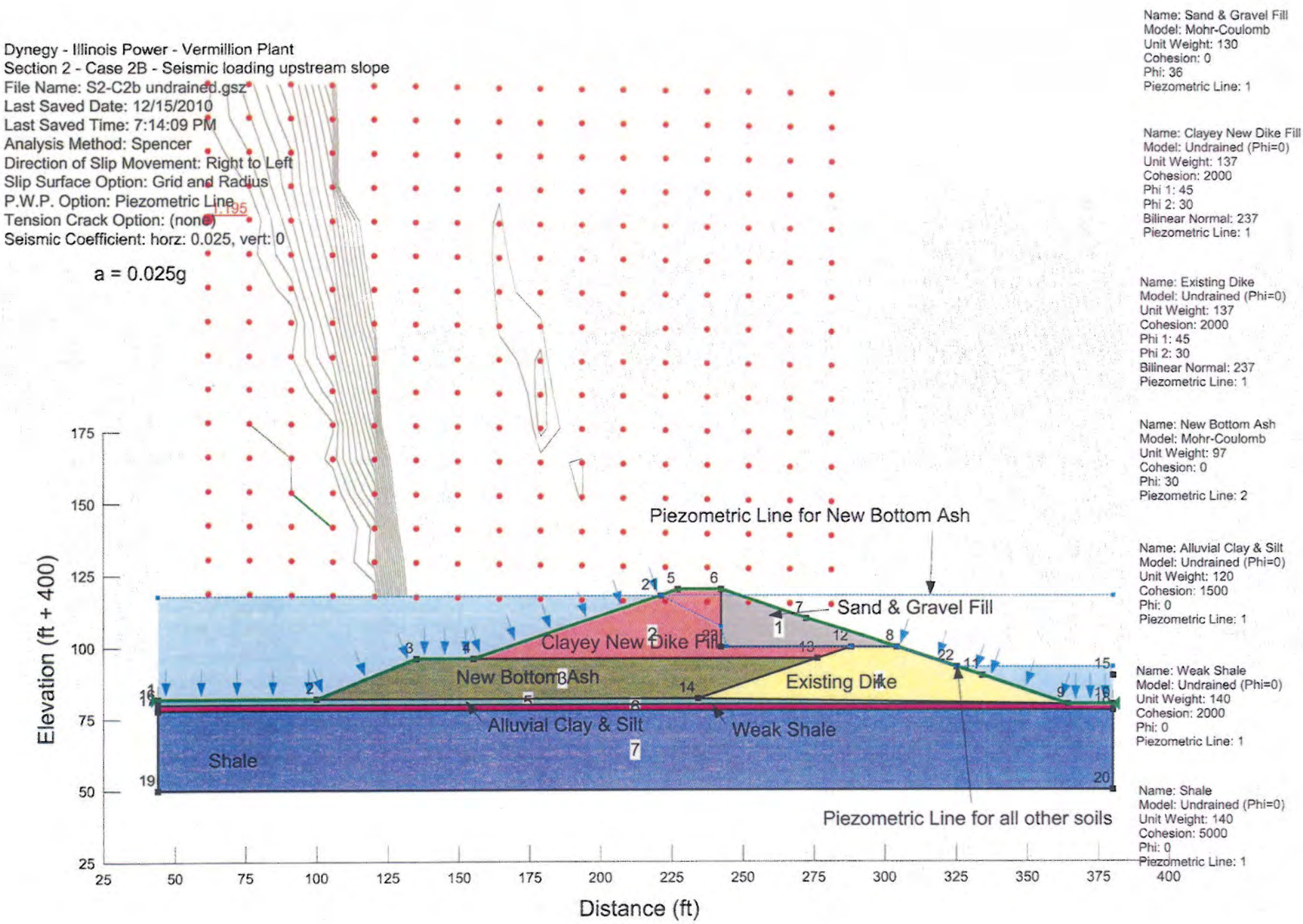
Dynegy - Illinois Power - Vermillion Plant
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Tension Crack Option: (none)
Seismic Coefficient: horz: 0.025, vert: 0
a = 0.025g
1.195
Piezometric Line for New Bottom Ash
Sand & Gravel Fill
Clayey New Dike Fill
New Bottom Ash
Existing Dike
Alluvial Clay & Silt
Weak Shale
Shale
Piezometric Line for all other soils
Elevation (ft + 400)
Distance (ft)
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
Name: Sand & Gravel Fill
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Piezometric Line: 1
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Model: Undrained (Phi=0)
Unit Weight: 137
Cohesion: 2000
Phi 1: 45
Phi 2: 30
Bilinear Normal: 237
Piezometric Line: 1
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Model: Undrained (Phi=0)
Unit Weight: 137
Cohesion: 2000
Phi 1: 45
Phi 2: 30
Bilinear Normal: 237
Piezometric Line: 1
Name: New Bottom Ash
Model: Mohr-Coulomb
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Piezometric Line: 2
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Unit Weight: 120
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Phi: 0
Piezometric Line: 1
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Unit Weight: 140
Cohesion: 2000
Phi: 0
Piezometric Line: 1
Name: Shale
Model: Undrained (Phi=0)
Unit Weight: 140
Cohesion: 5000
Phi: 0
Piezometric Line: 1

Dynegy - Illinois Power - Vermillion Plant
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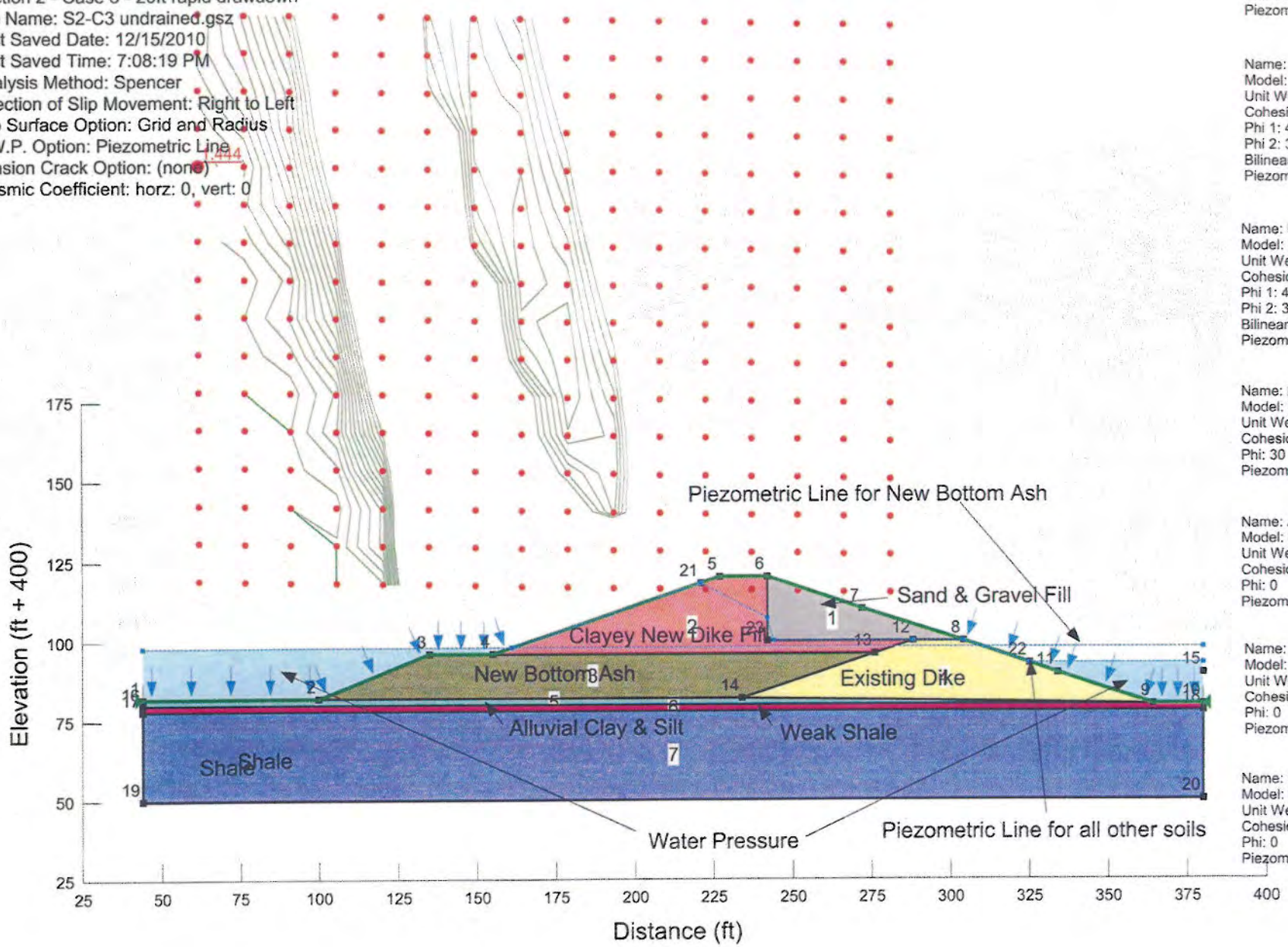

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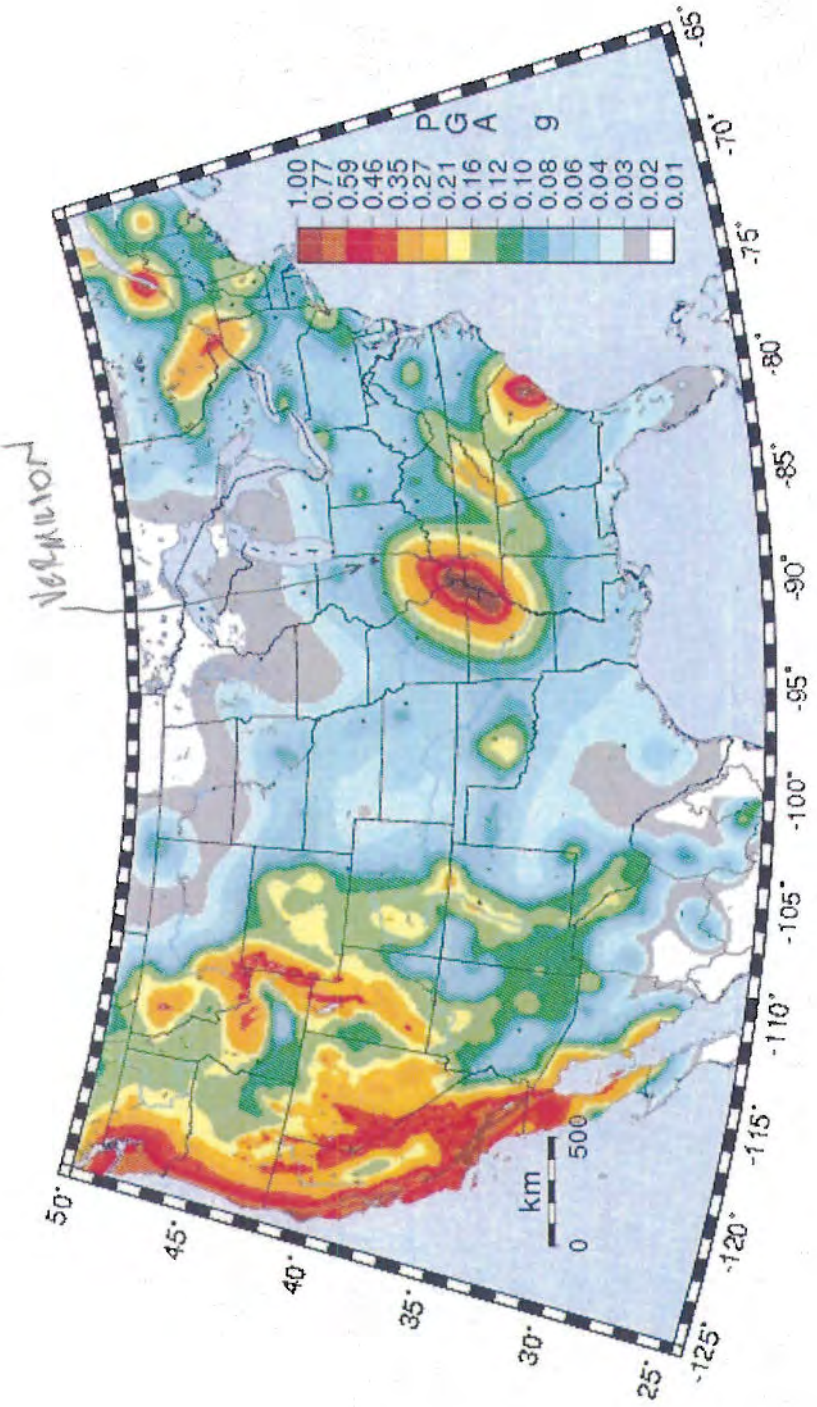
PGA with 2% in 50 year PE. BC rock. 2008 USGS