INITIAL SAFETY FACTOR ASSESSMENT
40 C.F.R. PART 257.73
PLANT DANIEL ASH POND B
MISSISSIPPI POWER COMPANY

EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule" (40 C.F.R. Part 257 and Part 261), §257.73(e), requires the owner or operator of an existing CCR surface impoundment to conduct periodic safety factor assessments. The owner or operator must document that the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) for the critical embankment section are achieved.

The CCR surface impoundment located at Mississippi Power Company's Plant Daniel referred to as the Plant Daniel Ash Pond B is located on Plant Daniel property north of Moss Point and Escatawpa, Mississippi. The CCR surface impoundment is formed by an engineered perimeter embankment. The critical section of this CCR unit has been determined to be located at the tallest point of the embankment, located on the southern dike.

The analyses used to determine the minimum safety factor for the critical section resulted in the following minimum safety factors:

Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	3.5	1.5
Maximum Surcharge Pool (Static)	3.5	1.4
Seismic	3.4	1.0

The embankments are constructed of compacted silts and clays that are not susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required. This assessment is supported by appropriate engineering calculations which are attached.

I hereby certify that the safety factor assessment was conducted in accordance with 40 C.F.R. Part 257.73 (e)(1).

10/17/16

James C. Pegues, P.E.
Licensed State of Mississippi, PE No. 18942

JAMES C. PEGUES
LICENSED PROFESSIONAL
ENGINEER
18942
STATE OF MISSISSIPPI

SOUTHERN COMPANY

Engineering and Construction Services Calculation

Calculation Number: TV-DO-MPC221806-001

Project/Plant: Plant Daniel Ash Pond B	**Unit(s):** -	**Discipline/Area:** TS-ENVSFS
Title/Subject: Factor of Safety Analysis		
Purpose/Objective: Analyze Factor of Safety of the Ash Pond		
System or Equipment Tag Numbers: NA	**Originator:** Joshua A. Lippert, P.E.	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	JAL/10-5-16	GHM/10-5-16	JCP/10-5-16

Notes:

Purpose of Calculation

Mississippi Power Company's Plant Daniel operates a surface impoundment that has historically been used to manage bottom ash and for water treatment. The impoundment, or ash pond, is constructed of an engineered compacted soil embankment. This calculation is intended to calculate the stability of the embankment.

Summary of Conclusions

The results of the analyses are summarized below. Output graphics are located in the body of the calculations. The analyses indicate that the exterior berms are stable with a factor of safety against sliding greater than the required minimum for all analyzed cases.

Condition	Minimum Required Factor of Safety	Calculated Factor of Safety
Static with Maximum Storage Pool	1.5	3.54
Static with Maximum Surcharge Pool	1.4	3.54
Seismic	1.0	3.49

Methodology

The calculation was performed using the following method and software:

SLOPE/W, Version 8.15, Copyright 1991-2016 GEO-SLOPE International Ltd., Calgary, Alberta, Canada, using the Morgenstern-Price method.

Strata (Version alpha, Revision 0.2.0), Geotechnical Engineering Center, Department of Civil, Architectural, and Environmental Engineering, University of Texas.

Assumptions

The slope stability model was run using the following assumptions:

- The highest section of the embankment, located on the southern end of the pond, was identified as the critical section.
- Maximum storage pool is at EL28.
- Maximum surcharge pool is at EL38, the top of dike elevation.

- The properties of unit weight, phi angle, and cohesion of the soil were taken from geotechnical investigations at surrounding areas of the plant and borings within the dike. Material properties are as follows:

Soil Type	Unit Weight, pcf	Cohesion, psf	Phi Angle, deg
Clay and Silt	130	500	19
Compacted Clay	120	1000	5
Silty Sand	120	0	34

Criteria

The slope stability analyses were based on the most recent design and as-built drawings available at the time of this calculation. Soil properties were obtained from historic laboratory data and soil investigations for the ash pond and recent ash pond embankment well installations.

The following scenarios were evaluated for the fully stacked condition:
1. Static with Maximum Storage Pool
2. Static with Maximum Surcharge Pool
3. Seismic Loading – Maximum storage pool plus seismic loading

Seismic site response was determined using a one-dimensional equivalent linear site response analysis. The analysis was performed using Strata and utilizing random vibration theory. The input motion consisted of the USGS published 2008 Uniform Hazard Response Spectrum (UHRS) for Site Class B/C at a 2% Probability of Exceedance in 50 years. The UHRS was converted to a Fourier Amplitude Spectrum, and propagated through a representative one dimensional soil column using linear wave propagation with strain-dependent dynamic soil properties. The input soil properties and layer thickness were randomized based on defined statistical distributions to perform Monte Carlo simulations for 100 realizations, which were used to generate a median estimate of the surface ground motions.

The median surface ground motions were then used to calculate a pseudostatic seismic coefficient for utilization in the stability analysis using the approach suggested by Bray and Tavasarou (2009). The procedure calculates the seismic coefficient for an allowable seismic displacement and a probability exceedance of the displacement. For this analysis, an allowable displacement of 0.5 ft, and a probability of exceedance of 16% were conservatively selected, providing a seismic coefficient of 0.003g for use as a horizontal acceleration in the stability analysis.

Design Inputs/References

Southern Company Services, Inc., 1992, *Report of Subsurface Investigation, Proposed Permanent Access Road for Plant Daniel*

Southern Company Services, Incl. laboratory data reports from Ash Pond B samples, 1992

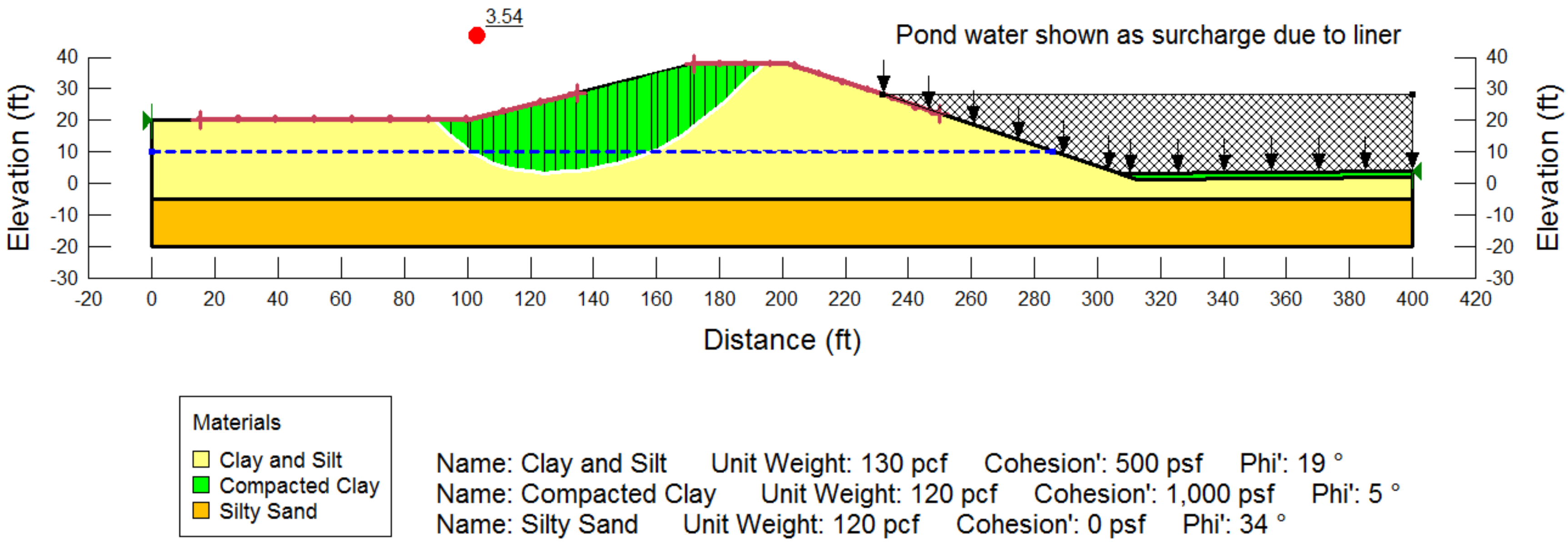
E&CS Drawing D-189073

Bray, J. D. and Travasarou, T., *Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation*, Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, September 2009

Body of Calculation

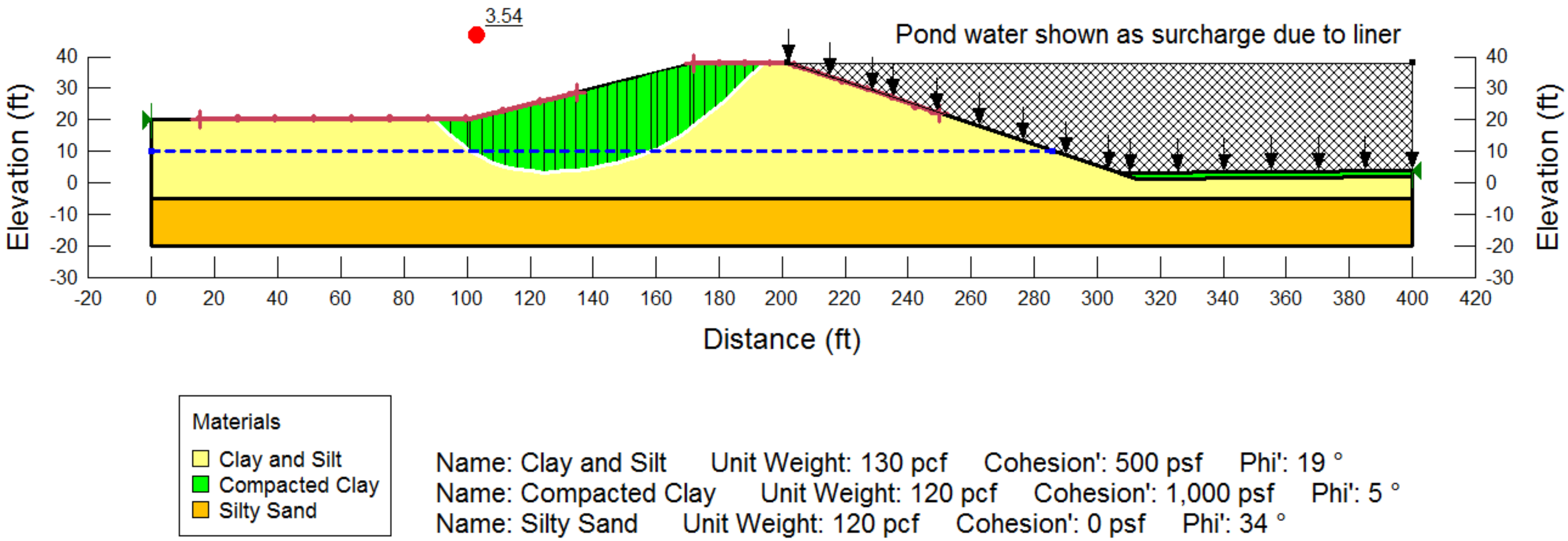
See following pages.

Plant Daniel Ash Pond B
Name: Static - Maximum Storage Pool
Method: Morgenstern-Price
Horz Seismic Coef.:



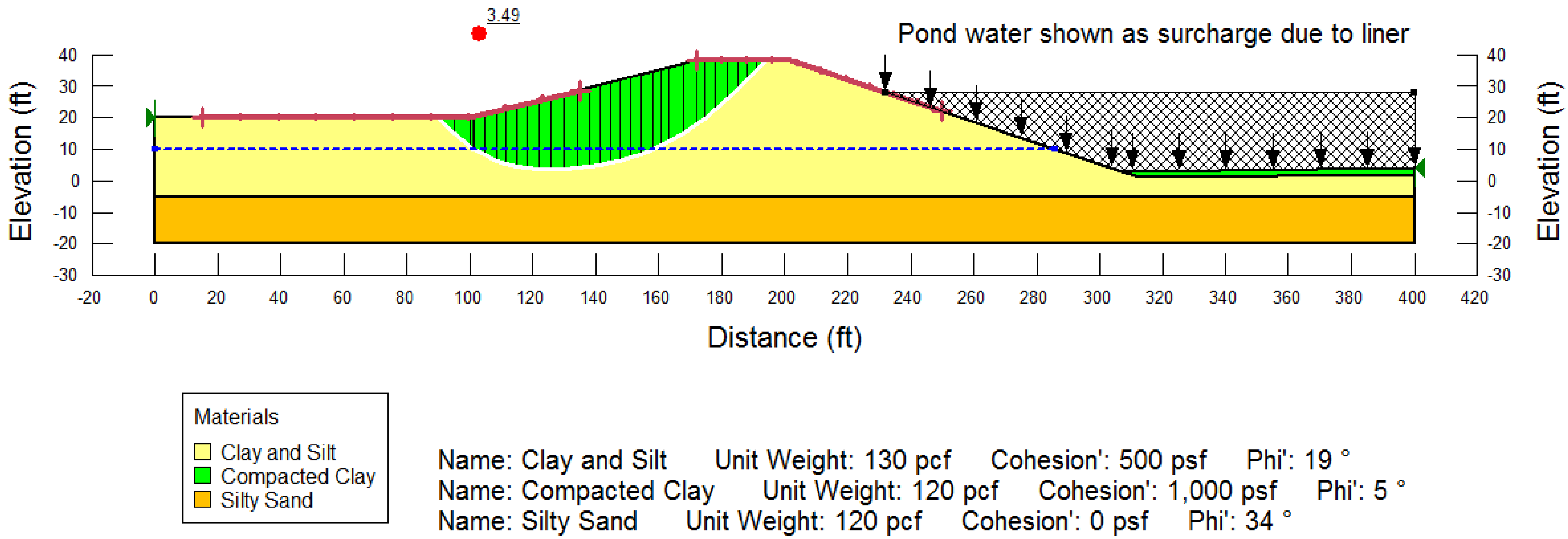
Name: Clay and Silt Unit Weight: 130 pcf Cohesion': 500 psf Phi': 19 °
Name: Compacted Clay Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 5 °
Name: Silty Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °

Plant Daniel Ash Pond B
Name: Static - Maximum Surcharge Pool
Method: Morgenstern-Price
Horz Seismic Coef.:



Name: Clay and Silt Unit Weight: 130 pcf Cohesion': 500 psf Phi': 19 °
Name: Compacted Clay Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 5 °
Name: Silty Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °

Plant Daniel Ash Pond B
Name: Seismic
Method: Morgenstern-Price
Horz Seismic Coef.: 0.003



Name: Clay and Silt Unit Weight: 130 pcf Cohesion': 500 psf Phi': 19 °
Name: Compacted Clay Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 5 °
Name: Silty Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °