INITIAL SAFETY FACTOR ASSESSMENT
PLANT GASTON ASH POND
ALABAMA 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 Alabama Power Company's Plant Gaston also referred to as the Plant Gaston Ash Pond is located on Plant Gaston property, east of Wilsonville, Alabama. The CCR surface impoundment is formed by an engineered perimeter embankment. The critical section of this CCR unit has been determined to be located on the south embankment, east of the discharge area.

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)	1.6	1.5
Maximum Surcharge Pool (Static)	1.6	1.4
Seismic	1.1	1.0

The embankments are constructed of clays that are not susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required.

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

10/12/16

James C. Pegues, P.E.
Licensed State of Alabama, PE No. 16516

ALABAMA LICENSED 16516 PROFESSIONAL ENGINEER JAMES C. PEGUES, JR.

SOUTHERN COMPANY

Engineering and Construction Services Calculation

Calculation Number: TV-GS-APC389725-001

Project/Plant: Plant Gaston	**Unit(s):** n/a	**Discipline/Area:** ES&FS
Title/Subject: Factor of Safety Assessment for CCR Rule		
Purpose/Objective: Analyze slope stability of the Ash Pond Dike		
System or Equipment Tag Numbers: NA	**Originator:** Jacob A. Jordan, P.E.	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	JAJ 10/4/16	JCP 10/4/16	JCP 10/4/16

Notes:

Purpose of Calculation

The purpose of this calculation is to determine the stability of the Ash Pond dike under various loading conditions as prescribed by the EPA CCR Rule.

Summary of Conclusions

The analyses determined that the factors of safety of the Ash Pond met or exceeded the minimum criteria set forth in the CCR Rule. The results are summarized in the following table.

Factor of Safety Summary Table

Loading Condition	Factor of Safety (FOS)	Minimum FOS
Long-term, Maximum Storage Pool	1.55	1.50
Maximum Surcharge Pool	1.57	1.40
Seismic	1.12	1.00

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2012 (Version 8.15.5.11777), August 2015 Release, Copyright 1991-2016, GEO-SLOPE International, Ltd. The Morgenstern-Price analytical method was used.

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

Criteria and Assumptions

Loading conditions inferred by the three criteria were assumed to be as follows:

- Long term, maximum storage pool: The maximum pool elevation the pond will maintain under normal operating conditions
- Maximum storage pool: The maximum pool that the pond can retain with no freeboard, but with the phreatic surface not affected from normal operating conditions
- 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 0.064g for use as a horizontal acceleration in the stability analysis.

Design Inputs/References

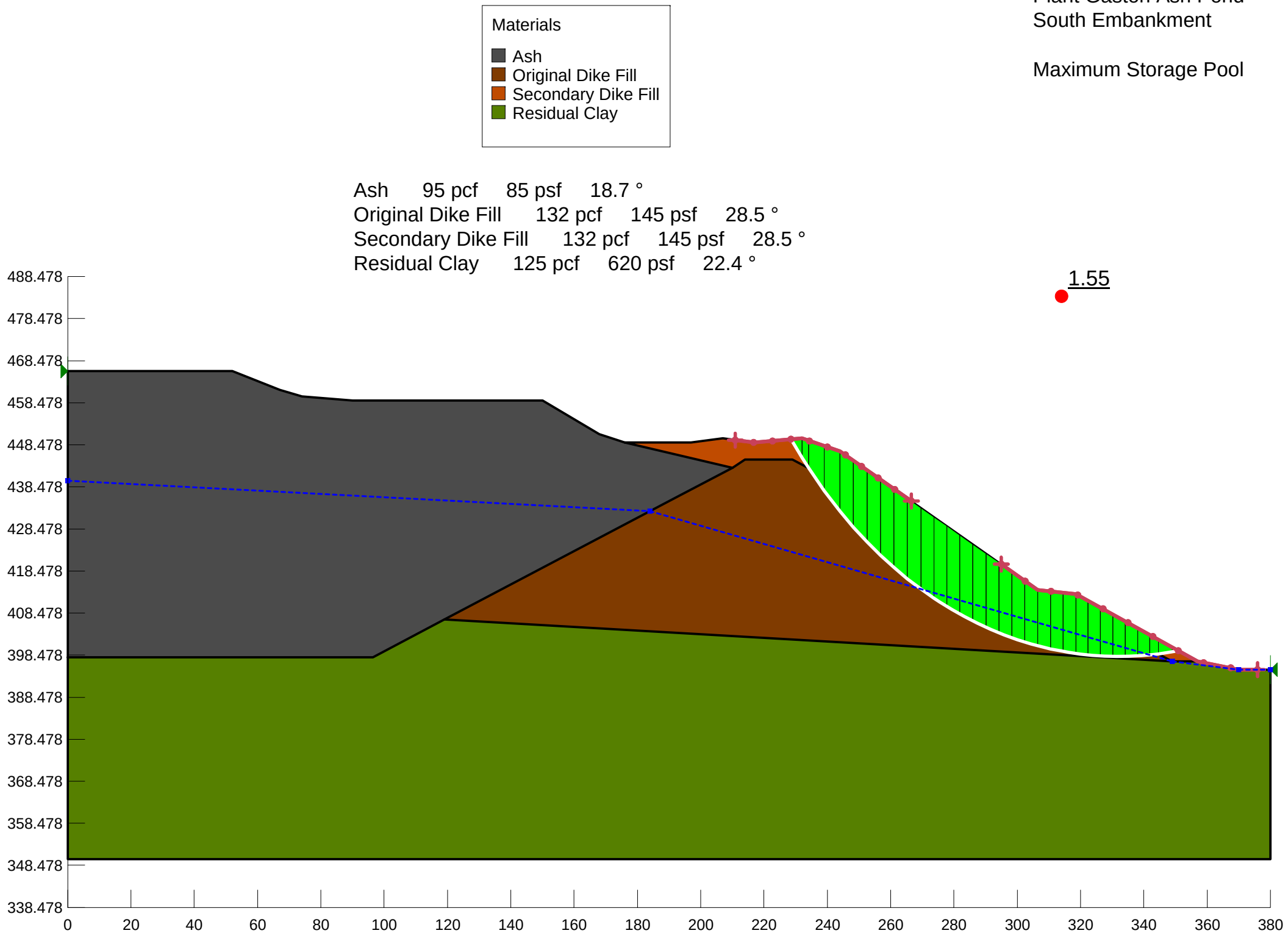
- The design parameters for the materials comprising the ash pond dike were obtained from historic boring logs and laboratory test results.
- Dike geometry was determined by reviewing section drawings from the design phase of the pond construction, and from recent LiDAR and bathymetric surveys.

Body of Calculation

Slope/W modeling is attached.

Plant Gaston Ash Pond
South Embankment

Maximum Storage Pool

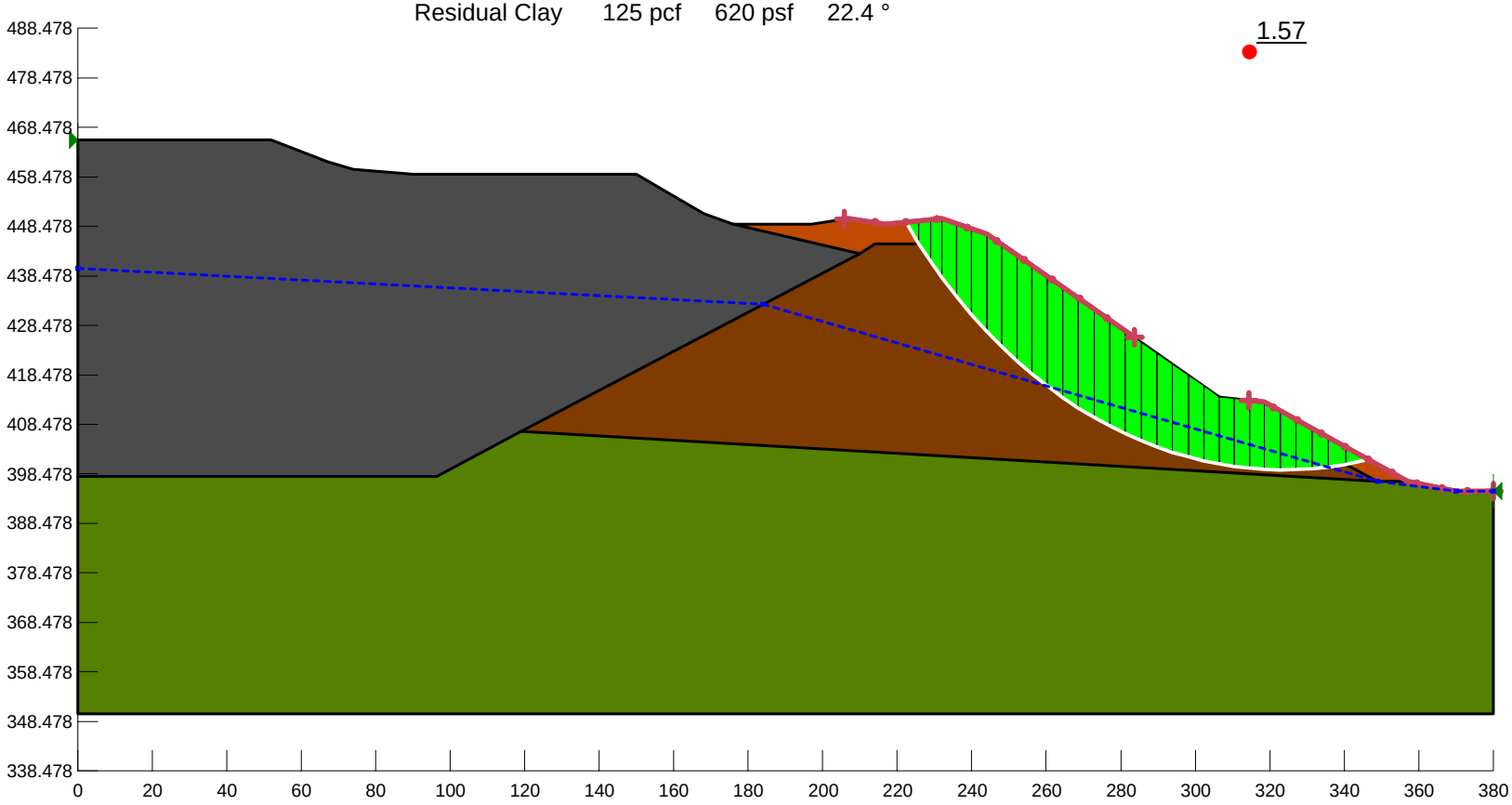


Plant Gaston Ash Pond
South Embankment

Maximum Surcharge Pool

Materials
- Ash
- Original Dike Fill
- Secondary Dike Fill
- Residual Clay

Ash	95 pcf	85 psf	18.7 °
Original Dike Fill	132 pcf	145 psf	28.5 °
Secondary Dike Fill	132 pcf	145 psf	28.5 °
Residual Clay	125 pcf	620 psf	22.4 °



Plant Gaston Ash Pond
South Embankment

Seismic Loading
Kh = 0.064g

Materials
- Ash
- Original Dike Fill
- Secondary Dike Fill
- Residual Clay

Ash	95 pcf	85 psf	18.7 °
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