INITIAL SAFETY FACTOR ASSESSMENT
40 C.F.R. PART 257.73
PLANT MCINTOSH ASH POND (AP-1)
GEORGIA 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 initial and periodic safety factor assessments. The owner or operator of the CCR unit must conduct an assessment and document whether the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) for the critical cross section of the embankment are achieved.

The CCR surface impoundment known as Plant McIntosh AP-1 is located on Plant McIntosh property, east of Rincon, Georgia. AP-1 is formed by an engineered perimeter embankment. The critical cross-section of AP-1 has been determined to be on the eastern side of Cell C.

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)	1.8	1.5
Maximum Surcharge Pool (Static)	1.8	1.4
Seismic	1.5	1.0

The embankments of AP-1 are constructed of 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).

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SOUTHERN COMPANY

Engineering and Construction Services Calculation

Calculation Number:
TV-MC-GPC603878-591-001

Project/Plant:	Unit(s):	Discipline/Area:
Plant McIntosh Ash Pond	-	ES&FS
Title/Subject: Slope Stability Analysis of Ash Pond Dike		
Purpose/Objective: Analyze Slope Stability of the Ash Pond Dike		
System or Equipment Tag Numbers: NA	**Originator:** Wayne Wang, P.E.	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for CCR Compliance	WW / 10-5-16	ARW / 10-5-16	JCP / 10-5-16

Notes:

Purpose of Calculation

Georgia Power Company's Plant McIntosh is comprised of nine generating units. Eight of the units are combustion turbine generators and one is a coal fired unit. The coal unit was originally designed to burn fuel oil but was converted to coal in 1982. The ash pond was commissioned in 1982.

The purpose of this calculation is to check the stability of the dike of Ash Pond 1 using current software.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2012 (Version 8.15, Build 11777), Copyright 1991-2016, GEO-SLOPE International, Ltd

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

Morgenstern-Price analytical method was reported.

Criteria and Assumptions

The slope stability model was run using the following assumptions:

- 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 0.049g for use as a horizontal acceleration in the stability analysis.

- The stability of the Plant McIntosh Ash Pond Dike is based on the safety factor requirements from EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (40 C.F.R. Part 257 and Part 261) subsection §257.73(e).

Ash Pond

- The critical section has been determined to be located on the eastern side of Cell C. This critical section is shown on Drawing ES1896S2
- Normal pool elevation is 59 ft.
- Maximum surcharge pool elevation is 60.4 ft based on the Hydrologic and Hydraulic Study Calculations for the Ash Pond prepared by Southern Company Services, Inc.
- 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:

Table 1: Summary of Ash Pond Material Properties.

Soil Description	Moist Unit Weight, pcf	Effective Stress Parameters		Total Stress Parameters	
		Cohesion, psf	Phi Angle, degrees	Cohesion, psf	Phi Angle, degrees
Clay Dike Fill 1	122	338	36.9	576	18.2
Clay Dike Fill 2	120	300	18	500	12
Clay Dike Fill 3	125	878	15.3	1066	8.8
Sand	112	0	38.7	159	25.1
Loose Sand	112	0	25	0	25

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.

Hydraulic Considerations

The normal pool elevation of the Ash Pond is 59 ft, based on plant operations. The maximum storage water elevation is based on the Hydrologic and Hydraulic Study Calculations for the Ash Pond prepared by Southern Company Services, Inc. This calculation states the Plant McIntosh Ash Pond is capable of handling the 100-year 24-hour storm event with a maximum surcharge pool elevation of 60.4 ft. The water level in the dike was determined using the high water level reading in piezometer M-6 of 49.3 ft. For the purposes of this evaluation, it is also assumed that the water level will be retained above Clay Dike Fill 2.

Loading Conditions

The Plant McIntosh Ash Pond Dike was evaluated for the loading conditions indicated in the Table 2.

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 of the analyses are summarized below.

Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	1.8	1.5
Maximum Surcharge Pool (Static)	1.8	1.4
Seismic	1.5	1.0

Design Inputs/References

USGS Earthquake Hazards website, http://earthquake.usgs.gov/hazards/hazmaps/.

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

Hydrologic and Hydraulic Study Calculations for the Ash Pond prepared by Southern Company Services, Inc.

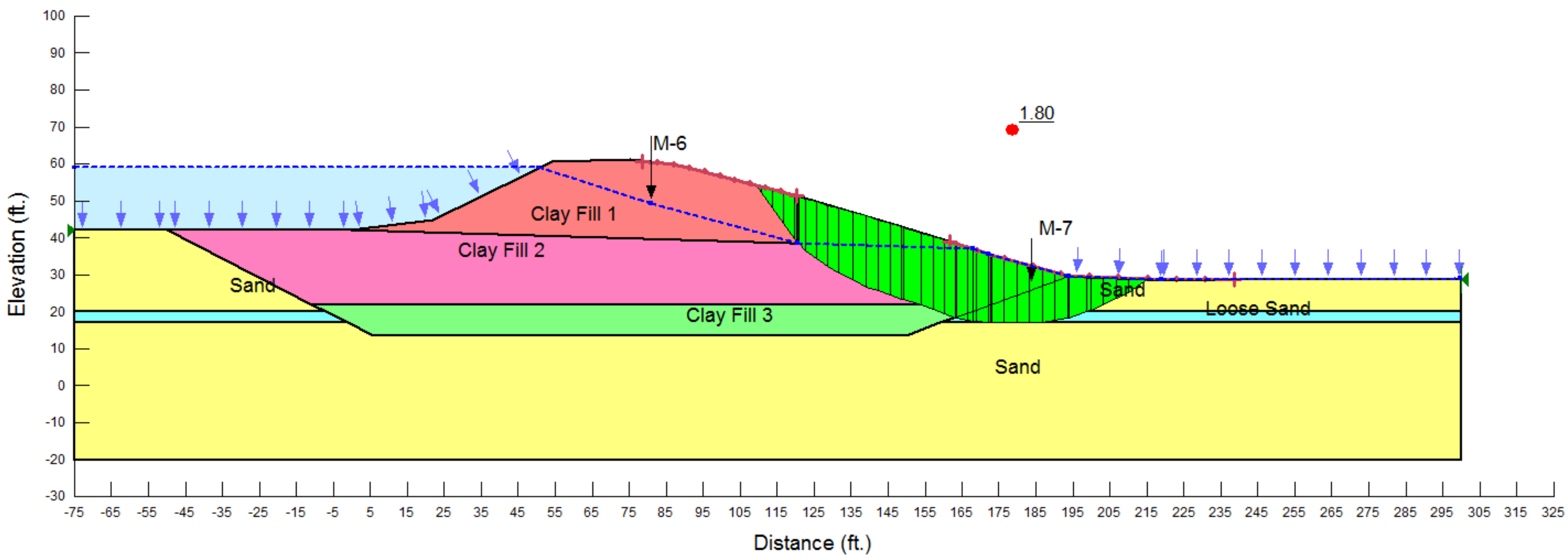
Georgia Power Company Drawing ES1896S2 – Boring and Well Locations and Cross Sections A-A’ and B-B’

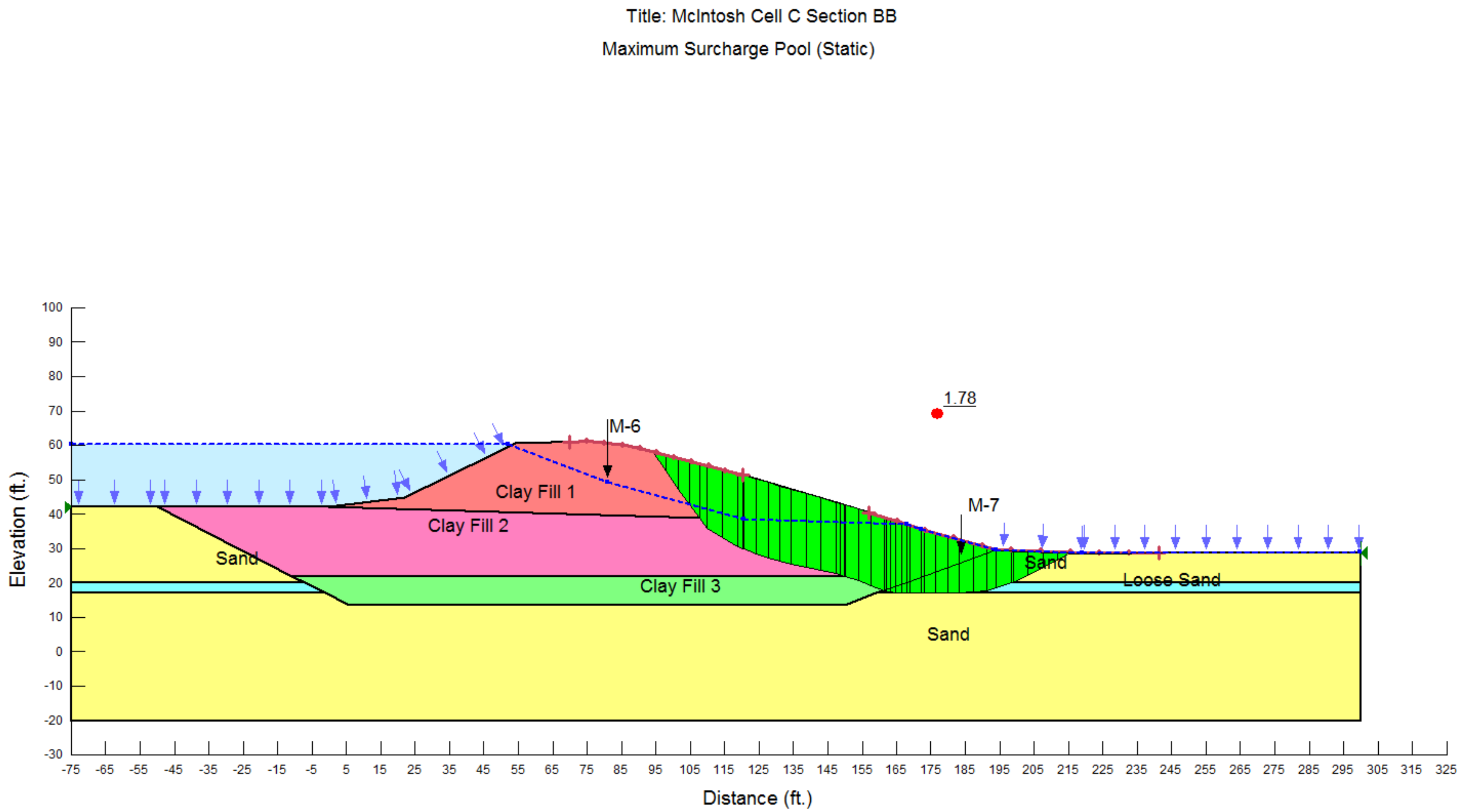
Body of Calculations

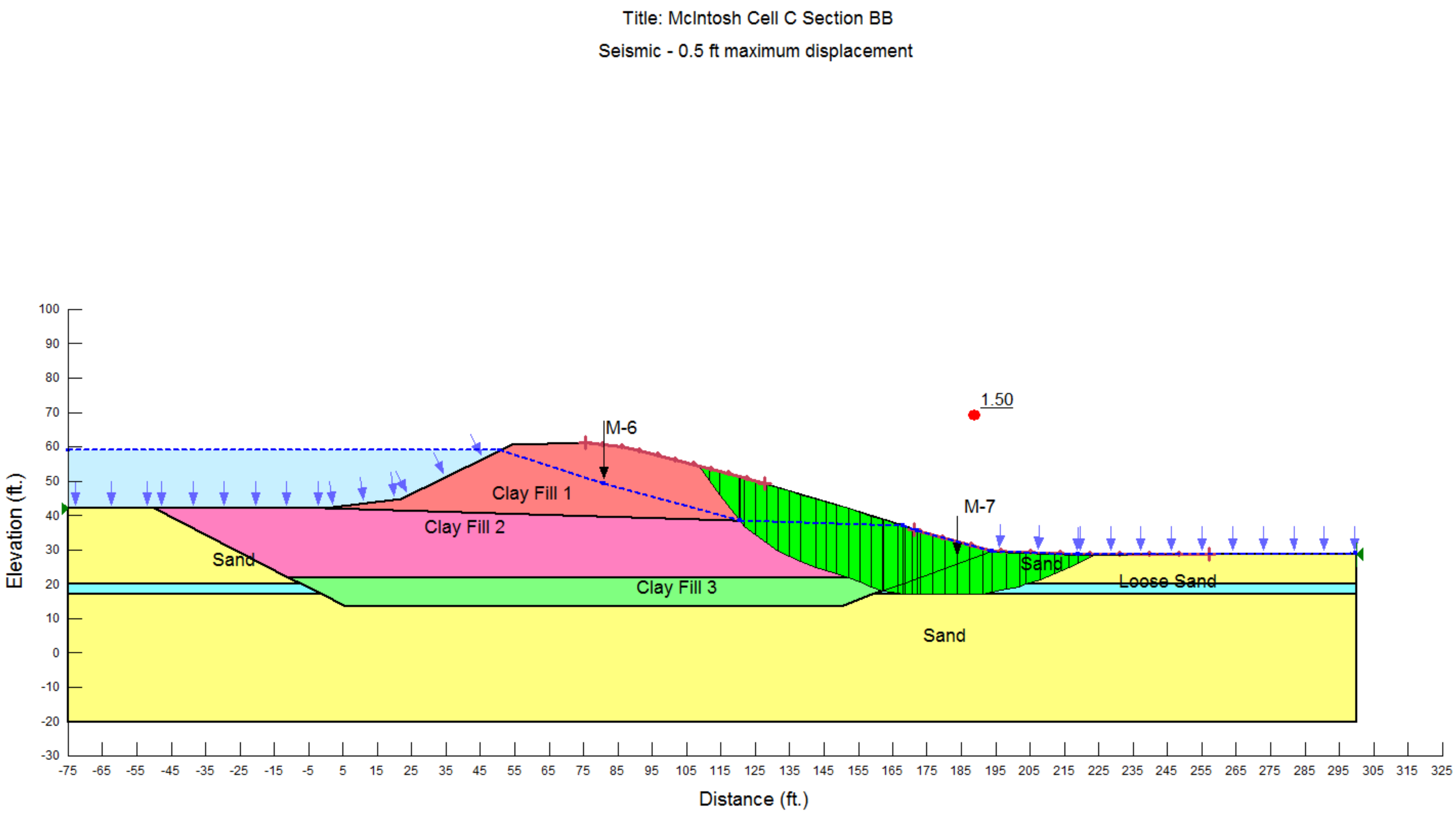
Calculation consists of Slope/W modeling attached.

Title: McIntosh Cell C Section BB

Long-Term Maximum Storage Pool (Static)

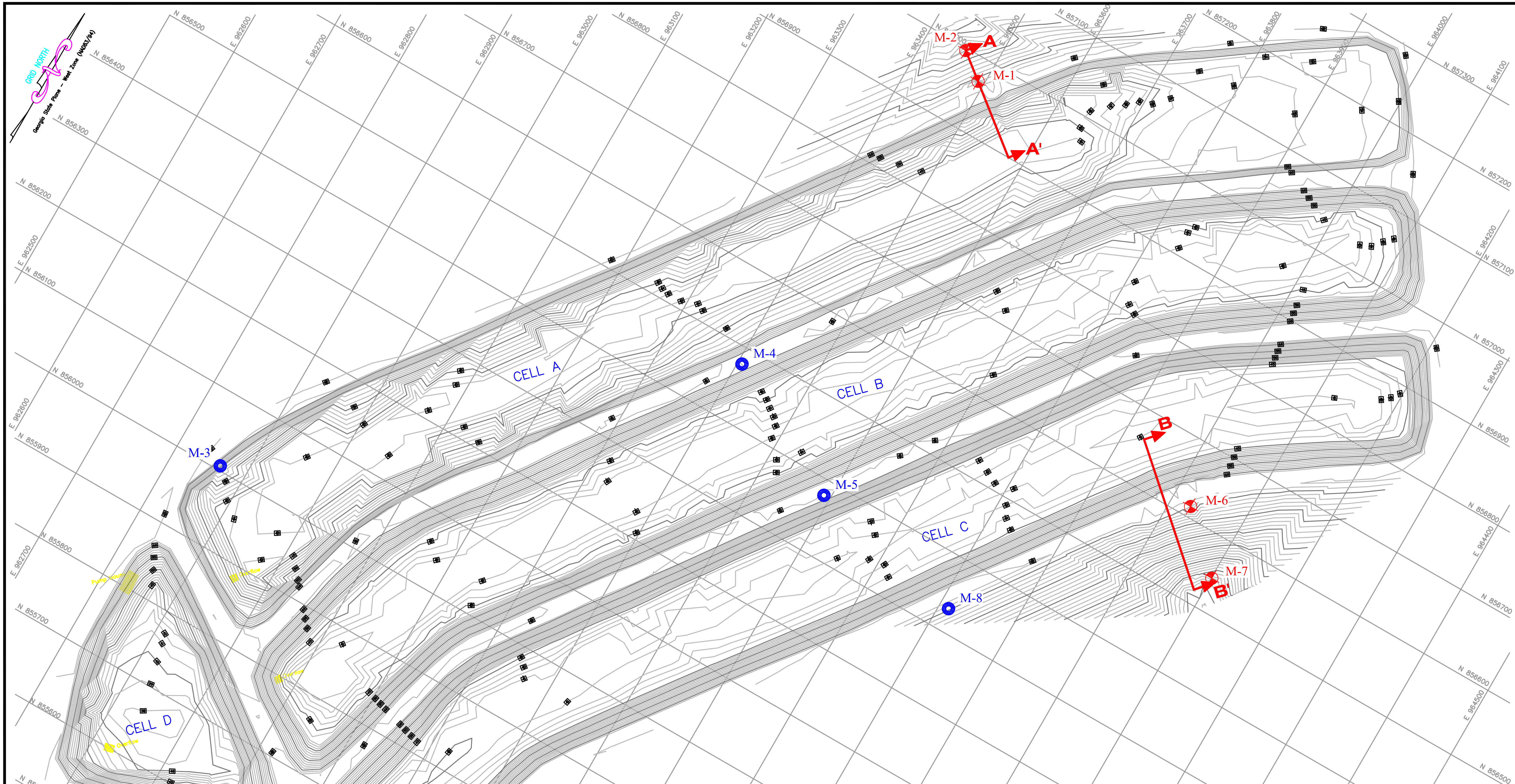



Title: McIntosh Cell C Section BB
Maximum Surcharge Pool (Static)
1.78
M-6
M-7
Clay Fill 1
Clay Fill 2
Clay Fill 3
Sand
Sand
Loose Sand
Sand
Elevation (ft.)
Distance (ft.)
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-75 -65 -55 -45 -35 -25 -15 -5 5 15 25 35 45 55 65 75 85 95 105 115 125 135 145 155 165 175 185 195 205 215 225 235 245 255 265 275 285 295 305 315 325


Title: McIntosh Cell C Section BB
Seismic - 0.5 ft maximum displacement
1.50
M-6
M-7
Clay Fill 1
Clay Fill 2
Clay Fill 3
Sand
Sand
Loose Sand
Sand
Elevation (ft.)
Distance (ft.)

Attachment A

Reference Drawing ES1896S2



Legend:

M-7 Well

M-3 Soil Boring

GRAPHIC SCALE

125 0 125 250

(IN FEET)
1 inch =125 ft.

BY	CHK'D	DATE

Southern Company Generation Engineering and Construction Services

FOR

Georgia Power Company

ATTACHMENT A – FIGURE 1
PLANT MCINTOSH CALC. # TV-MC-3160BW-001
BORING & WELL LOCATIONS
CROSS SECTIONS A-A' & B-B'

SCALE	DRAWING NUMBER	SHEET	CONT'D	REV
AS SHOWN	ES1896S2	1	FINAL	0