PERIODIC SAFETY FACTOR ASSESSMENT
391-3-4-.10(4) and 40 C.F.R. PART 257.73
PLANT MCINTOSH ASH POND (AP-1)
GEORGIA POWER COMPANY

The Federal CCR Rule, and, for Existing Surface Impoundments where applicable, the Georgia CCR Rule (391-3-4-.10) require the owner or operator of a CCR surface impoundment to conduct initial and periodic safety factor assessments. *See* 40 C.F.R. § 257.73(e); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b)[1]. The owner or operator must conduct an assessment of the CCR unit and document that the minimum safety factors outlined in § 257.73(e)(1)(i) through (iv) for the critical embankment section are achieved. In addition, the Rules require a subsequent assessment be performed within 5 years of the previous assessment. ***See*** 40 C.F.R. § 257.73(f)(3); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b) [1].

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 was previously determined to be on the eastern side of Cell C. Under current conditions, the critical section remains on the eastern side of Cell C. The Notification of Intent to Initiate Closure was placed in the Operating Record on 4/17/2019 and closure has been designed to have no negative impacts on the stability of the perimeter embankment. Closure by removal activities have substantially dewatered and removed all CCR from AP-1.

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	1.4	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.

[1] In a typographical error, 391.3-4.10(4)(b) references the “structural integrity criteria in 40 CFR 247.73,” when the reference to such criteria should be 40 CFR 257.73.

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

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Southern Company

Technical and Project Solutions Calculation

Calculation Number:
TV-MC- GPC1259025 -001

Project/Plant: Plant McIntosh Ash Pond	**Unit(s):** -	**Discipline/Area:** Env. Solutions
Title/Subject: Periodic Factor of Safety Assessment for CCR Rule		
Purpose/Objective: Determine the Factor of Safety of the Ash Pond Dike		
System or Equipment Tag Numbers: n/a	**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/06-08-21	JCP/06-08-21	JCP/06-08-21

Notes:

Purpose of Calculation

The Plant McIntosh Ash Pond was originally commissioned in 1982, to receive ash from the plant's single coal-burning unit. The unit has since been decommissioned. The purpose of this calculation is to update the 2016 stability analysis of the Ash Pond dike.

Summary of Conclusions

The following table lists the factors of safety for various slope stability failure conditions. All conditions are steady state except where noted. Construction cases were not considered. The analyses indicate that in all cases the factor of safety is above the require minimum.

Load Conditions	Computed Factor of Safety	Required Minimum Factor of Safety
Long-term Maximum Storage (Static)	1.8	1.5
Maximum Surcharge Pool (Static)	1.8	1.4
Seismic	1.4	1.0

Methodology

The calculation was performed using the following methods and software:

- GeoStudio 2021 R2 version 11.1.1.22085 Copyright 1991-2021, GEO-SLOPE International, Ltd.
- Strata (Version 0.8.0),University of Texas, Austin
- Morgenstern-Price analytical method

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- 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 2014 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 0.065g for use as a horizontal acceleration in the stability analysis.

- The current required minimum criteria (factors of safety) were taken from the Structural Integrity Criteria for existing CCR surface impoundment from 40 CFR 257.73, published April 17, 2015.

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

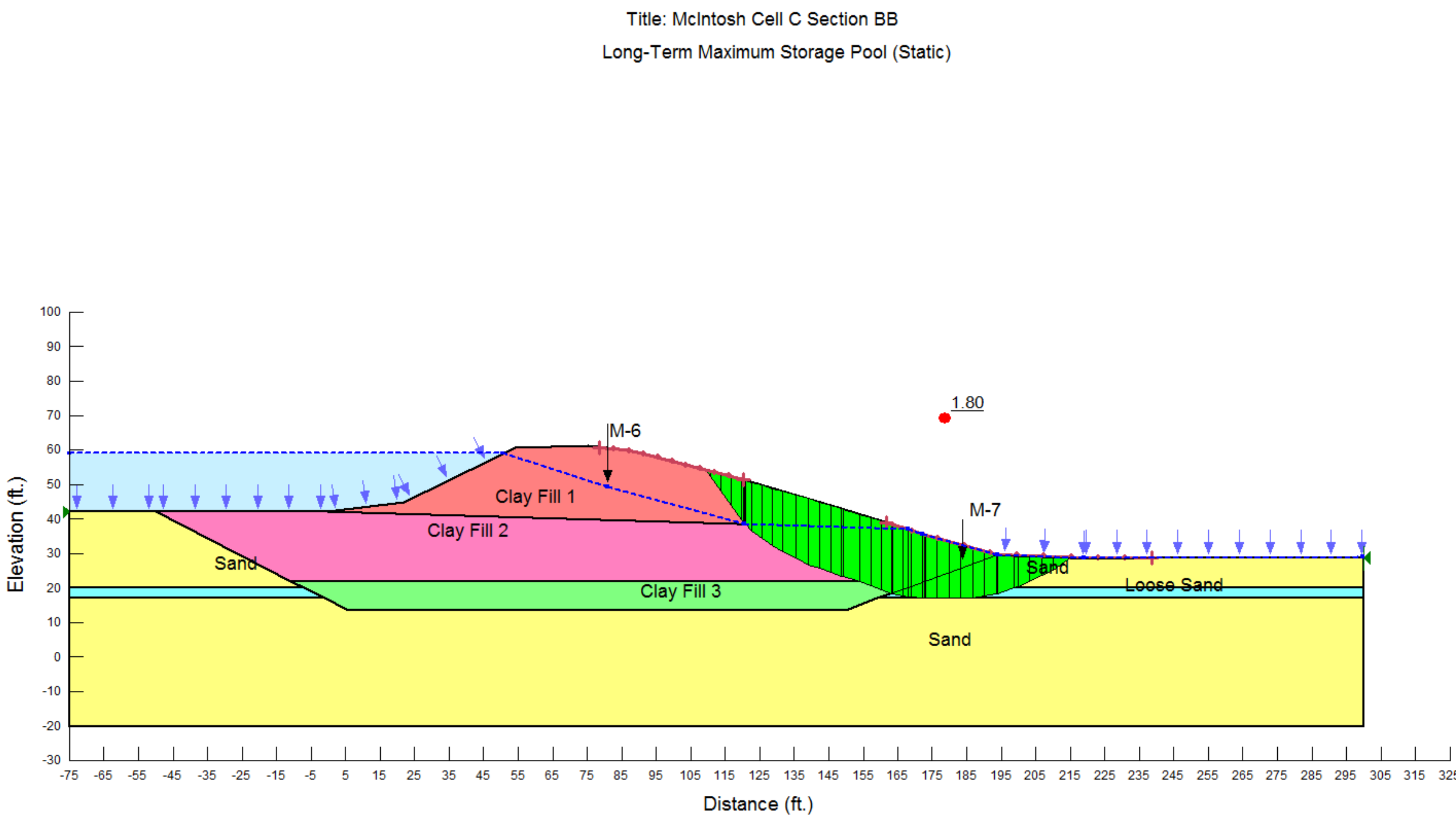
The Plant McIntosh Ash Pond Dike was evaluated for the maximum storage, maximum surcharge, and seismic loading conditions.

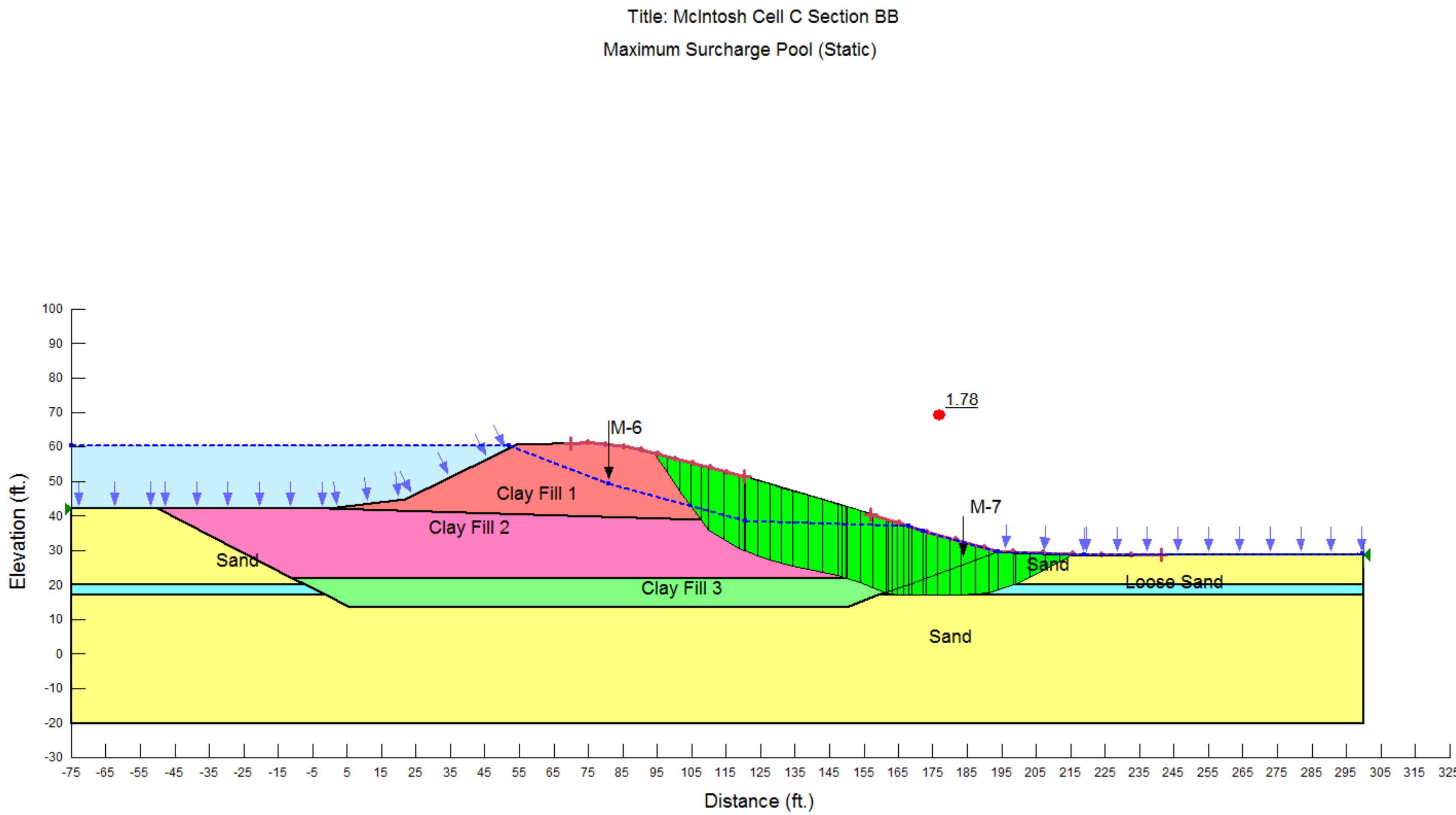
Design Inputs/References

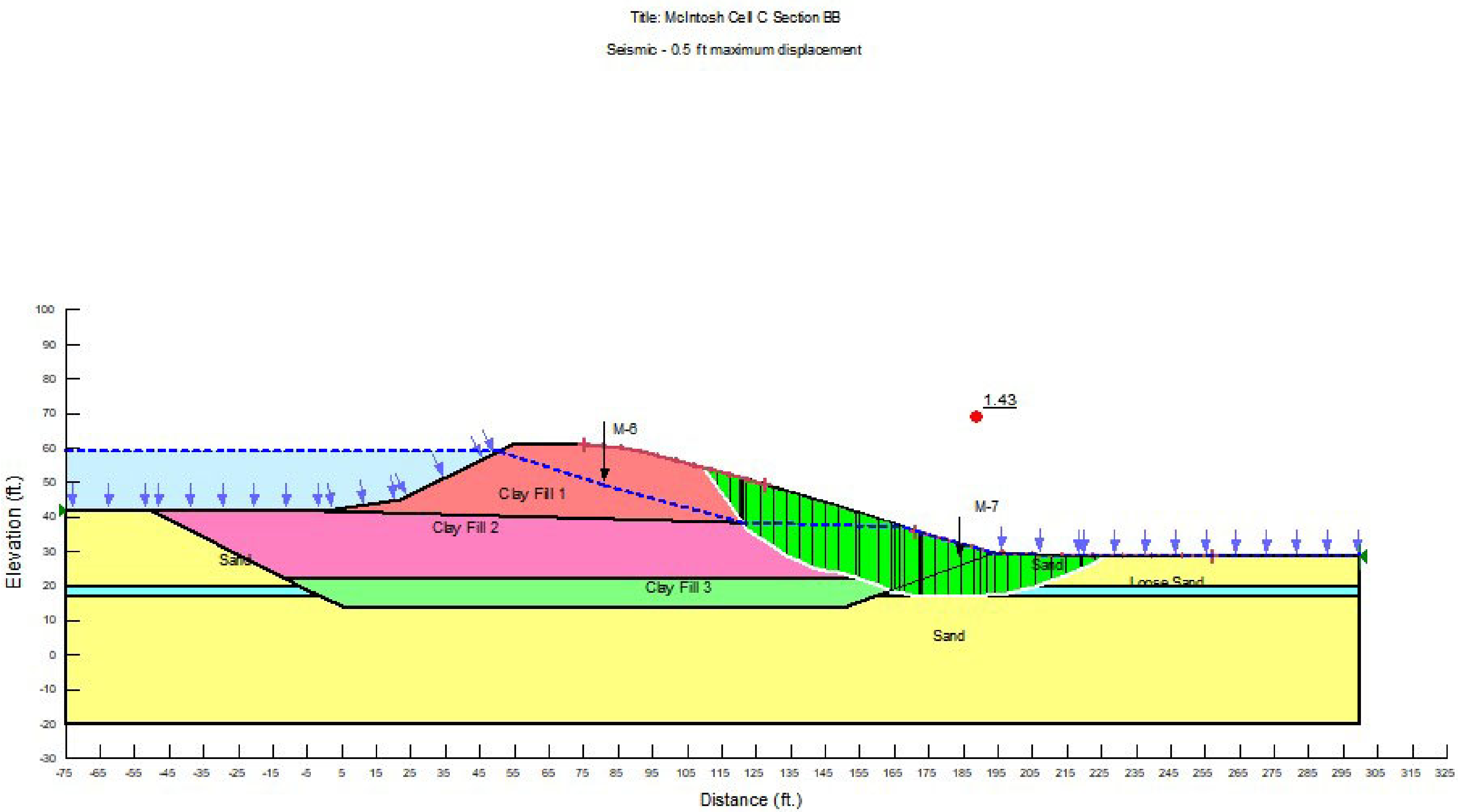
E&CS Calculation TV-MC-GPC603878591-001
USGS Earthquake Hazards website, http://earthquake.usgs.gov/hazards/hazmaps/.
Bray, J. D. and Travasarou, T., *Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation*, Journal of Geotechnical and Environmental Engineering, American Society 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 Calculation

SLOPE/W modeling attached.

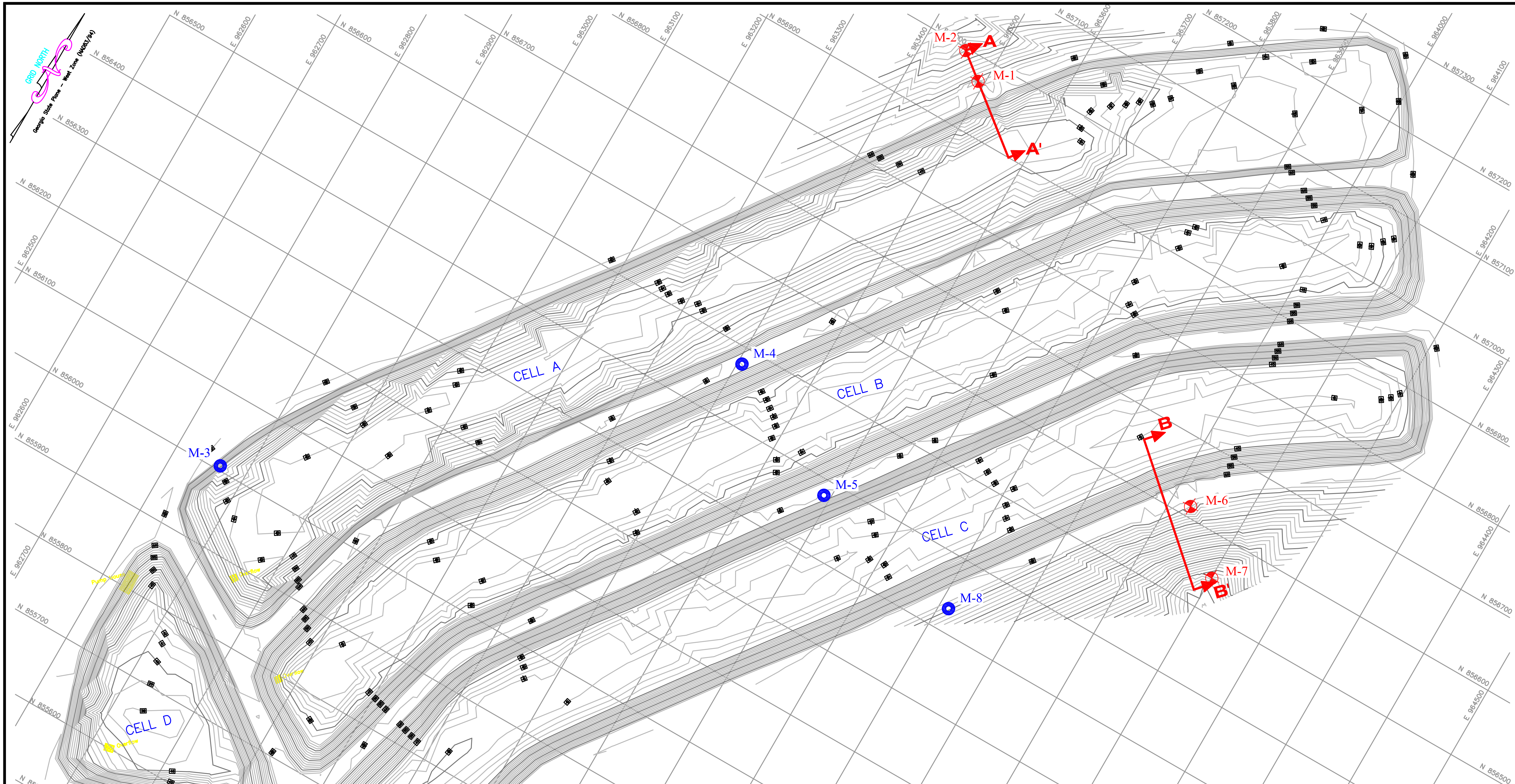

Title: McIntosh Cell C Section BB
Long-Term Maximum Storage Pool (Static)
1.80
M-6
M-7
Clay Fill 1
Clay Fill 2
Clay Fill 3
Sand
Sand
Loose Sand
Sand
Elevation (ft.)
Distance (ft.)


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
Sand
Loose Sand
Elevation (ft.)
Distance (ft.)


Title: McIntosh Cell C Section BB
Seismic - 0.5 ft maximum displacement
1.43
M-6
M-7
Clay Fill 1
Clay Fill 2
Clay Fill 3
Sand
Loose Sand
Elevation (ft.)
Distance (ft.)

Attachment A

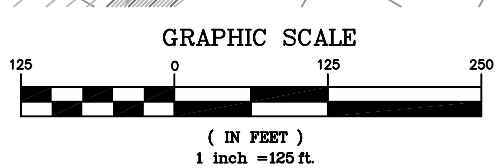
Reference Drawing ES1896S2



Legend:

M-7 Well

M-3 Soil Boring



CONFIDENTIAL BUSINESS INFORMATION

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

BY	CHK'D	DATE

Southern Company Generation Engineering and Construction Services

FOR

Georgia Power Company

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