CLECO CAJUN LLC

BIG CAJUN II POWER PLANT

NEW ROADS, POINTE COUPEE PARISH, LOUISIANA

5-YEAR PERIODIC REVIEW
SAFETY FACTOR ASSESSMENT

BOTTOM ASH BASIN

OCTOBER 2021

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Providence Project No: 996-018

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1.0 INTRODUCTION

Providence was contracted by Cleco Cajun LLC (Cleco) to conduct the 5-year periodic review of the safety factor assessment of the Bottom Ash Basin at Cleco's Big Cajun II (BCII) Power Plant.

The Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(e)(1) established requirements for owners and operators to conduct safety factor assessments to document whether the calculated factors of safety for the Bottom Ash Basin achieve the minimum safety factors specified below:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

This 5-year periodic review of the safety factor assessment pertains to the Bottom Ash surface impoundment (Basin) that is utilized for the BCII coal-fired generation unit. BCII is located at 10431 Cajun II Road, New Roads, Pointe Coupee Parish, Louisiana. A site location map showing the BCII Power Plant is included as **Figure 1.** The Bottom Ash Basin is shown in **Figure 2**.

2.0 BOTTOM ASH BASIN BACKGROUND

The Bottom Ash Basin is located west of the BCII Power Plant. It is bordered on the west by the Fly Ash Basin, on the north by wooded property and agricultural land, on the east by treatment ponds, and on the south by wooded property and grassy fields.

The Bottom Ash Basin has approximately 66 acres waste surface area. It was constructed above natural grade with a base elevation of approximately 30 feet MSL with a surrounding berm with a crest of 48-foot MSL.

The Bottom Ash Basin has an approximate storage capacity of 1,188 acre-feet with a permitted total ash storage capacity of 2,585,000 cubic yards. The soils underlying the Bottom Ash Basin consists of naturally occurring and/or recompacted clay soil that is a minimum 3 feet thick to over 10 feet thick in some areas.

3.0 FACTORS OF SAFETY

Providence performed a review of the 2016 safety factor analysis (slope stability analysis) for the levees surrounding the Bottom Ash Basin. This analysis required a review of the previous permitting and construction drawings for the Bottom Ash Basin, a review of the topographic survey of the perimeter levees of the Bottom

Ash Basin, a review of borings in the perimeter levees for the soil conditions that exist within the perimeter levee system for these basins, and a review of the safety factor models and calculations.

Providence reviewed the cross sections for the Bottom Ash Basin and noted the following information from the 2016 CB&I report:

Table 1 Subsurface Soil Classification and Parameters

	Soil Type	Elevation (ft)	Unit Wt. (lb/ft^3)	Cohesion (lb/ft^2)	Friction Angle(Φ)
Bottom Ash Basin General Soil Profile	**Stiff Clay**	30 to 26	114	1,000	0
	Soft Clay	26 to 20	114	500	0
	Soft Clay	20 to 10	114	400	0
	Medium Sand	10 to 0	117	0	20
	Medium to Dense Sand	0 to -10	117	0	25
	Dense Sand	-10 to -50	117	0	30

The safety factor analysis uses the strength of the soil material of which the levee is made of and subgrade to assess levee stability in accordance with the existing conditions. The Spencer Method for slope stability was used since it is the most conservative approach. The Spencer Method is a general method of slices developed on the basis of limit equilibrium. It requires satisfying equilibrium of forces and moments acting on individual blocks. The blocks are created by dividing the soil above the slip surface by dividing planes. Deep failure analysis evaluates the potential of the levees to fail through the bottom of the levees into the existing native soils. The analysis was based upon the following assumptions and input parameters.

- The subgrade stratigraphy was modeled using soil profiles from completed soil borings at the site.
- The slope stability analysis was conducted for slopes at two (2) cross-sections for the Bottom Ash Basin with and without consideration of seismic loads. These included the slope stability analysis at the existing slope and the proposed final slope of the Bottom Ash Basin.
- Natural groundwater level assumed to be at ground level.
- Water elevations in the Bottom Ash Basin were based on static maximum storage pool (elevation +38 feet) and static maximum surcharge pool (elevation +39.9 feet).

The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50

Providence reviewed the 2016 CB&I report and the results of the long-term, static maximum storage pool factor of safety values. The current operational status of the Bottom Ash Basin has not changed since 2016. After a review of the results of

the 2016 slope stability analysis, Providence has determined that the following minimum factors of safety will remain the same:

Table 2 Long-Term Factors of Safety

Surface Impoundment	Slope Scenario	Storage Pool Elevation (feet)	Calculated Factor of Safety	Required Factor of Safety
Bottom Ash Basin	Existing Slope	38.0	1.50	1.50
Bottom Ash Basin	Proposed Capped Slope	38.0	1.60	1.50

The calculated long-term static factor of safety under maximum storage pool loading conditions is greater than or equal to 1.50, therefore these safety factors are adequate.

The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40

Providence reviewed the 2016 CB&I report and the results of the static maximum surcharge pool factor of safety values. The current operational status of the Bottom Ash Basin has not changed since 2016. After a review of the results of the 2016 slope stability analysis, Providence has determined that the following minimum factors of safety will remain the same:

Table 3 Short-Term Factors of Safety

Surface Impoundment	Slope Scenario	Storage Pool Elevation (feet)	Calculated Factor of Safety	Required Factor of Safety
Bottom Ash Basin	Existing Slope	39.9	1.48	1.40
Bottom Ash Basin	Proposed Capped Slope	39.9	1.58	1.40

The calculated short-term static factor of safety under maximum surcharge pool loading conditions is greater than 1.40, therefore these safety factors are adequate.

The calculated seismic factor of safety must equal or exceed 1.00

The Louisiana Geological Survey and the United States Geological Survey classifies the entire state of Louisiana as a low seismic risk area. This low seismic risk classification denotes that the levels of horizontal shaking have a 2 in 100 chance of being exceeded in a 50-year period (coefficient,Kh = 0.05).

Providence reviewed the 2016 CB&I report and the results of the seismic maximum surcharge pool factor of safety values. The current operational status of the Bottom Ash Basin has not changed since 2016. After a review of the results of the 2016

slope stability analysis, Providence has determined that the following minimum factors of safety will remain the same:

Table 4 Seismic Factors of Safety

Surface Impoundment	Slope Scenario	Storage Pool Elevation (feet)	Calculated Factor of Safety	Required Factor of Safety
Bottom Ash Basin	Existing Slope	38.0	1.12	1.0
Bottom Ash Basin	Proposed Capped Slope	38.0	1.19	1.0
Bottom Ash Basin	Existing Slope	39.9	1.11	1.0
Bottom Ash Basin	Proposed Capped Slope	39.9	1.18	1.0

The calculated seismic static factor of safety is greater than 1.0, therefore these safety factors are adequate.

For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.2

The medium to dense sands and dense clay soils in the Bottom Ash Basin levees are able to resist earthquake motions and acceleration and therefore these soils are not subject to liquefaction.

4.0 CONCLUSIONS

After a review of the 2016 results from the safety factor analysis, the existing levee design for the Bottom Ash Basin achieves the minimum safety factor requirements of the 40 CFR 257.73(e)(1) CCR regulations. **Appendix A** contains a P.E. Certification that attests to the 5-year periodic safety factor assessment of the Bottom Ash Basin.

5.0 REFERENCES

The following reports/documents were used to prepare this 5-year periodic review of the safety factor assessment for the Bottom Ash Basin:

CB&I Environmental & Infrastructure, Inc.; 2016; Big Cajun II CCR Compliance, Fly Ash and Bottom Ash Basin Structural Integrity Assessment Report, NRG Louisiana Generating, LLC, NRG Energy, Inc., New Roads, Louisiana.

Geosyntec Consultants; 2020; Big Cajun II Power Plant; CCR Surface Impoundment Annual Inspection Report, Cleco Cajun LLC, New Roads, Louisiana.

Environmental Protection Agency; 2015; 40 CFR Parts 257 and 261 Rules and Regulations, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, Volume 80, No. 74; Final Rule.

GeoEngineers, Inc.; 2011 (May); Preliminary Geotechnical Engineering Services, Ash Basins/Wastewater Treatment Ponds, Big Cajun II Generating Site, New Roads, Pointe Coupee Parish, Louisiana.

GeoEngineers, Inc.; 2011 (September); Embankment Dike Inspections Services, Ash Basins/Wastewater Treatment Ponds, Big Cajun II Generating Site, New Roads, Pointe Coupee Parish, Louisiana.

GeoEngineers, Inc.; 2012; Geotechnical Engineering Services Report, Big Cajun II Generating Site, New Roads, Pointe Coupee Parish, Louisiana.

GeoEngineers, Inc.; 2014; Preliminary Geotechnical Engineering Services, Ash Basins/Wastewater Treatment Ponds, Big Cajun II Generating Site, New Roads, Pointe Coupee Parish, Louisiana.

GeoEngineers, Inc.; 2015; Dike Slope and Failure Evaluations, Ash Basin Ponds, Big Cajun II Generating Site, New Roads, Pointe Coupee Parish, Louisiana.

Louis J. Capozzoli and Associates, Inc.; 1974; Preliminary Subsoil Investigation and Foundation Design Data, Big Cajun 2, Site C-2, New Roads, Louisiana, File No. 74-30.

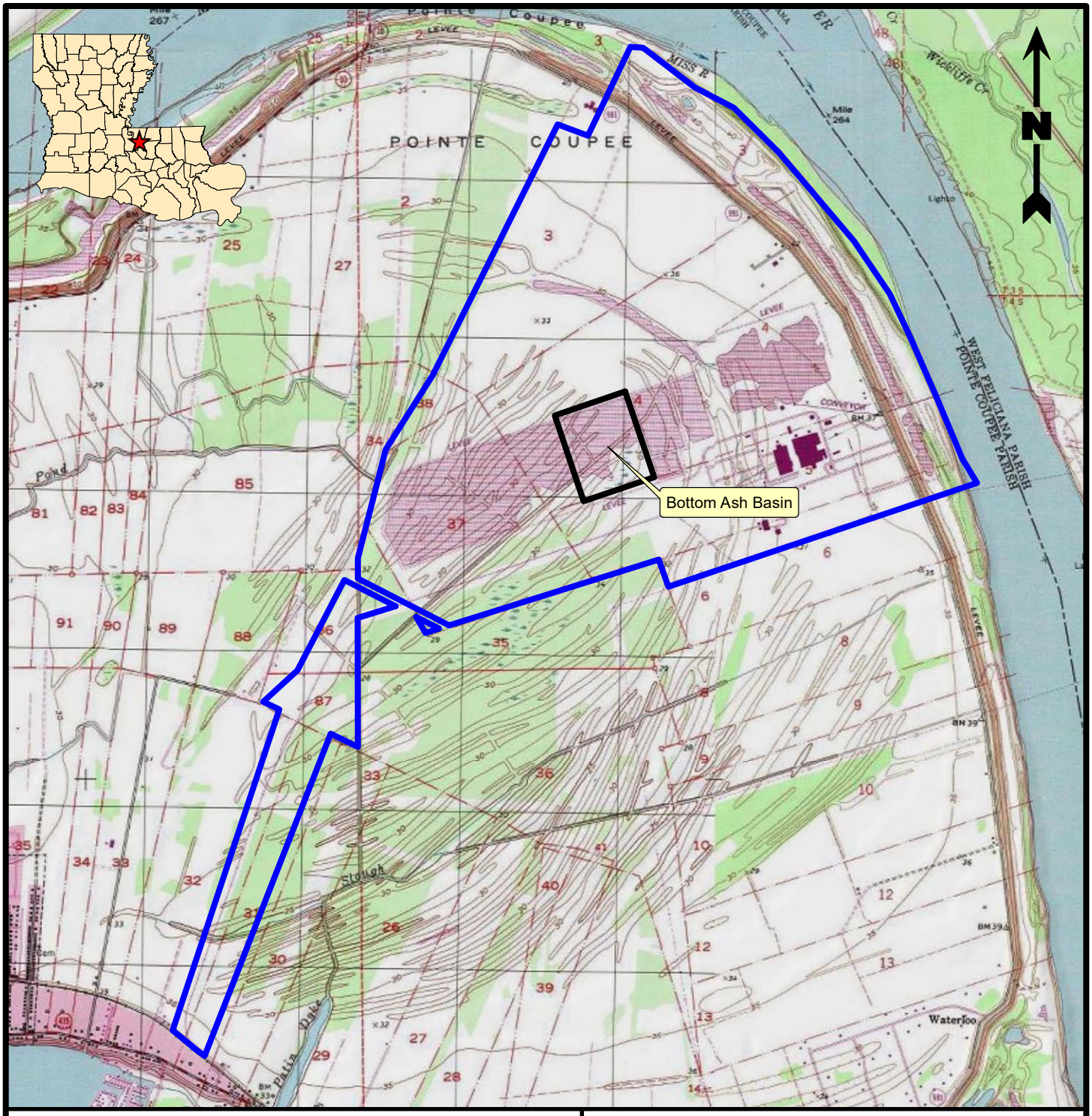
Louis J. Capozzoli and Associates, Inc.; 1977; Preliminary Subsurface Soil Investigation and Laboratory Testing, Ash Storage Area, CEPCO No. 2, Plant Site, New Roads, Louisiana.

Louis J. Capozzoli and Associates, Inc.; 2006; Geotechnical Investigation, Bottom Ash Storage Pond Expansion; Big Cajun No. 2, Pointe Coupee Parish Plant Site, Louisiana, LJC&A File 0558.

Providence Engineering and Environmental Group LLC; November 2019; Type I Industrial Surface Impoundments Permit Renewal Application P-0108R1 prepared for Louisiana Generating LLC, Big Cajun II Power Plant, New Roads, Pointe Coupee Parish, Louisiana.

FIGURE 1

SITE LOCATION MAP



Legend

- Property Boundary
- Facility Boundary

Reference

Base map comprised of United States Geological Survey (USGS) 7.5-minute topographic maps, "St. Francisville, LA", "Elm Park, LA", "New Roads, LA", and "Port Hudson, LA".

Site Location Map

5-Year Periodic Review
Safety Factor Assessment - Bottom Ash Basin
New Roads, Pointe Coupee Parish, Louisiana

Cleco Cajun LLC
Big Cajun II

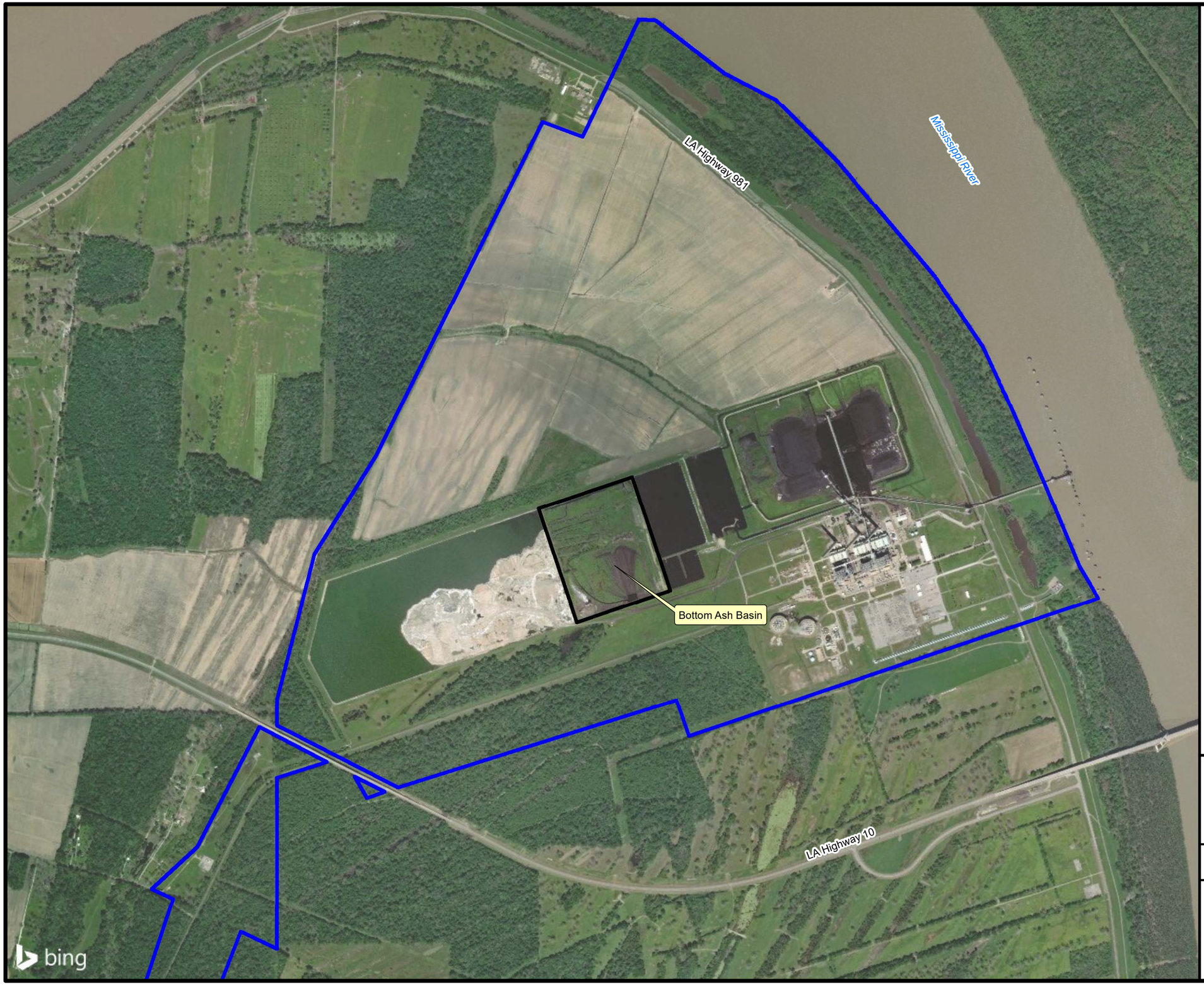
PROVIDENCE

Drawn By	LMH	10/08/21
Checked By	LMH	10/08/21
Approved By	CVH	10/08/21

Project Number	996-018
Drawing Number	996-018-A003
1	Figure

FIGURE 2

SITE MAP



N

Legend

- Property Boundary
- Facility Boundary

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2021 Microsoft Corporation and its data suppliers.

1,500 750 0 1,500 Feet

Site Map

5-Year Periodic Review
Safety Factor Assessment - Bottom Ash Basin
New Roads, Pointe Coupee Parish, Louisiana

Cleco Cajun LLC
Big Cajun II

PROVIDENCE

Drawn By	LMH	10/08/21
Checked By	LMH	10/08/21
Approved By	CVH	10/08/21

Project Number 996-018

Drawing Number 996-018-B011

2 Figure

APPENDIX A

P.E. CERTIFICATION

BIG CAJUN II POWER PLANT
BOTTOM ASH BASIN
5-YEAR PERIODIC REVIEW - CCR SAFETY FACTOR ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed the 5-year periodic review of the safety factor assessment for Cleco Cajun LLC (Cleco) Big Cajun II Power Plant Bottom Ash Basin in accordance with the 40 CFR 257.73(e)(1) CCR requirements. This 5-year periodic review of the safety factor assessment has determined that the Bottom Ash Basin continues to meet the following requirements:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.

And that the requirement below is not applicable based on the findings:

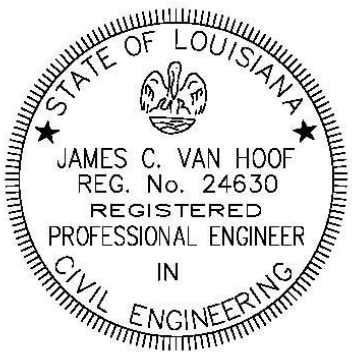
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

October 15, 2021
Date



(Seal)