

CLECO POWER LLC

BRAME ENERGY CENTER



5-YEAR PERIODIC REVIEW

HAZARD POTENTIAL CLASSIFICATION

ASSESSMENT

BOTTOM ASH POND

OCTOBER 2021

Providence Engineering and Environmental Group LLC
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Providence Project No: 002-292



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1.0 INTRODUCTION

Providence Engineering and Environmental Group LLC (Providence) was contracted by Cleco Power LLC (Cleco) to perform the 5-year periodic review of the Hazard Potential Classification Assessment of the Bottom Ash Pond at Cleco's Brame Energy Center.

The Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(a)(2) established requirements for owners and operators to conduct a hazard potential classification assessment to assess the potential adverse incremental consequences that would occur if there was a failure of the CCR surface impoundment. Providence completed the initial Hazard Potential Classification Assessment and Cleco placed it in the facility operating record on October 17, 2016.

This 5-year periodic review for the Hazard Potential Classification Assessment pertains to the Bottom Ash surface impoundment (Pond) that is utilized for the Rodemacher Unit 2 coal-fired generation unit. The Brame Energy center is located approximately 6 miles southeast of Lena, Rapides Parish, Louisiana. A site location map is included as **Figure 1**. The Bottom Ash Pond is shown on **Figure 2**.

2.0 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

Per the CCR regulations, a hazard potential classification provides an indication for danger to life, development, or the environment in the event of a release of CCR from a surface impoundment. The CCR rule requires an owner or operator of any existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment to determine which of the following hazard potential classifications apply to their particular CCR unit. These potential classifications include the following:

- High Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation will probably cause loss of life.
- Significant Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- Low Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment's owner's property.

In the 2016 Hazard Potential Classification Assessment Report, the Bottom Ash Pond was analyzed to determine effects of a breach in the current levee system. Two scenarios were used in each model: Maximum and Most Probable Loss. In both scenarios, a shear break to the bottom of the levee was assumed. The

Maximum scenario flow rate was calculated using a height of water measured from the bottom of pond to the top of levee. The Most Probable Loss scenario flow rate was calculated using a height of water measured from the bottom of pond to the normal operating elevation.

The Bottom Ash Pond was initially constructed by excavating material from within the footprint of the pond and using that material for the construction of the perimeter levees. The northwest perimeter of the pond was cut out of an existing terrace area. The flood elevations in the vicinity of the Bottom Ash Pond are highly influenced by the existing water surface elevations of Bayou Jean de Jean and the Red River. The surface elevation data used in this analysis for adjacent property is from Light Detection and Ranging (LIDAR) data and shows the bottom elevation of the drainage feature between the Bottom Ash Pond and Interstate 49 at elevation 79 feet NAVD 88, Bayou Jean de Jean at elevation 74 feet NAVD 88, and the Red River at elevation 74 feet NAVD 88.

The 2016 Hazard Potential Classification Assessment Report results of the levee breach analysis for the Bottom Ash Pond shows that the rise in water is mostly contained in the drainage features between the pond and Interstate 49. The outflow from the pond during this flood event has a very negligible volume to add to Bayou Jean de Jean and the Red River. The downstream flood area allows the floodwaters to spread into existing bodies of water over a large area, therefore adjacent property is not affected. Also not affected are the properties along Bayou Jean de Jean which are protected by levees. This is true for both the Maximum and the Most Probable Loss scenarios.

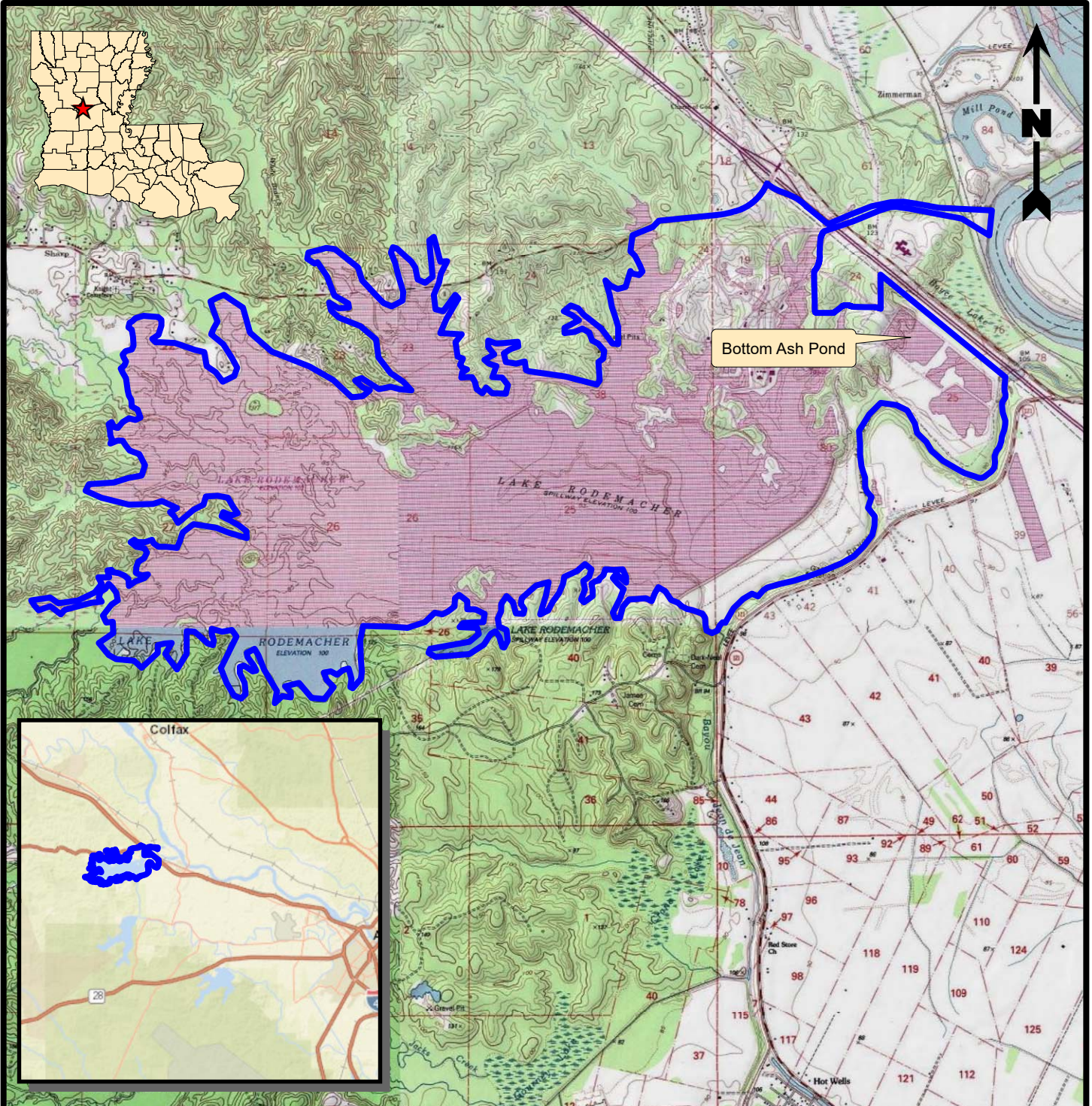
The bottom ash is sluiced to the southwest corner of the Bottom Ash Pond and only a small portion of that area contains the bottom ash. It is excavated and sold before any substantial amount accumulates in the pond, therefore a breach in the Bottom Ash Pond would only release a minimal amount of bottom ash and it would fall out quickly due to its specific gravity and grain size. The model shows that any release from the Bottom Ash Pond would go into the channel beside the pond and then enter Bayou Jean de Jean and thence the oxbow on the Red River.

The Bottom Ash Pond is currently operated in the same manner that it was in 2016, when the initial Hazard Potential Classification Assessment was completed. Providence reviewed and updated the costs in the Levee Breach Analysis (**Appendix A**) and has determined that the Bottom Ash Pond will remain classified as a significant hazard potential CCR surface impoundment.

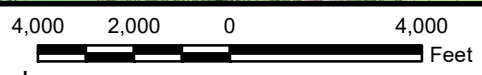
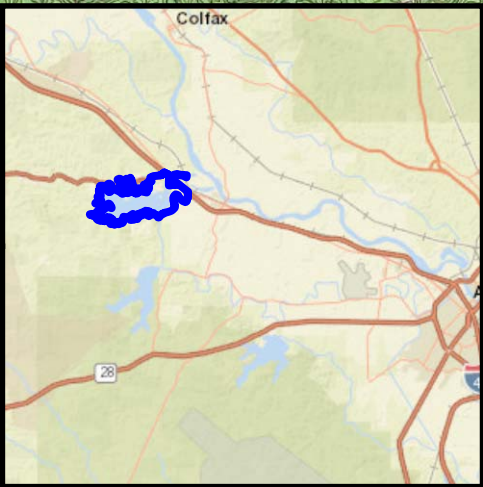
3.0 CONCLUSIONS

Based on the review of the results of the Maximum and Most Probable Loss scenarios, the Bottom Ash Pond at Cleco's Brame Energy Center will remain classified as a significant hazard potential CCR surface impoundment due to the potential effects on Bayou Jean de Jean and the oxbow of the Red River. **Attachment B** contains a P.E. Certification that attests to the 5-year periodic review of the Hazard Potential Classification Assessment of the Bottom Ash Pond.


FIGURE 1
SITE LOCATION MAP



Bottom Ash Pond



Legend

 Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

**5-Year Periodic Review
Hazard Potential Classification Assessment - Bottom Ash Pond**
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center



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Checked By	LMH	09/21/21
Approved By	CVH	09/21/21

Project Number	002-292	1 Figure
Drawing Number	002-292-A001	

FIGURE 2
SITE MAP

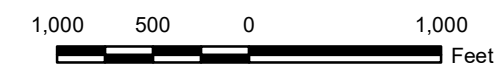


Legend

 Property Boundary

Reference

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



Site Map

**5-Year Periodic Review
Hazard Potential Classification Assessment - Bottom Ash Pond**
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center



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Project Number	002-292	
Drawing Number	002-292-B002	
	2 Figure	



APPENDIX A
LEVEE BREACH ANALYSIS

**CLECO POWER LLC
BRAME ENERGY CENTER
RAPIDES PARISH, LENA, LOUISIANA**



**5-YEAR PERIODIC REVIEW
LEVEE BREACH ANALYSIS REPORT
BOTTOM ASH POND**

OCTOBER 2021

Providence Engineering and Environmental Group LLC
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Providence Project No: 002-292



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- A Acquired Data
- B Levee Breach Cost Analysis

1.0 PROJECT DESCRIPTION

Brame Energy Center is a 6,000-acre site located west of Interstate 49 (I-49) in Lena, Louisiana. The site has a Bottom Ash Pond that accepts the byproducts derived from burning coal for the generation of electricity. This report is a review of the 2016 Levee Breach Analysis Report and includes updated costs associated with a levee breach of the Bottom Ash Pond. The Bottom Ash Pond is currently operated in the same manner that it was in 2016, when the initial Levee Breach Analysis Report was completed.

2.0 DATA ACQUISITION

The proposed project is located on Federal Emergency Management Agency (FEMA) map panel 0125B in Rapides Parish and is bound by Interstate 49 and the Red River to the east, LA 28 to the south, and LA 8 to the west and north. The study area is presented in **Figure 1**.

The flood elevations are highly influenced by the existing water surface elevations of Bayou Jean de Jean and the Red River. The water surface elevation data used in this analysis is from Light Detection And Ranging (LIDAR) data and shows Bayou Jean de Jean at elevation 74' NAVD88 and the Red River at 74' NAVD88. The channel adjacent to the pond has a bottom elevation ranging from 84' NAVD88 at the most upstream point to 74' NAVD88 at the junction with Bayou Jean de Jean.

3.0 HYDRAULIC MODEL DEVELOPMENT

Providence reviewed the LIDAR information that was obtained and used to develop the ground model of existing conditions for the project area. In 2016, this information was imported into a hydraulic analysis program in order to model the effects of breaking the levee system. An elevation terrain was generated based on LIDAR data. Channel geometry for the outflows from the Bottom Ash Pond was created using raindrop analysis, and cross sections were created by referencing the elevation terrain. Cross sections were extended to cover any area of concern both within and surrounding the project area.

The Bottom Ash Pond was analyzed as two separate events. Two scenarios were used in each model: Maximum and Most Probable Loss. In both scenarios, a shear break to the bottom of the levee was assumed. The Maximum scenario flow rate was calculated using a height of water measured from the bottom of pond to the top of levee. The Most Probable Loss scenario flow rate was calculated using a height of water measured from the bottom of pond to the normal operating elevation.

In 2016, the outflow was modeled in GeoHEC-RAS by inputting the steady flow data for each scenario. The upstream boundary for the Most Probable Loss scenario was the normal operating elevation of this pond. The upstream boundary for the Maximum scenario was the top of levee elevation for this pond. The analysis

was then computed on the steady flow data. The results for the flood maps and for the cross sections were then generated. It should be noted that these models were generated based on a continuous outflow from the pond as this was determined to be the most conservative way to model a levee breach. Real-world scenarios should be less impactful as the flow rate will steadily decrease as the pond empties.

Providence reviewed the hydraulic analysis program and the GeoHEC-RAS model and determined that these results have not changed from the 2016 inputs and outputs.

4.0 MODELING RESULTS

The results of the levee breach analysis for the Bottom Ash Pond shows that the rise in water is mostly contained to the channel area adjacent to the pond. The outflow from the pond during this flood event has a very negligible volume to add to Bayou Jean de Jean and the Red River. The downstream flood area allows the floodwaters to spread into existing bodies of water, therefore adjacent property is not affected. Also not affected are the properties along Bayou Jean de Jean which are protected by levees. This is true for both the Maximum and the Most Probable Loss scenarios.

For the Bottom Ash Pond, the Most Probable Loss condition results in no more than a 3' increase which is localized to the channel adjacent to the pond and has no effects to surrounding properties or Interstate 49. The Maximum condition results in no more than a 7' increase which is localized to the channel adjacent to the pond and has no effects to surrounding properties or Interstate 49. The Bottom Ash Pond results are presented in **Figure 2 and Figure 3**.

The Bottom Ash Pond is sluiced to the southwest corner of the pond and only a small portion of that area contains the bottom ash. It is excavated and sold before any substantial amount accumulates in the pond, therefore a breach in the Bottom Ash Pond would only release a minimal amount of bottom ash and it would fall out quickly due to its specific gravity and grain size.

It should be noted that the average elevation shown in **Figure 2 and Figure 3** represents the average elevation of the entire outflow path.

5.0 COST ANALYSIS

A cost analysis was completed based on the information obtained in the Flood Analysis and available historical cost data. In 2016, a cost estimate was determined for both the Most Probable Loss and the Maximum Loss scenarios for the pond.

The 5-year periodic review determined that the cost estimates would increase according to the Consumer Price Index (CPI) calculator found at the Bureau of

Labor Statistics website (https://www.bls.gov/data/inflation_calculator.htm). The increase from 2016 to 2021 is 13%.

The flood area was broken into categories of wooded land, existing channels, plant property, and structures. As noted in the Flood Analysis section, for all of the failures, the majority of the pond water would spread across wooded land.

It is assumed that the levee breach and resulting flood waters would negatively impact all surrounding timber to the point that the timber would be declared a total loss. This is very conservative, as the flood waters should dissipate in a relatively short amount of time depending on site conditions at the time of the event.

Cleanup costs associated with a levee breach are a substantial portion of the total cost for this analysis. Clearing & Grubbing of the impacted properties will be necessary to clear the existing timber that is damaged and was estimated at \$2,260 per acre of affected wooded land.

A breach in the Bottom Ash Pond would release a minimal amount of bottom ash, which would fall out quickly due to its specific gravity and grain size. The quantity of ash in the pond is constantly changing; therefore, it was assumed that the pond was half full of ash before the levee breach. Elevation data for the Bottom Ash Pond is included in **Appendix A**. Multiple percentages of ash loss were analyzed, all of which were minimal (ranging from 10% to 20% for the Bottom Ash Pond). For the purpose of this report, the costs of a 20% ash loss for the Bottom Ash Pond have been included in the final cost for each scenario of each pond. The volume and cost for all assumed percentages can be found in **Appendix B**. The material would be returned to the pond, as there is no landfill for the bottom ash. The cost for removal and hauling ash back to the pond was estimated at \$28 per cubic yard of ash.

It is assumed that the length of exposure of pond water to ash would be minimal and would not cause contamination of drinking water, nor would it contaminate the topsoil. For this reason, removal of topsoil is not necessary and was not included in the cost estimate.

It is assumed that any vegetation impacted by a levee breach would need to be reestablished to original conditions. Site Preparation/Planting includes the reestablishment of pine/hardwood timber and the spraying of underbrush vegetation during re-establishment and was priced at \$565 per acre of affected wooded land. The Loss of Timber Value assumes that valuable timber (pine/hardwood) was present and was priced at \$848 per acre. Seeding and Fertilizing was also considered and includes the re-establishment of grass for erosion control of the cleared and grubbed acreage. This was priced at \$2,825 per acre of land. Any value of the timber harvested was not included as a discount to the total cost.

It was also assumed that the affected levee of the pond would be rebuilt immediately, and no temporary measures for levee replacement would be

necessary. The failure shape of the levee is assumed to be a shear type failure. In order to reconstruct the levee, an additional removal of material is anticipated to safely reconstruct the levee. The cost to reestablish the levee was estimated at \$28 per cubic yard and \$7.74 per square foot.

As mentioned in the Flood Analysis, the rise in water is mostly contained in the drainage feature between the pond and I-49. The downstream flood area allows the floodwaters to spread into existing bodies of water over a large area; therefore, no structures within or surrounding the plant are affected. This is true for both the Maximum and the Most Probable Loss scenarios for the pond.

Details of the Levee Risk Assessment Costs are included in **Appendix B**. The calculations show a total cost for each scenario of the pond. These costs are broken down into the different percentages of ash loss. The total clean-up cost is then divided into the cost of on-site clean-up and the cost of off-site clean-up. These totals are also broken down into the different percentages of ash loss.

A cost for Mobilization/Demobilization was added to each total. For the on-site costs, mobilization/demobilization was estimated at \$13,560. For the off-site costs, mobilization/demobilization was estimated at 9%.

The total costs for each scenario of each pond, assuming a 20% ash loss for the Bottom Ash Pond are as follows:

- For the Bottom Ash Pond, clean-up costs for the Most Probable Loss scenario total \$3.2 million, and clean-up costs for the Maximum Loss scenario total \$5.4 million.

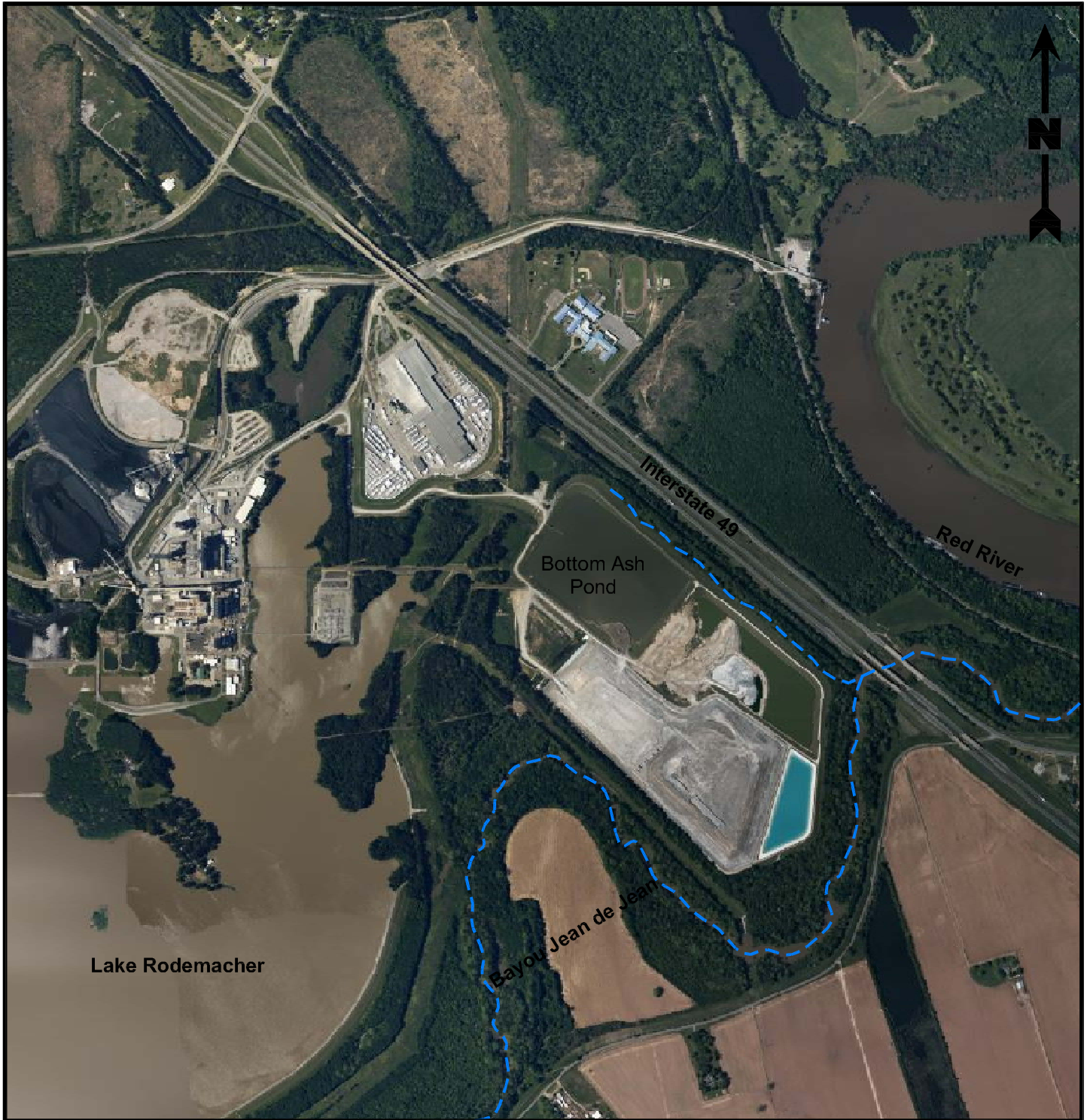
The on-site scenario of the pond includes only the levee repair costs and assumes that any ash that falls on-site is in the levee repair area. The on-site costs for each scenario of the pond are as follows:

- For the Bottom Ash Pond, on-site clean-up costs for the Most Probable Loss scenario total \$120,462, and on-site clean-up costs for the Maximum Loss scenario total \$120,462.

The off-site costs for each scenario of the pond, assuming a 20% ash loss for the Bottom Ash Pond are as follows:

- For the Bottom Ash Pond, off-site clean-up costs for the Most Probable Loss scenario total \$3.1 million, and off-site clean-up costs for the Maximum Loss scenario total \$5.2 million.

FIGURE 1
LEVEE BREACH STUDY AREA

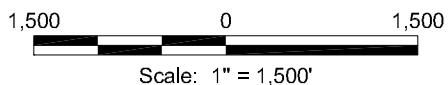


Legend

--- Channel Alignment

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2021 Microsoft Corporation and its data suppliers, exported 09/21/21.



**Bottom Ash Pond
Levee Breach Study Area**

5-Year Periodic Review
Levee Analysis - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

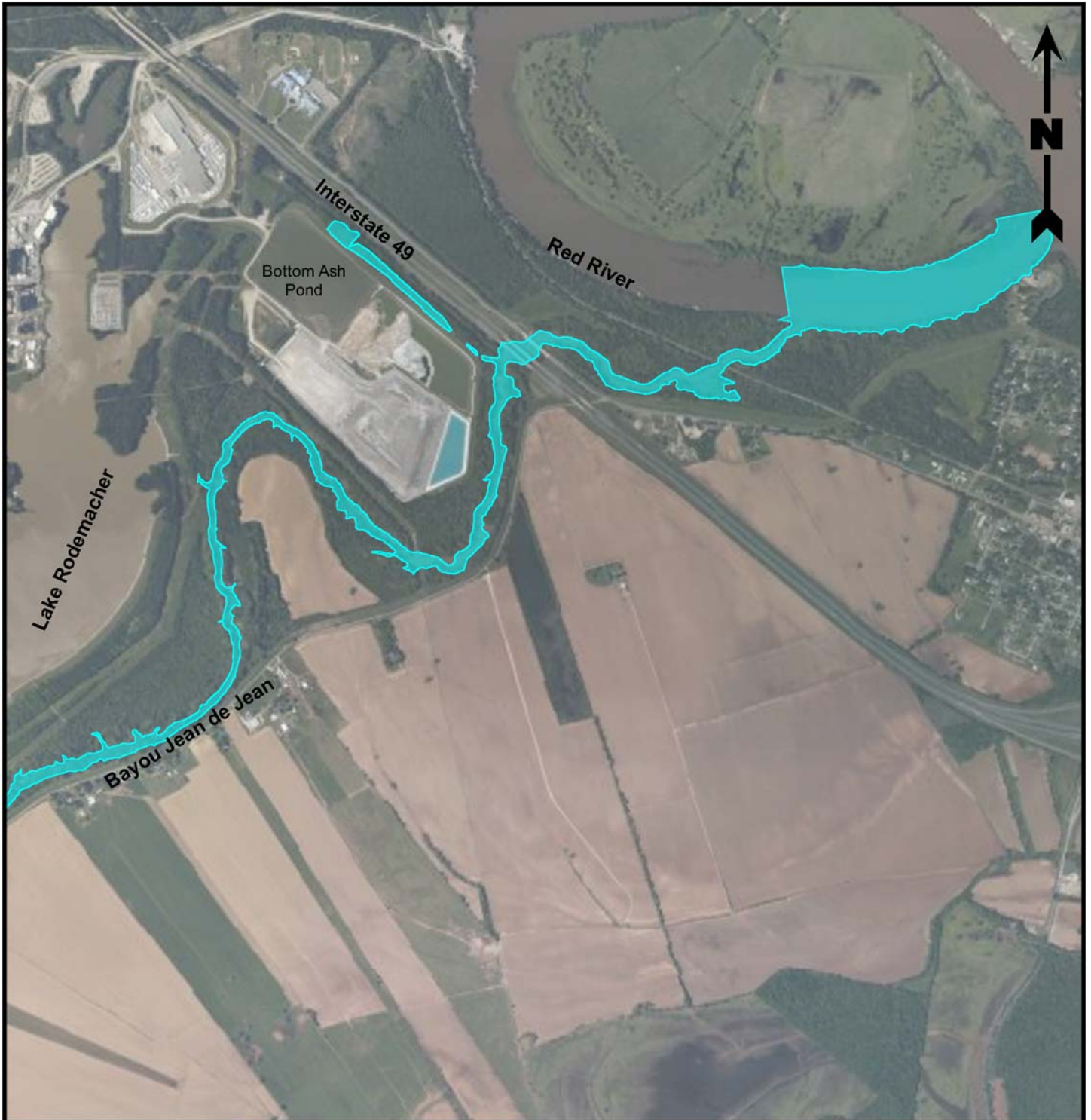


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FIGURE 2
BOTTOM ASH POND MOST PROBABLE LOSS

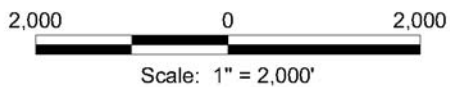


Legend

 Most Probable Loss (Avg. El. 75.98')

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2021 Microsoft Corporation and its data suppliers, exported 09/21/21.



**Bottom Ash Pond
Most Probable Loss**

5-Year Periodic Review
Levee Analysis - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

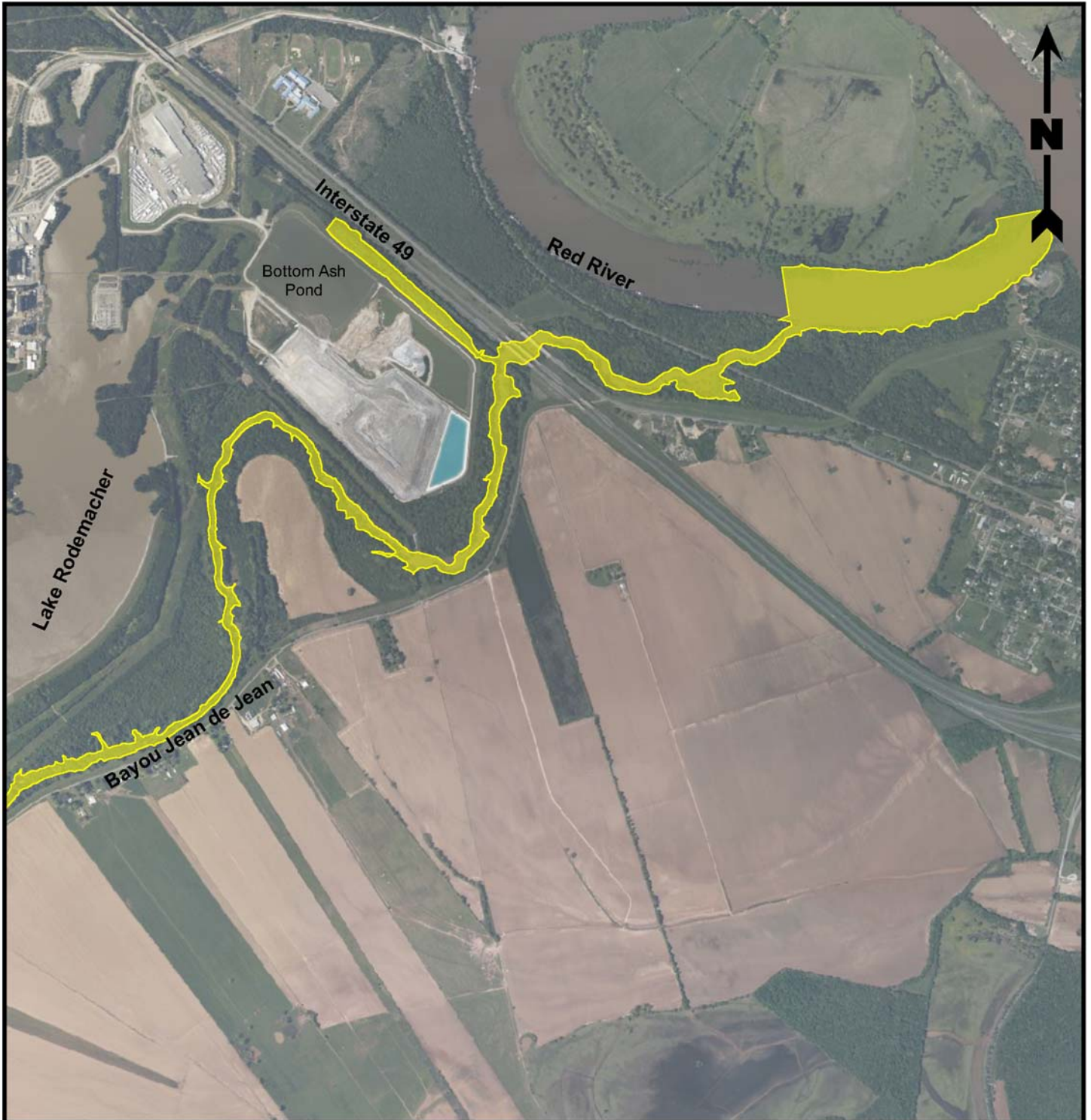
Cleco Power LLC
Brame Energy Center



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Project Number 002-292	2 Figure
Drawing Number 002-292-A004	

FIGURE 3
BOTTOM ASH POND MAXIMUM LOSS

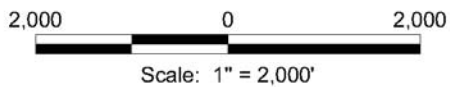


Legend

 Maximum Loss (Avg. El. 76.38')

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2021 Microsoft Corporation and its data suppliers, exported 09/21/21.



**Bottom Ash Pond
Maximum Loss**

5-Year Periodic Review
Levee Analysis - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center



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Project Number 002-292	3 Figure
Drawing Number 002-292-A005	

APPENDIX A
ACQUIRED DATA

Facility Name:				Cleco Brame Energy Center			
Address:				275 Rodemacher Rd. Lena, LA			
Surface Impoundment Name :		Bottom Ash Pond		Owner:		Cleco Power LLC	
Surface Impoundment ID:		P-0005		Operator:		Cleco Power LLC	
Nearest City:		Boyce		Parish:		Rapides	
GENERAL							
Dam Status:		Operational		Year Built:		1982	
Latitude:		31° 23.83' N		Longitude:		92° 42.27' W	
Dam Size:		760.5 Acre-Feet (3' Freeboard)					
Bottom of Pond Elevation Information:		85 ft. MSL		Top of Dike Elevation:		106 ft. NAVD 88	
Low Operating Level Elevation:		90 ft. NAVD 88		High Operating Level Elevation:		96 ft. NAVD 88	
High Operating Level Storage:		464.75 acre-feet @ elevation 96.0 ft. NAVD 88					
Maximum Storage:		760.5 acre feet @ elevation 103.0 ft. NAVD 88					
Maximum Waste Surface Area:		42.25 Acres					
Offsite Drainage Area:		Discharges to Lake Rodemacher via LPDES Outfall 401					
Spillway Type:		None, Pumped through HDPE discharge pipe					

APPENDIX B
LEVEE BREACH COST ANALYSIS

**APPENDIX B
LEVEE BREACH COST ANALYSIS
BRAME ENERGY CENTER
BOTTOM ASH POND**

Description	Unit	Most Probable Loss	Maximum Loss
Wooded land	acres	112	118
Existing channel/bayou/river	acres	40	40
Area of levee repair	sq ft	5,712	5,712
Volume of levee repair	cu yd	2,221	2,221
10% ash leaving pond	cu yd	37,490	71,572
15% ash leaving pond	cu yd	56,235	107,357
20% ash leaving pond	cu yd	74,980	143,143
Plant property	acres	none	none
Structures other than levee wall	each	none	none

Bottom Ash Pond Costs

Description	Unit	2021 Unit Price	Most Probable Loss	Maximum Loss
Site prep/planting ¹	acre	\$565	\$63,246	\$66,399
Loss of timber value ²	acre	\$848	\$94,869	\$99,598
Clearing & grubbing	acre	\$2,260	\$252,984	\$265,595
Seeding & fertilizing ³	acre	\$2,825	\$316,231	\$331,994

Levee Repair	Unit	2021 Unit Price	Most Probable Loss	Maximum Loss
Incorporation of lime, reprocessing, recompacting clay material on exterior of slope	cu yd	\$28	\$62,753	\$62,753
Purchase and installation of structural geogrid material	sq ft	\$0.57	\$3,227	\$3,227
Purchase and installation of HDPE membrane	sq ft	\$0.47	\$2,711	\$2,711
Purchase and installation of fabric formed concrete revetment	sq ft	\$6.22	\$35,500	\$35,500
Purchase and placement of erosion control matting	sq ft	\$0.40	\$2,259	\$2,259
Seeding and fertilization	sq ft	\$0.08	\$452	\$452
Levee repair total			\$106,902	\$106,902

**APPENDIX B
LEVEE BREACH COST ANALYSIS
BRAME ENERGY CENTER
BOTTOM ASH POND**

Ash Removal and Haul to Landfill⁴	Unit	2021 Unit Price	Most Probable Loss	Maximum Loss
10% ash leaving pond	cu yd	\$28	\$1,059,088	\$2,021,895
15% ash leaving pond	cu yd	\$28	\$1,588,632	\$3,032,842
20% ash leaving pond	cu yd	\$28	\$2,118,176	\$4,043,790

Mobilization/Demobilization on-site			\$13,560	\$13,560
Mobilization/Demobilization off-site			9%	9%

On-site Costs⁵	\$120,462	\$120,462
----------------------------------	------------------	------------------

Off-site Costs

10% ash loss	\$1,947,910	\$3,037,289
15% ash loss	\$2,525,325	\$4,139,626
20% ash loss	\$3,102,739	\$5,241,963

Total Costs

10% ash loss	\$2,068,372	\$3,157,750
15% ash loss	\$2,645,787	\$4,260,088
20% ash loss	\$3,223,201	\$5,362,425

NOTES:

1. Includes the re-establishment of pine/hardwood timber and the spraying of underbrush vegetation.
2. Assumes that valuable timber (pine/hardwood) is present. Also assumes that cost for haul/cut is included.
3. Includes the re-establishment of grass for erosion control.
4. Assumes that half of the pond is filled with ash, and minimal amounts would be released.
5. Includes levee repair costs and assumes that any ash that falls on-site is in the levee repair area.
6. Timber value once purchased and brought to mill is not included.
7. Assume no contamination of topsoil; therefore, no removal necessary.
8. Assume length of exposure of pond water to ash is minimal and will not cause contamination of drinking water.
9. Assume affected pond is being rebuilt immediately and no temporary measures for levee replacement are necessary.
10. 2016 unit costs have been increased by 13% based on 2021 CPI adjustment found at Bureau of Labor Statistics.

**APPENDIX B
LEVEE BREACH COST ANALYSIS
BRAME ENERGY CENTER
BOTTOM ASH POND**

Bottom Ash Pond Ash

Pond area (acre) 42.25

	Most Probable Loss	Maximum Loss
High Operating Level (ft)	96	
Top of Levee (ft)		106
Levee Toe (ft)	85	85
Half Full of Ash (ft)	6	10.5
Volume of Existing Ash (yd ³)	374,898	715,715

Volume of Ash Leaving Pond (yd³):	Most Probable Loss	Maximum Loss
10%	37,490	71,572
15%	56,235	107,357
20%	74,980	143,143

Bottom Ash Pond Levee

Slope = 3:1

	Most Probable Loss	Maximum Loss
Width At Break (ft)	126	126
Length Across Top	42	42
Volume of Repair	2,221	2,221

APPENDIX B
P.E. CERTIFICATION

**CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
5-YEAR PERIODIC REVIEW - CCR HAZARD POTENTIAL CLASSIFICATION
ASSESSMENT**

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed the 5-year periodic review of the Hazard Potential Classification Assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the CCR requirements at 40 CFR 257.73(a)(2). This 5-year periodic review of the Hazard Potential Classification Assessment has determined that the Bottom Ash Pond continues to be classified as a significant hazard potential surface impoundment.

James C. Van Hoof

Name

24630

Registration No.

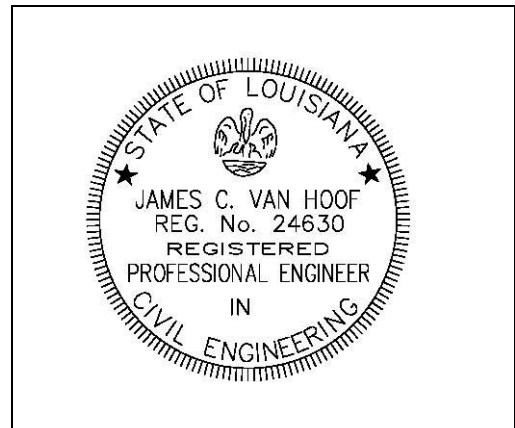
LA

State

Signature

October 15, 2021

Date



(Seal)