

**CLECO POWER LLC
BRAME ENERGY CENTER**

**FLY ASH POND
LENA, LA**

**Placement Above Uppermost Aquifer
Location Restriction Demonstration
for the Coal Combustion Residuals Rule**

October 2018



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1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the evaluation for the Placement above the Uppermost Aquifer Location Restriction for the Fly Ash Pond unit at the Brame Energy Center (BEC) located in Lena, Louisiana (Figure 1). This report summarizes a hydrogeological evaluation of the uppermost water bearing zone and its relationship with the Fly Ash Pond unit in accordance with §257.60 of the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule.

2.0 FACILITY INFORMATION

Cleco owns and operates BEC located at 275 Rodemacher Road, Lena, Louisiana 71447. Per “Annual CCR Inspection for the Fly Ash Pond” (January 13, 2017) the base of the Fly Ash Pond unit is 85 feet Mean Sea Level (MSL). Based on this determination, the base of the two-foot thick clay liner is estimated at 83 feet MSL.

3.0 HYDROGEOLOGIC SETTING

Characterization of BEC has included the geomorphologic, geologic and hydrogeologic evaluation of the soils at BEC and are presented in this section. The site layout with the CCR unit identified is shown in Figure 2.

Geomorphology

BEC is located across two different geomorphologic features that consist of Intermediate Terrace deposits of Pleistocene age to the north and northwest and alluvium and natural levee deposits of Holocene age to the south and southeast. The northern portion of BEC is located on the Intermediate Terrace deposits and the remainder of BEC is located on the alluvium/natural levee deposits. The Fly Ash Pond unit is situated entirely on the alluvium deposits. The geomorphology features are shown in Figure 2.

Geologic Characterization

Geologic cross sections illustrate the difference in stratigraphy and depth to the uppermost water bearing zone for the alluvium/natural levee deposits. These geologic cross sections are constructed from soil borings trending in a north-south profile across the Fly Ash Pond unit. The profiles of these geologic cross sections are shown in Figure 2. The geologic cross sections are included in Figure 3.

The uppermost water bearing zone within the alluvium/natural levee deposits is described as sandy silt to silty sand with some gravel in its base, often underlain by sandy clay and clay. The geologic cross sections show extensive clay deposits underlying the Fly Ash Pond unit. The thickness of the clay is greater than 5 feet below the base of the CCR units.

Hydrographs of Alluvium Potentiometric Surface

Groundwater surface elevations determined from monitoring wells screened in the uppermost water bearing zone in the alluvium/natural levee deposits were used to construct a hydrograph from data measured since 1987 as shown in the hydrograph in Figure 4. The hydrograph also includes the base depth of the Fly Ash Pond units at 83 feet MSL and the 5-foot buffer distance below this liner base is shown at 78 feet MSL.

This hydrograph illustrates the fluctuations of the water table over a 31-year monitoring period and shows the groundwater surface approaching the 5-foot buffer below the base of the units only in 2009 and 2016. This coincides with record high flood stages of the Red River and its tributary Bayou Jean de Jean in 2009 and 2016. The high river stage of the Red River in 2009 and 2016 are

considered anomalous and not normal fluctuations. The 2016 spring flood stage is the highest ever recorded for the nearest Red River United States Geological Survey stage gages which are named 'Red River @ Lock & Dam No. 3 Lower' and 'Red River @ Alexandria'. These two river gages are immediately upstream and downstream of BEC along the Red River. Even with these extremely high river stages in 2009 and 2016, the groundwater surface did not encounter the base liner elevation of the Fly Ash Pond unit.

4.0 PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTION DETERMINATION

The hydrogeological data presented in this evaluation indicate that the Fly Ash Pond unit meets the criteria of the Location Restriction, Placement above the Uppermost Aquifer. The Fly Ash Pond is entirely over only the alluvium deposits of which the monitoring wells included in the hydrograph (Figure 4). This hydrograph illustrates the relationship of the base of the CCR unit with the groundwater surface of the uppermost water bearing zone and clearly shows significant separation (>5 ft) over the extensive 31-year period of monitoring data. The geologic cross sections show extensive clay deposits underlying the Fly Ash Pond with a thickness of the clay greater than 5 feet below the base of the CCR unit.

5.0 CONCLUSIONS

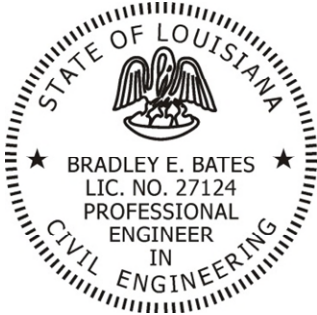
Cleco BEC has completed its evaluation of §257.60, the Placement above the Uppermost Aquifer Location Restriction. As required by the CCR Rule part §257.60, BEC hereby demonstrates that the Fly Ash Pond unit meets the following criteria:

- §257.60 Placement Above the Uppermost Aquifer Location Restriction**
§257.60 (a) The evaluation of the Fly Ash Pond unit, indicates that the existing CCR unit, meets and exceeds the minimum requirements in this standard for separation distance of the placement of CCR waste above the uppermost aquifer.

This evaluation has concluded that the Fly Ash Pond unit meets the criteria for §257.60.

6.0 CERTIFICATION

I hereby certify this location restriction evaluation for Cleco Power LLC. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.



27124

Signature

PE Registration Number

Bradley E. Bates

Professional Engineer

Name

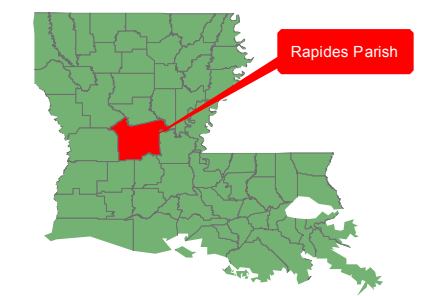
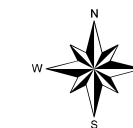
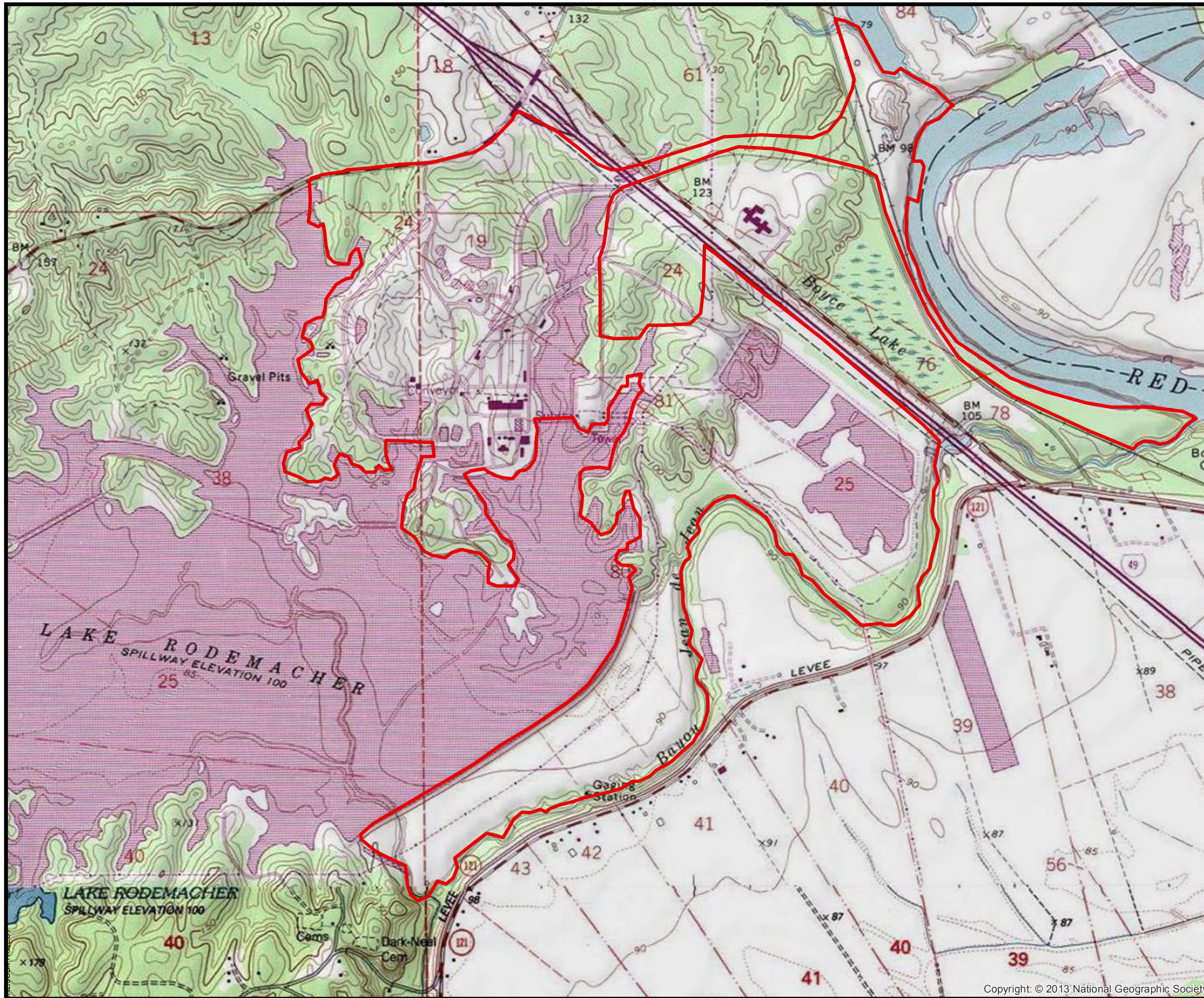
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Eagle Environmental Services, Inc.

10-08-2018

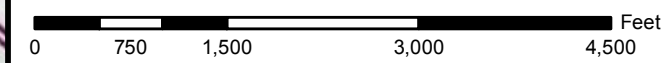
Company

Date



Legend

— Property Boundary Line



Reference
 U.S.G.S. TOPOGRAPHIC MAPS "LENA, LOUISIANA", "BOYCE, LOUISIANA", "JERICO, LOUISIANA", AND "GARDNER, LOUISIANA."



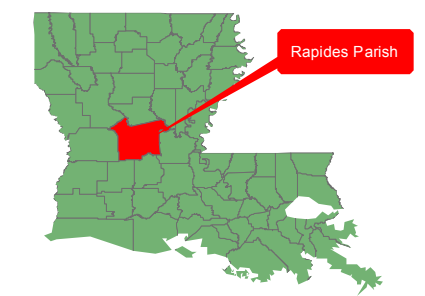
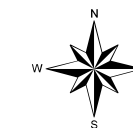
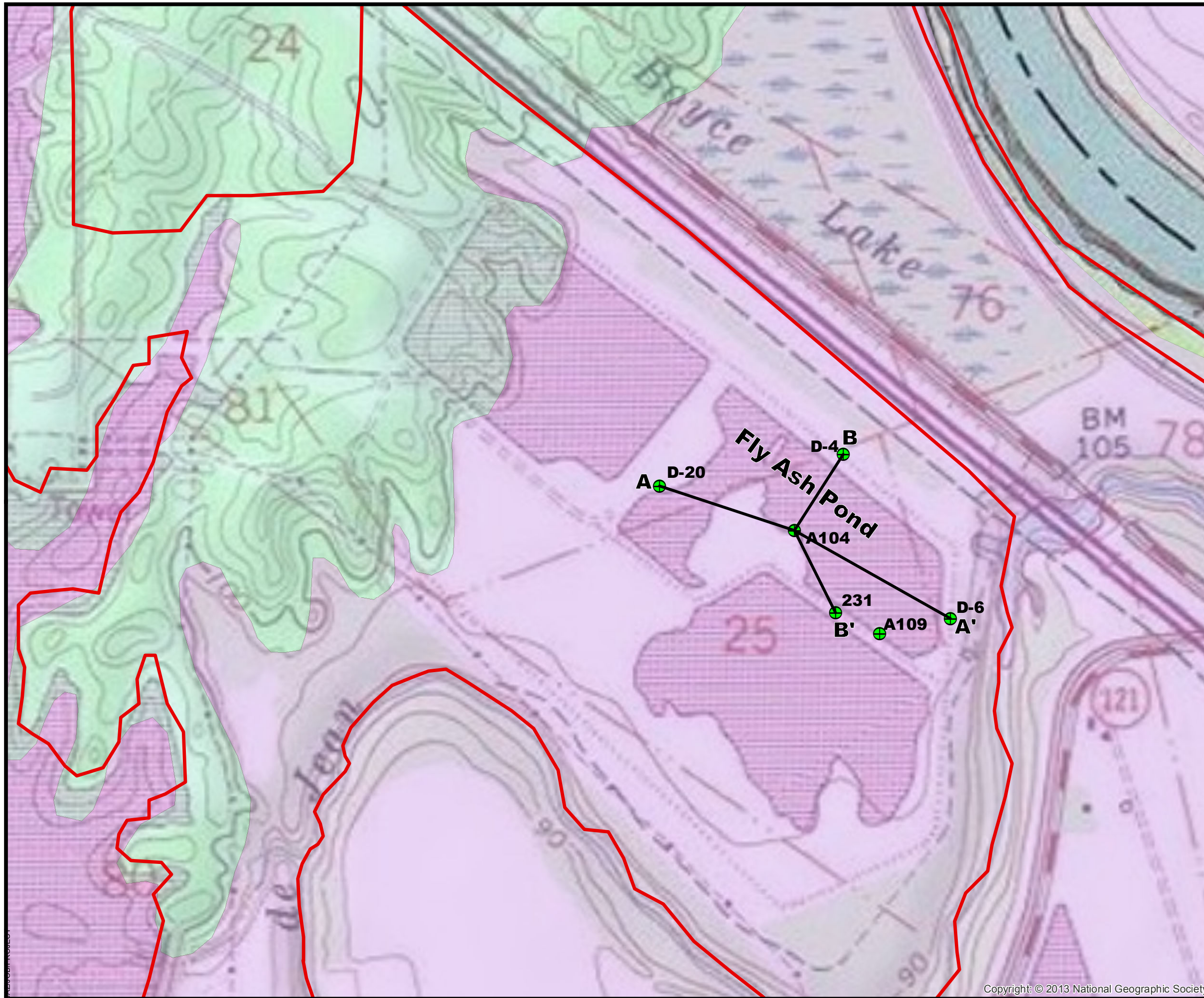
Site Location Map

Rapides Parish, Louisiana



Drawn:	JP
Checked:	JM
Approved:	RS
Date:	9/9/16
Dwg. No.:	01-18-0185-A005

Figure 1



Terraces

- Qtp - Prairie Terrace
- Mfcb - Carnahan Bayou Member
- Qth - High Terrace
- Qti - Intermediate Terrace

Alluvial

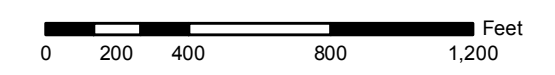
- Qal - Alluvium; Qnl - Natural Levees

Wells

- Boring Locations (Sargent & Lundy, 1981)

Cross Section Profile Location

- Cross Section Profile Line



Reference

U.S.G.S. TOPOGRAPHIC MAPS "LENA, LOUISIANA", "BOYCE, LOUISIANA", "JERICO, LOUISIANA", AND "GARDNER, LOUISIANA."



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Fly Ash Pond

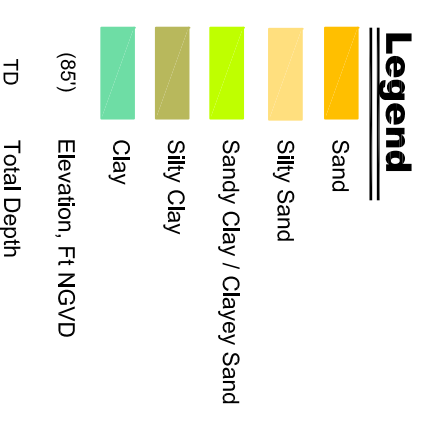
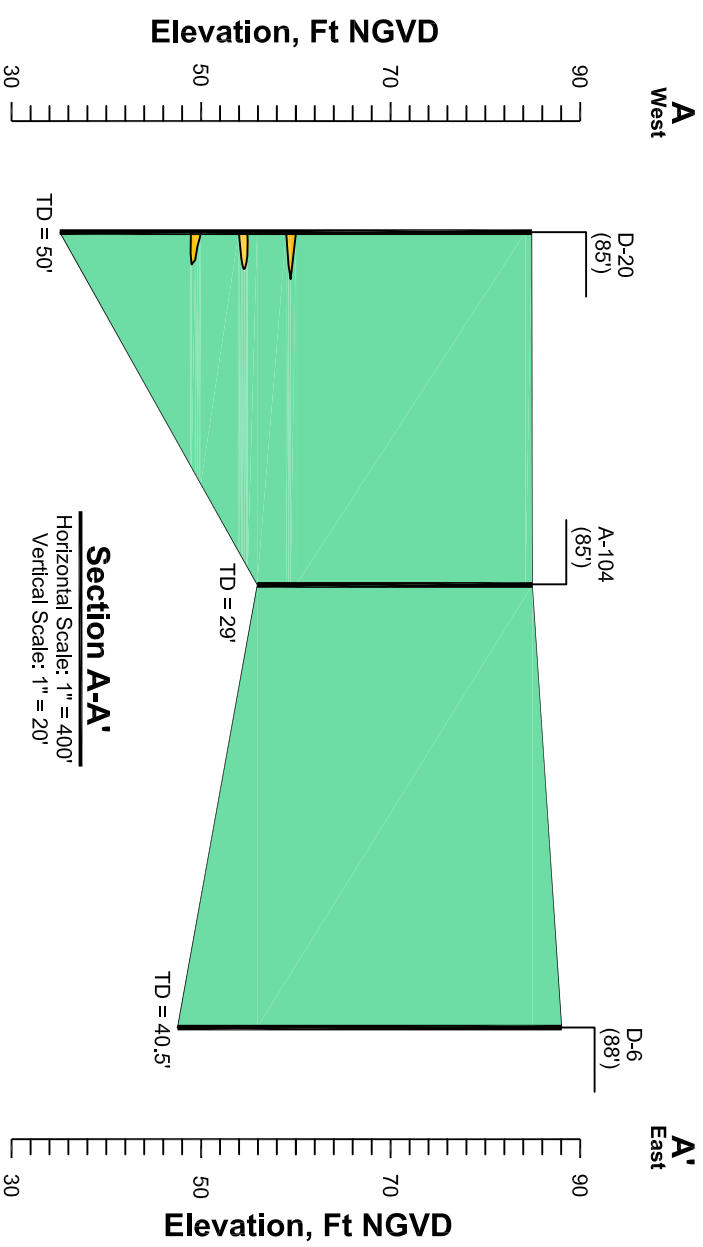
Geologic Cross Section Profiles Map

Rapides Parish, Louisiana



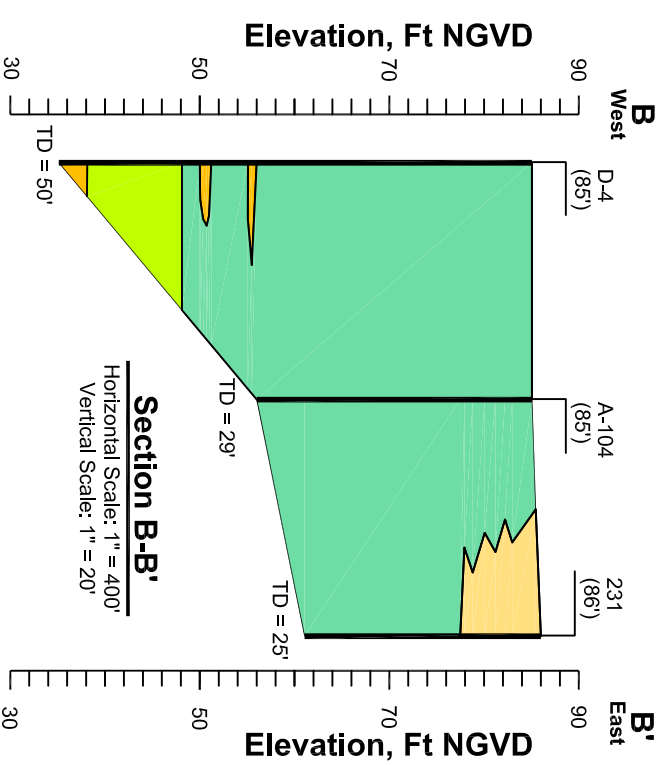
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Dwg. No.:	01-18-0185-B002B

Figure 2



Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

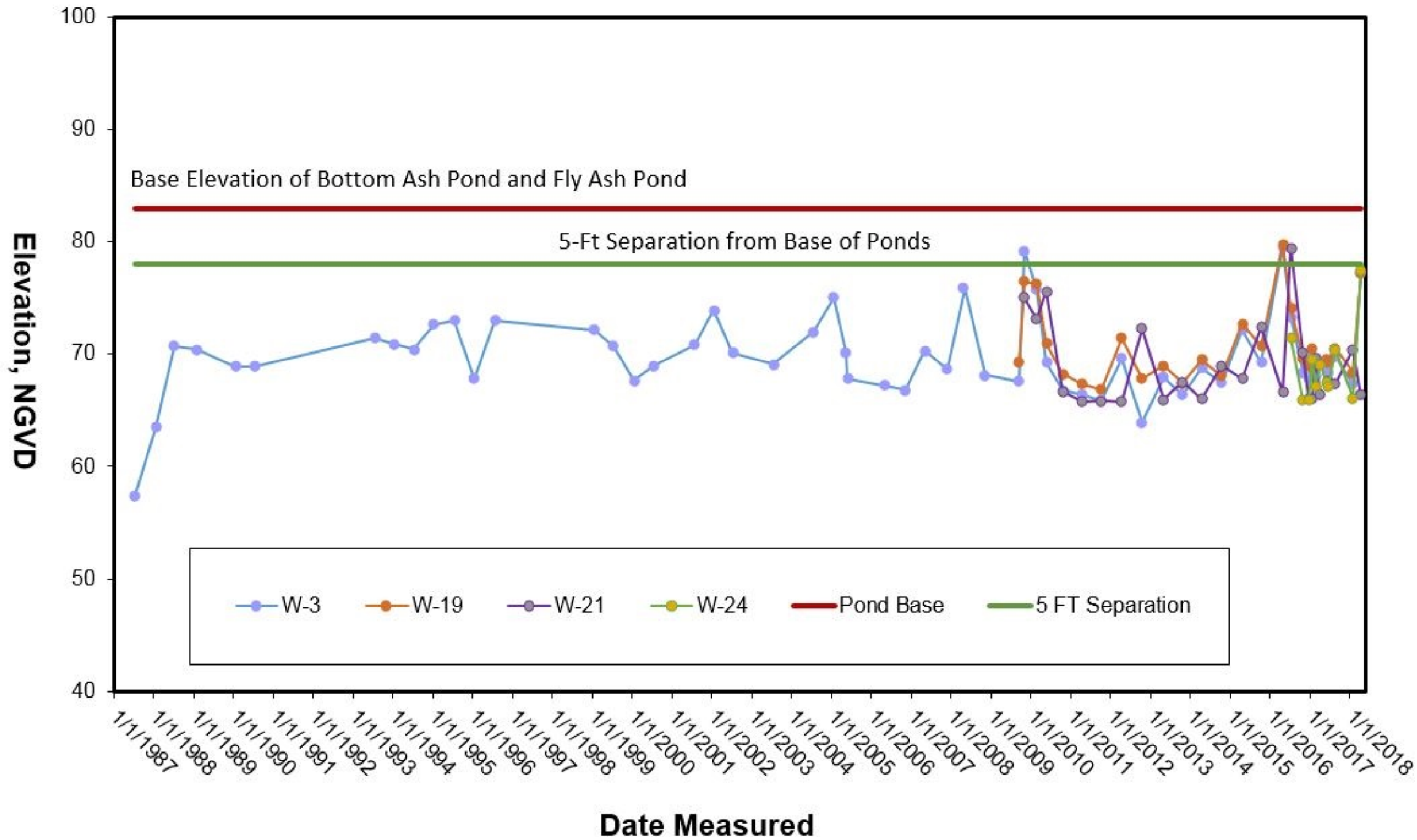
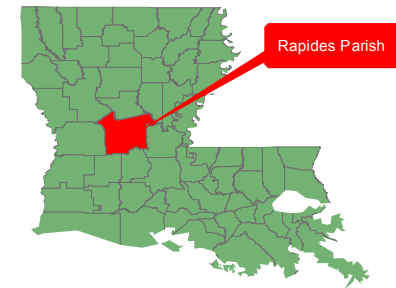


CLECO Power LLC
Brame Energy Center
Fly Ash Pond
Geologic Cross Sections
A-A' and B-B'
Rapides Parish, Louisiana

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E·A·G·L·E
ENVIRONMENTAL SERVICES, INC.

Figure 3



Brame Energy Center

Hydrograph of Alluvium Wells

Rapides Parish, Louisiana



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Date:	8/23/18
Dwg. No.:	01-18-0185-A007

Figure 4