CLECO POWER LLC

BRAME ENERGY CENTER
LENA, RAPIDES PARISH, LOUISIANA

CCR COMPLIANT UPPERMOST AQUIFER LOCATION RESTRICTION DEMONSTRATION

ASH MANAGEMENT LANDFILL CELL 4

AGENCY INTEREST NO. 2922

D-079-0390/P-0379-R1-M2

DECEMBER 2023

Providence Engineering and Environmental Group LLC
1201 Main Street
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Providence Project No: 002-322

PROVIDENCE

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1.0 INTRODUCTION

On April 17, 2015, the United States Environmental Protection Agency (EPA) issued the final version of the federal coal combustion residuals rule (CCR Rule) to regulate the disposal of CCR materials generated at coal-fired units. The rule is being administered as part of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. §6901 et seq.), using the Subtitle D approach.

Cleco Power LLC (Cleco) operates an existing coal combustion residuals (CCR) landfill referred to as the Ash Management Landfill at the Brame Energy Center (BEC) located near Boyce, Rapides Parish, Louisiana. The landfill is considered a Type I Industrial Facility by the Louisiana Department of Environmental Quality and operates under solid waste permit P-0379-R1-M3. Cells 1-3 of the Ash Management Landfill were active prior to the effective date of the CCR Rule. On October 11, 2021, the Louisiana Department of Environmental Quality (LDEQ) approved a minor modification for design changes to Cell 4 to comply with CCR design requirements. These changes included raising the excavation grades in Cell 4, changes to final waste grades, raising the perimeter levee elevations, and reorientation of the leachate collection trenches. Cleco contracted and completed the design and construction of the lateral expansion for Cell 4 of the Ash Management Landfill. This report is to certify that Cell 4 of the Ash Management Landfill was designed, operates and meets the criteria outlined in 40 CFR 257.60(a).

Per 40 CFR §257.60(b), Cleco must obtain certification from a qualified professional engineer that the evaluation of the Placement above the Uppermost Aquifer Location Restriction meets the requirements of 40 CFR 257.60(a) and is included in Appendix A.

2.0 PLACEMENT ABOVE THE UPPERMOST AQUIFER ASSESSMENT

40 CFR 257.60 (a) states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).

The owner or operator of a new CCR landfill, or any lateral expansion of a CCR unit, must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of the uppermost aquifer assessment no later than the date of initial receipt of CCR in the CCR unit.

The BEC facility is located across two different geomorphologic features consisting 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 mapped boundary of the Intermediate Terrace and the alluvium/natural levee deposits is displayed on Figure 1. Cell 4 is located primarily on the Intermediate Terrace deposits.

A review of existing hydrogeological information for the uppermost water bearing zone and its relationship to Cell 4 was performed. Boring logs, geological cross sections from the solid waste

permit (Attachment 1), water level measurements (Attachment 2) and the Eagle Environmental Services, Inc. (Eagle) report for the 2019 Fatal Flaws Location (Attachment 3) restrictions report were reviewed. Eagle noted in their report that Cell 4 is located primarily on Intermediate Terrace deposits. Based on additional water level measurements, the potentiometric surface is 105 feet NGVD in the Terrace and 77 feet NGVD in the Alluvium.

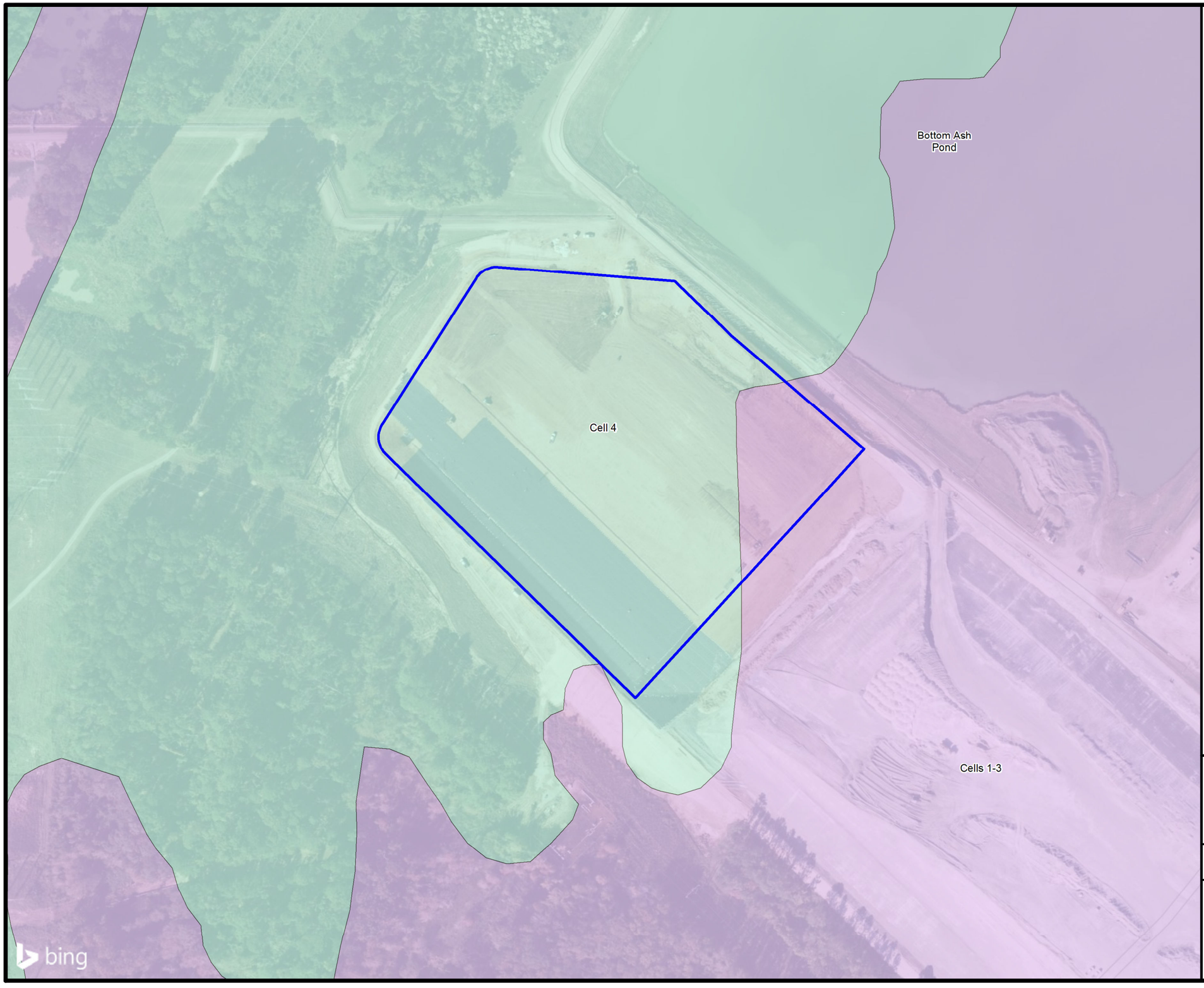
Cell 4 was recently constructed to meet the requirements of 257.60. The base of excavation in Cell 4 was raised to 110 NGVD to ensure it was constructed at least five feet above the upper limit of the uppermost aquifer. Other changes included raising the perimeter levee elevations, changes to final waste grades, and reorientation of the leachate collection trenches.

3.0 CONCLUSION

Based on the results of the uppermost aquifer location restriction demonstration, Providence concludes that Cell 4 was constructed at least five feet above the upper limit of the uppermost aquifer. Cell 4 meets the requirements at 257.60 of the CCR regulations.

FIGURE 1

CELL 4 GEOMORPHOLOGY FEATURES



N

Legend

- Cell 4 Boundary

Soil Data:

- Qal- Alluvium
- Qti- Intermediate Terrace

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2023 Microsoft Corporation and its data suppliers, exported 12/27/23.
Soil data obtained from client provided figure titled: "Geomorphology Features with Groundwater Monitoring Network", drawing number: 01-20-0219-A001, dated: 12/02/20.

200 100 0 200
Feet

Cell 4
Geomorphology Features

Uppermost Aquifer Location Restriction Demonstration
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	12/27/23
Checked By	LMM	12/27/23
Approved By	ARC	12/27/23

Project Number 002-322

Drawing Number 002-322-B015

1 Figure

APPENDIX A

CERTIFICATION

CERTIFICATION

I certify that this Uppermost Aquifer fulfills the minimum requirements of 40 CFR 257.60 as applicable. This certification is based on my review of the Cleco Brame Aquifer and operational information about the CCR units.

Gary J. Leonards, P.E.
Name

30568 **Louisiana**
Registration No. State

Signature

12/29/23
Date

(Seal)

ATTACHMENT 1

BORING LOGS, GEOLOGICAL CROSS SECTIONS FROM THE SOLID WASTE PERMIT

SOIL BORING LOG

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

BORING/WELL NO.:	**W-25**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**124.74 Ft NGVD**
GROUND SURFACE ELEV.:	**121.32 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/06/2017**

Notes:

Water level during drilling: 25 ft bgs

Water level in completed well: 23.35 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0 to -5			Fill: Orange, black, tan, rocks, sandy clay, sand, loose, loose	100			Well Cap	
-5 to -10		CL	Sandy Silty Clay: Dark brown, ligght grey, moist-dry	90			4.5-inch Borehole	
-10 to -15		SP	Sand: Tan, yellow, very fine-grained, loose, well sorted, dry	100				
-15 to -20		CL SP	Clay: Light red-brown, pink, soft Sand: Yellow-tan, very finegrained, loose, well sorted	100			Grouted Annulus	
-20 to -25			- becoming pale yellow, white - with coarse gravel	100			2-inch Dia Sch 40 PVC Casing	
-25 to -30			- fine- to coarse-grained, poorly sorted, with some pebbles, wet	100				
-30 to -35			- becoming pink to red-beige	100				
-35 to -40			- with abundant pebbles Clay: Mottled red-grey, soft	100				
-40 to -45		CL SP	Sand: Red-orange, light brown, slightly clayey, fine- to coarse-grained, poorly sorted, with pebbles and gravel	100				
-45 to -50				100			Bentonite Seal 20/30 Sand Above Pre-pack	
-50 to -55			- coarse-grained sand, with pebbles and gravel	100			2-inch Dia Sch 40 PVC Screen 20/30 Pre-pack Sand	
-55 to -60		SW	Silty Sand: Brown, fine-grained, loose, wet	100			Total Depth Drilled	

SOIL BORING LOG

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

BORING/WELL NO.:	**W-26**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**129.42 Ft NGVD**
GROUND SURFACE ELEV.:	**125.89 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/07/2017**

Notes:

Water level during drilling: 30 ft bgs

Water level in completed well: 29.93 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0 to -60		SP	Sand: Tan, yellow, fine- to medium-grained, loose, moist	60			Well Cap	
		CL						
		SM	Silty Clay: Orange-red, stiff, with sand seams at 2.0 ft, 2.5 ft, 3.0 ft	90			4.5-inch Borehole	
			Sandy Silt: Orange-red, very fine-grained, loose, dry - with dark orange bands	100			Grouted Annulus	
		SP	Sand: Dark orange-red, very fine- to fine-grained, loose, dry	100			2-inch Dia Sch 40 PVC Casing	
			- becoming yellow	100				
			- becoming orange - fine-grained, wet	100				
			- becoming tan-light yellow - with thin soft orange clay pocket	100				
		SW	- trasition to white, pale yellow sand - with random fine to coarse gravel, light brown, with some clayey sand	100				
			- becoming dark yellow, light brown	100			Bentonite Seal 20/30 Sand Above Pre-pack	
			- with coarse gravel - with coarse gravel, fine- to medium-grained sand	100			2-inch Dia Sch 40 PVC Screen 20/30 Pre-pack Sand	
				100			Total Depth Drilled	

SOIL BORING LOG

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

BORING/WELL NO.:	**W-27**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**119.43 Ft NGVD**
GROUND SURFACE ELEV.:	**116.92 Ft NGVD**

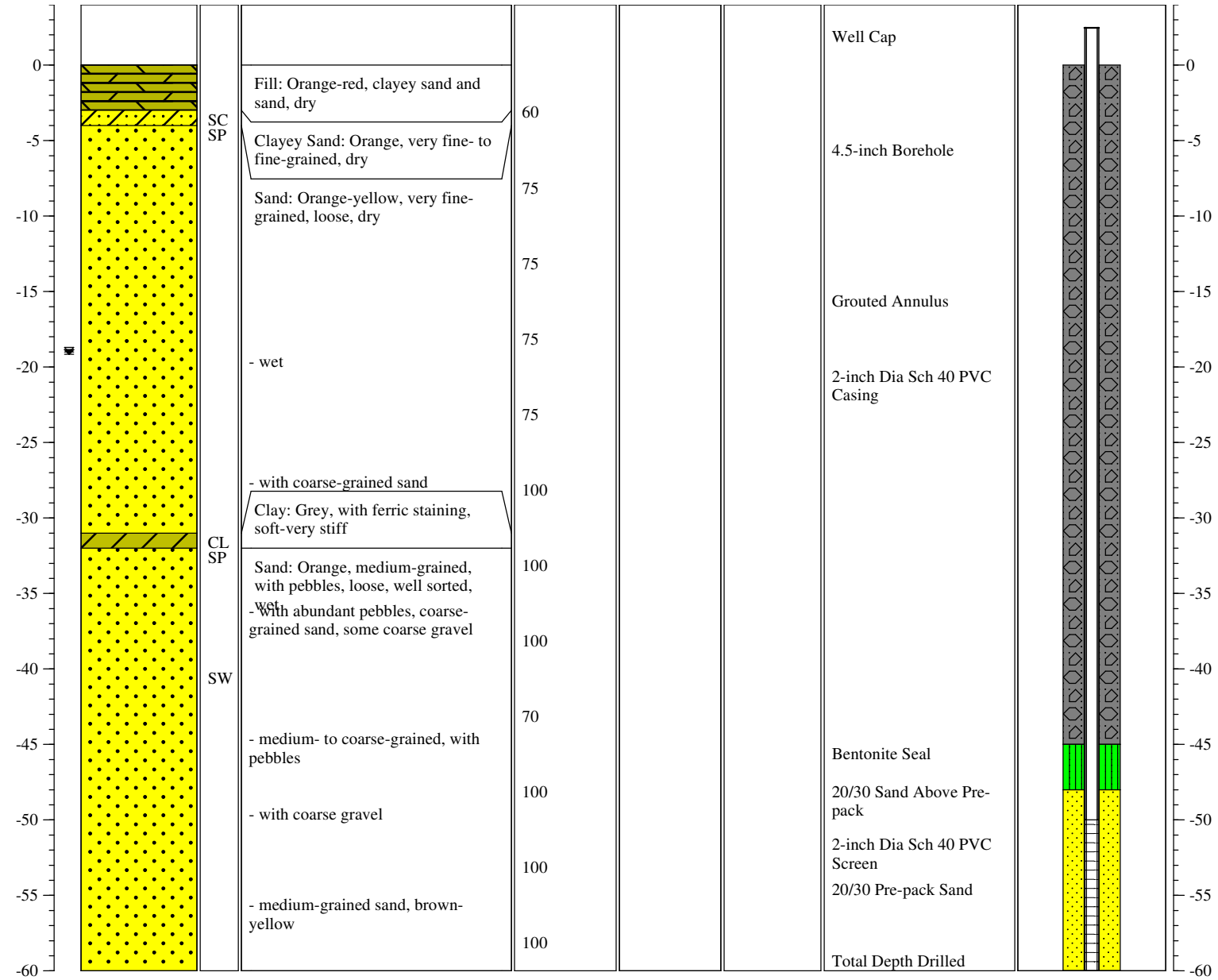
CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/08/2017**

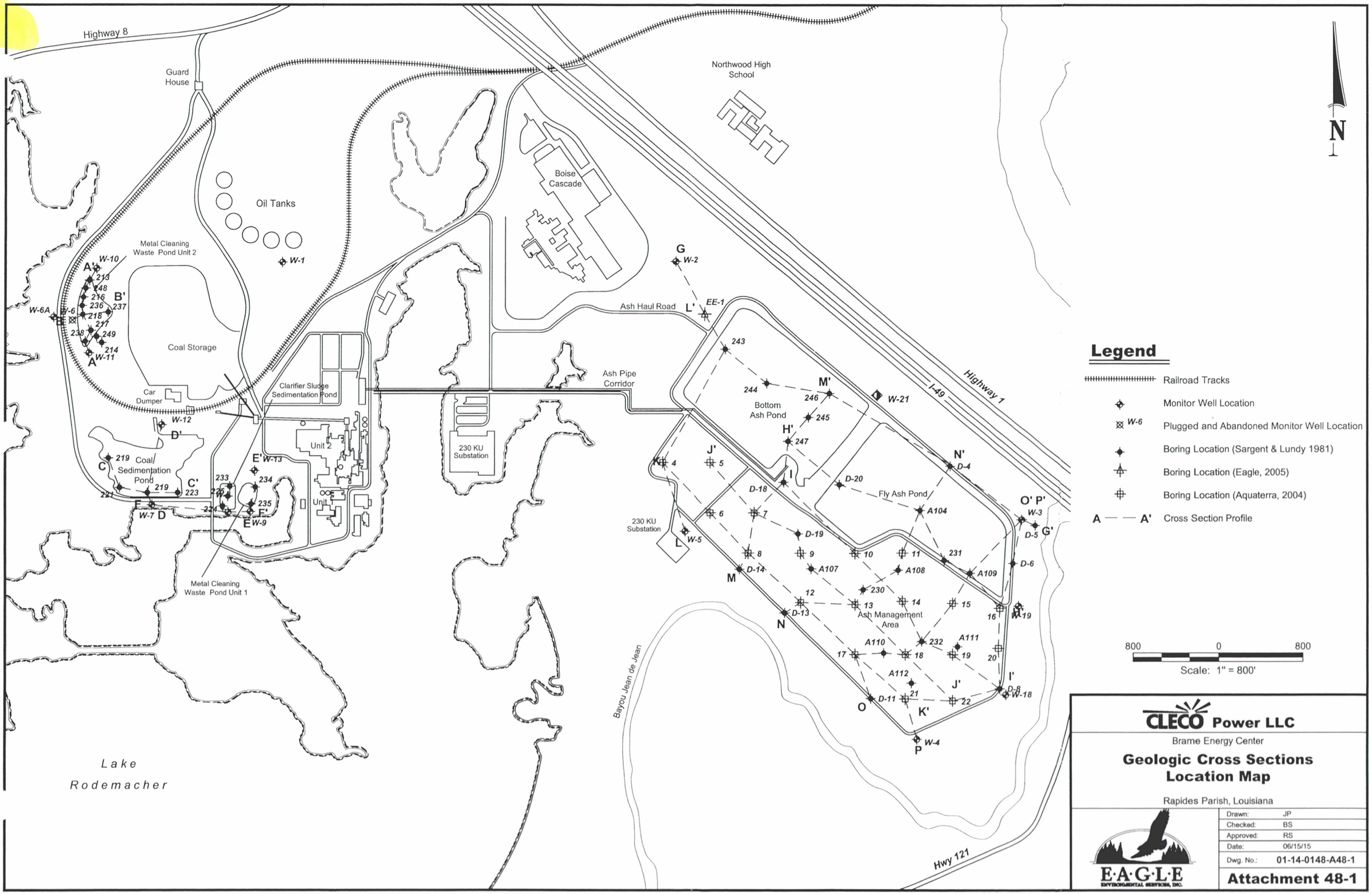
Notes:

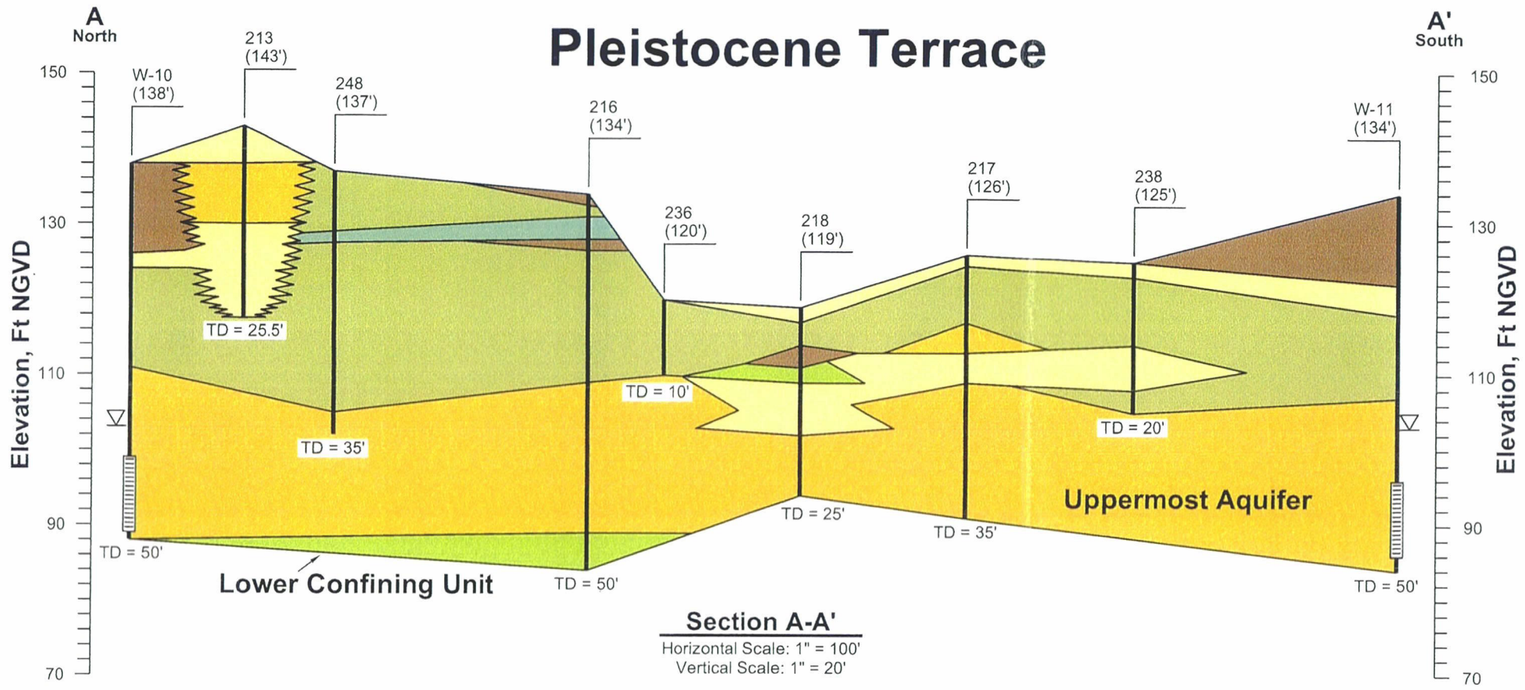
Water level during drilling: 19 ft bgs

Water level in completed well: 19.15 ft bgs

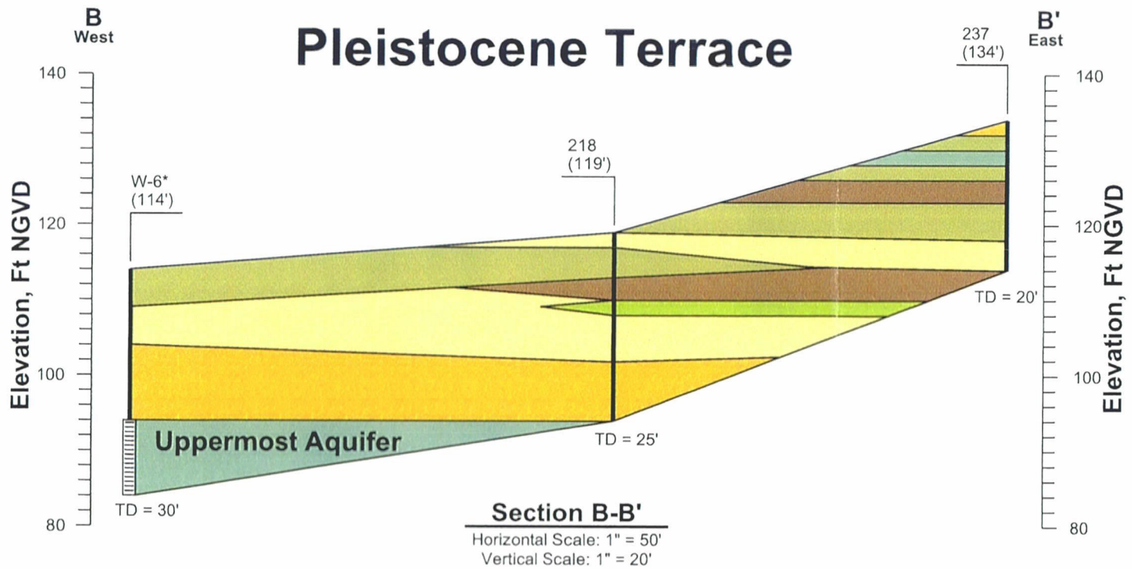
DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION




Highway 8
Guard House
Northwood High School
Boise Cascade
Oil Tanks
Metal Cleaning Waste Pond Unit 2
W-1
W-10
A'
213
248
216
B'
237
W-6A
W-6
218
236
217
238
249
214
A
W-11
Coal Storage
Car Dumper
W-12
D'
Clarifier Sludge Sedimentation Pond
Unit 2
230 KU Substation
Unit 1
E' W-13
C
219
Coal Sedimentation Pond
C'
219
223
221
233
234
235
F
W-7
D
E
W-9
F'
Metal Cleaning Waste Pond Unit 1
Lake Rodemacher
G
W-2
Ash Haul Road
L'
EE-1
Ash Pipe Corridor
243
M'
244
246
245
Bottom Ash Pond
W-21
H'
247
J'
5
K
4
I
D-20
N'
D-4
D-18
Fly Ash Pond
A104
O' P'
W-3
6
7
D-19
D-5
G'
230 KU Substation
L
W-5
8
9
10
11
231
D-6
M
D-14
A107
A108
A109
12
230
13
14
15
16
W-19
N
D-13
Ash Management Area
A110
232
A111
17
18
19
20
A112
I'
D-8
W-18
O
D-11
21
22
J'
K'
P
W-4
Bayou Jean de Jean
Hwy 121
I-49
Highway 1
N
Legend
Railroad Tracks
Monitor Well Location
W-6 Plugged and Abandoned Monitor Well Location
Boring Location (Sargent & Lundy 1981)
Boring Location (Eagle, 2005)
Boring Location (Aquaterra, 2004)
A — — A' Cross Section Profile
800 0 800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Geologic Cross Sections Location Map
Rapides Parish, Louisiana
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Drawn: JP
Checked: BS
Approved: RS
Date: 06/15/15
Dwg. No.: 01-14-0148-A48-1
Attachment 48-1



Section A-A'
Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 20'



Section B-B'
Horizontal Scale: 1" = 50'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- ▽ High Potentiometric Surface (2010-2015)

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

* Well W-6 was plugged and abandoned.

CLECO Power LLC

Brame Energy Center

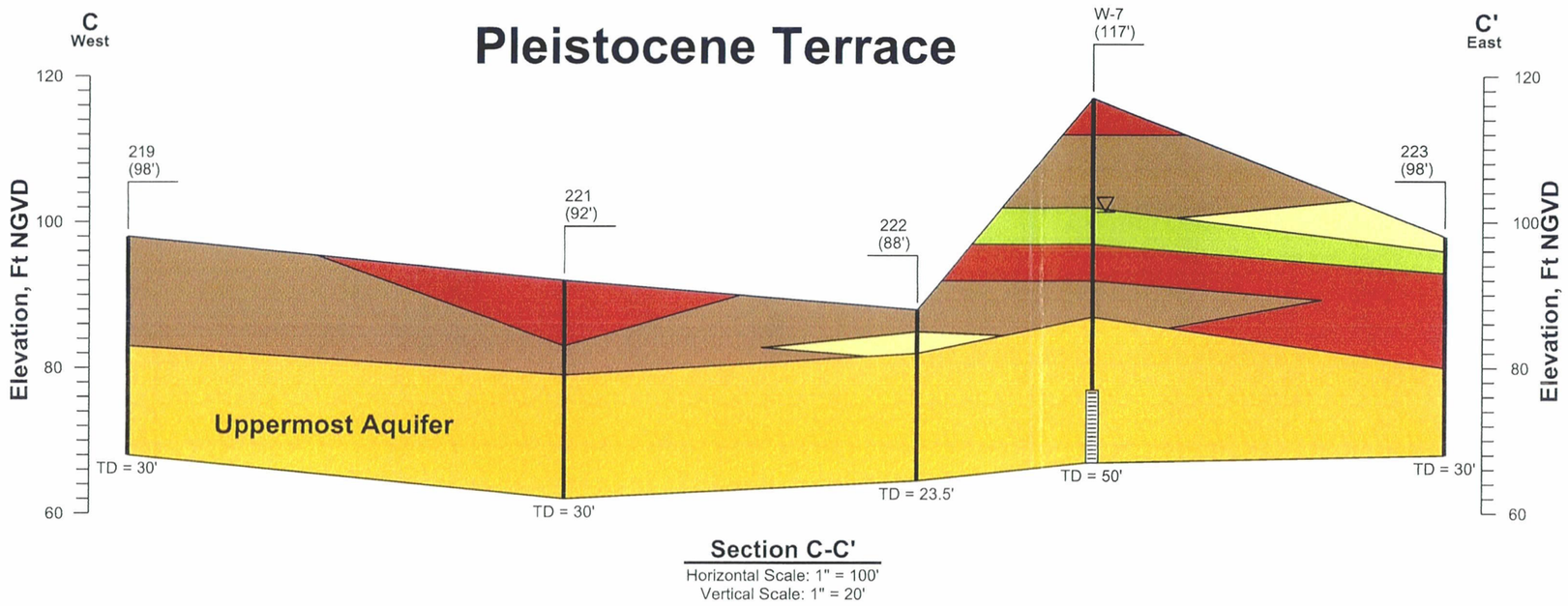
Geologic Cross Sections A-A' and B-B'

Rapides Parish, Louisiana

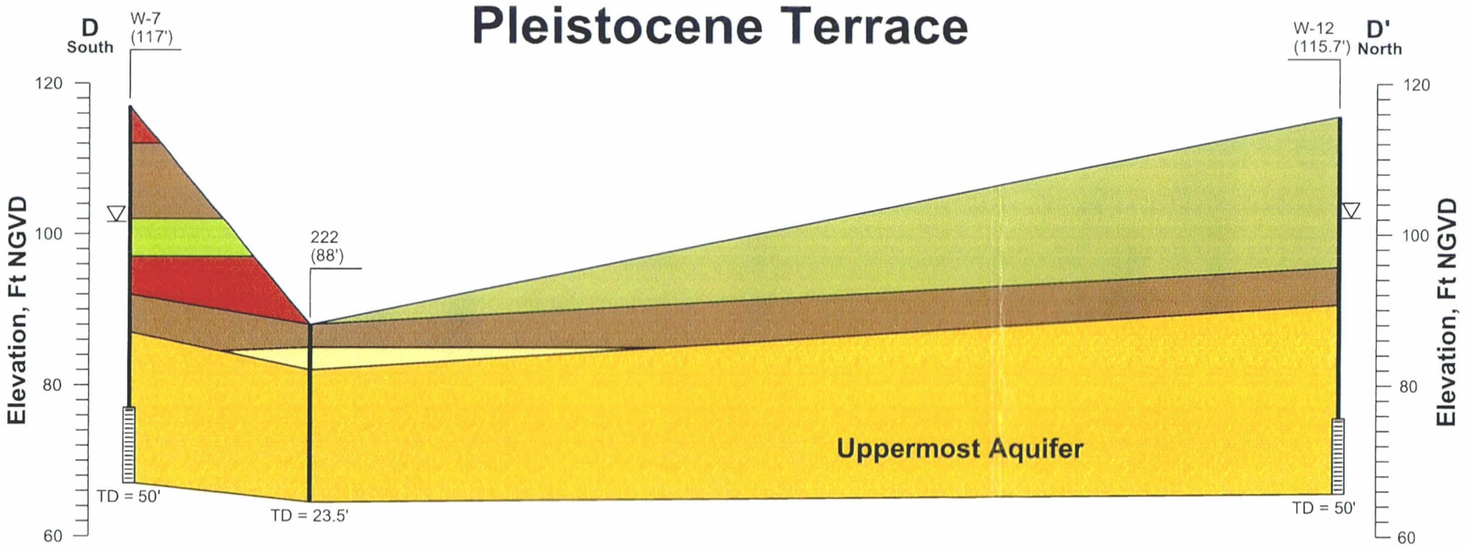
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	07/7/15
Dwg. No.:	01-15-0148-A48-2

Attachment 48-2



Section C-C'
Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 20'



Section D-D'
Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- ▽ High Potentiometric Surface Elevation (2010-2015)

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

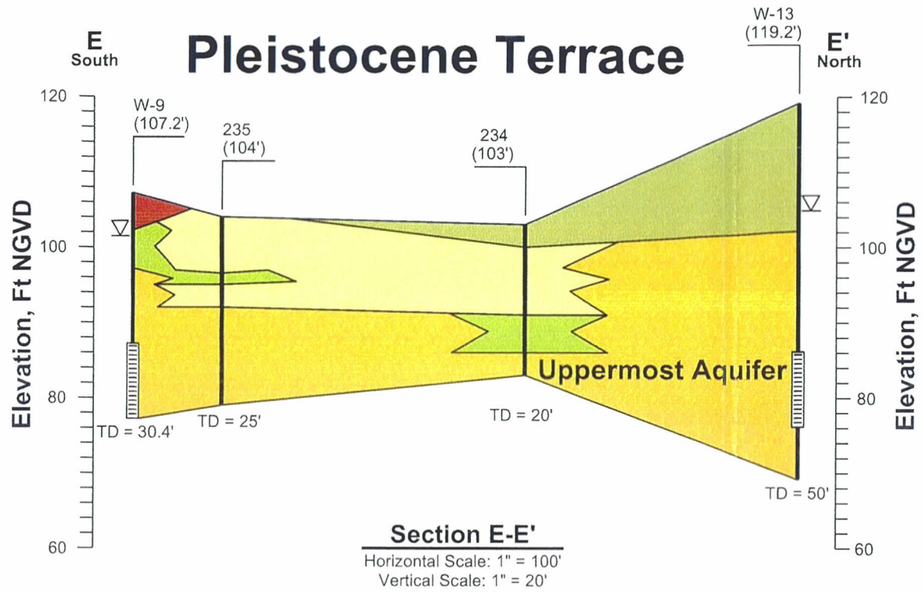
Geologic Cross Sections C-C' and D-D'

Rapides Parish, Louisiana

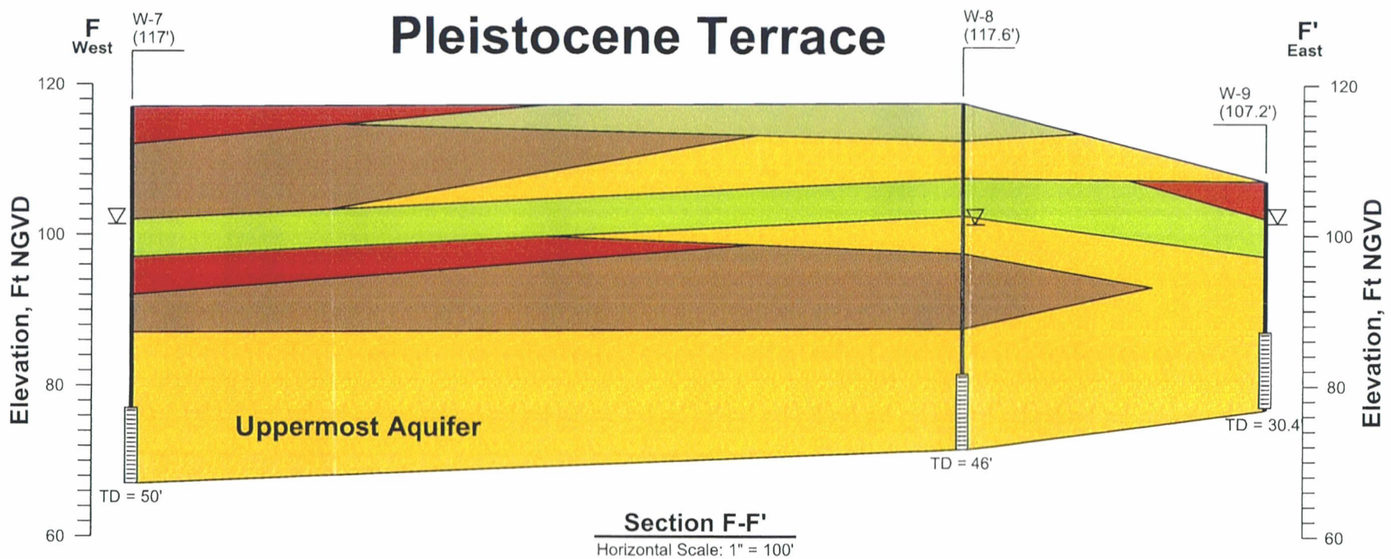
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	07/7/15
Dwg. No.:	01-15-0148-A48-3

Attachment 48-3



Section E-E'
Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 20'



Section F-F'
Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- ▽ High Potentiometric Surface Elevation (2010-2015)

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

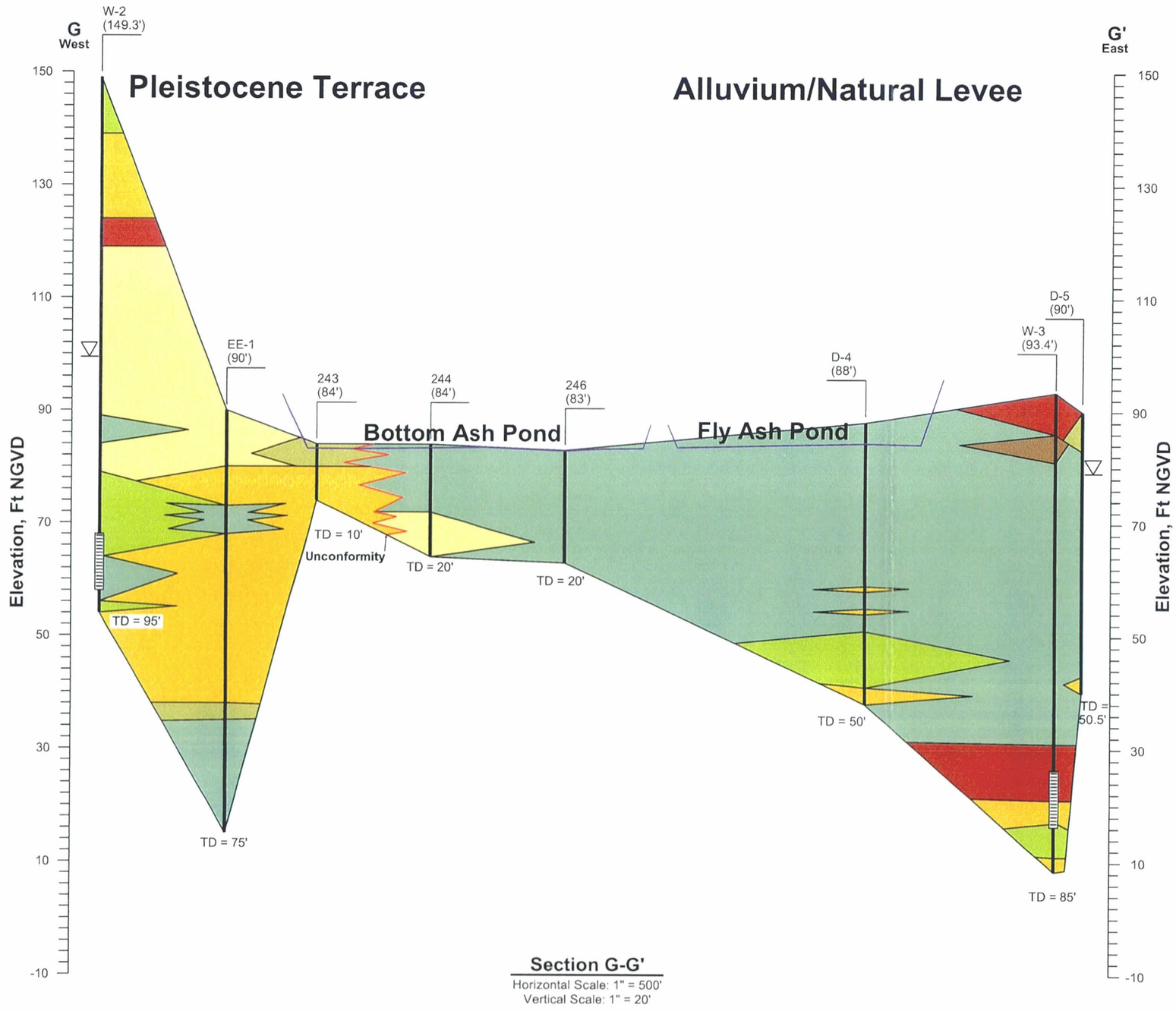
Geologic Cross Sections E-E' and F-F'

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	07/7/15
Dwg. No.:	01-15-0148-A48-4

Attachment 48-4



Section G-G'
Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth
- High Potentiometric Surface Elevation (2009-2015)
- Bottom Ash Pond and Fly Ash Pond
- Pleistocene Terrace and Alluvium/Natural Levee Boundary

Note:

Drawing comprised of client provided drawing "01-0009-F002" dated 03/11/09.

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

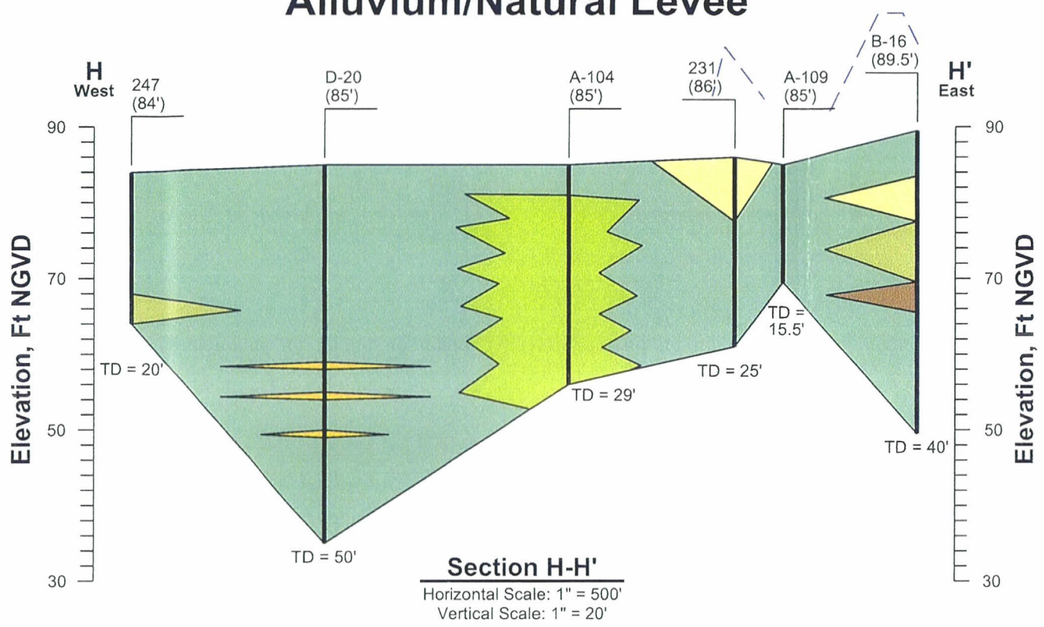
Geologic Cross Section G-G'

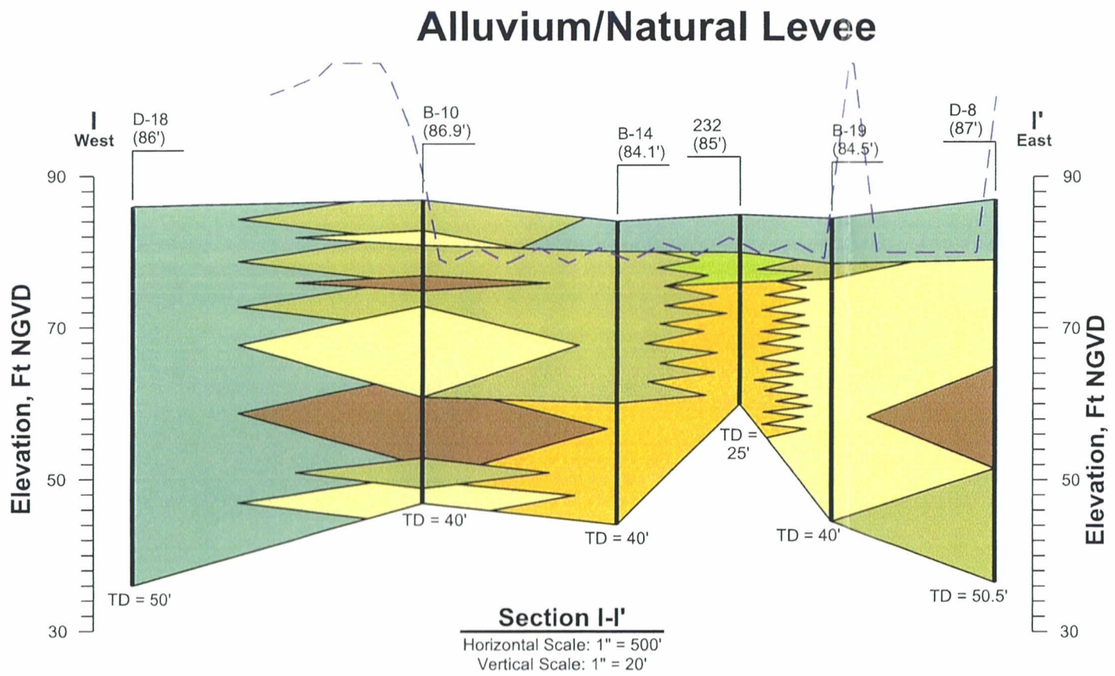
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-5

Attachment 48-5





Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (85') Elevation, Ft NGVD
- TD Total Depth
- Landfill Cells 1-4 and Pond Subgrade

Note:

Stratigraphy between borings are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F003" dated 03/11/09. Cells 1-4 and pond subgrade were added.

CLECO Power LLC

Brame Energy Center

Geologic Cross Sections H-H' and I-I'

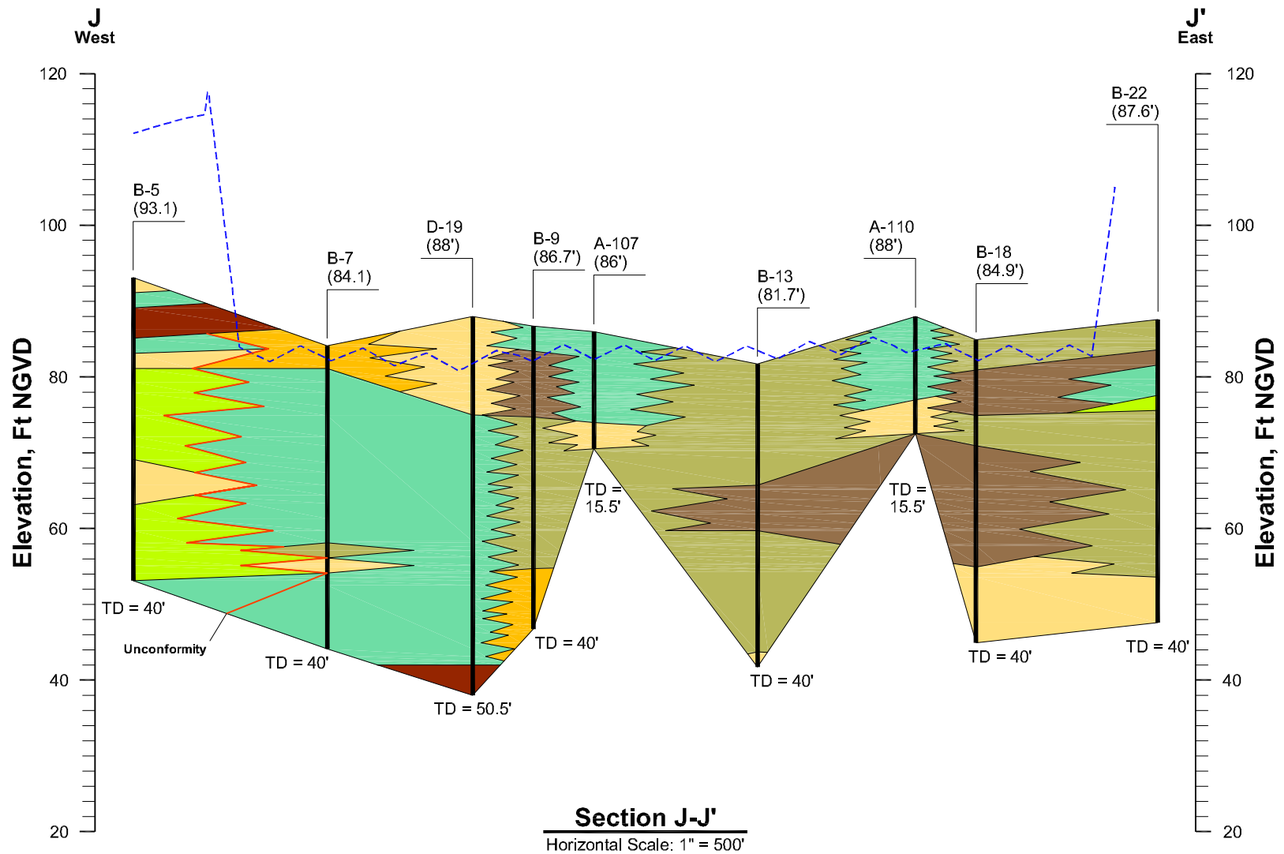
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-6

Attachment 48-6

Pleistocene Terrace **Alluvium/Natural Levee**



Section J-J'
Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- Cells 1-4 and Pond Subgrade
- Pleistocene Terrace and Alluvium/Natural Levee Boundary

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F004" dated 03/11/09. Cells 1-4 and pond subgrade were added.

Geologic Cross Section J-J'

Solid Waste Permit Modification
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

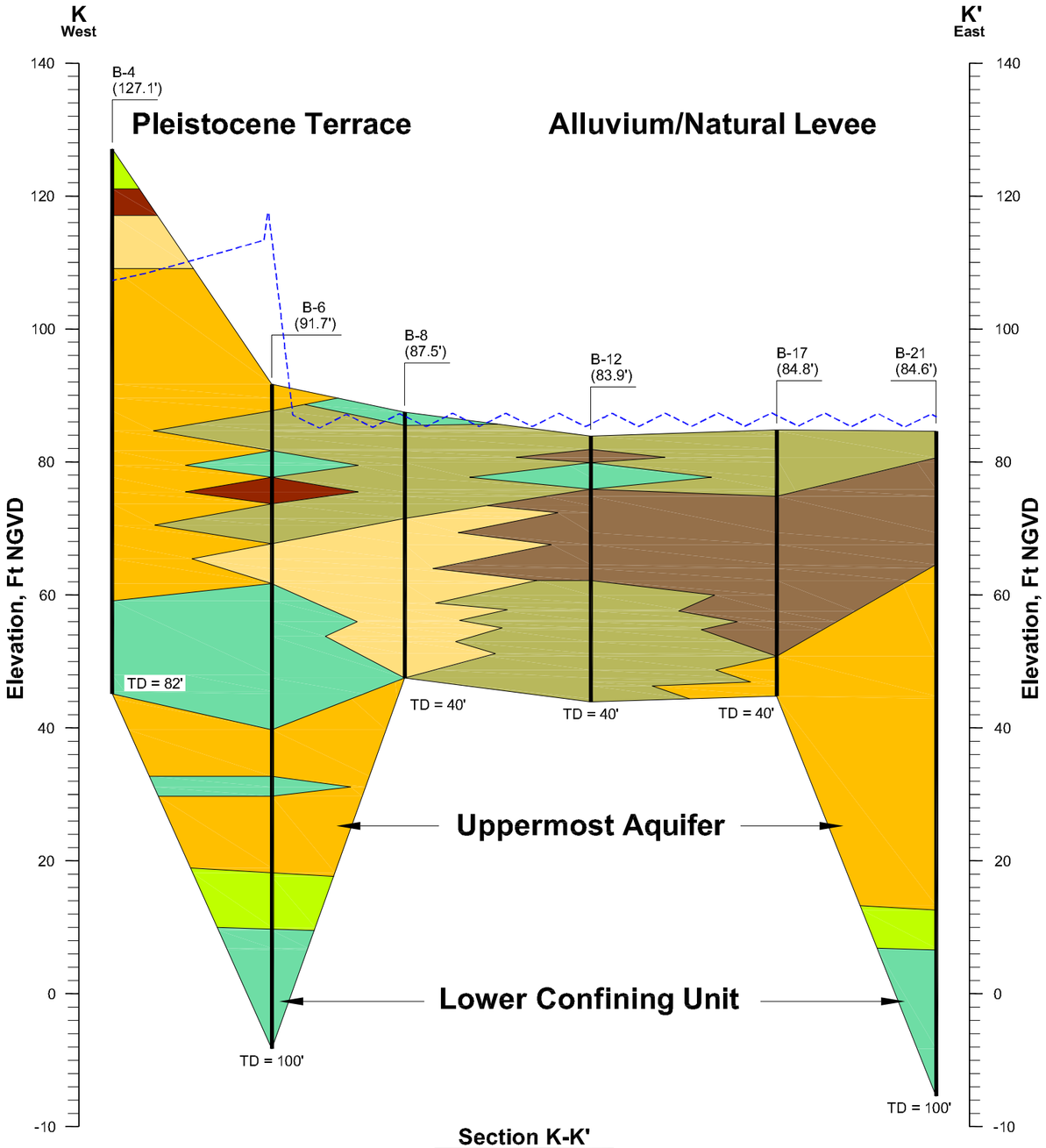
PROVIDENCE

Drawn By	DSG	06/03/21
Checked By	LMH	06/03/21
Approved By	GJL	06/03/21

Project Number
002-278

Drawing Number
002-278-B014

48-7
Attachment



Section K-K'
Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- Cells 1-4 and Pond Subgrade

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F005" dated 03/11/09. Cells 1-4 and pond subgrade were added.

Geologic Cross Section K-K'

Solid Waste Permit Modification
Boyce. Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

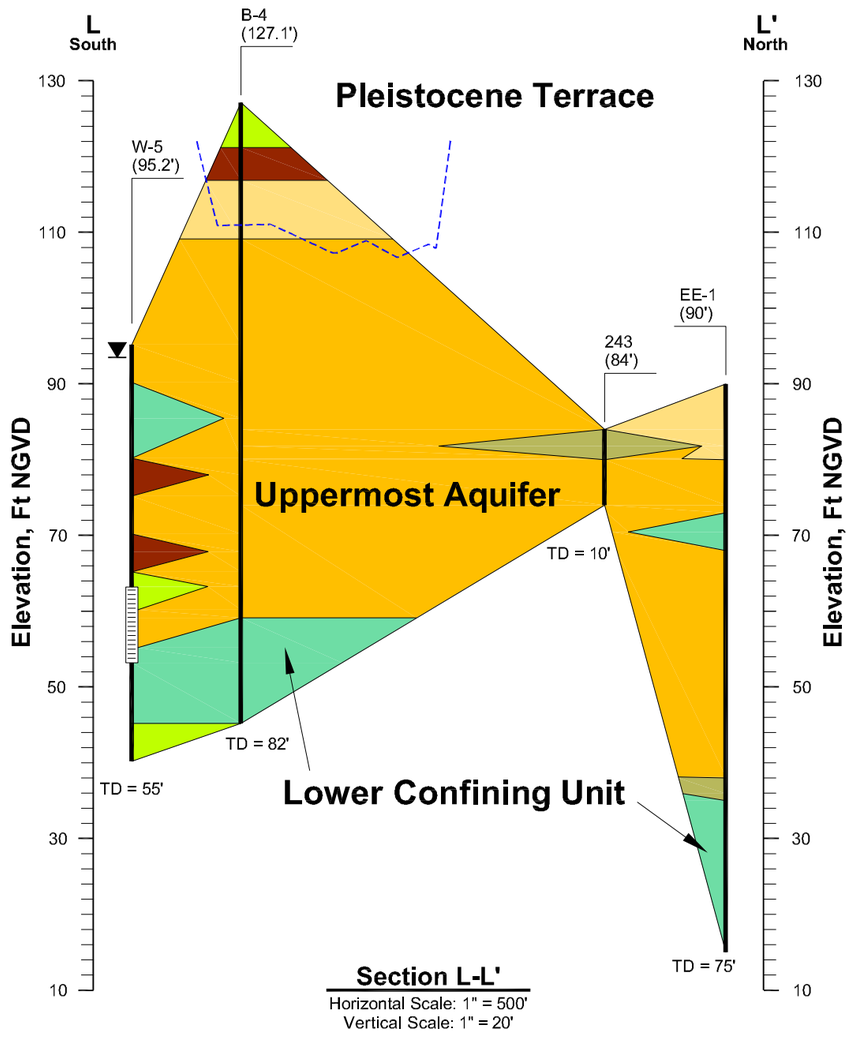
PROVIDENCE

Drawn By	DSG	06/03/21
Checked By	LMH	06/03/21
Approved By	GJL	06/03/21

Project Number
002-278

Drawing Number
002-278-B015

48-8
Attachment



Section L-L'
Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (114') Elevation, Ft NGVD
- TD Total Depth
- ------- Cells 1-4 and Pond Subgrade
- ▼ High Potentiometric Surface Elevations (2010-2015)

Note:

Stratigraphy between boring are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F006" dated 03/11/09. Cells 1-4 and pond subgrade were added.

Geologic Cross Section L-L'

Solid Waste Permit Modification
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

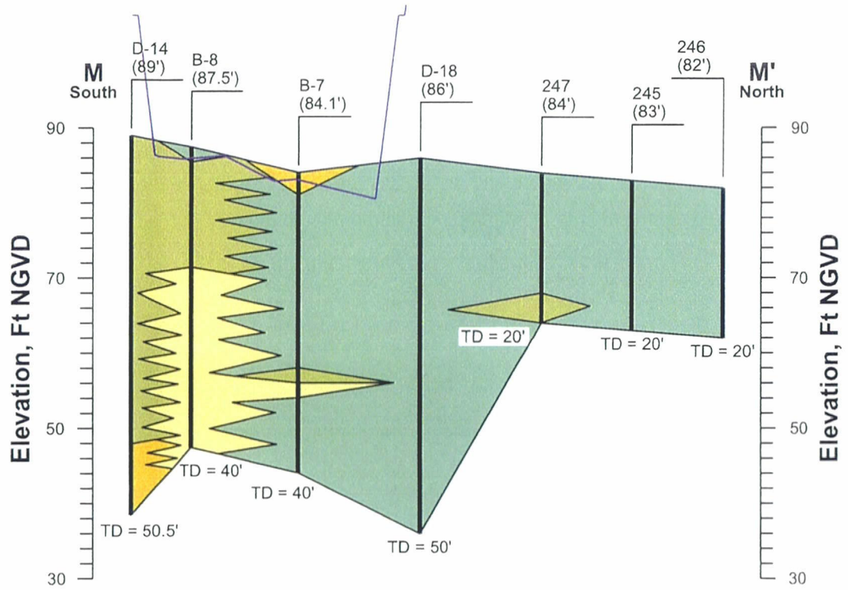
PROVIDENCE

Drawn By	DSG	06/03/21
Checked By	LMH	06/03/21
Approved By	GJL	06/03/21

Project Number
002-278

Drawing Number
002-278-B016

48-9
Attachment



Section M-M'

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (89') Elevation, Ft NGVD
- TD Total Depth
- Landfill Cells 1-4 and Pond Subgrade

Note:

Stratigraphy between borings are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F007" dated 03/11/09. Cells 1-4 and pond subgrade were added.

CLECO Power LLC

Brame Energy Center

Geologic Cross Section M-M'

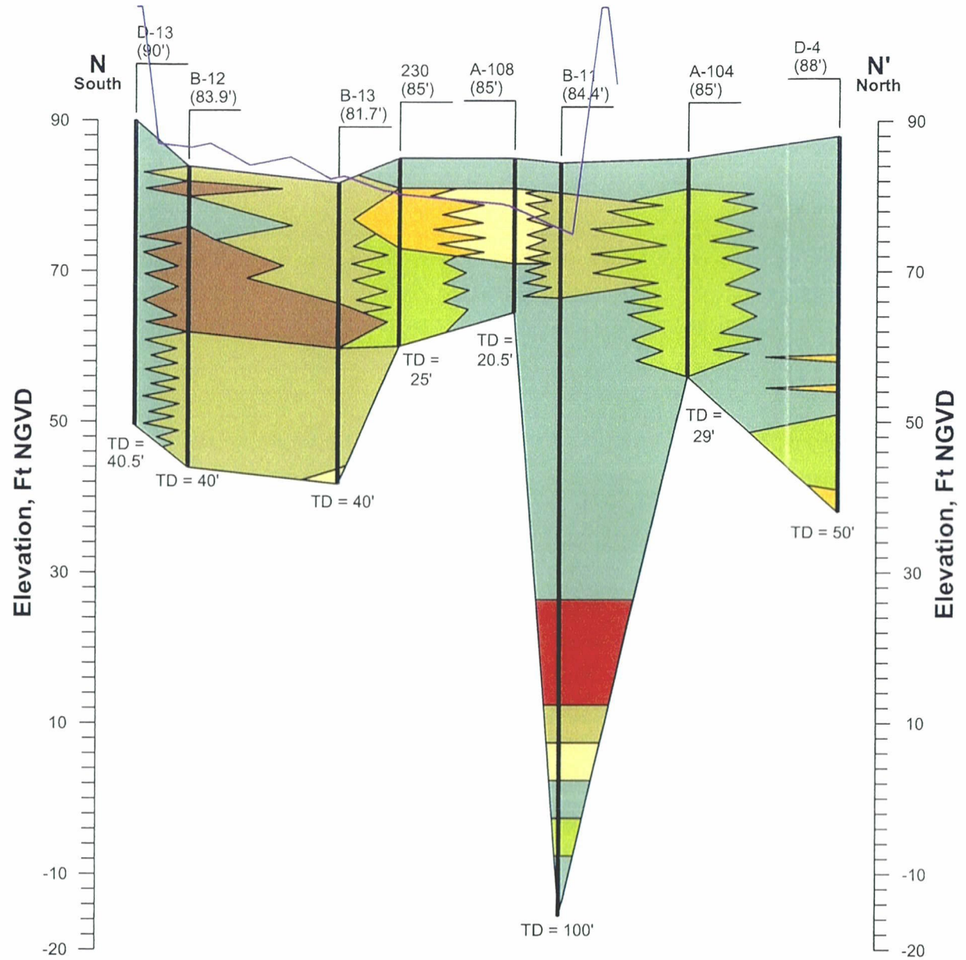
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-10

Attachment 48-10

Alluvium/Natural Levee



Section N-N'

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth
- Landfill Cells 1-4 and Pond Subgrade

Note:

Stratigraphy between borings are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "002-034-B037" dated 03/13/09.

CLECO Power LLC

Brame Energy Center

Geologic Cross Section N-N'

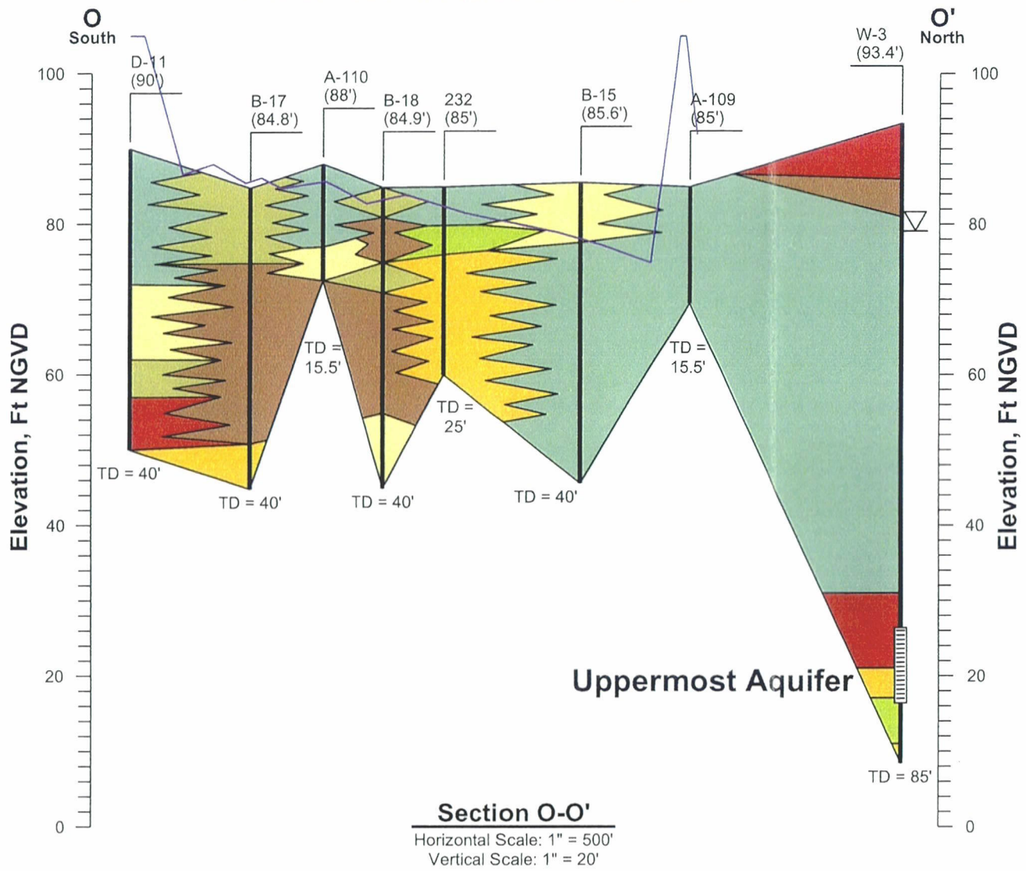
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/9/15
Dwg. No.:	01-15-0148-A48-11

Attachment 48-11

Alluvium/Natural Levee



Section O-O'

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth
- Landfill Cells 1-4 and Pond Subgrade
- High Potentiometric Surface Elevations (2010-2015)

Note:

Stratigraphy between borings are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F009" dated 03/11/09. Cells 1-4 and pond subgrade were added.

CLECO Power LLC

Brame Energy Center

Geologic Cross Section O-O'

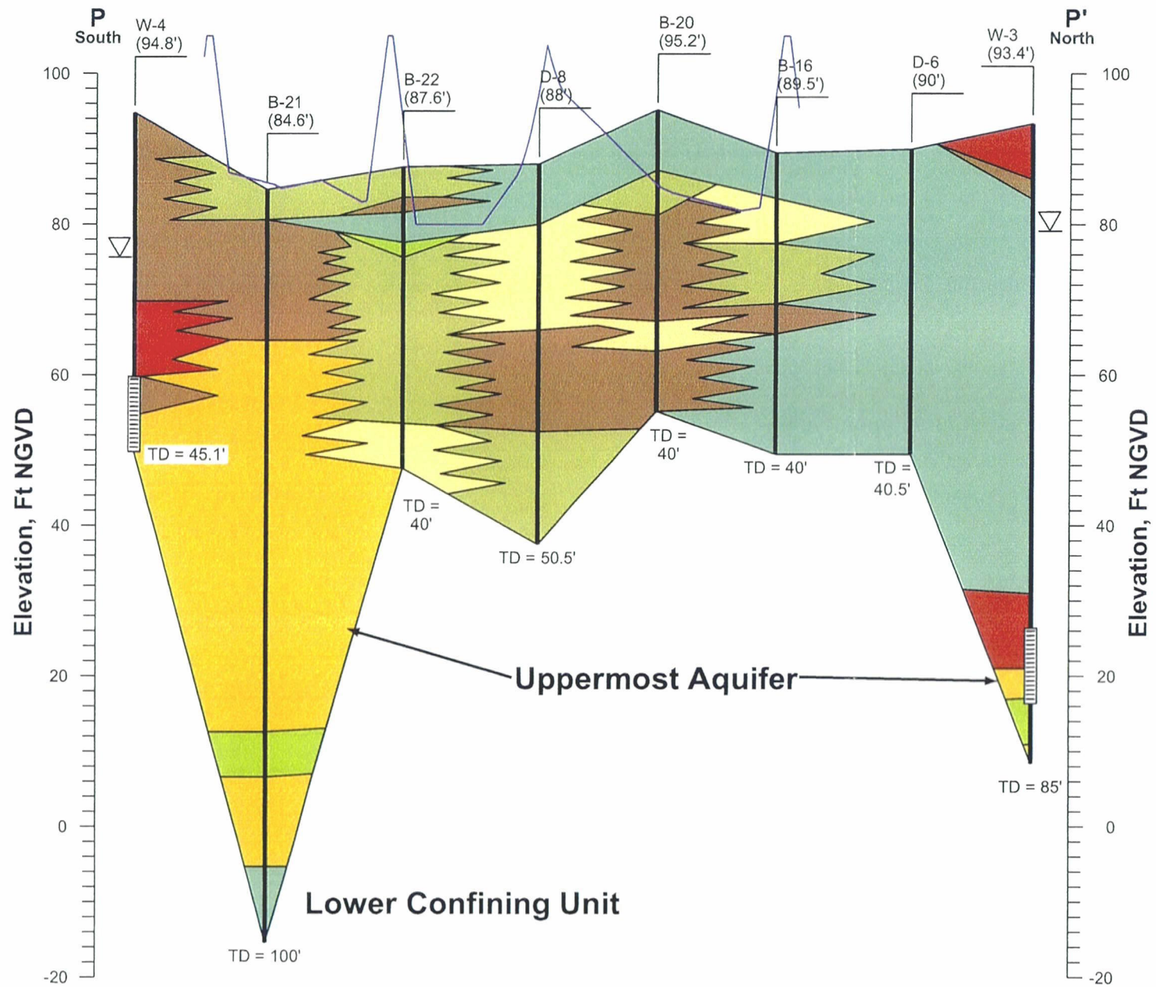
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-12

Attachment 48-12

Alluvium/Natural Levee



Section P-P'

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth
- Landfill Cells 1-4 and Pond Subgrade
- High Potentiometric Surface Elevation (2010-2015)

Note:

Stratigraphy between borings are inferred. Actual conditions may vary.

Reference

Drawing comprised of client provided drawing "01-0009-F010" dated 03/11/09. Cells 1-4 and pond subgrade were added.

CLECO Power LLC

Brame Energy Center

Geologic Cross Section P-P'

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-13

Attachment 48-13

Highway 8

Guard House

Northwood High School

N

Boise Cascade

Oil Tanks

W-1

Metal Waste Cleaning Pond Unit 2

W-10

W-2

B

A

W-6A

Ash Haul Road

Coal Storage

W-11

Proposed Unit 3

Ash Pipe Corridor

Bottom Ash Pond

W-21

I-49

Highway 1

Car Dumper

W-12

Unit 2

230 KU Substation

C

W-13

A'

Coal Sedimentation Pond

W-20

W-8

W-7

W-9

Unit 1

W-14

D

W-3

B'

230 KU Substation

W-5

Fly Ash Pond

Clarifier Sludge Sedimentation Pond

Metal Waste Cleaning Pond Unit 1

W-15

W-19

W-16

Ash Management Area

Bayou Jean de Jean

W-17

W-18

D'

W-4

C'

Lake Rodemacher

Hwy 121

Legend

- Railroad Tracks
- Monitoring Well Location
- Background Monitoring Well Location
- Piezometer Location
- A — A' Cross-Section Profile

800 0 800

Scale: 1" = 800'

CLECO Power LLC

Brame Energy Center

Geologic Cross-Section Location Map

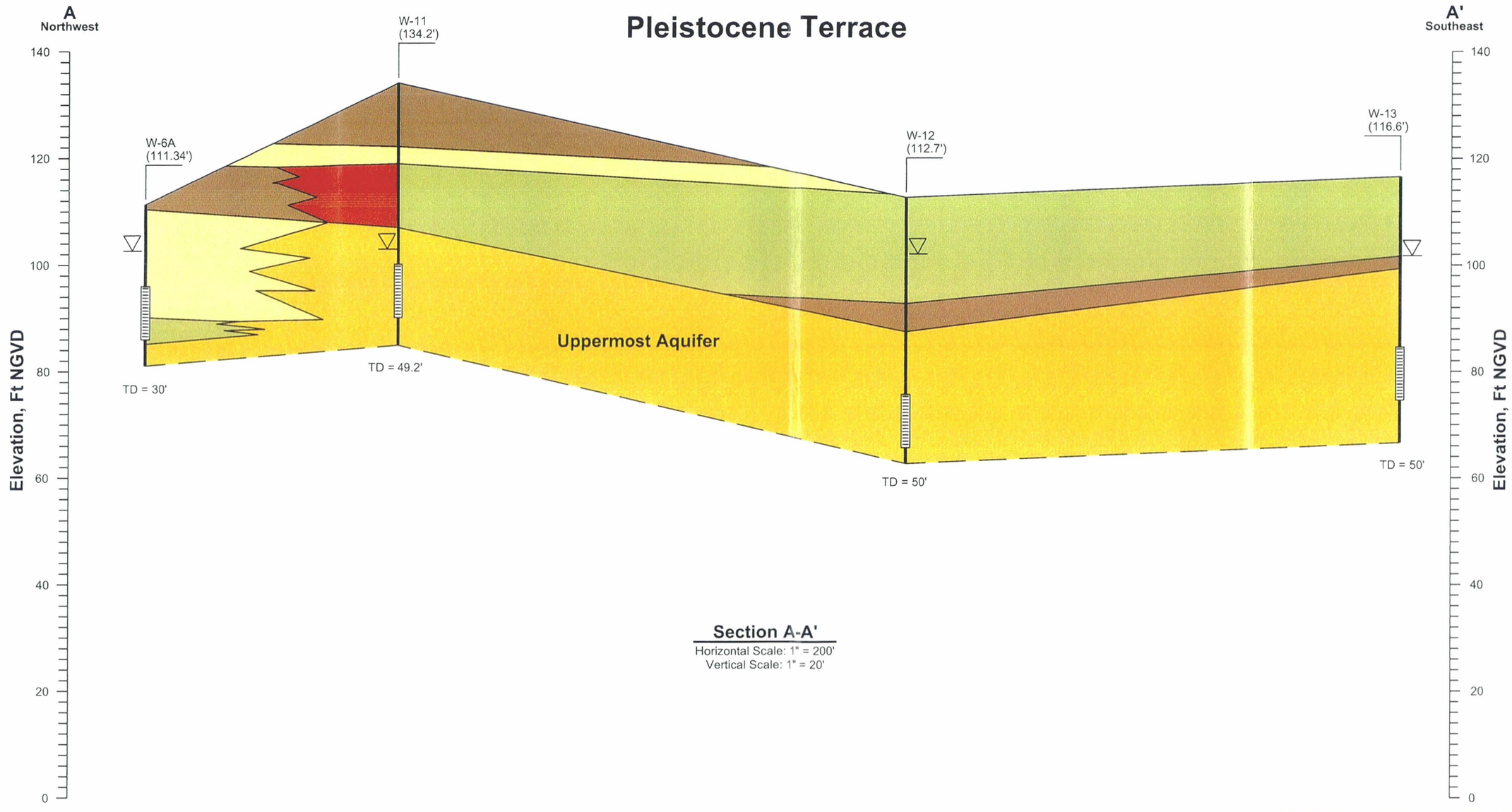
Rapides Parish, Louisiana

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

Drawn:	jlp
Checked:	JM
Approved:	RS
Date:	07/16/08
Dwg. No.:	01-15-0148-A48-14

Attachment 48-14

Pleistocene Terrace



Section A-A'
Horizontal Scale: 1" = 200'
Vertical Scale: 1" = 20'

Legend:

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Clay
- Screen Interval
- ▽ High Potentiometric Surface Elevation (2010-2015)
- TD Total Depth
- (134.2') Elevation, Ft NGVD

Note:
Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC
Brame Energy Center

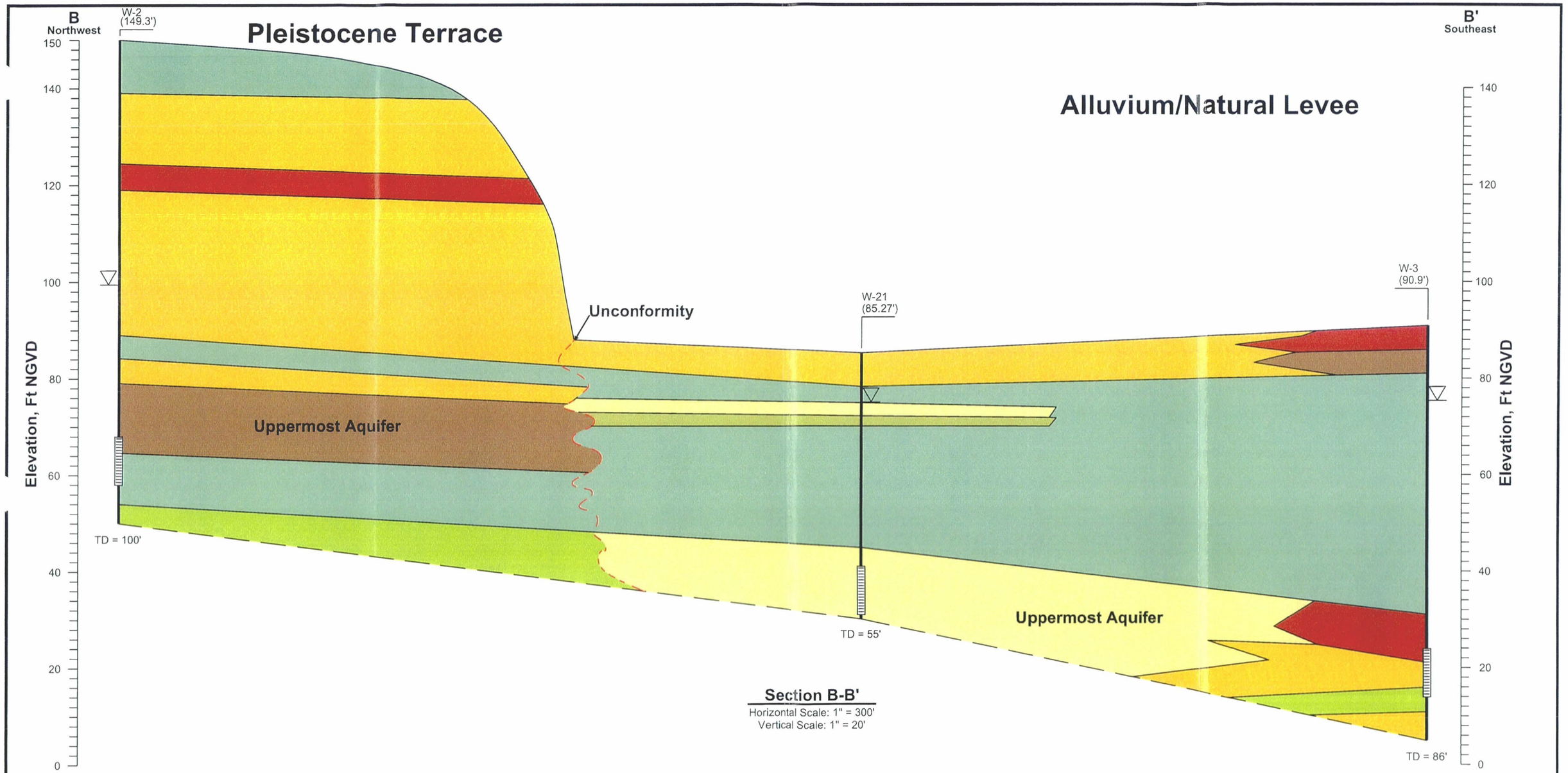
Geologic Cross-Section A-A'

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/7/15
Dwg. No.:	01-15-0148-A48-15

Attachment 48-15



Section B-B'
Horizontal Scale: 1" = 300'
Vertical Scale: 1" = 20'

Legend:

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Clay
- Screen Interval
- Pleistocene Terrace and Alluvium/Natural Levee Boundary
- ▽ High Potentiometric Surface Elevation (2010-2015)
- TD Total Depth
- (90.9') Elevation, Ft NGVD

Note:
Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC
Brame Energy Center

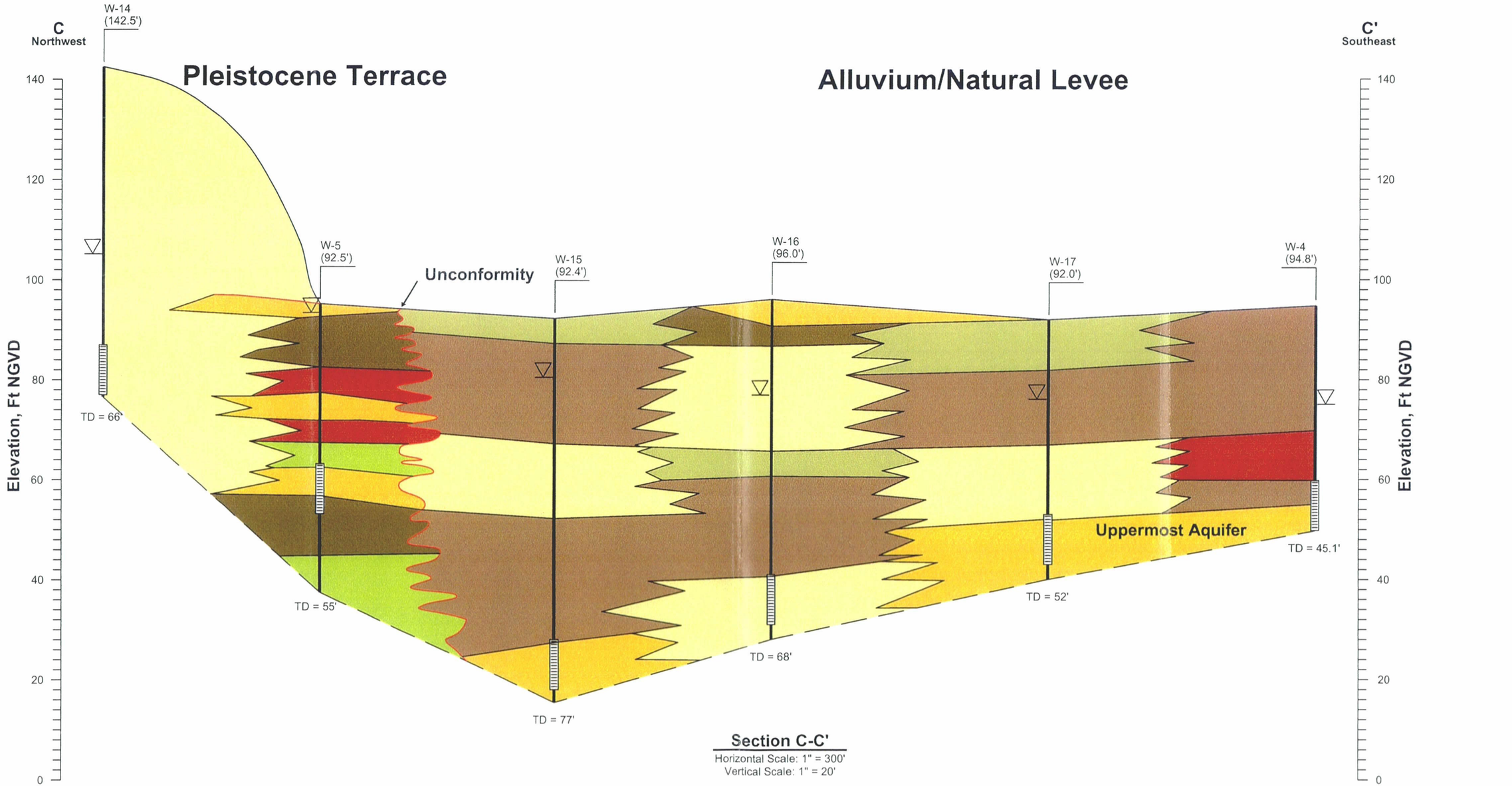
Geologic Cross-Section B-B'

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	7/15/15
Dwg. No.:	01-15-0148-A48-16

Attachment 48-16



Section C-C'
Horizontal Scale: 1" = 300'
Vertical Scale: 1" = 20'

Legend:

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Clay
- Screen Interval
- Pleistocene Terrace and Alluvium/Natural Levee Boundary
- ▽ High Potentiometric Surface Elevation (2010-2015)
- TD Total Depth
- (92') Elevation, Ft NGVD

Note:
Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC
Brame Energy Center

Geologic Cross-Section C-C'

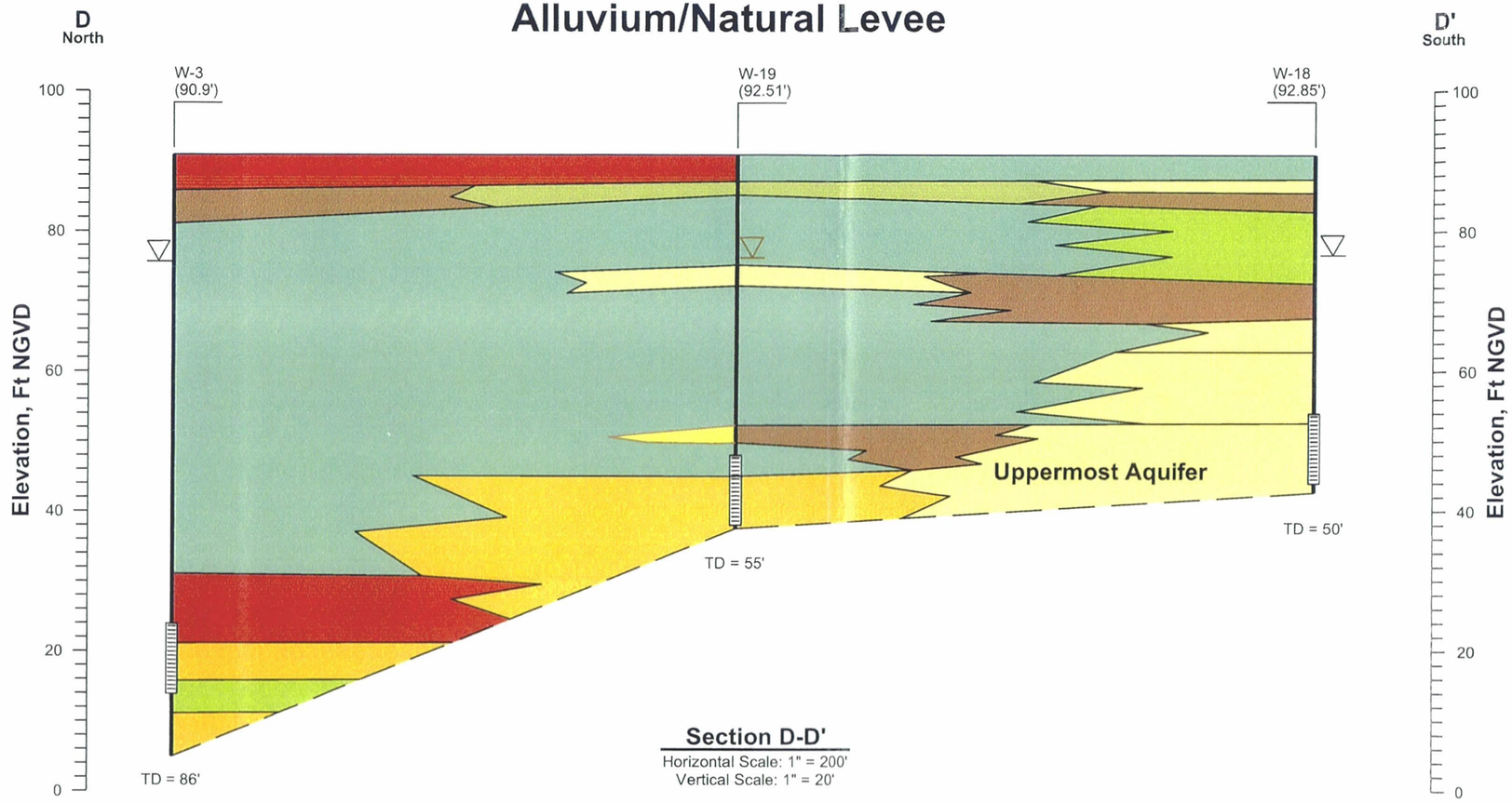
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	07/15/15
Dwg. No.:	01-15-0148-A48-17

Attachment 48-17

Alluvium/Natural Levee



Section D-D'
Horizontal Scale: 1" = 200'
Vertical Scale: 1" = 20'

Legend:

- Sand
- Silty Sand / Sandy Silt / Silt
- Sandy Clay / Silty Sandy Clay
- Silty Clay
- Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
- Clayey Sand
- Clay
- Screen Interval
- High Potentiometric Surface Elevation (2010-2015)
- TD — Total Depth
- (90.9') — Elevation, Ft NGVD

Note:
Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC
Brame Energy Center

Geologic Cross-Section D-D'

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	07/7/15
Dwg. No.:	01-15-0148-A48-18

Attachment 48-18

ATTACHMENT 2

WATER LEVEL MEASUREMENTS

CLECO BRAME ENERGY CENTER
SUMMARY OF WATER LEVELS

WELL	TOP OF CASING ELEVATION	6/3/2022		6/17/2022		7/7/2022		7/22/2022		8/5/2022		8/17/2022		9/2/2022		9/16/2022	
		DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION
	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD
W-15	94.95	19.23	75.72	19.80	75.15	20.40	74.55	20.85	74.10	20.94	74.01	21.50	73.45	-	#VALUE!	20.21	74.74
W-21	87.86	21.11	66.75	20.15	67.71	21.70	66.16	21.80	66.06	21.59	66.27	21.70	66.16	-	#VALUE!	21.77	66.09
W-25	129.42	25.53	103.89	25.65	103.77	25.70	103.72	25.85	103.57	25.71	103.71	25.60	103.82	25.47	103.95	25.53	103.89
W-26	124.74	31.63	93.11	31.70	93.04	31.70	93.04	31.80	92.94	31.63	93.11	31.40	93.34	31.21	93.53	30.92	93.82
W-27	119.43	20.39	99.04	20.50	98.93	20.60	98.83	20.75	98.68	20.55	98.88	20.45	98.98	20.32	99.11	20.44	98.99

WELL	TOP OF CASING ELEVATION	9/30/2022		10/14/2022		11/4/2022		11/18/2022		12/5/2022		1/27/2023		2/10/2023		3/10/2023	
		DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION
	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD
W-15	94.95	20.80	74.15	21.20	73.75	-	#VALUE!	21.21	73.74	20.93	74.02	-	#VALUE!	15.33	79.62	-	#VALUE!
W-21	87.86	21.83	66.03	21.75	66.11	-	#VALUE!	21.65	66.21	21.17	66.69	-	#VALUE!	12.62	75.24	-	#VALUE!
W-25	129.42	25.59	103.83	25.63	103.79	25.66	103.76	25.67	103.75	25.47	103.95	25.11	104.31	24.83	104.59	24.77	104.65
W-26	124.74	31.07	93.67	31.18	93.56	31.33	93.41	31.31	93.43	31.05	93.69	30.54	94.20	30.17	94.57	30.07	94.67
W-27	119.43	20.46	98.97	20.48	98.95	20.51	98.92	20.51	98.92	20.32	99.11	20.01	99.42	19.73	99.70	19.67	99.76

WELL	TOP OF CASING ELEVATION	3/24/2023		4/28/2023		5/19/2023	
		DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION	DEPTH TO WATER	GROUNDWATER ELEVATION
	FT NGVD	FT	FT NGVD	FT	FT NGVD	FT	FT NGVD
W-15	94.95	-	#VALUE!	16.98	77.97	17.29	77.66
W-21	87.86	12.69	75.17	19.59	68.27	18.45	69.41
W-25	129.42	24.75	104.67	24.76	104.66	24.84	104.58
W-26	124.74	30.07	94.67	30.24	94.50	30.34	94.40
W-27	119.43	19.67	99.76	19.65	99.78	19.74	99.69

ATTACHMENT 3

EAGLE ENVIRONMENTAL SERVICES, INC. (EAGLE) REPORT FOR THE 2019 FATAL FLAWS LOCATION

Eagle Environmental Services, Inc.
18379 Petroleum Drive
Baton Rouge, LA 70809
(225) 757-0870 Office
(225) 757-8855 Facsimile

DATE: November 14, 2019

TO: Charlie Van Hoof, Providence Engineering
Jonathan Roque, Cleco Corporation
Brent Croom, Cleco Corporation
Jacob Hudson, Cleco Corporation Brame Energy Center

FROM: Ray Sturdivant, Eagle Environmental Services, Inc.

RE: Cleco Brame Energy Center
Ash Management Area *Placement above the Uppermost Aquifer* Evaluation

This preliminary evaluation summarizes a hydrogeological evaluation of the uppermost water bearing zone using current data and its relationship with the Ash Management Area unit in accordance with §257.60 of the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule for the *Placement above the Uppermost Aquifer* Location Restriction This evaluation is also focused on the transfer of the Ash Management Area to a disposal facility for Coal Combustion Rule (CCR) materials.

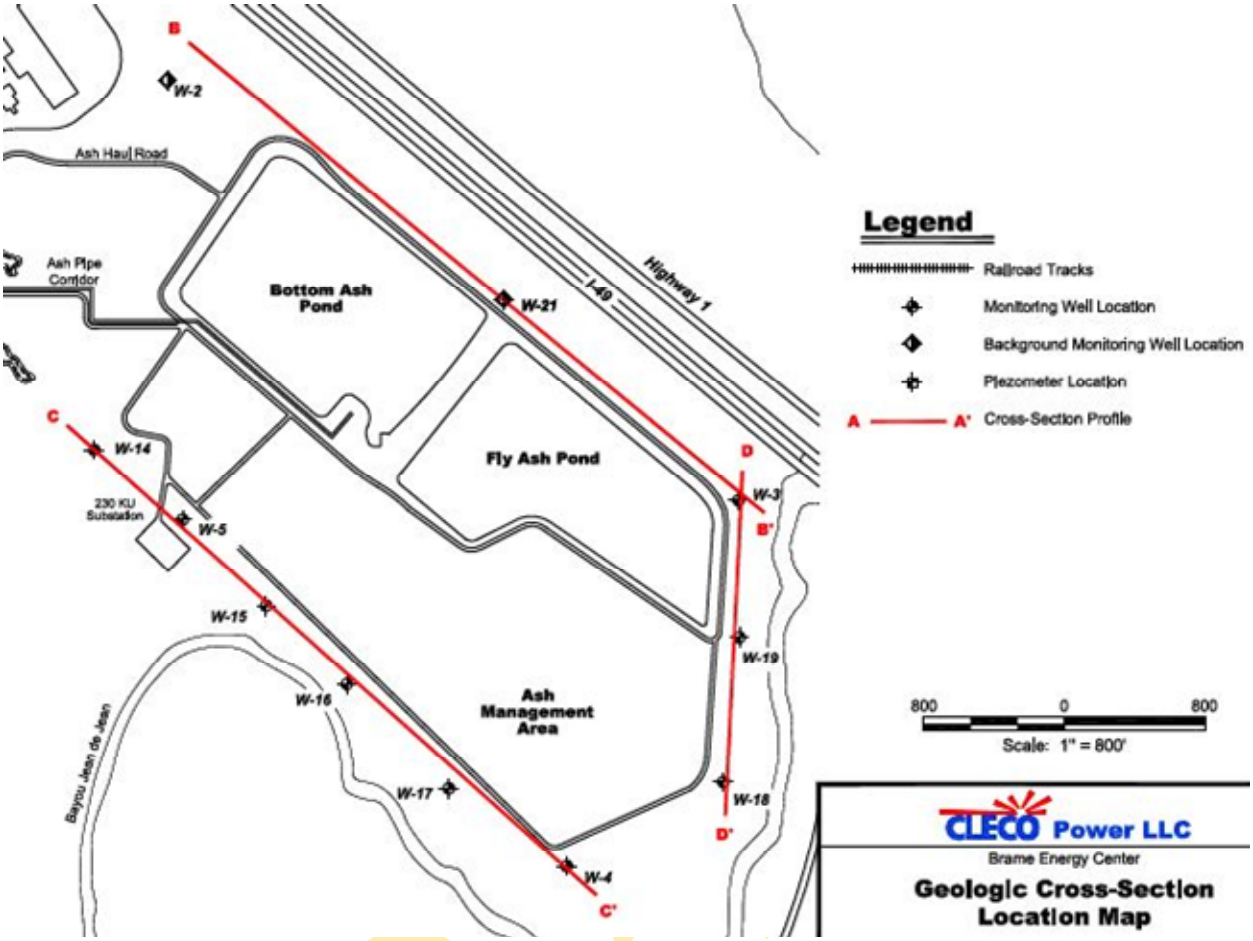
The Ash Management Area is separated into 4 separate cells with Cells 1, 2, and 3 constructed and Cell 4 proposed for construction. The Cells are oriented in a linear pattern from south to north with Cell 1 in the south and Cell 4 in the north. The lowest known subgrade elevation of the landfill is 74.91 NAVD 88 for Cells 1, 2, and 3.

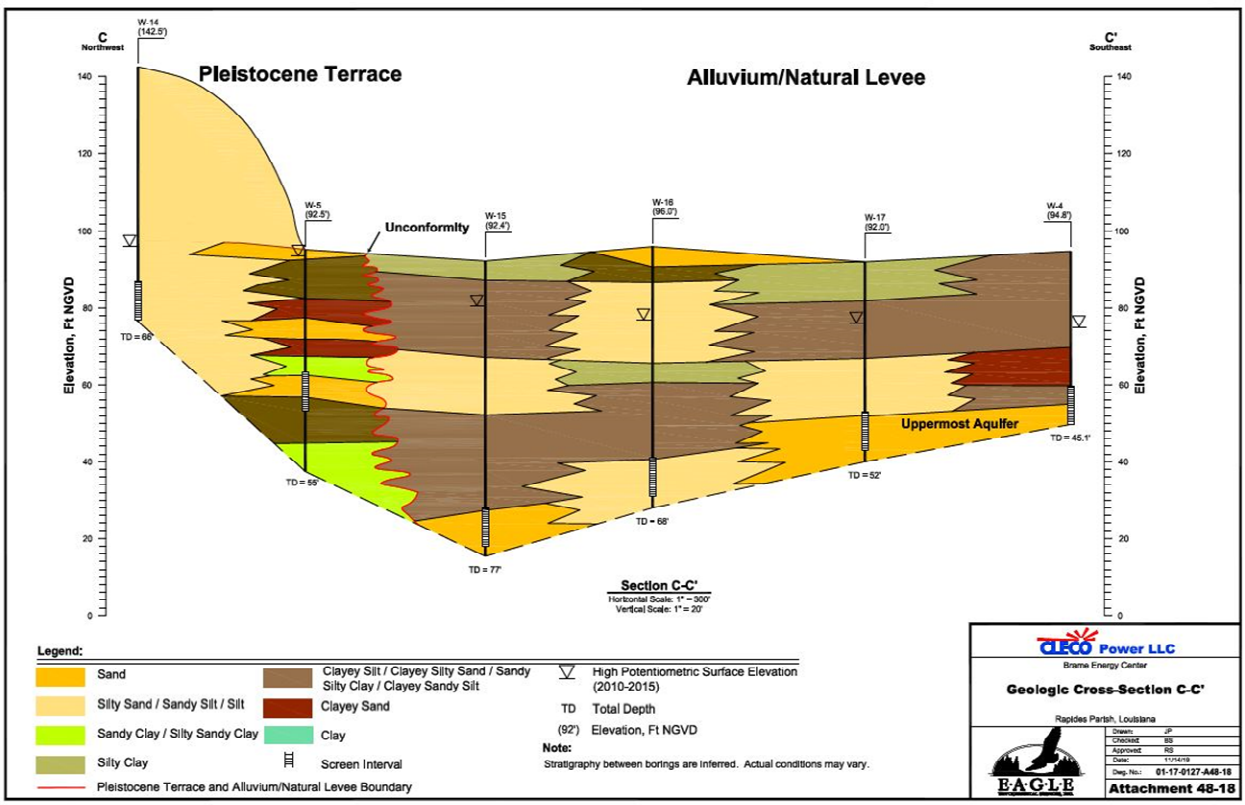
Geomorphology

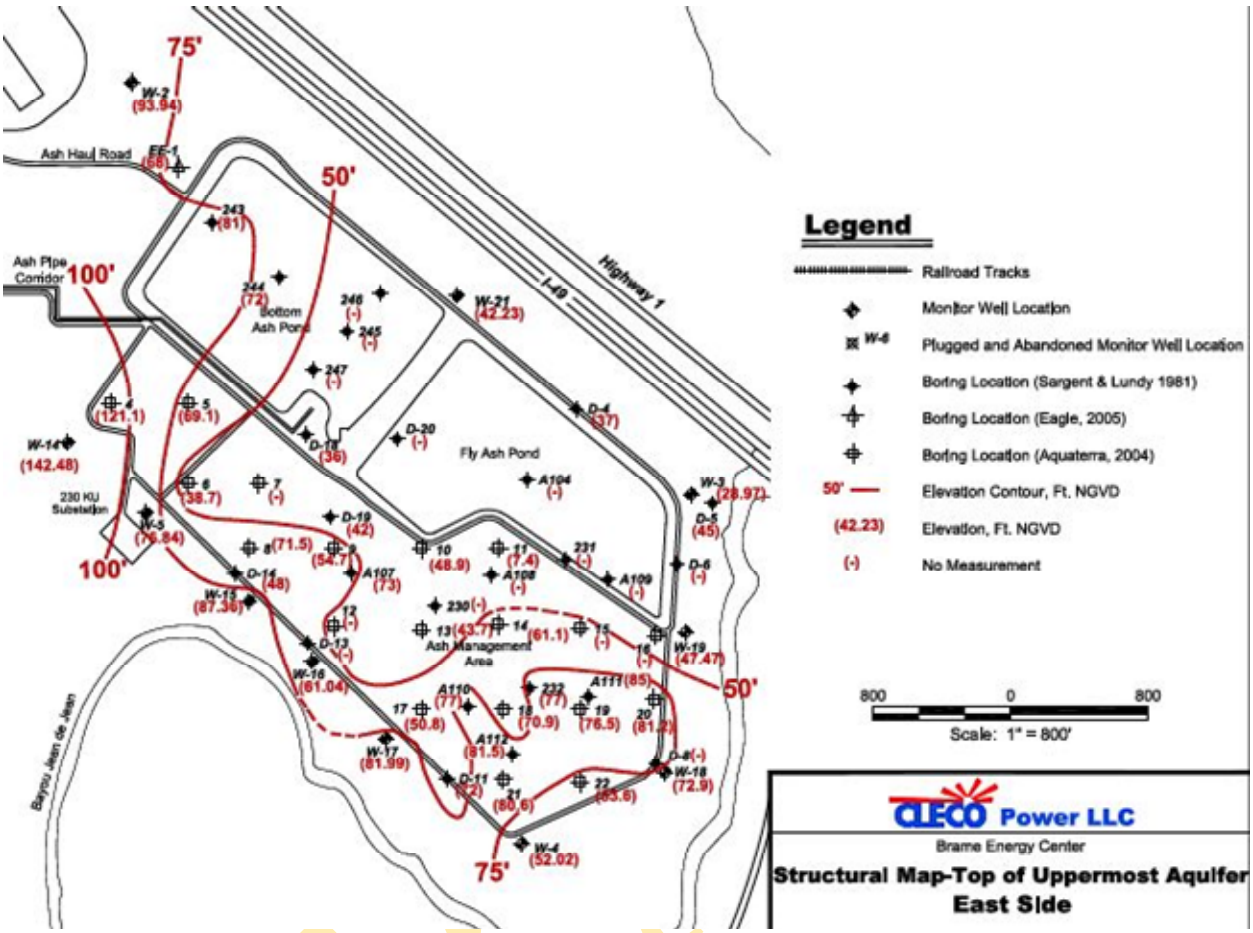
As noted in previous evaluations of the BEC facility, BEC is located across two different geomorphologic features that consist of Intermediate Terrace deposits of Pleistocene age to the north and northwest and alluvium and natural levee deposits of Holocene age to the south and southeast. The mapped boundary of the Intermediate Terrace and the alluvium/natural levee deposits is adjacent to the northern end (Cell 4) of the Ash Management Area. Cell 4 of the Ash Management Area is located primarily on the Intermediate Terrace deposits and the remainder of the Ash Management Area (Cells 1, 2, and 3) are located on the alluvium/natural levee deposits.

Geology

Numerous soil borings have been completed in the vicinity of the Ash Management Area as part of historical solid waste permitting activities for the facility. Geologic cross sections and other geologic maps have been constructed from these data. A cropped selection of these drawings is shown below. Please note that these drawings were constructed prior to CCR application to these facilities. Editing of the terminology and interpretation may be necessary in lieu of the CCR application to the facility geology.


B
W-2
Ash Haul Road
Ash Pipe Corridor
Bottom Ash Pond
W-21
I-49
Highway 1
C
W-14
Fly Ash Pond
D
W-3
B'
230 KU Substation
W-5
W-15
W-19
W-16
Ash Management Area
Bayou Jean de Jean
W-17
W-18
D'
W-4
C'
Legend
Railroad Tracks
Monitoring Well Location
Background Monitoring Well Location
Piezometer Location
A
A'
Cross-Section Profile
800
0
800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Geologic Cross-Section Location Map


C
Northwest
C'
Southeast
W-14 (142.5')
Pleistocene Terrace
Alluvium/Natural Levee
Unconformity
W-5 (92.5')
W-15 (92.4')
W-16 (96.0')
W-17 (92.0')
W-4 (94.8')
Elevation, Ft NGVD
TD = 66'
TD = 55'
TD = 77'
TD = 68'
TD = 52'
TD = 45.1'
Uppermost Aquifer
Section C-C'
Horizontal Scale: 1" = 300'
Vertical Scale: 1" = 20'
Legend:
Sand
Silty Sand / Sandy Silt / Silt
Sandy Clay / Silty Sandy Clay
Silty Clay
Clayey Silt / Clayey Silty Sand / Sandy Silty Clay / Clayey Sandy Silt
Clayey Sand
Clay
Screen Interval
Pleistocene Terrace and Alluvium/Natural Levee Boundary
High Potentiometric Surface Elevation (2010-2015)
TD Total Depth
(92') Elevation, Ft NGVD
Note:
Stratigraphy between borings are inferred. Actual conditions may vary.
CLECO Power LLC
Brame Energy Center
Geologic Cross-Section C-C'
Rapides Parish, Louisiana
EAGLE
Drawn: JP
Checked: BS
Approved: RS
Dwg. No.: 01-17-0127-A48-18
Attachment 48-18



Hydrogeology

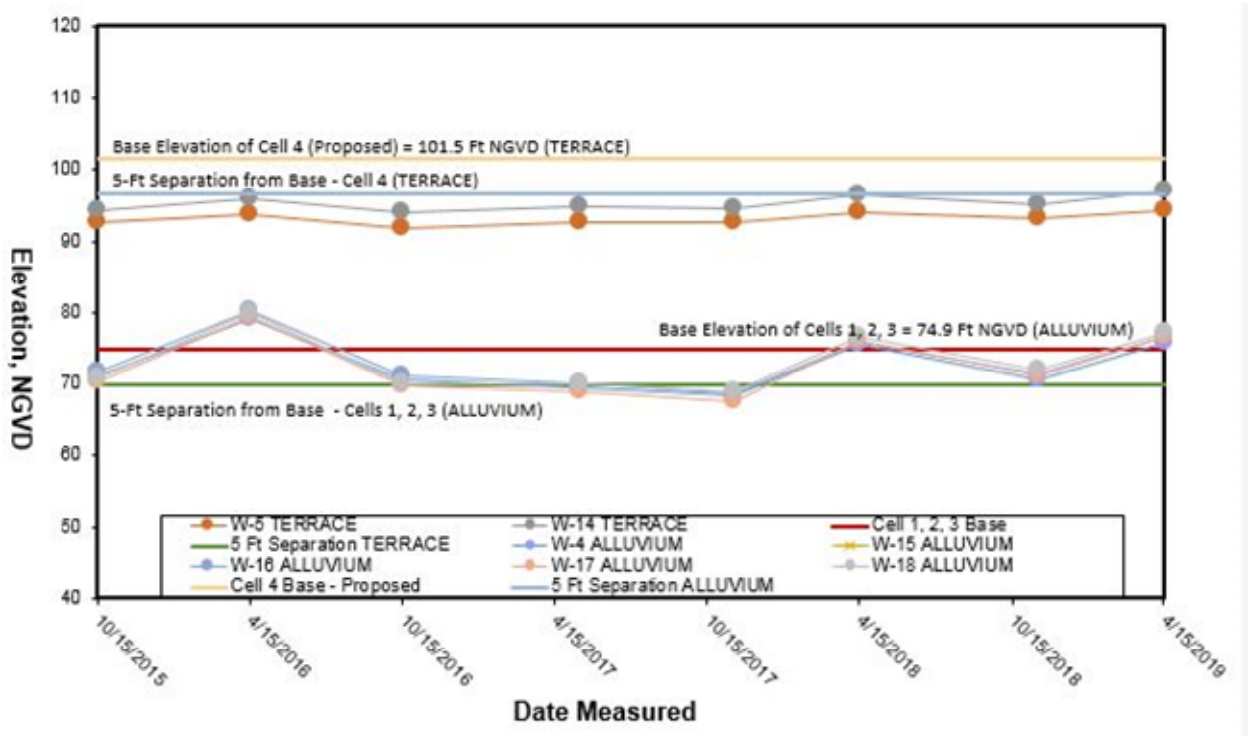
Seven (7) monitoring wells are currently positioned along the west and south ends of the Ash Management Area. Soil boring logs for existing monitoring wells were evaluated that included the following wells and their relationship to the geomorphology of the site and their proximity to cells of the Ash Management Area.

This is summarized below:

Monitoring Well	Cell Proximity	Geomorphology	Ground Surface Elevation Feet NGVD	Well Total Depth Feet BGS
W-14	4	Terrace	142.48	66
W-5	4/3	Terrace	91.84	42.6
W-15	3	Alluvium	92.36	74
W-16	3/2	Alluvium	96.04	65.1
W-17	2	Alluvium	91.99	49.4
W-4	1	Alluvium	92.02	45.1
W-18	1/SW Pond	Alluvium	92.90	48.5

Groundwater surface elevations determined from monitoring wells screened in the uppermost water bearing zone in the alluvium/natural levee deposits and the terrace deposits were used to construct a hydrograph from data measured since 2015 as shown below. The hydrograph also includes the base depth of Cells 1, 2, and 3 at 74.9 Ft

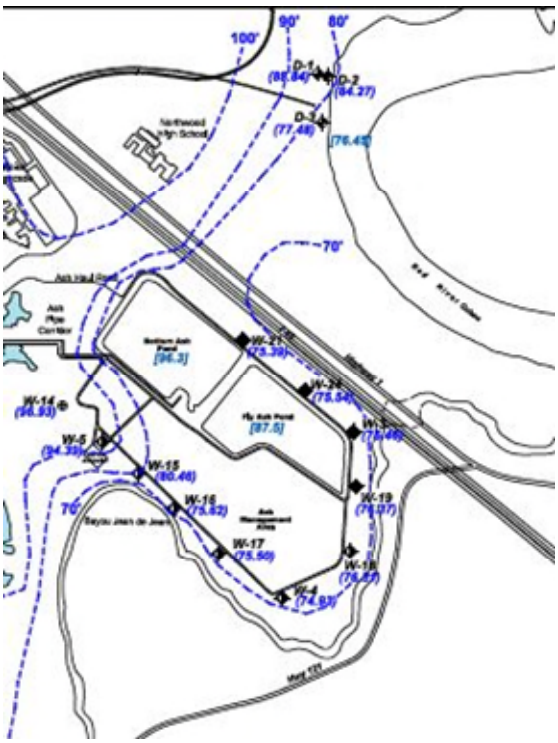
NGVD in the alluvium and an estimated base elevation for Cell 4 in the terrace deposits of 101.5 Ft NGVD. A 5-foot buffer distance below this liner base is shown at 69.9 Ft NGVD for Cells 1, 2, and 3 and an estimated 96.5 Ft NGVD for proposed Cell 4.



This hydrograph illustrates the fluctuations of the water table over the last 5 years and shows the groundwater surface approaching the 5-foot buffer below the base of the units. The 2015, 2018 and 2019 data reflect record high flood stages of the Red River and its tributary Bayou Jean de Jean. As shown in the hydrograph, the response to the high river stages is more evident in the alluvium than the terrace.

The July 2019 potentiometric 'surface of the uppermost aquifer in the area of the Ash Management Area is shown below. This interpretation of the potentiometric surface in the terrace in the proximity of Cell 4 indicates a potentiometric surface of approximately 95 feet NGVD. This elevation would necessitate construction with a base of Cell 4 exceeding 100 feet NGVD. Please note that the groundwater surface is estimated in the area of Cell 4 and should be verified with actual geotechnical data.

The evaluation of these data indicates the importance of clarifying the nature of the potentiometric surface in regard to this surface being in a confined, semi-confined or water table condition. A few select borings would confirm this relationship. Often, the water surface measured in a completed well does not reflect the first occurrence of water but reflects the pressure head of the water in the permeable zone and can be at a much higher elevation, while the presence of the saturate soils is at a deeper depth.



Proposed Action Items

Amendment of the hydrograph with all historical data for the monitoring wells listed above in the summary table with comparison to the base of the Cells. Data is available since 1987 of a select group of these wells.

Completion of soil borings adjacent to existing wells W-4 and W-5. These are existing wells and the records for the soil boring logs for these monitoring wells are incomplete. The termination depths of the soil borings would coincide with the top of the uppermost water bearing zone. This activity would occur over a maximum 1-day field exercise. Additionally, these soil borings would confirm the confined potential of the water surface in the subsurface as compared to the water surface in a completed well.

For the Cell 4 evaluation, a temporary well in the terrace in this area would assist in determining the equilibrated water surface. This activity would occur over a maximum 2-day field exercise and would include the installation of one (1) 2-inch diameter polyvinyl chloride (pvc) temporary well constructed with its screen interval in the sand of the terrace deposits.

Please note that the groundwater in the terrace can be managed by withdrawal via a horizontal extraction well with beneficial recharge to the lake water levels of the captured groundwater. This would assist with lowering of the floor elevation of a cell in this area.

Please review the summarized decisions included in this memo and let me know if you have any corrections or questions regarding our current understanding. We greatly

appreciate the opportunity to assist with this important project and are committed to making this a successful project.