

CLECO POWER LLC DOLET HILLS POWER STATION

**ASH BASINS NO. 1 AND NO. 2
MANSFIELD, LA**

**2018 Annual Groundwater Monitoring Report
for the Coal Combustion Residuals Rule**

January 2019



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1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the 2018 Annual Groundwater Monitoring report for Ash Basins No. 1 and No. 2 at the Dolet Hills Power Station (DHPS) located in Mansfield, Louisiana (Figure 1). This report summarizes groundwater sampling and analysis activities completed in accordance with applicable portions of the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule.

2.0 FACILITY INFORMATION

Cleco owns and operates the DHPS located at 963 Power Plant Road, Mansfield, Louisiana 71052. The Ash Basins in service at the plant have been permitted to operate by the Louisiana Department of Environmental Quality (LDEQ) Waste Permits Division. The materials deposited in these facilities are non-hazardous, on-site-generated materials only.

As required by the CCR Rule part §257.90, DHPS has a groundwater monitoring well system to evaluate the groundwater quality conditions near the Ash Basins. The monitoring system consists of newly installed monitoring wells and monitoring wells installed previously to conduct groundwater monitoring required by DHPS's LDEQ approved solid waste permits. A total of twelve monitoring wells have been installed per applicable portions of §257.91. The uppermost water bearing zone that is laterally continuous beneath the Ash Basins is referred to as Zone 4. Locations of the monitoring wells can be found on Figure 2, and a table of monitoring well construction details can be found in Table 1.

3.0 FIELD ACTIVITIES

Groundwater sampling events were conducted by Cleco approved contract personnel in accordance with applicable portions of §257.93. Semi-annual detection monitoring sampling events were conducted in May and September 2018, while additional voluntary baseline sampling events were conducted in March and July 2018.

Prior to purging and sampling activities, the depth-to-water below the top of each well casing was measured and recorded prior to purging each well during each sampling event. Water levels were measured to the nearest 0.01 foot from the top of casing using an electronic water level indicator. Total depth of each well was also measured to confirm that the screened interval was open to groundwater flow. Water level measurements were recorded in groundwater sampling forms. The water level measurements were subtracted from the top of casing elevations to obtain the groundwater elevations.

Groundwater purging and sampling activities were conducted using electric submersible pumps. These activities were conducted in accordance with applicable portions of Sections 6.1, 6.2, 6.3 and 8.1.4 of the *Standard Guide for Sampling Groundwater Monitoring Wells* (ASTM International, Publication D4448). Non-dedicated sampling equipment which came into contact with groundwater samples was decontaminated prior to sampling each well to reduce the potential for cross-contamination. Groundwater samples were collected by filling the sample containers directly from the disposable tubing connected to the pump or from a disposable bailer. Care was taken to minimize agitation of the samples. Samples were placed in laboratory-provided plastic containers with appropriate preservatives, per Section 9 of ASTM D4448. Samples were properly preserved on ice in the field and shipped to Pace Analytical Services, LLC of St. Rose, Louisiana, for analysis of the CCR groundwater detection monitoring parameters by the following methods: chloride, fluoride and sulfate by 300.0; total dissolved solids by 2540C; and metals by 6020. Full chain-of-custody protocols were observed

during sample collection, transportation, and analysis. Sample shipment/transport procedures were conducted per Sections 9.9 through 9.11 of ASTM D4448.

4.0 GROUNDWATER FLOW EVALUATION

Zone 4 is the most suitable water-bearing zone to monitor groundwater quality at the Ash Basins. The potentiometric surface maps prepared for Zone 4 (Figures 3 through 6) indicate that groundwater flow in Zone 4 mimics the topography of the site. This pattern of groundwater flow is consistent in the potentiometric surface maps, indicating little significant fluctuation in groundwater flow.

Groundwater flow rate was evaluated using the groundwater flow equation, $v = [k(dh/dl)] / n_e$. For this equation, v is groundwater flow velocity in ft/day, k is hydraulic conductivity in ft/day, dh/dl is hydraulic gradient in ft/ft, and n_e is effective porosity (unitless).

For Zone 4, hydraulic conductivity (k) values ranging from 2.0E-07 to 1.4E-02 ft/day were assumed based on slug tests completed at the site. Hydraulic gradient (dh/dl) values are listed below based on potentiometric surface maps completed for Zone 4. An effective porosity (n_e) of 0.2 was assumed based on the soil types of Zone 4 (Fetter, 2001). Using these values, estimated groundwater flow rates (v) are listed below.

Date	Hydraulic Gradient (feet/feet)	Estimated Groundwater Flow Velocity (feet/day)
March 2018	0.01 to 0.06	1.1E-08 to 4.2E-03
May 2018	0.01 to 0.06	1.1E-08 to 4.0E-03
July 2018	0.01 to 0.05	1.3E-08 to 3.8E-03
September 2018	0.01 to 0.05	9.9E-09 to 3.7E-03

It is important to note that this is an advective rate and does not take into account potential hydrogeological heterogeneities such as adsorption, biodegradation, dispersion, or other retarding factors in the groundwater flow in this zone. Additionally, variations in the advective flow may occur due to potential lateral geological heterogeneities.

5.0 ANALYTICAL RESULTS

Groundwater samples collected at the Ash Basins were analyzed for the CCR Rule detection monitoring parameters pH, boron, calcium, chloride, fluoride, sulfate, and total dissolved solids (TDS) using appropriate EPA approved analytical methods. Results show frequent detections of all parameters in both up- and downgradient monitoring wells at the Ash Basins. Analytical results are provided in Table 2.

6.0 STATISTICAL EVALUATION

Statistical evaluations of groundwater data have been performed per applicable portions of §257.93.f. The goal of the statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality. Statistical evaluations are conducted to determine if there are any statistically significant increases (SSIs) between groundwater quality upgradient and groundwater quality downgradient of the Ash Basins.

Due to statistically significant variation found in upgradient monitoring well data, all detection monitoring parameters were statistically evaluated using intrawell prediction limits. Intrawell tests are

within well comparisons. In the case of limit-based tests, historical data from within a given monitoring well for a given parameter are used to construct a limit. Compliance points are compared to the limit to determine whether a change is occurring on a per-well/per-parameter basis. Normal distributions of data values use parametric methods. Non-normal distributions use non-parametric methods, in which case, the prediction limit is based on the highest value in the background data set.

Intrawell limit-based tests are recommended when there is evidence of spatial variation in groundwater quality, particularly among upgradient monitoring wells, as it is inappropriate to pool those data across monitoring wells for the purpose of creating interwell limits for comparison with compliance monitoring well data. Intrawell tests may be used at both new and existing facilities. Data used in the intrawell limit-based tests were screened for outliers, which, if found, were removed from the background data set prior to constructing limits for each well/parameter pair.

Verification resampling for SSIs is only conducted for SSIs generated in downgradient wells via intrawell methodology. Intrawell statistics have been performed on all wells; however, since the goal of the statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality downgradient of the facilities, only downgradient wells are subject to verification resampling.

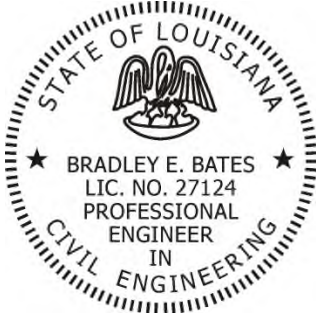
Intrawell statistical analysis of the September 2018 data generated an SSI for TDS in downgradient monitoring well OW-39. Verification resampling was conducted in November 2018. The verification resampling result has been incorporated into updated intrawell statistical analysis which shows that this SSI was not confirmed.

7.0 CONCLUSIONS AND RECOMMENDATIONS

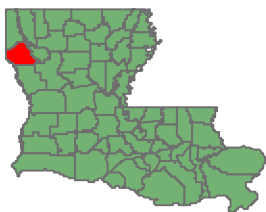
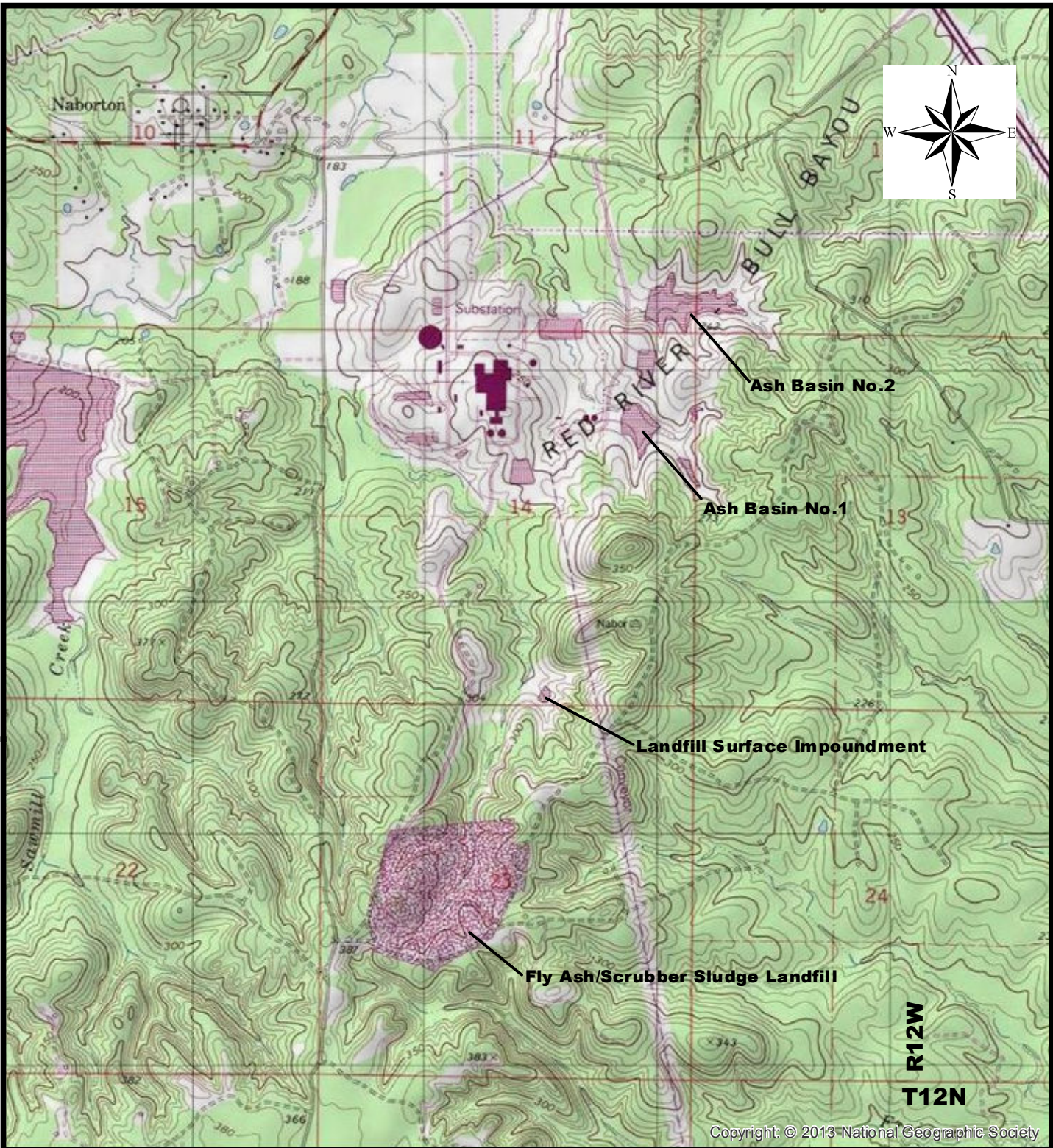
- Cleco DHPS has a monitoring well system to monitor groundwater quality at Ash Basins No. 1 and No. 2 per applicable portions of §257.91. The network consists of five upgradient and seven downgradient monitoring wells.
- Cleco conducted sufficient detection monitoring sampling events, per applicable portions of §257.93 and §257.94.
- Potentiometric surface evaluation at the Ash Basins indicates consistent groundwater flow to the west.
- Statistical evaluations of data conducted per applicable portions of §257.93 indicate that no SSIs have been generated in downgradient wells.
- Semi-annual detection monitoring sampling events are tentatively scheduled for May and September of 2019. Data generated during these sampling events will be included in the next annual report.

8.0 CERTIFICATION

I hereby certify this annual groundwater monitoring report for Cleco Power LLC. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.



<u>Signature</u>	<u>27124</u>
<u>Bradley E. Bates</u>	<u>Professional Engineer</u>
<u>Name</u>	<u>Title</u>
<u>Eagle Environmental Services, Inc.</u>	<u>12/13/2018</u>
<u>Company</u>	<u>Date</u>



Note:

U.S.G.S. Quadrangle "Bayou Pierre Lake, LA" at scale 1:24,000

CLECO Corporation

Dolet Hills Power Station

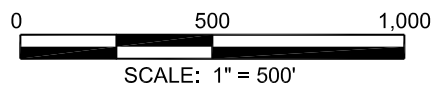
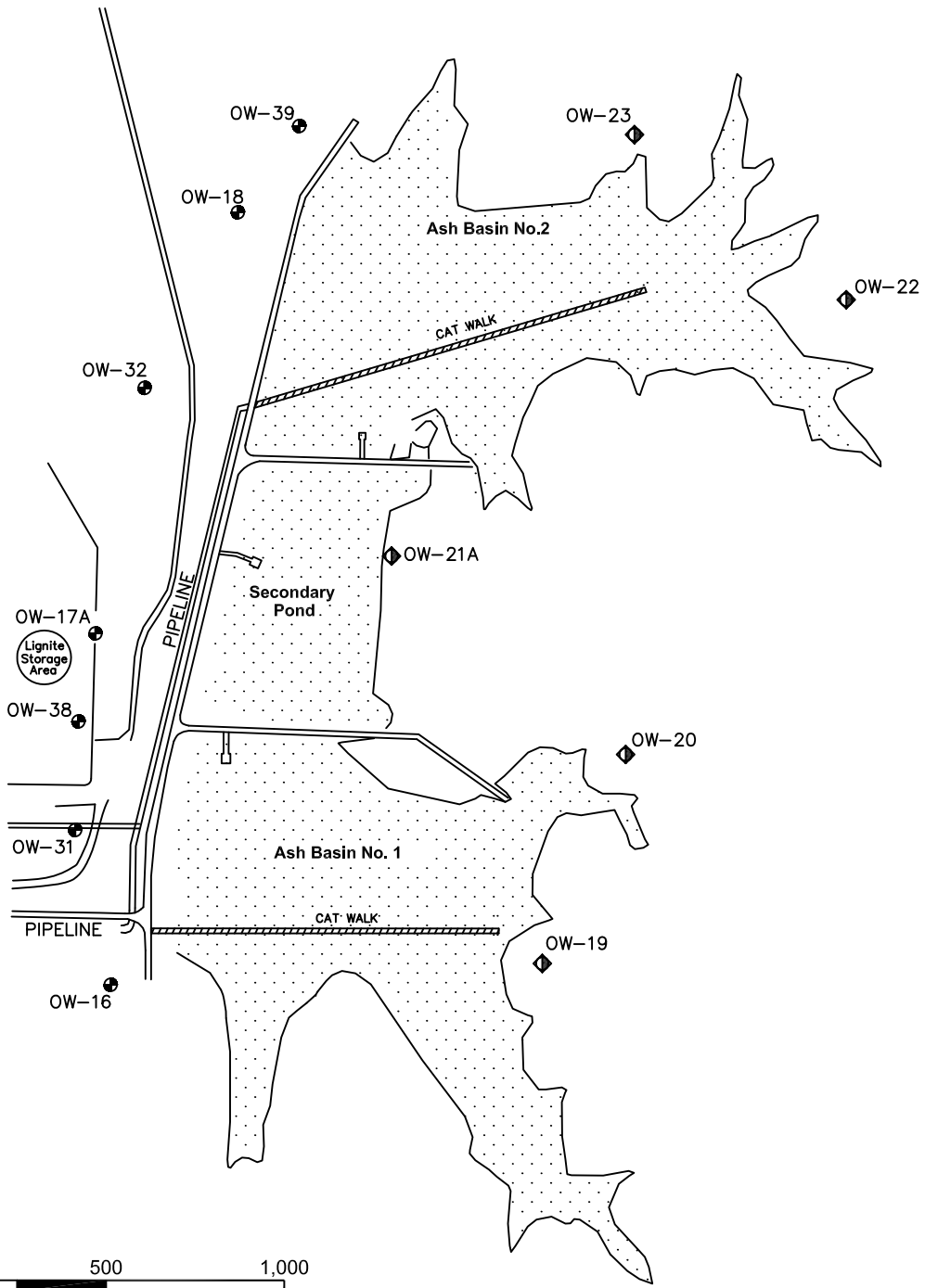
Site Location Map

DeSoto Parish, Louisiana



Drawn:	JP
Checked:	RS
Approved:	JM
Date:	3/23/17
Dwg. No.:	01-17-0168-C001

FIGURE 1



Legend

- OW-16 Zone 4 Compliance Monitoring Well Location
- OW-23 Zone 4 Background Monitoring Well Location
- Permitted Facility


 Dolet Hills Power Station

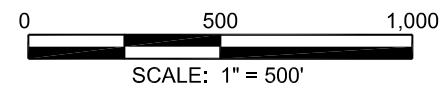
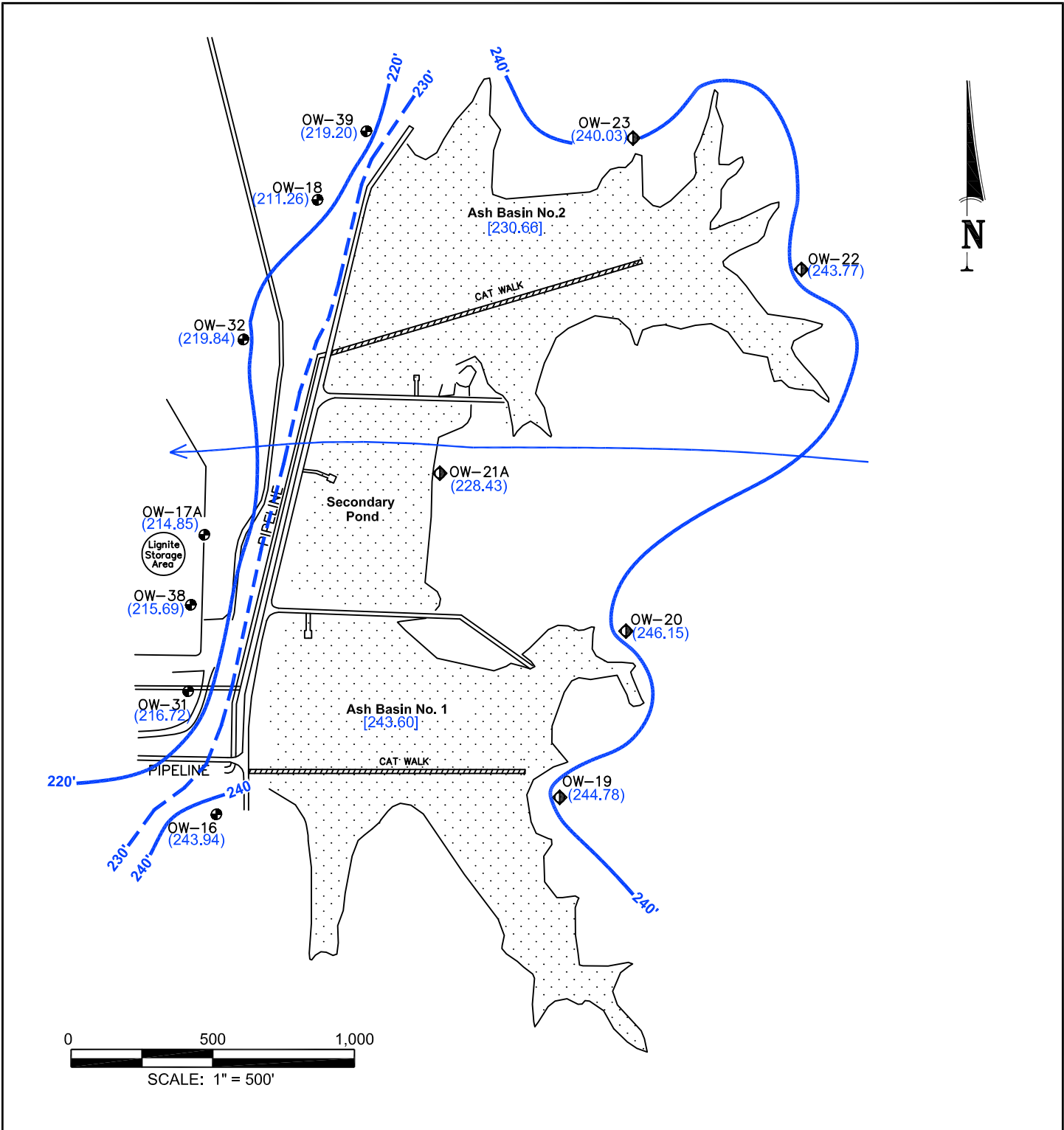
Zone 4 Monitoring Wells Location Map

DeSoto Parish, Louisiana




Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/4/16
Dwg. No.:	01-16-0159-A004

Figure 2



Legend

- OW-16 Zone 4 Compliance Monitoring Well Location
- OW-23 Zone 4 Background Monitoring Well Location
- Permitted Facility
- (240.03) Potentiometric Surface Elevation (ft. NGVD)
- [243.60] Surface Water Elevation (ft. NGVD)
- 240' — Potentiometric Surface Elevation Contour Line (ft. NGVD)
- Inferred Groundwater Flow Direction



Dolet Hills Power Station

Potentiometric Surface Map March 2018

DeSoto Parish, Louisiana


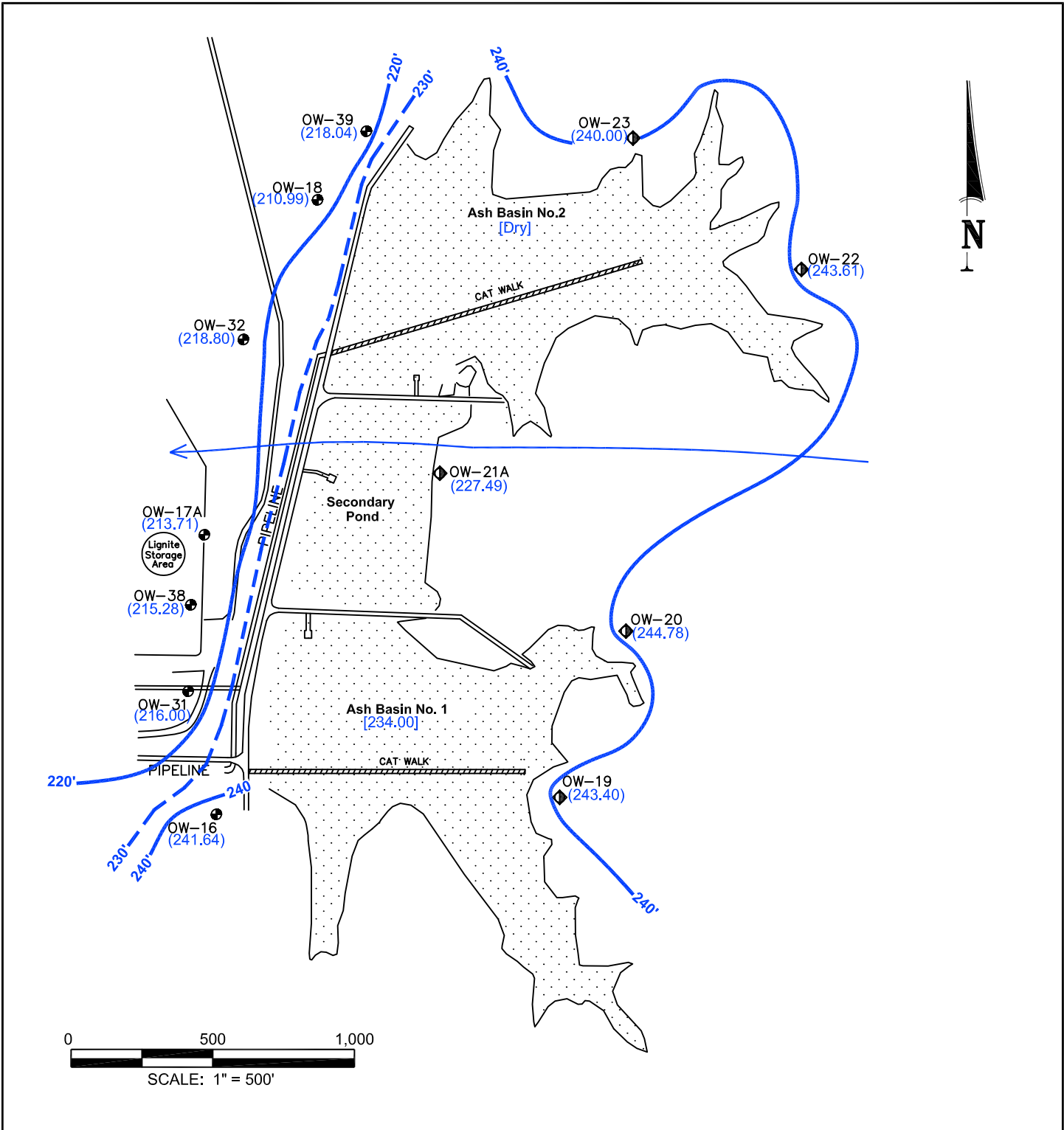
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	Approved: JM
	Date: 4/5/18
	Dwg. No.: 01-18-0168-A001



Figure 3

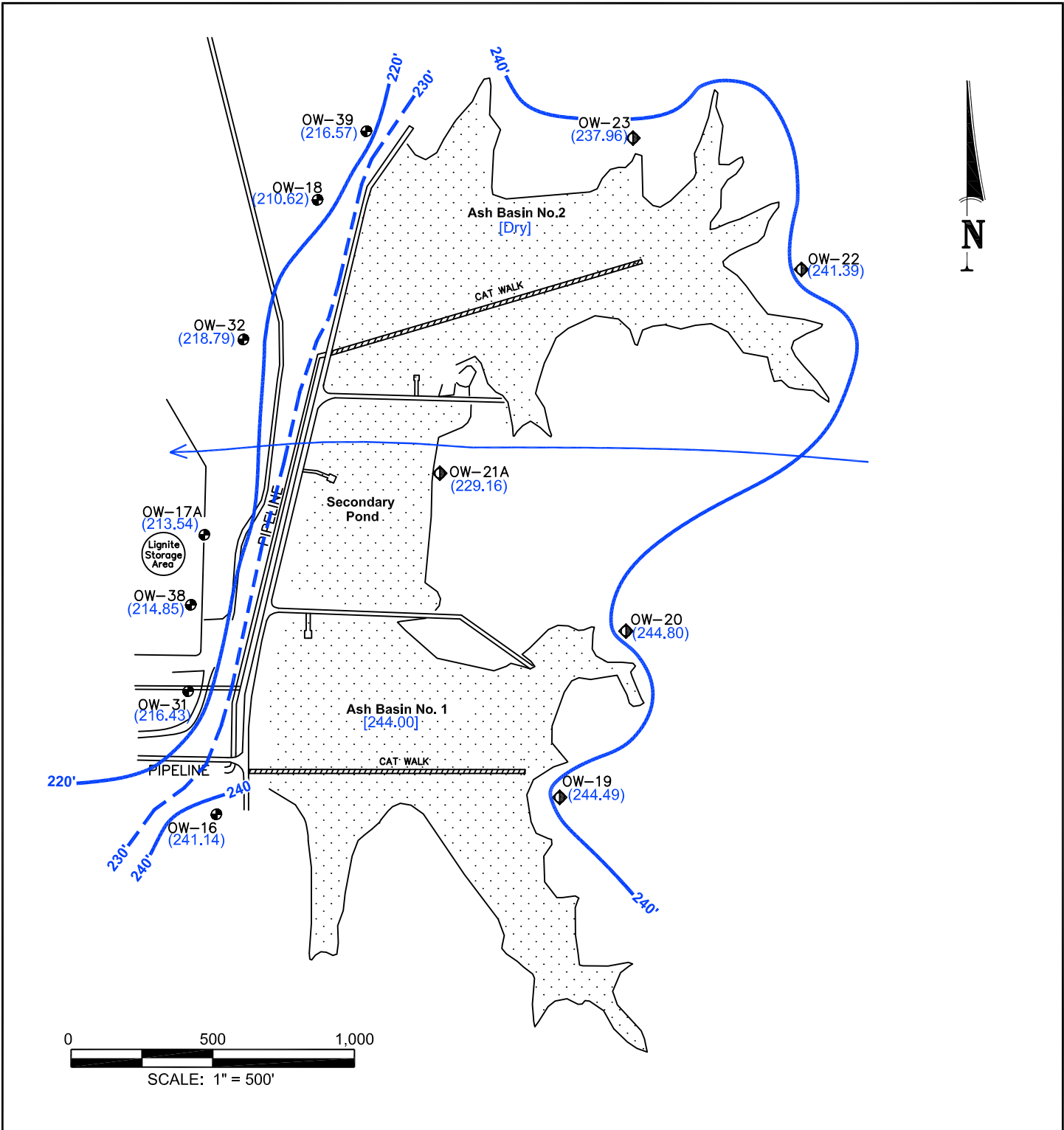


0 500 1,000
SCALE: 1" = 500'



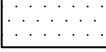

Legend



- OW-16 Zone 4 Compliance Monitoring Well Location
- ◆ OW-23 Zone 4 Background Monitoring Well Location
- ▨ Permitted Facility
- (244.78) Potentiometric Surface Elevation (ft. NGVD)
- [234.00] Surface Water Elevation (ft. NGVD)
- 240' — Potentiometric Surface Elevation Contour Line (ft. NGVD)
- ← Inferred Groundwater Flow Direction

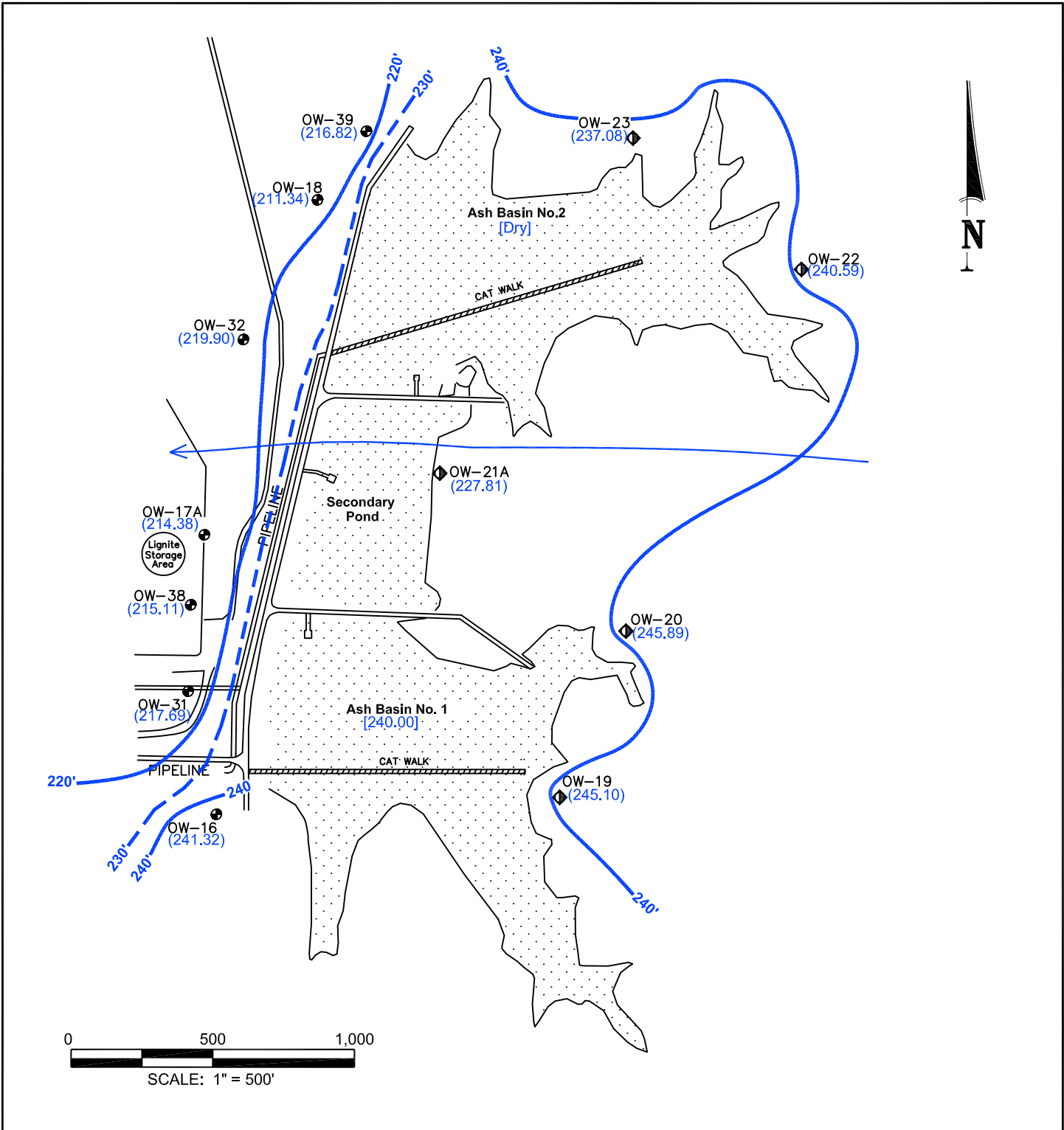
 Dolet Hills Power Station											
Potentiometric Surface Map May 2018											
DeSoto Parish, Louisiana											
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Figure 4											





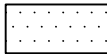




Legend

-  OW-16 Zone 4 Compliance Monitoring Well Location
-  OW-23 Zone 4 Background Monitoring Well Location
-  Permitted Facility
- (244.49) Potentiometric Surface Elevation (ft. NGVD)
- [244.00] Surface Water Elevation (ft. NGVD)
- 240' ——— Potentiometric Surface Elevation Contour Line (ft. NGVD)
-  Inferred Groundwater Flow Direction

 Dolet Hills Power Station	
Potentiometric Surface Map July 2018	
DeSoto Parish, Louisiana	
	Drawn: JP
	Checked: JM
	Approved: JM
	Date: 8/13/18
	Dwg. No.: 01-18-0168-A005
Figure 5	



Legend

-  OW-16 Zone 4 Compliance Monitoring Well Location
-  OW-23 Zone 4 Background Monitoring Well Location
-  Permitted Facility
-  (241.32) Potentiometric Surface Elevation (ft. NGVD)
-  [240.00] Surface Water Elevation (ft. NGVD)
-  240' — Potentiometric Surface Elevation Contour Line (ft. NGVD)
-  ← Inferred Groundwater Flow Direction



Dolet Hills Power Station

Potentiometric Surface Map September 2018

DeSoto Parish, Louisiana



Drawn:	JP
Checked:	JM
Approved:	JM
Date:	11/12/18
Dwg. No.:	01-18-0168-A007

Figure 6



Table 1
Monitoring Well Information

Cleco Dolet Hills Power Station
Ash Basins

Well Number	OW-16	OW-17A	OW-18	OW-19	OW-20	OW-21A
Up or Down Gradient	D	D	D	U	U	U
Ash Basin Unit Monitored	AB No. 1	AB No. 1	AB No. 2	Both	Both	Both
Latitude (dd°mm'ss")	32°03'26"	32°03'36"	32°03'47"	32°03'26"	32°01'52"	32°01'56"
Longitude (dd°mm'ss")	93°31'52"	93°31'53"	93°31'49"	93°31'52"	93°33'31"	93°33'41"
Casing Elevation (ft NGVD)	254.95	231.57	218.44	260.01	258.84	244.40
Well Depth (ft bgs)	42.0	45.3	31.5	34.1	31.8	31.9
Screen Length (ft)	10	10	10	10	10	10
Top of Screen (ft NGVD)	217.97	194.13	194.17	230.98	234.39	219.93
Bottom of Screen (ft NGVD)	207.97	184.13	184.17	220.98	224.39	209.93
Casing Diameter & Material	4" PVC	4" PVC	4" PVC	4" PVC	4" PVC	4" PVC

Well Number	OW-22	OW-23	OW-31	OW-32	OW-38	OW-39
Up or Down Gradient	U	U	D	D	D	D
Ash Basin Unit Monitored	Both	Both	AB No. 1	AB No. 2	AB No. 1	AB No. 2
Latitude (dd°mm'ss")	32°02'07"	32°02'10"	32°01'51"	32°02'05"	32°01'55"	32°02'10"
Longitude (dd°mm'ss")	93°33'22"	93°33'31"	93°33'51"	93°33'48"	93°33'50"	93°33'44"
Casing Elevation (ft NGVD)	256.98	255.55	221.71	237.65	221.60	228.96
Well Depth (ft bgs)	31.1	38.4	29.5	30.0	37.3	32.5
Screen Length (ft)	10	10	10	10	10	10
Top of Screen (ft NGVD)	234.19	224.57	199.11	214.7	192.36	203.69
Bottom of Screen (ft NGVD)	224.19	214.57	189.11	204.7	182.36	193.69
Casing Diameter & Material	4" PVC	4" PVC	2" PVC	2" PVC	2" PVC	2" PVC



Table 2
2018 Analytical Data Summary

Cleco Dolet Hills Power Station
Ash Basins

Parameter/Well/Date	Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
OW-16	3/7/18	1.1	579	305	0.22	7.29	5,160
	5/10/18	1.4	669	279	0.13	6.83	4,770
	7/18/18	1.1	586	304	0.11	7.53	4,840
	9/25/18	1.1	546	309	0.18	7.38	4,680
OW-17A	3/8/18	1.9	78.5	776	0.21	8.07	2,000
	5/10/18	2.6	67.1	761	0.19	7.18	1,820
	7/17/18	2.5	71.4	804	0.2	7.96	1,880
	9/25/18	2	74.5	811	0.19	7.37	1,900
OW-18	3/8/18	0.19	9.9	30.9	0.42	8.06	<1
	5/10/18	0.18	10.9	34.2	0.39	7.22	1.1
	7/17/18	0.17	12.4	36.5	0.37	7.78	<1
	9/25/18	0.15	11.6	34.9	0.37	7.37	0.564
OW-19 (BG)	3/7/18	0.29	16.2	120	0.25	8.03	60.6
	5/10/18	0.55	15.6	131	0.23	7.91	48.8
	7/18/18	0.36	16.4	115	0.23	7.35	54.3
	9/25/18	0.29	15.4	109	0.24	7.52	53.4
OW-20 (BG)	3/7/18	0.24	87.4	117	0.14	7.88	399
	5/10/18	0.31	162	137	<0.1	6.88	463
	7/18/18	0.23	160	176	0.29	6.53	715
	9/25/18	0.23	201	186	<0.1	7.29	716
OW-21A (BG)	3/7/18	0.35	372	589	0.11	7.31	1,090
	5/10/18	0.45	477	565	<0.1	7.23	1,020
	7/18/18	0.33	352	503	<0.1	7.15	1,160
	9/25/18	0.35	361	723	<0.1	7.22	901
OW-22 (BG)	3/8/18	0.17	146	170	0.25	7.68	346
	5/10/18	0.16	140	156	0.12	7.42	303
	7/18/18	0.16	140	175	<0.1	7.89	305
	9/26/18	0.14	145	183	0.15	7.53	320
OW-23 (BG)	3/8/18	1.3	250	466	<0.1	7.86	1,820
	5/10/18	1.8	314	458	<0.1	7.65	1,700
	7/18/18	1.5	263	487	<0.1	7.95	1,810
	9/25/18	1.4	262	473	0.17	7.54	1,720
OW-31	3/8/18	2.9	99	1,340	0.19	7.88	3.6
	5/10/18	2.8	90.5	1,440 / 1,370*	0.19	7.73	2.2
	7/17/18	3.2	95	<1	0.16	8.01	<1
	9/25/18	2.9	97.1	1,380	0.22	7.33	1.24
OW-32	3/8/18	1.8	528	480	<0.1	7.37	4,260
	5/10/18	1.7	538	512	<0.1	6.89	3,980
	7/17/18	2	571	506	1.2	7.17	4,040
	9/25/18	1.7	661	531	<0.1	7.08	4,020
OW-38	3/8/18	1.8	21.2	178	0.51	8.49	13.5
	5/10/18	1.6	20	174	0.49	7.99	11.8
	7/17/18	2	21	191	0.53	8.47	10.3
	9/25/18	2.1	20.6	188	0.51	7.34	12
OW-39	3/8/18	0.66	450	1,350	0.26	7.61	3,530
	5/10/18	0.69	431	1,340	0.23	7.33	3,130
	7/17/18	0.77	456	1,340	0.16	7.53	3,160
	9/25/18	0.69	439	1,350	0.33	7.41	3,240

* 6/14/18 resampling result.

** 11/16/18 resampling result

Notes:
mg/l = milligrams per liter
S.U. = standard units