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American Electric Power Service Corporation

East Bottom Ash Pond - CCR Location Restriction Evaluation

H. W. Pirkey Power Plant
2400 FM 3251
Harrison County
Hallsville, Texas

July 6, 2016

ARCADIS

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Acronyms and Abbreviation

AEP	American Electric Power Service Cooperation
amsl	above mean sea level
ARCADIS	ARCADIS U.S., Inc.
BAP	bottom ash pond
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
FAP	fly ash pond
FGD	flue gas desulfurization
ft	feet
PTI	Permit to Install
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality

1. Objective

This report was prepared by ARCADIS U.S., Inc. (ARCADIS) for American Electric Power Service Corporation (AEP) to assess the location of the East Bottom Ash Pond relative to the location restrictions included in the Coal Combustion Residual (CCR) requirements, as specified in the Code of Federal Regulations (CFR) 40 CFR 257.60 to 257.64, at the AEP H.W. Pirkey Generating Plant (Plant) located at 2400 FM 3251 in Hallsville, Harrison County, Texas (**Figure 1**). The CCR requirements include an evaluation of the adequacy of the groundwater monitoring well network to characterize groundwater quality up and down gradient of the CCR unit and an evaluation of whether the CCR unit meets up to 5 location restrictions, which include: the base of the CCR unit is 5 feet (ft) above the uppermost aquifer, the CCR unit may not be located in a wetland, within 200 ft of the damage zone of a fault that has displacement during the Holocene, within a seismic impact zones, or in an unstable area.

Four regulated CCR units associated with the Plant were identified for review, which include the West Bottom Ash Pond (BAP), East BAP, Stack Out Area, and Landfill (**Figure 2**). This report summarizes the evaluation of the location restriction criteria at the East BAP (Site). The evaluation of the groundwater monitoring well network in the uppermost aquifer for the East BAP is not included in this report and will be completed under separate cover.

This evaluation included a review of AEP-provided data associated with previously completed subsurface investigation activities in the vicinity of the East BAP CCR unit, as well as publically-available geologic and hydrogeologic data. The following report also presents the current Conceptual Site Model based on documents reviewed and will further describe the uppermost aquifer.

2. Background Information

The following section provides background information for the AEP H.W. Pirkey Generating Plant East BAP.

2.1 Facility Location Description

The AEP H.W. Pirkey Plant is located in southern Harrison County, approximately 5 miles southeast of Hallsville, Texas, and approximately 8 miles southwest of Marshall, Texas. The East BAP CCR unit is located at the north end of the Plant and approximately 2,000 feet north-northwest of Brandy Branch Reservoir (**Figures 1** and **2**).

2.2 Description of East Bottom Ash Pond CCR Unit

The following section will discuss the embankment configuration, area, volume, construction and operational history, and surface water control associated with the East BAP.

2.2.1 Embankment Configuration

The East BAP is partially incised into native soils with an embankment height of approximately 4 feet (AMEC, 2011). The East BAP embankments are constructed of compacted clay on a 3:1 slope (3 feet horizontal, 1 foot vertical) (Sargent & Lundy, 1983). The elevation of the top of the embankment around the perimeter of the East BAP is approximately 357 feet amsl, and the normal operating level is approximately 354 feet amsl (Johnson & Pace, May 2011). The interior bottom elevation of the East BAP is approximately 347 feet amsl (Sargent & Lundy, 1983; Johnson & Pace, June 2011).

2.2.2 Area/Volume

The East BAP is approximately 31.5 acres in size. The design maximum ash storage capacity of the East BAP is 188 acre feet (Sargent & Lundy, 1983). Johnson & Pace calculated the East BAP ash storage capacity in 2011 at 161 acre feet at an elevation of 355 feet amsl (maximum operating level) (Johnson & Pace, June 2011).

2.2.3 Construction and Operational History

The H.W. Pirkey Power Plant East BAP was constructed in 1983 and 1984, and began operation in 1985. Throughout the life of the Plant, CCR materials (fly ash, bottom ash, economizer ash, flue gas desulfurization sludge) have been generated. The East BAP, which was placed into operation in 1985, receives bottom ash and economizer ash

sluiced from the power plant boiler (**Figure 3**). Clear water overflow from the East BAP discharges into the Clearwater Pond located directly south of the East BAP. Bottom ash and economizer ash are periodically excavated from the East BAP and hauled by truck to either the on-site landfill for disposal, or for beneficial re-use.

The base of the East BAP was constructed in 1983 with a compacted clay liner (Sargent & Lundy, 1983). Following installation of the compacted clay liner, soil borings S-4 through S-7 were advanced below the base of the East BAP to total depths of six feet in September 1983 (Southwestern Laboratories, 1984). The lithologic data from soil borings S-4 through S-7 confirm at least six feet of clay is present below the base of the East BAP (Sargent & Lundy, 1984).

2.2.4 Surface Water Control

Surface water elevation in the East BAP is controlled by a weir box and a manually operated gate valve on a 36-inch-diameter discharge pipe at the southwest corner of the pond. Clear water overflow from the East BAP discharges through the 36-inch-diameter pipe into the 2.7- acre Clearwater Pond located directly south of the East BAP (Figure 3). Water in the Clearwater Pond is either pumped (re-circulated) back into the boiler ash hopper, or gravity discharged through a pipe at the southwest corner of the Clearwater Pond into an unnamed intermittent tributary of Hatley Creek via Outfall 006 in accordance with Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0002496000.

2.3 Previous Investigations

The initial soils investigation and design of the East BAP was provided in a January 31, 1983 report prepared by Sargent & Lundy entitled "*Henry W. Pirkey Power Plant, Design Summary for Lignite Storage Area and Wastewater Pond Facilities*". This investigation included advancement of soil borings throughout the Plant, and design of the East BAP. As discussed above in Section 2.2.3, the design included installation of a clay liner below the East BAP.

In September-October 1983, Southwestern Laboratories conducted a soil investigation at the Plant, including advancement of four soil borings (S-4 through S-7) below the East BAP (Southwestern Laboratories, 1984).

In 1984, Sargent & Lundy conducted an evaluation of the East BAP. This report included evaluation of soil sample geotechnical data, and concluded a low-permeability clay liner was present below the East BAP (Sargent & Lundy, 1984).

In 2009, ETTL Engineers & Consultants (ETTL) conducted a geotechnical investigation of the East BAP earthen embankment. The investigation included installation of two

soil borings through the embankment (E1, E2), completion of the soil borings as piezometers PE-1 and PE-2, respectively, and collection of soil samples for geotechnical analyses. The report concluded the embankment was stable and the existing embankment slopes were acceptable if conditions are maintained (ETTL, 2010). The conditions to be maintained included embankment protection from erosion (vegetative cover), removal of brush and trees two feet or more in height, and control of animal burrowing.

In 2010 and January 2011, Apex Geoscience expanded the groundwater monitoring well system at the Plant, including installation of monitoring wells AD-16 through AD-29. Apex Geoscience also conducted video surveillance of the existing monitoring wells and plugged monitoring wells MW-1, MW-5, MW-6, MW-9, MW-11, MW-14, MW-15, M-2, and M-3 (Apex Geoscience, 2011).

In 2011, Johnson & Pace performed a hydraulic analysis of the East BAP for a 10-year, 24-hour rainfall event in accordance with the TCEQ TPDES permit design criteria. The report concluded the storage capacity of the East BAP is hydraulically adequate (Johnson & Pace, May 2011).

In 2015, Auckland Consulting further expended the groundwater monitoring well system at the Plant, including installation of monitoring wells AD-30 through AD-35 (Auckland Consulting, 2016).

2.4 Hydrogeologic Setting

The site area is located within the West Gulf Coastal Plain. Cretaceous formations crop out in belts that extend in a northeasterly direction parallel to the Gulf of Mexico, and dip gently southeast. The central and northern portions of the Plant are located on the outcrop of the Eocene-age Recklaw Formation. The Recklaw Formation consists predominantly of clay and fine grained sand, and attains a maximum thickness of approximately 100 feet (Broom, 1966).

The Recklaw Formation is underlain by the Eocene-age Carrizo Sand, which outcrops in the topographically low southern portion of the Plant. The Carrizo Sand consists of fine to medium grained sand interbedded with silt and clay, and attains a thickness of approximately 100 feet (Broom, 1966).

These features are further illustrated on five lines of cross section that were prepared through the East BAP area, with three lines trending from west to east (A-A'; B-B'; C-C'), and the other two lines trending from north to south (D-D'; E-E'). The cross section location map is included as **Figure 3** and the lines of cross section are included as **Figure 4** (A-A') through **Figure 8** (E-E').

2.4.1 Climate and Water Budget

Average temperatures in Harrison County, Texas range from 47.1° Fahrenheit (F) in January to 83.8°F in July, and the mean annual growing season is 238 days. Average annual precipitation (including liquid water equivalent from snowfall) is approximately 47 inches (Broom, 1966).

2.4.2 Regional and Local Geologic Setting

The central and northern portions of the Plant, including the East BAP, are located on the outcrop of the Eocene-age Recklaw Formation. The Recklaw Formation is underlain by the Eocene-age Carrizo Sand, which outcrops in the topographically low southern end of the Plant (Broom, 1966; Flawn, 1965).

Detailed regional geologic characterization can be found in several published reports including Texas Water Development Report 27 "*Ground-Water Resources of Harrison County, Texas*" (Broom, 1966), The University of Texas at Austin Bureau of Economic Geology "*Geologic Atlas of Texas – Tyler Sheet*" (Flawn, 1965), and U.S. Geological Survey Open-File Report 88-450K "*Petroleum Geology and the Distribution of Conventional Crude Oil, Natural Gas, and Natural Gas Liquids, East Texas Basin*" (USGS, 1988).

Detailed regional and site geologic characterization can also be found in the 2010 ETTL report entitled "*Geotechnical Investigation, Pirkey Power Station, Existing Ash, Surge, Lignite and Limestone Runoff, and Landfill Stormwater Ponds Embankment Investigation, Hallsville, Texas*" (ETTL, 2010).

2.4.3 Surface Water and Surface Water Groundwater Interactions

Figure 9 is a potentiometric surface map based on January 2016 water level data for the uppermost water bearing unit at the Site, and water level elevations in the Site monitoring wells are summarized on **Table 1**. As shown on **Figure 9**, shallow groundwater flow direction in the area of the East BAP is west-southwesterly at an average hydraulic gradient of approximately 0.01 foot per foot.

The East BAP is located approximately 2,000 feet north-northwest of Brandy Branch Reservoir, which was dammed during Plant construction in the 1980's. The normal pool level of Brandy Branch Reservoir is approximately 340 feet amsl. As shown on **Figure 9**, shallow groundwater flow direction at the Site generally follows surface topography to the west and southwest toward Hatley Creek, which is located in a topographically low area approximately one mile west of the Site. Therefore shallow groundwater in the area of the East BAP does not discharge into Brandy Branch Reservoir. Brandy Branch Reservoir likely recharges the uppermost water bearing unit

in the southern portion of the Plant, where the pool level in the Reservoir (340 feet amsl) is higher than water level elevations in monitoring wells located southwest (downslope) of the Reservoir.

2.4.4 Water Users

A water well inventory conducted by Banks Information Solutions showed 12 water wells had been drilled within a ½-mile radius of the Site (Banks, 2015). The nearest water well was reportedly drilled approximately 500 feet south (side gradient) of the East BAP in 2004 by Bennett Drilling for use as a rig supply well. The water well was screened from 350 to 430 feet below ground surface, therefore this water well is completed in a deeper water bearing unit relative to the uppermost water-bearing unit at the Site.

The second closest water well was reportedly drilled approximately ¼-mile southwest (downgradient) of the East BAP for NFR Energy in 2008 for use as a rig supply well. The water well was screened from 250 to 310 feet below ground surface, therefore this water well is completed in a deeper water bearing unit relative to the uppermost water-bearing unit at the Site.

All of the water wells identified within a ½-mile radius of the Site were drilled to total depths of 160 feet or deeper except one water well (Well ID: 35-37-4E) that was drilled to a total depth of 55 feet in 1982. This water well was completed with concrete tile from the surface to total depth, and is located approximately ¼-mile east (up gradient) of the Pirkey Power Plant.

3. Isolation from the Uppermost Aquifer

CCR Rule 40 CFR Part 257.60 requires that the base of new and existing CCR surface impoundments be constructed such that the base of the unit is no less than 5 ft above the top of the uppermost aquifer, or that if the base is within 5 ft of the uppermost aquifer, that there will not be hydraulic connection between the base of the unit and the uppermost aquifer.

3.1 Uppermost Aquifer and Piezometric Analysis

3.1.1 Piezometric Analysis

3.1.1.1 Horizontal and Vertical Position Relative to CCR Unit

Geologic data from soil borings, piezometers, and monitoring wells installed at the Site show the uppermost water bearing unit in the area of the East BAP is a very fine to fine grained clayey and silty sand stratum with an average thickness of approximately 15 feet that is located between an elevation of approximately 325 and 340 feet amsl (**Appendix A**). The base of the East BAP is at an elevation of 347 feet amsl. Therefore the separation distance between the uppermost water-bearing unit and the base of the East BAP is approximately seven feet. This separation distance is further illustrated on cross section A-A' (**Figure 4**) and cross section E-E' (**Figure 8**).

3.1.1.2 Overall Flow Conditions

Groundwater is recharged from regional precipitation infiltration. The uppermost water bearing unit (clayey and silty sand) is expected to have a hydraulic conductivity of approximately 10^{-4} centimeters per second (Fetter, 1980). Based on the hydraulic conductivity and saturated thickness (approximately 15 feet), the yield of the uppermost water-bearing unit is anticipated to exceed the TCEQ non-useable (Class 3) limit of 150 gallons per day (TCEQ, 2010).

Available groundwater elevations are summarized on **Table 1** for 2011 through 2016. The most recent comprehensive groundwater data set from January 2016 is depicted on **Figure 9**. The groundwater flow is west-southwesterly towards Hatley Creek, which is located approximately one mile west of the Site.

3.1.2 Uppermost Aquifer

3.1.2.1 CCR Rule Definition

The CCR rule definitions for an aquifer and the uppermost aquifer as specified in 40 CFR 257.53 indicates an aquifer is a geologic formation capable of yielding usable

quantities of groundwater to wells or springs while an uppermost aquifer is defined as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers, that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural groundwater surface to which the aquifer rises during the wet season.

3.1.2.2 Common definitions

An aquifer is commonly defined as a geologic unit that stores and transmits water (readily or at sufficient flow rates) to supply wells and springs (USGS, 2015; Fetter, 2001). The uppermost aquifer is considered the first encountered aquifer nearest to the CCR unit.

3.1.3 Identified onsite hydrostratigraphic unit

The identified Site hydrostratigraphic unit in the area of the East BAP is the clayey and silty sand stratum that is located between an elevation of approximately 325 and 340 feet amsl.

3.2 Compliance with Isolation Distance

The uppermost water-bearing unit underlying the East BAP meets the regulatory definition of an aquifer. As shown on the cross-sections presented on **Figures 4** and **8**, the base of the East BAP is six feet or more above this aquifer. Therefore, this CCR Unit complies with the requirement for placement above the uppermost aquifer. Also, four soil borings (S-4 through S-7) were advanced six feet below the base of the East BAP in 1983 following installation of the clay liner, and these four soil borings confirm the presence of the clay liner below the East BAP.

4. Wetlands

CCR Rule 40 CFR Part 257.61 requires that existing and new CCR surface impoundments must not be located in wetlands.

4.1 Local Wetlands

Based on the August 19, 2015 site visit and review of available published information, the East BAP is not located within an area that exhibited wetland characteristics that might be classified as a regulated wetland. Photos of the East BAP area are included in **Appendix B**, and **Figure 10** is a map showing wetlands locations in the CCR unit area.

4.2 Compliance with Wetland Restrictions

Based on the August 19, 2015 site visit and review of available information, the East BAP does not contain wetlands. Therefore, this CCR Unit complies with the requirement for not being located in a wetlands.

5. Fault Areas

CCR Rule 40 CFR Part 257.62 requires that existing and new CCR surface impoundments must not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates that an alternate setback will prevent damage to the structural integrity of the CCR unit.

5.1 Description of Regional Geologic Structural Features

Regional geologic publications were reviewed to determine structural features for the Site. A regional fault map is provided on **Figure 11**. The U.S. Geological Survey Open File Report 88-450K shows the Site is located within the East Texas Basin, with faulting north of the basin (Talco Fault Zone) and south of the basin (Elkhart-Mt. Enterprise Fault Zone). No faulting was identified in the Site area (USGS, 1988). Texas Water Development Board Report 27, and the University of Texas at Austin Bureau of Economic Geology Geologic Atlas of Texas – Tyler Sheet show no faulting at the Site (Broom, 1966; Flawn, 1965).

A previous evaluation of geologic structural features at the Site was conducted by ETTL, and no evidence of faulting was identified (ETTL, 2010).

5.2 Compliance with Fault Area Restrictions

A review of available geologic reports and maps has indicated that the Site is not located near any faults with displacement in the Holocene. Therefore, the CCR unit complies with the requirement for not being located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time.

6. Seismic Impact Zone

CCR Rule 40 CFR Part 257.63 requires that existing and new CCR surface impoundments must not be located within a seismic impact zone unless the owner or operator demonstrates that all structural components of the CCR unit are designed to withstand the maximum horizontal acceleration in lithified earth material for the site.

6.1 Definition of Seismic Impact Zone

CCR Rule 40 CFR Part 257.53 defines a seismic impact zone as an area having a 2% or greater probability that the maximum horizontal acceleration expressed as a percentage of the earth's gravitational pull (g) will exceed 0.10 g in 50 years.

6.2 Compliance with Seismic Impact Zone Restriction

Figure 12 presents the seismic hazard map for Texas, as published by the USGS. As shown on **Figure 12**, the Site falls within the zone having a maximum horizontal acceleration of 0.04 to 0.06 g. Therefore, the CCR unit complies with the requirement for not being located in a seismic impact zone.

7. Unstable Areas

CCR Rule 40 CFR Part 257.64 requires that existing and new CCR surface impoundments must not be located within an unstable area unless the owner or operator demonstrates that the design of the unit will ensure the integrity of the structural components of the unit.

7.1 Definition of Unstable Area and local Conditions

7.1.1 CCR Rule Definition

CCR Rule 40 CFR Part 257.53 defines an unstable area as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of the CCR unit. These may include poor foundation conditions, areas susceptible to mass movements (landslides), and karst terrains.

7.1.2 Poor Foundation Soils

The East BAP design report was prepared by Sargent & Lundy in 1983 (Sargent & Lundy, 1983). The East BAP was constructed in 1983 using compacted clay. The specifications included installation of clay embankments with 3:1 slopes (3 feet horizontal, 1 foot vertical) around the perimeter of the pond with a crest (top of embankment) elevation of 357 feet amsl, and compaction of the clay embankments to ≥95% standard proctor density. The specifications also included emplacement of a compacted cohesive clay lining below the pond base elevation of 347 feet amsl.

ETTL conducted a geotechnical investigation of the East BAP earthen embankment in 2009. The investigation included installation of two soil borings through the embankment (E1, E2), completion of the soil borings as piezometers PE-1 and PE-2, respectively, and collection of soil samples for geotechnical analyses. The report noted the East BAP was cut (incised) into native soils with minimal embankment heights. The report concluded the embankment was stable and the existing embankment slopes were acceptable if conditions are maintained (ETTL, 2010). The conditions to be maintained included embankment protection from erosion (vegetative cover), removal of brush and trees two feet or more in height, and control of animal burrowing.

7.1.3 Mass Movements

The East BAP is not located within an area subject to mass movements. This conclusion is supported by the ETTL soil stability report (ETTL, 2010).

7.1.4 Karst

The site area is located on the outcrop of unconsolidated Cretaceous Formations consisting predominantly of sand and clay (Broom, 1966; Flawn, 1965). The East BAP is not located in a karst area.

7.1.5 Subsurface Mining

No subsurface mines are known to exist below the CCR units at the Site.

7.2 Compliance with Unstable Areas Restriction

Based on our site visit and review of available information, the East BAP is not located within unstable areas. Therefore, this CCR unit complies with the requirement of not being located in an unstable area.

8. Summary, Conclusions, and PE Certification

I, Kenneth J. Brandner, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, as well as the evaluations discussed within this report, the H.W. Pirkey Power Plant East Bottom Ash Pond complies with the requirements of the location restrictions sections of 40 CFR 257 Subpart D that apply to surface impoundments and therefore the CCR unit is not located in a restricted location.

Kenneth J. Brandner

Printed Name of Registered Professional Engineer

Kenneth J Brandner

Signature

69586	Texas	7-6-16
Registration No.	Registration State	Date

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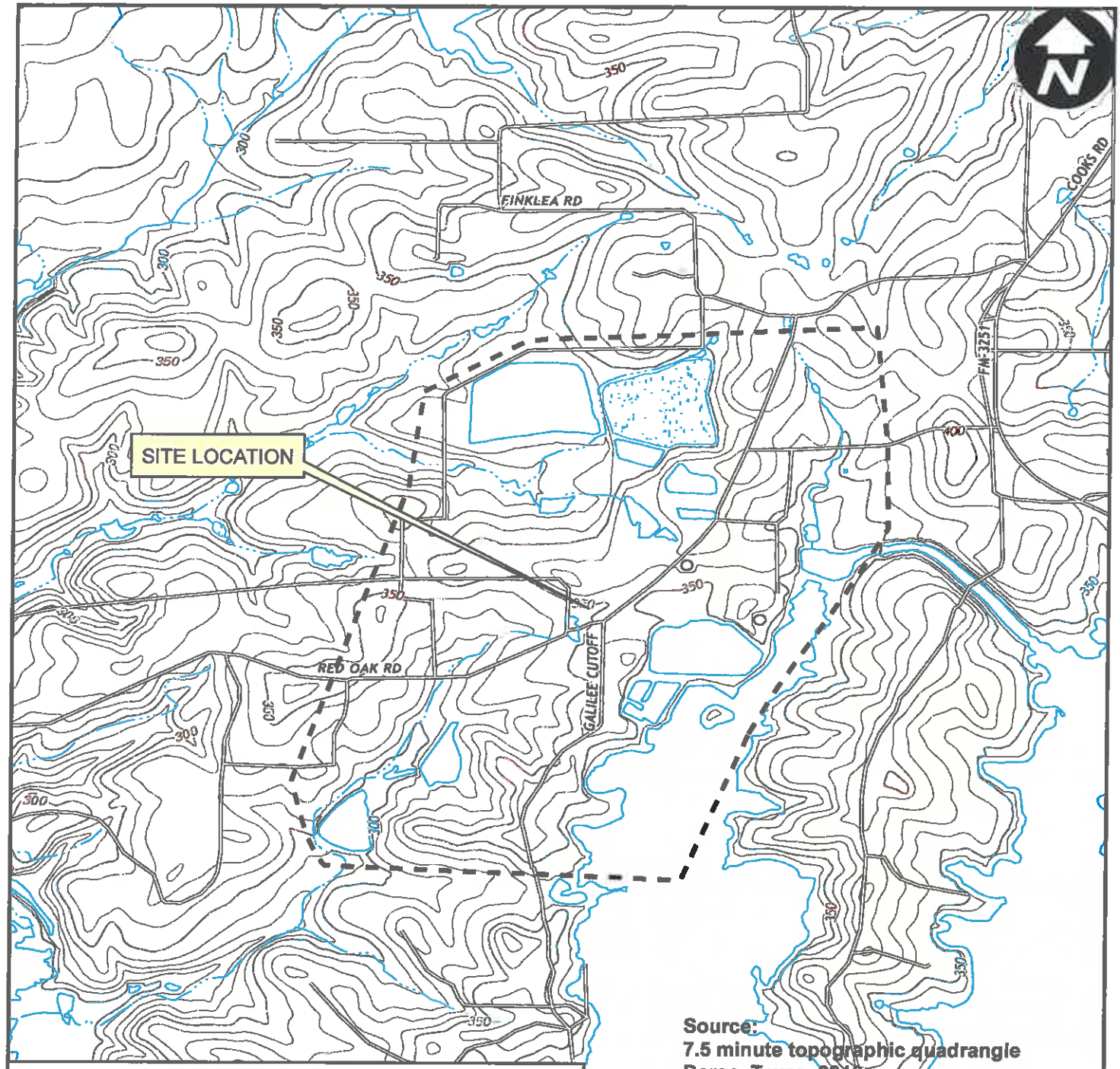
Table 1
Water Level Data
AEP Pirkey Power Plant - CCR Storage Areas
Hallsville, Harrison County, Texas

Well ID	Latitude	Longitude	Ground Surface Elevation[a]	Top of Casing Elevation[a]	Borehole depth ft. bls	Date Installed	Screen Material	Well diameter inches	Top of Screen[b]		Bottom of Screen[b]		4/13/2011	12/15/2011	6/20/2012	1/23/2013	7/7/2013	1/22/2014	7/9/2014	1/28/2015	1/20/2016
									Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl
Monitoring Wells																					
MW-2/AD-2	32° 27' 54.753"	94° 29' 25.282"	341.25	344.04	40	10/7/83	Sch. 40 PVC	4	20	321.25	40	301.25	326.90	327.12	327.17	327.26	326.62	327.70	327.19	328.62	328.55
MW-3/AD-3	32° 28' 6.829"	94° 29' 21.498"	372.76	375.30	57	11/4/83	Sch. 40 PVC	4	37	335.76	57	315.76	342.95	341.59	343.70	341.10	343.27	341.42	343.96	345.01	347.03
MW-4/AD-4	32° 27' 59.247"	94° 29' 4.692"	363.69	366.79	46	10/10/83	Sch. 40 PVC	4	26	337.69	46	317.69	351.45	351.24	352.44	354.42	349.22	355.58	353.33	359.00	359.16
MW-7/AD-7	32° 27' 43.611"	94° 29' 15.611"	359.61	362.79	40	10/3/83	Sch. 40 PVC	4	20	339.61	40	319.61	344.34	343.75	344.15	344.90	343.35	346.61	346.23	349.17	349.31
MW-8/AD-8	32° 27' 25.095"	94° 29' 14.925"	356.92	359.84	35	10/4/83	Sch. 40 PVC	4	20	336.92	35	321.92	341.65	340.29	341.65	340.72	341.25	341.67	343.36	344.03	347.21
MW-10/AD-10	32° 27' 52.446"	94° 29' 16.545"	359.48	362.21	40	10/10/83	Sch. 40 PVC	4	20	339.48	40	319.48	342.03	341.90	342.19	341.41	339.85	342.27	342.22	344.39	343.97
MW-12/AD-12	32° 27' 51.702"	94° 29' 3.238"	378.84	381.99	51	1/30/86	Sch. 40 PVC	4	31	347.84	51	327.84	358.95	357.99	359.33	368.07	357.41	369.97	367.04	372.75	371.05
MW-13/AD-13	32° 27' 46.002"	94° 29' 5.71"	361.98	364.76	40.5	2/23/88	Sch. 40 PVC	4	30.5	331.48	40.5	321.48	349.46	348.91	349.52	350.81	348.61	351.97	351.29	354.47	354.15
AD-16	32° 27' 40.871"	94° 29' 38.637"	356.81	360.05	35	12/30/10	Sch. 40 PVC	2	15.0	341.81	35.0	321.81	338.08	335.50	337.58	335.43	336.67	339.53	340.84	343.34	347.68
AD-17	32° 28' 2.315"	94° 29' 39.45"	342.65	346.09	30	12/30/10	Sch. 40 PVC	2	10.0	332.65	30.0	312.65	322.66	322.29	323.31	323.51	323.06	325.19	324.15	328.42	326.78
AD-18	32° 28' 9.245"	94° 29' 6.469"	360.48	363.42	25	1/3/11	Sch. 40 PVC	2	15.0	345.48	25.0	335.48	355.53	351.54	357.21	355.47	357.23	360.03	358.06	359.88	360.52
AD-19	32° 27' 50.512"	94° 29' 13.973"	359.50	362.82	30	12/30/10	Sch. 40 PVC	2	10.0	349.50	30.0	329.50	344.07	343.58	344.29	344.62	342.60	345.11	345.76	347.92	347.40
AD-20	32° 27' 51.346"	94° 29' 21.576"	352.30	355.79	35	12/28/10	Sch. 40 PVC	2	15.0	337.30	35.0	317.30	334.50	334.63	334.69	334.78	333.38	335.38	334.87	336.88	336.07
AD-21	32° 27' 45.403"	94° 29' 19.195"	347.23	350.72	30	12/27/10	Sch. 40 PVC	2	10.0	337.23	30.0	317.23	340.43	340.02	340.22	341.57	339.16	342.36	341.67	345.45	343.82
AD-22	32° 27' 41.349"	94° 29' 17.779"	355.57	358.51	30	12/16/10	Sch. 40 PVC	2	10.0	345.57	30.0	325.57	343.64	343.16	343.74	344.83	342.90	346.49	345.77	350.24	350.29
AD-23	32° 27' 3.384"	94° 29' 41.258"	346.72	350.10	35	12/15/10	Sch. 40 PVC	2	15.0	331.72	35.0	311.72	319.65	318.94	319.29	318.66	318.87	319.80	319.79	319.84	321.23
AD-24	32° 27' 1.455"	94° 29' 56.388"	287.68	291.14	20	12/27/10	Sch. 40 PVC	2	5.0	282.68	20.0	267.68	282.92	284.29	285.10	285.63	285.06	288.30	287.10	288.56	---
AD-25	32° 27' 17.187"	94° 29' 58.998"	334.15	337.09	30	12/14/10	Sch. 40 PVC	2	10.0	324.15	30.0	304.15	324.51	321.90	323.14	321.94	322.15	322.56	324.24	326.42	327.00
AD-26	32° 27' 25.426"	94° 29' 54.775"	342.41	345.25	40	12/14/10	Sch. 40 PVC	2	10.0	332.41	40.0	302.41	324.53	323.77	323.62	322.32	322.09	323.24	322.51	323.04	326.06
AD-27	32° 27' 36.66"	94° 29' 47.272"	349.83	352.62	37.5	12/15/10	Sch. 40 PVC	2	17.5	332.33	37.5	312.33	325.82	324.54	326.13	325.39	325.35	326.39	327.91	329.69	330.89
AD-28	32° 27' 55.439"	94° 29' 39.418"	335.92	339.40	40	12/28/10	Sch. 40 PVC	2	15.0	320.92	35.0	300.92	319.67	319.16	319.92	320.21	319.69	320.65	320.22	322.16	321.39
AD-29	32° 28' 8.271"	94° 29' 31.939"	350.21	353.37	30	1/3/11	Sch. 40 PVC	2	10.0	340.21	30.0	320.21	334.68	333.37	334.74	337.47	336.84	338.55	335.85	340.57	338.48
AD-30[d]	32° 27' 56.49"	94° 29' 32.53"	339.04	342.02	25	12/8/15	Sch. 40 PVC	2	10.0	329.04	25.0	314.04	---	---	---	---	---	---	---	---	323.70
AD-31[d]	32° 28' 02.48"	94° 29' 20.90"	357.75	360.75	35	12/8/15	Sch. 40 PVC	2	20.0	337.75	35.0	322.75	---	---	---	---	---	---	---	---	346.60
AD-32[d]	32° 27' 56.20"	94° 29' 11.86"	357.23	359.18	33	12/11/15	Sch. 40 PVC	2	13.0	344.23	33.0	324.23	---	---	---	---	---	---	---	---	352.32
AD-33[d]	32° 27' 38.70"	94° 29' 15.82"	359.30	362.37	30	12/11/15	Sch. 40 PVC	2	15.0	344.30	30.0	329.30	---	---	---	---	---	---	---	---	351.13
AD-34[d]	32° 27' 10.13"	94° 29' 57.93"	304.64	307.61	25	12/11/15	Sch. 40 PVC	2	10.0	294.64	25.0	279.64	---	---	---	---	---	---	---	---	307.61
AD-35[d]	32° 27' 09.64"	94° 29' 42.74"	316.01	318.95	20	12/11/15	Sch. 40 PVC	2	3.0	313.01	18.0	298.01	---	---	---	---	---	---	---	---	309.85
Piezometers[c]																					
W-3 (PW-3)	32° 27' 57.6"	94° 29' 31.8"	356.30	356.30	38	10/20/09	Sch. 40 PVC	2	28.0	328.30	38.0	318.30	NM	NM	NM	NM	NM	NM	NM	NM	NM

(a) Source: Apex Geoscience Inc. (March 23, 2011).
(b) Screen length and screened intervals for AD-2 through AD-12 estimated from video surveillance (Apex Geoscience Inc., March 23, 2011).
(c) Souce: EETL (October 2010).
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-30 through AD-35 installed during December 2015.
Groundwater Elevation Source: AEP, Pirkey Monitoring Well Groundwater Elevations through January 2015.
NM - Not Measured



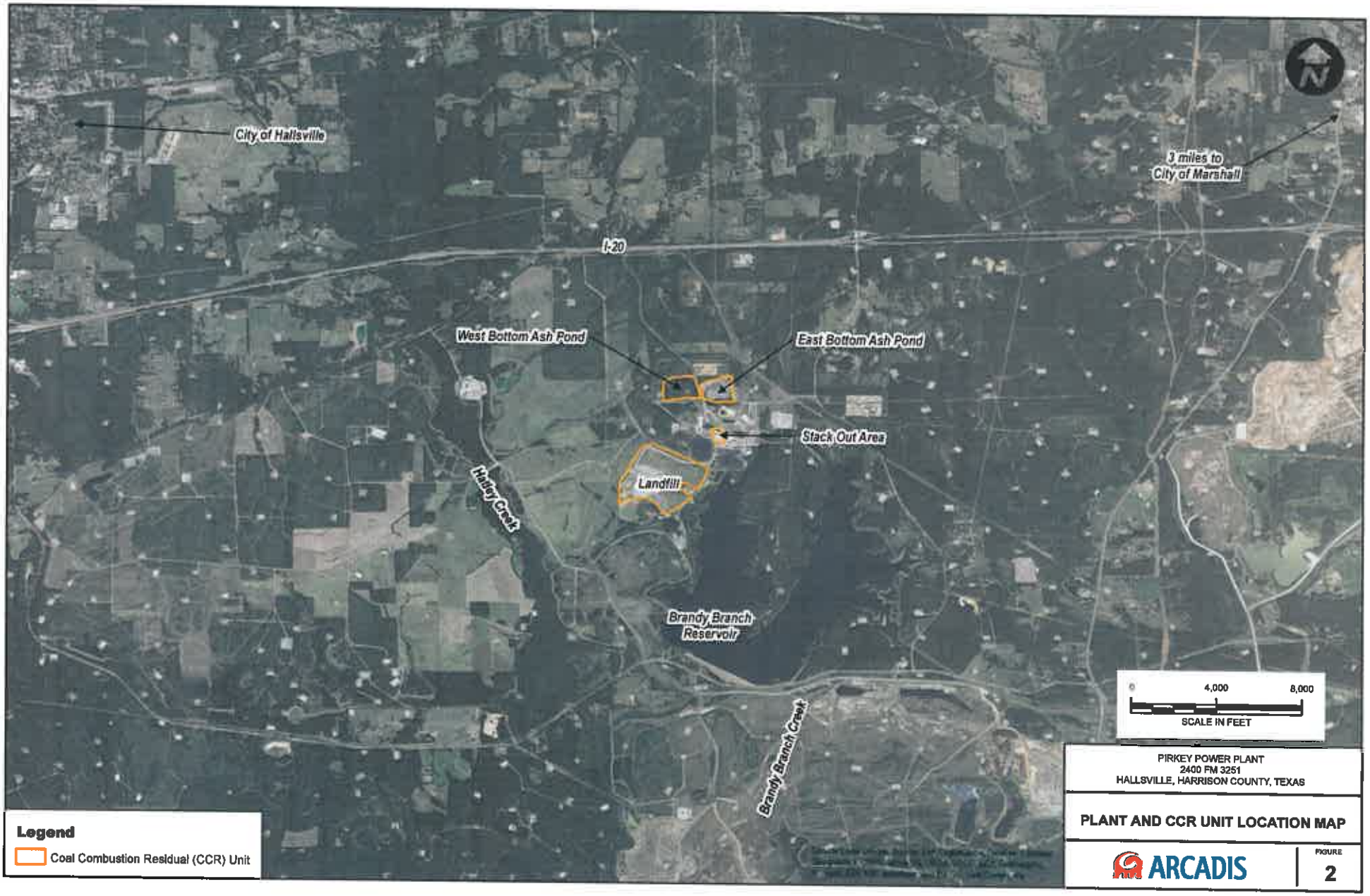
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

SITE LOCATION MAP

ARCADIS

FIGURE
1

Document Path: Z:\GIS\PROJECTS_ENVAEP\Pirkey Plant\MXD\Figure 1 - Site Location Map.mxd



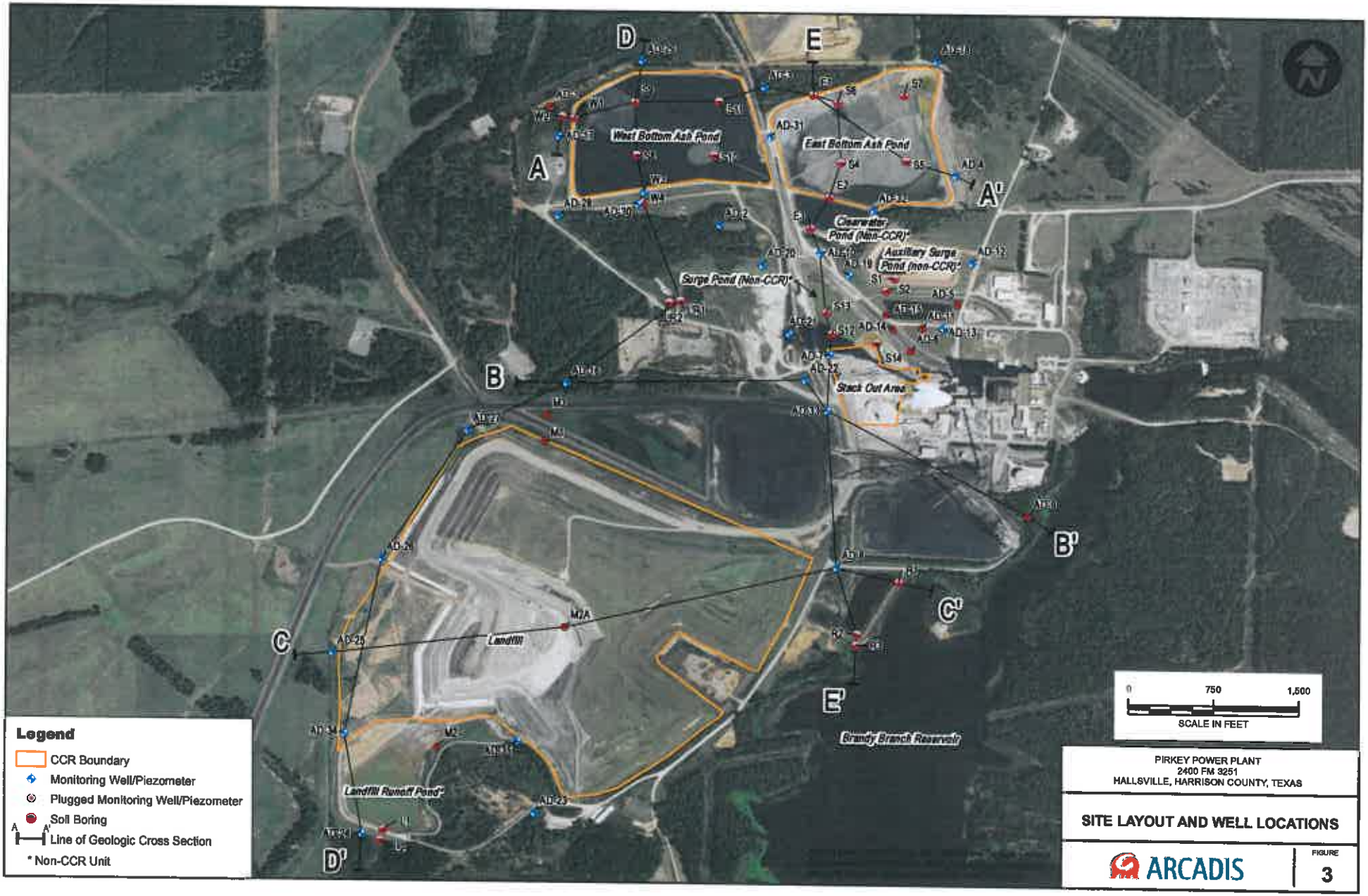
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

PLANT AND CCR UNIT LOCATION MAP

ARCADIS

FIGURE 2

Document Path: Z:\GIS\PROJECTS_ENVAE\Pirkey Plant\MXD\Figure 2 - Plant and CCR Unit Location Map.mxd



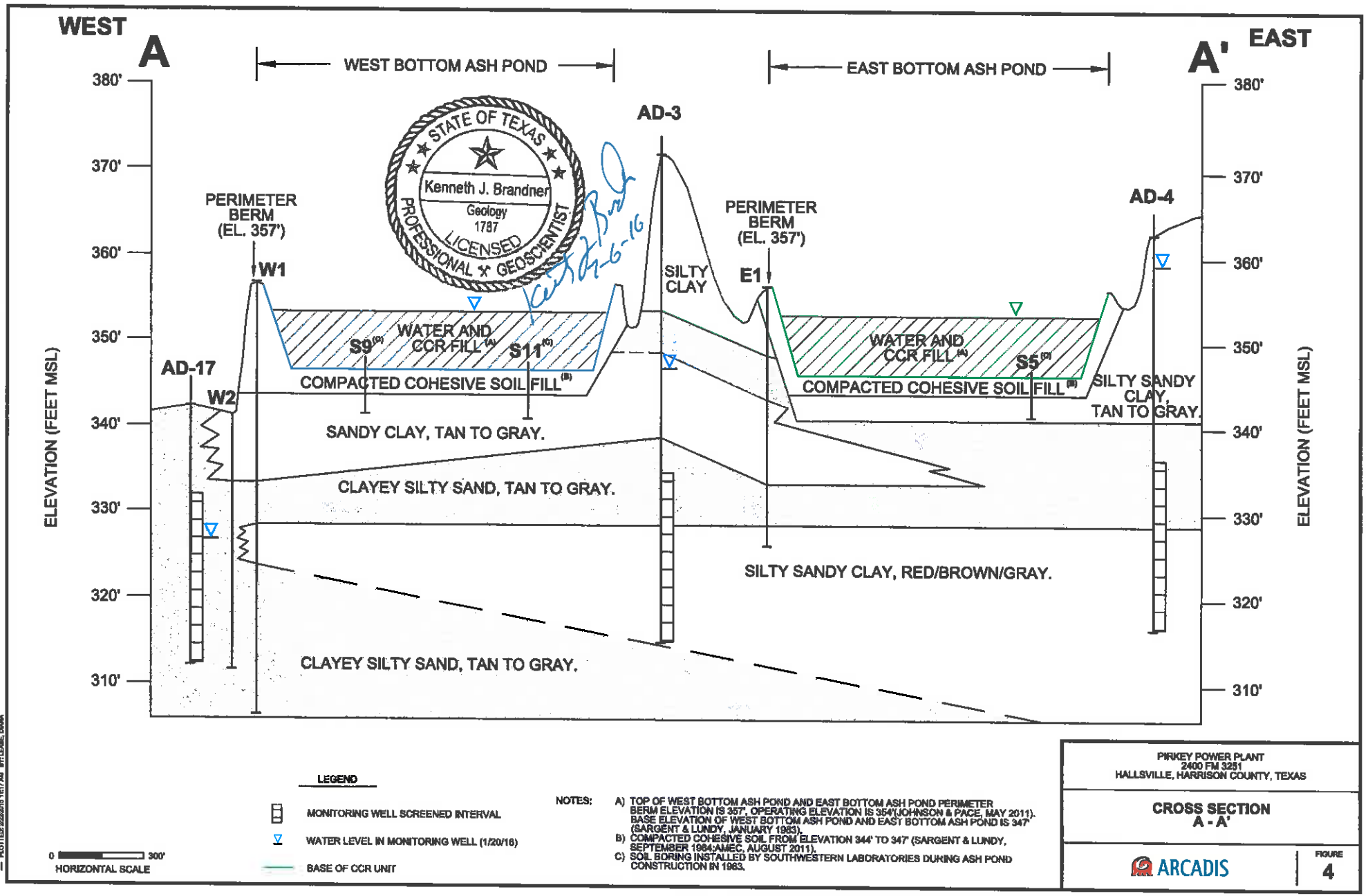
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

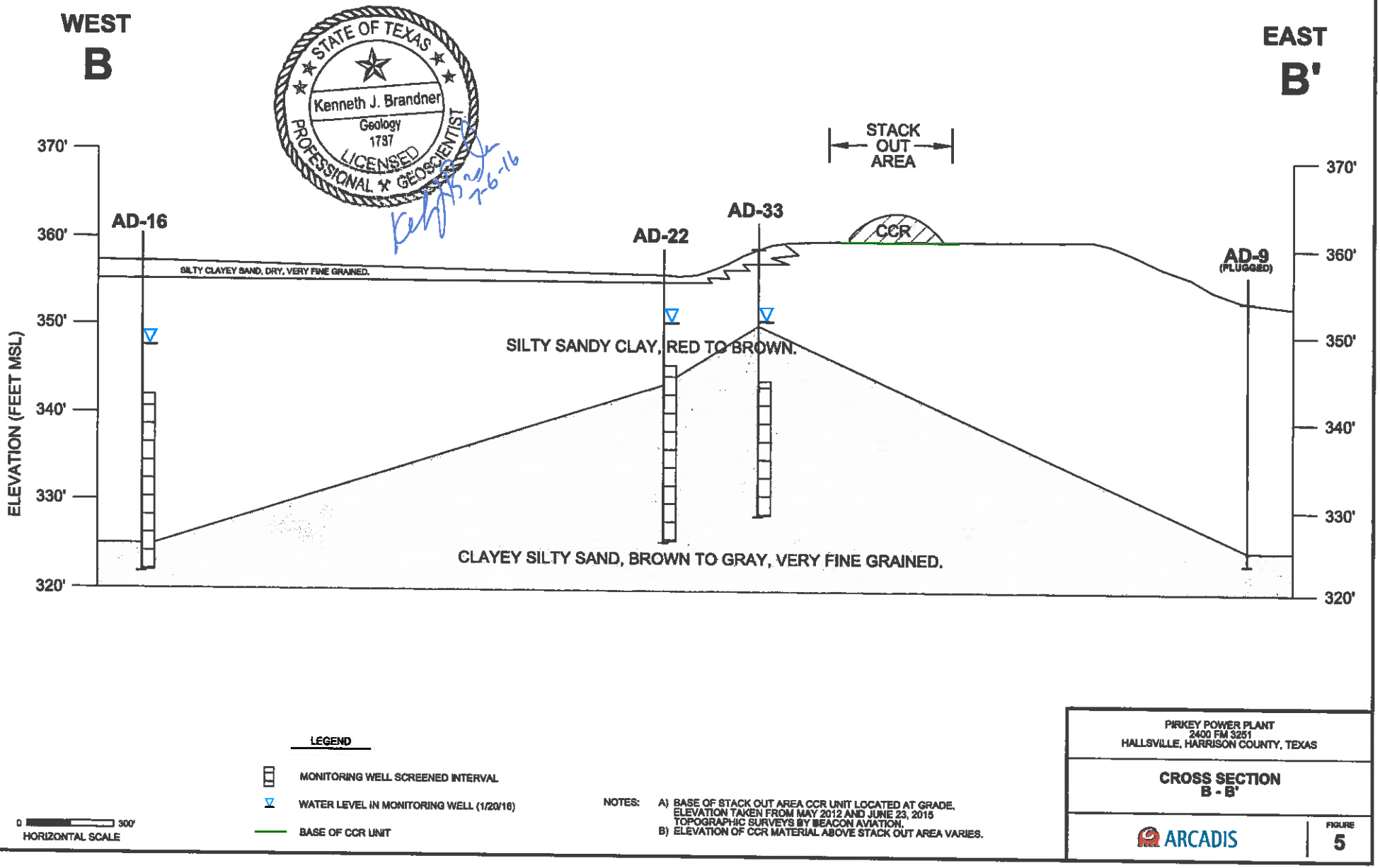
SITE LAYOUT AND WELL LOCATIONS

ARCADIS

FIGURE 3

Document Path: Z:\GIS\PROJECTS_ENV\AEP\Pirkey Plant\MXD\Figure 3 - Site Layout and Well Locations.mxd


WEST
A
A'
EAST
WEST BOTTOM ASH POND
EAST BOTTOM ASH POND
380'
370'
360'
350'
340'
330'
320'
310'
ELEVATION (FEET MSL)
PERIMETER BERM (EL. 357')
W1
W2
E1
AD-17
AD-3
AD-4
SILTY CLAY
WATER AND CCR FILL (A)
S9 (C)
S11 (C)
S5 (C)
COMPACTED COHESIVE SOIL FILL (B)
SANDY CLAY, TAN TO GRAY.
CLAYEY SILTY SAND, TAN TO GRAY.
SILTY SANDY CLAY, RED/BROWN/GRAY.
SILTY SANDY CLAY, TAN TO GRAY.
STATE OF TEXAS
Kenneth J. Brandner
Geology
1787
LICENSED
PROFESSIONAL GEOSCIENTIST
6-6-16
LEGEND
MONITORING WELL SCREENED INTERVAL
WATER LEVEL IN MONITORING WELL (1/20/16)
BASE OF CCR UNIT
0
300'
HORIZONTAL SCALE
NOTES:
A) TOP OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING ELEVATION IS 354'(JOHNSON & PACE, MAY 2011). BASE ELEVATION OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) COMPACTED COHESIVE SOIL FROM ELEVATION 344' TO 347' (SARGENT & LUNDY, SEPTEMBER 1984;AMEC, AUGUST 2011).
C) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
CROSS SECTION
A - A'
ARCADIS
FIGURE
4

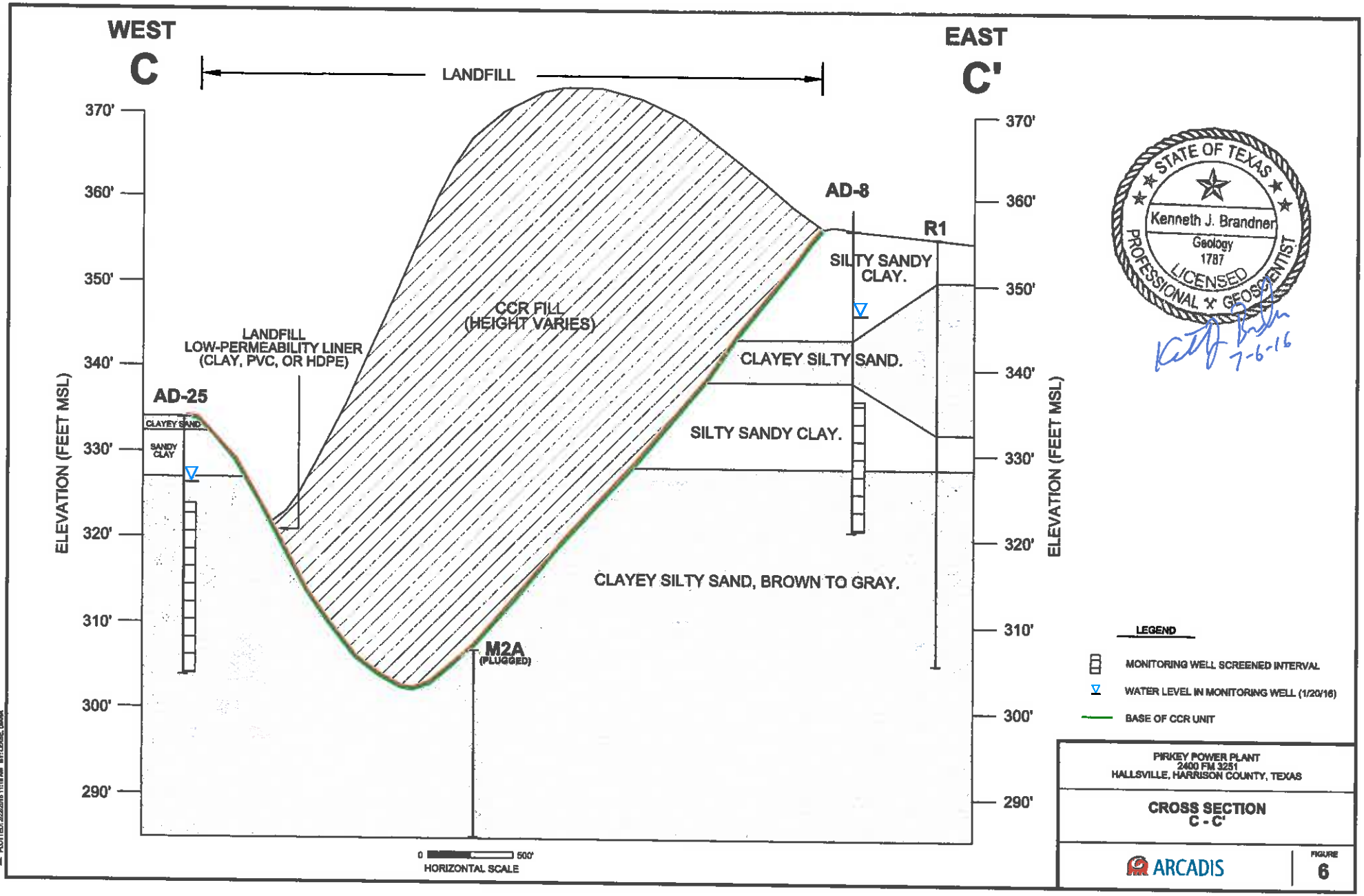


PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION
B - B'

ARCADIS

FIGURE
5



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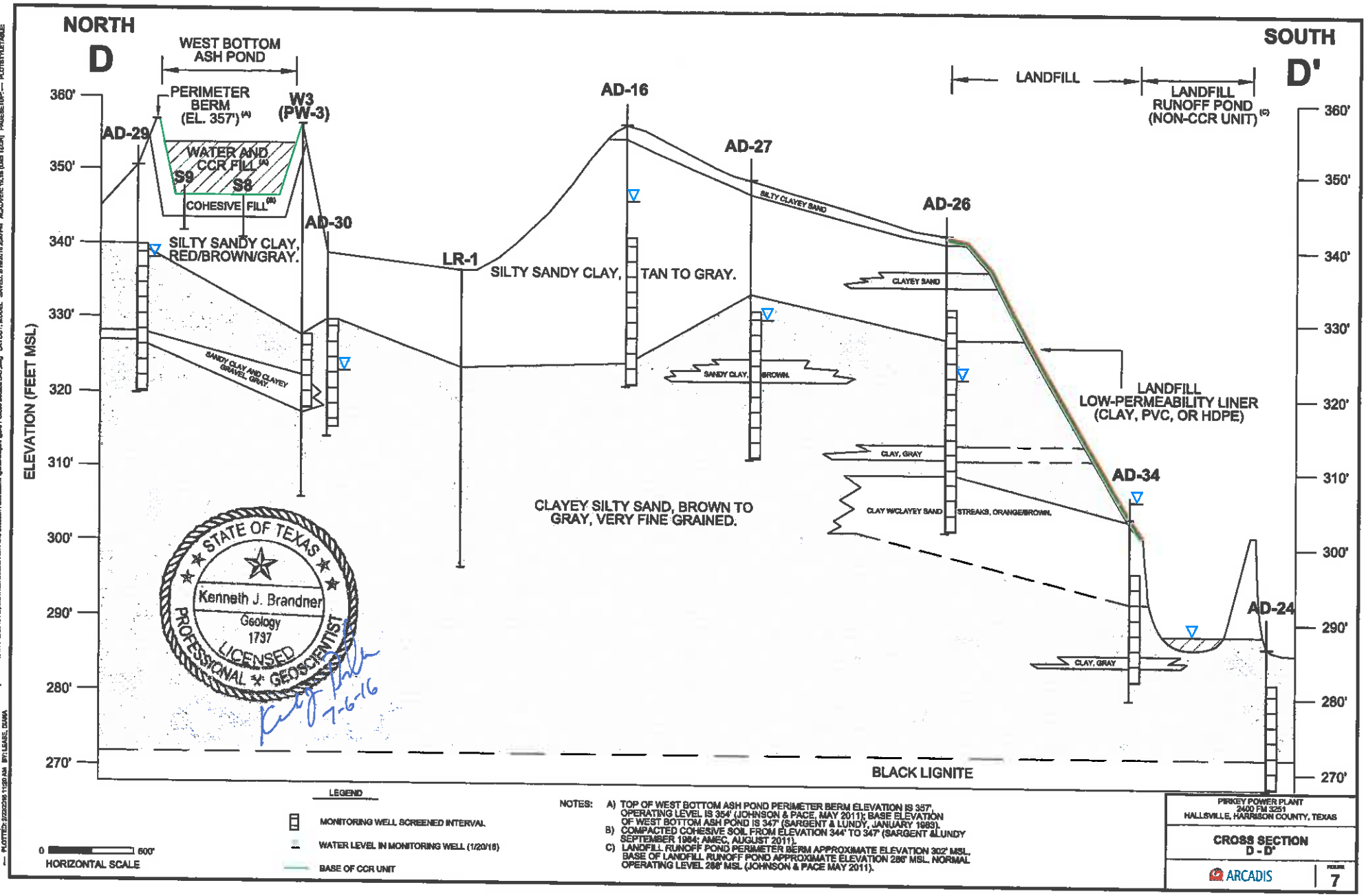
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION
C - C'

ARCADIS

FIGURE
6


NORTH
D
SOUTH
D'
WEST BOTTOM ASH POND
PERIMETER BERM (EL. 357') (A)
W3 (PW-3)
AD-29
WATER AND CCR FILL (A)
S9
S8
COHESIVE FILL (B)
AD-30
AD-16
AD-27
AD-26
AD-34
AD-24
LR-1
LANDFILL
LANDFILL RUNOFF POND (NON-CCR UNIT) (C)
SILTY SANDY CLAY, RED/BROWN/GRAY.
SILTY SANDY CLAY, TAN TO GRAY.
SILTY CLAYEY SAND
CLAYEY SAND
SANDY CLAY, BROWN
SANDY CLAY AND CLAYEY GRAVEL, GRAY.
CLAY, GRAY
CLAY W/CLAYEY SAND STREAKS, ORANGE/BROWN.
CLAYEY SILTY SAND, BROWN TO GRAY, VERY FINE GRAINED.
LANDFILL LOW-PERMEABILITY LINER (CLAY, PVC, OR HDPE)
BLACK LIGNITE
ELEVATION (FEET MSL)
360'
350'
340'
330'
320'
310'
300'
290'
280'
270'
STATE OF TEXAS
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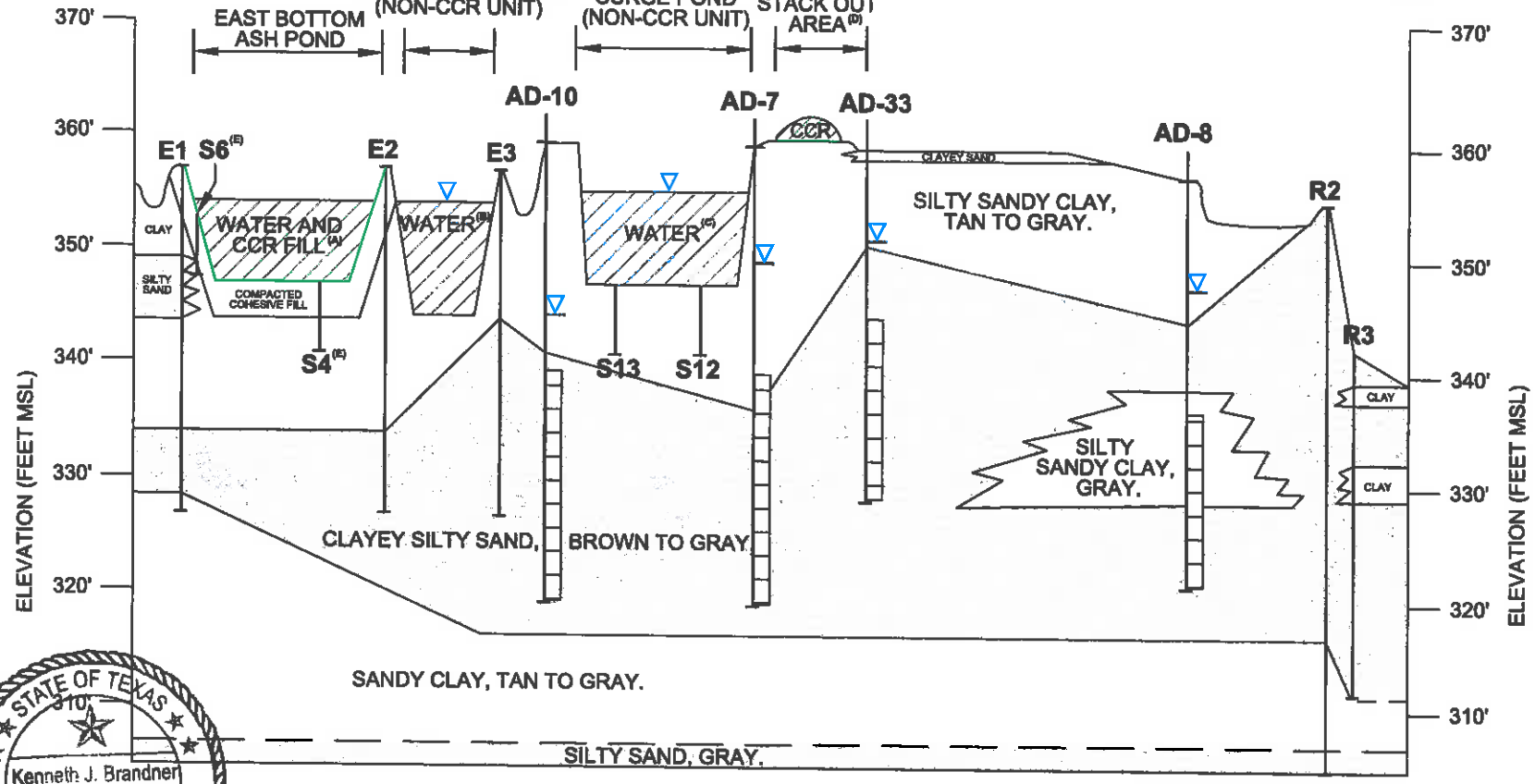
7-6-16
LEGEND
MONITORING WELL SCREENED INTERVAL
WATER LEVEL IN MONITORING WELL (1/20/16)
BASE OF CCR UNIT
0
600'
HORIZONTAL SCALE
NOTES:
A) TOP OF WEST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF WEST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) COMPACTED COHESIVE SOIL FROM ELEVATION 344' TO 347' (SARGENT &LUNDY SEPTEMBER 1984; AMEC, AUGUST 2011).
C) LANDFILL RUNOFF POND PERIMETER BERM APPROXIMATE ELEVATION 302' MSL, BASE OF LANDFILL RUNOFF POND APPROXIMATE ELEVATION 286' MSL, NORMAL OPERATING LEVEL 286' MSL (JOHNSON & PACE MAY 2011).
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
CROSS SECTION
D - D'
ARCADIS
FIGURE
7



STATE OF TEXAS
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PROFESSIONAL GEOSCIENTIST

7-6-16

0 500'
HORIZONTAL SCALE

LEGEND

- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (1/20/16)
- BASE OF CCR UNIT

NOTES:

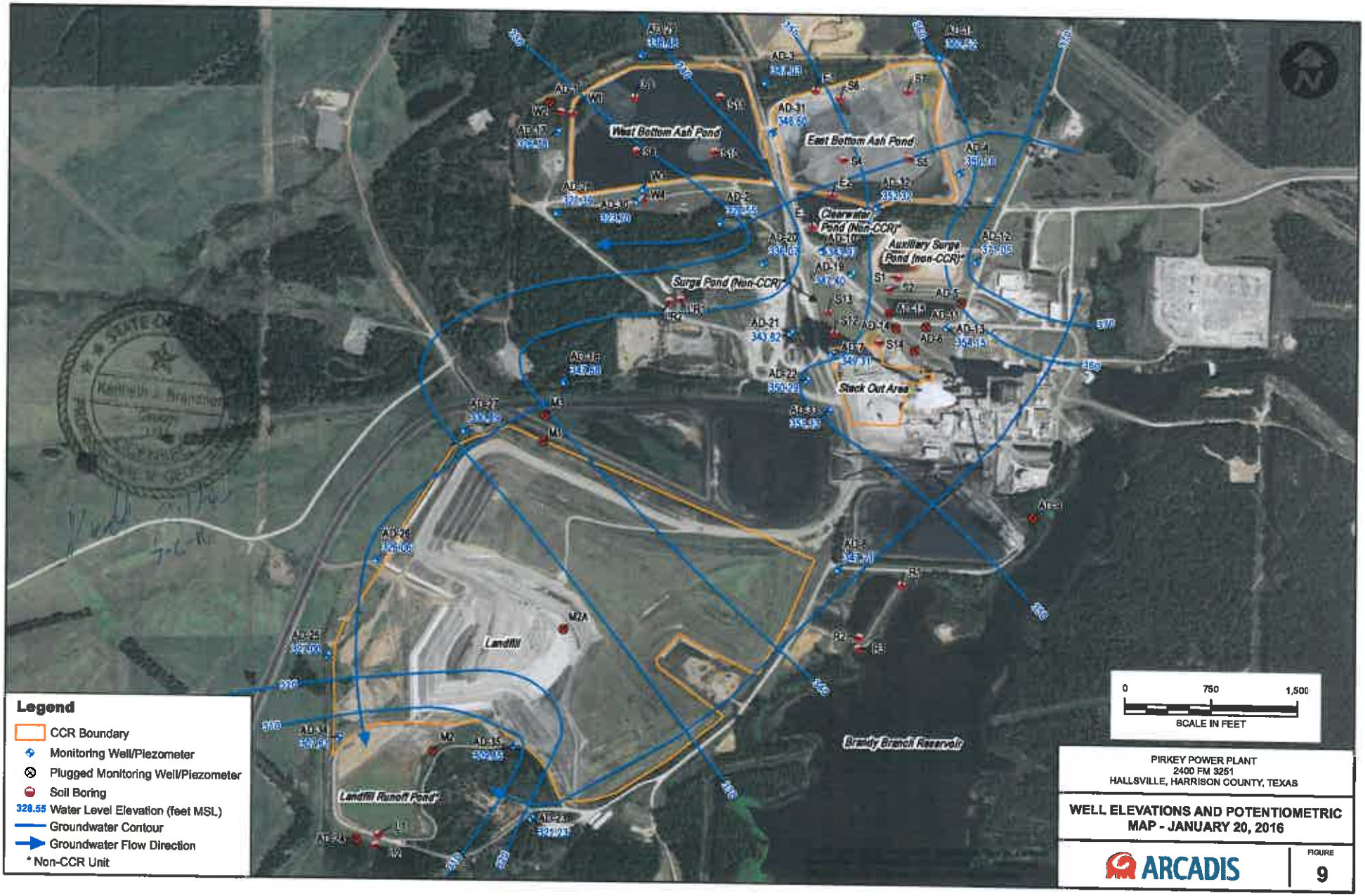
A) TOP OF EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357'. OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) TOP OF CLEARWATER POND PERIMETER BERM ELEVATION IS 357',OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011). BASE ELEVATION OF CLEARWATER POND IS 344' (SARGENT & LUNDY, JANUARY 1983).
C) BASE ELEVATION OF SURGE POND (347-352'MSL) AND POND DESIGN LEVEL (355'MSL) TAKEN FROM JANUARY 31, 1983 SARGENT & LUNDY REPORT "DESIGN SUMMARY FOR LIGNITE STORAGE AREA AND WASTEWATER POND FACILITIES".
D) BASE OF STACK OUT AREA CCR UNIT LOCATED AT GRADE. ELEVATION TAKEN FROM MAY 2012 AND JUNE 23, 2015 TOPOGRAPHIC SURVEYS BY BEACON AVIATION.
E) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.

PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION
E - E'

ARCADIS

FIGURE
8



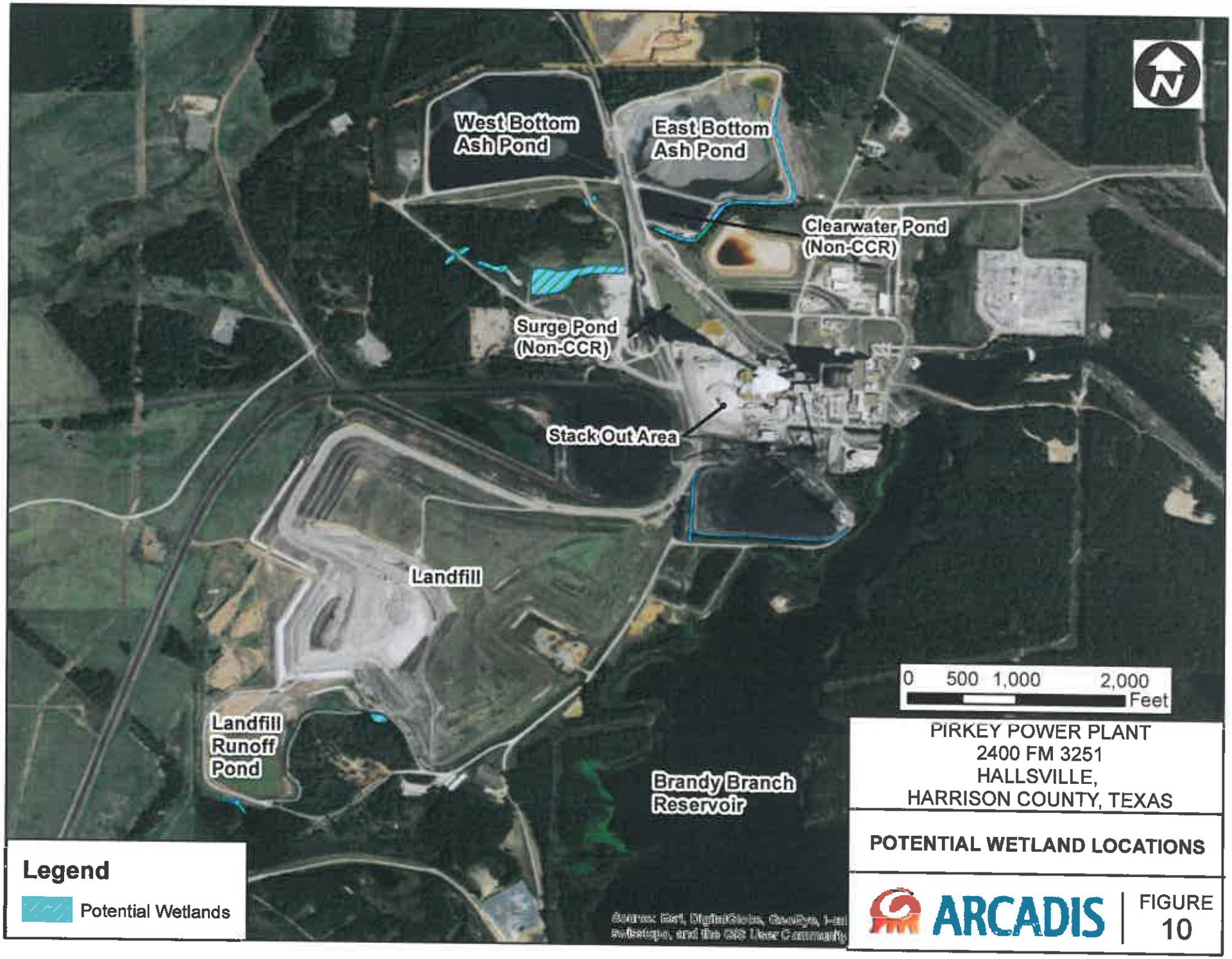
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

WELL ELEVATIONS AND POTENTIOMETRIC MAP - JANUARY 20, 2016

ARCADIS

FIGURE 9

Document Path: Z:\GIS\PROJECTS_ENVAEPP\Pirkey Plant\MXD\Figure 9 - Well Elevations and Potentiometric Map - January 20, 2016.mxd

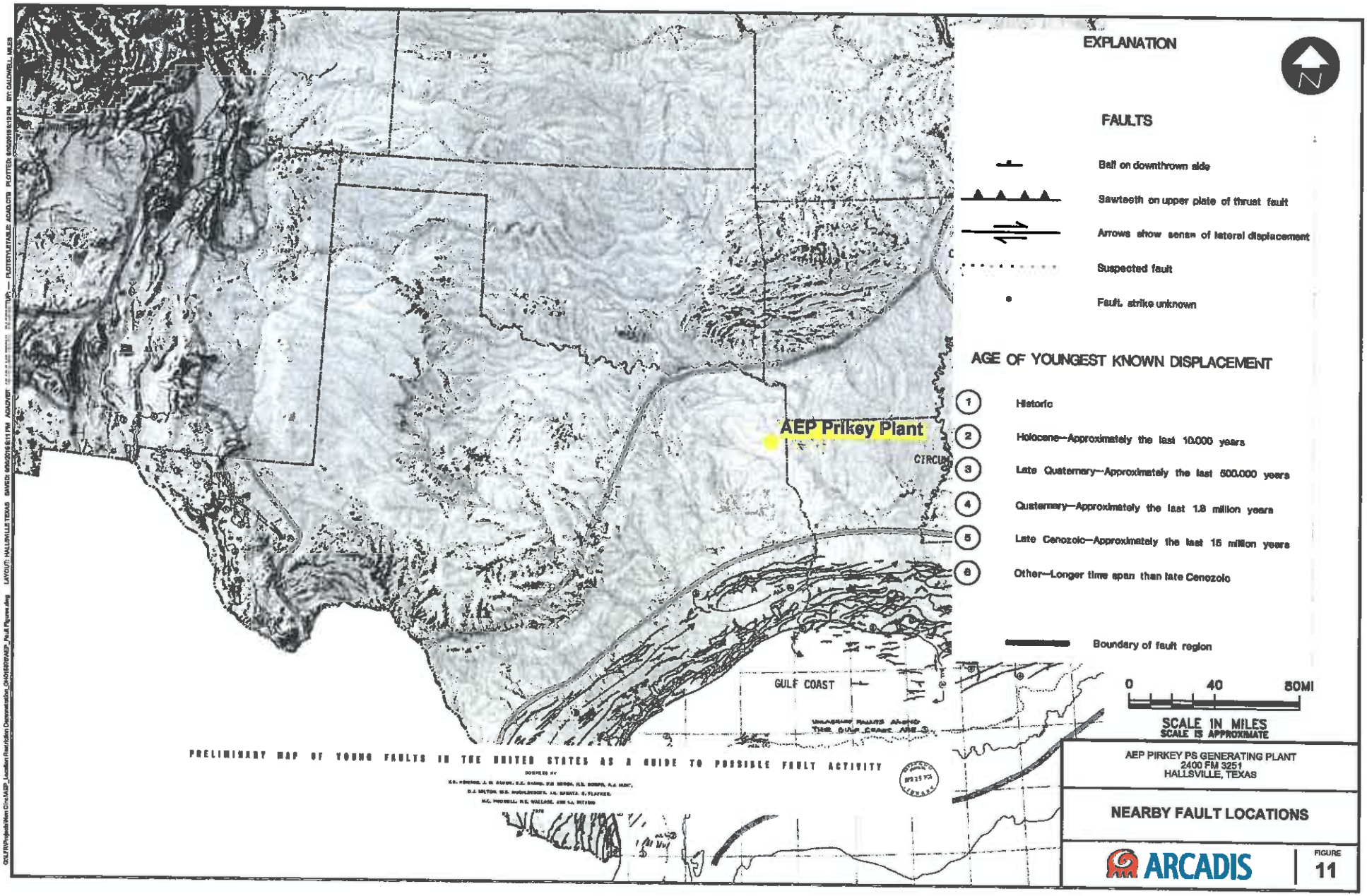


PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE,
HARRISON COUNTY, TEXAS

POTENTIAL WETLAND LOCATIONS

ARCADIS

FIGURE
10

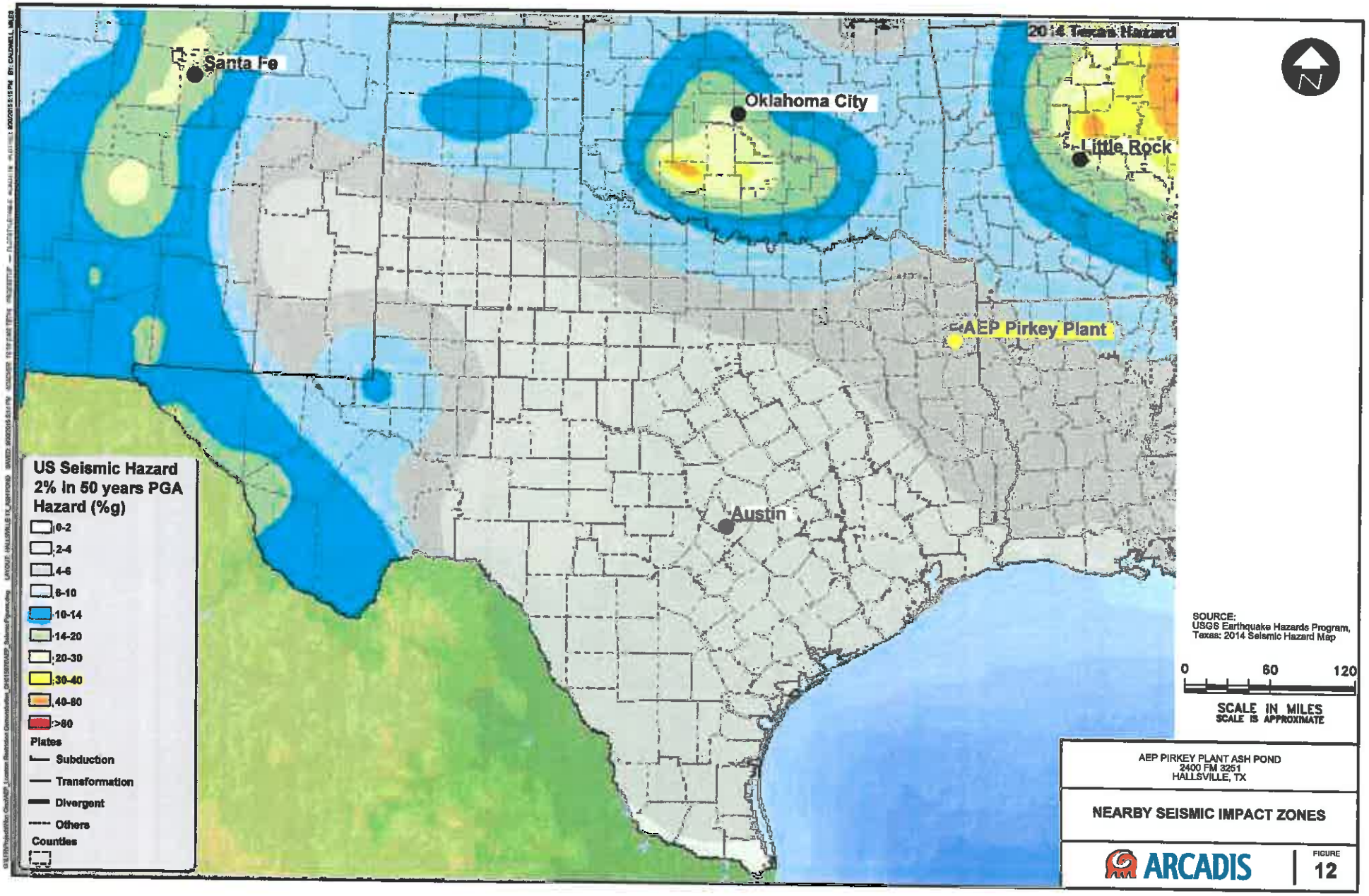


AEP PIRKEY PS GENERATING PLANT
2400 FM 3251
HALLSVILLE, TEXAS

NEARBY FAULT LOCATIONS

ARCADIS

FIGURE
11


Santa Fe
Oklahoma City
Little Rock
AEP Pirkey Plant
Austin
US Seismic Hazard
2% in 50 years PGA
Hazard (%g)
0-2
2-4
4-6
6-10
10-14
14-20
20-30
30-40
40-80
>80
Plates
Subduction
Transformation
Divergent
Others
Counties
SOURCE:
USGS Earthquake Hazards Program,
Texas: 2014 Seismic Hazard Map
0
60
120
SCALE IN MILES
SCALE IS APPROXIMATE
AEP PIRKEY PLANT ASH POND
2400 FM 3251
HALLSVILLE, TX
NEARBY SEISMIC IMPACT ZONES
ARCADIS
FIGURE
12

Appendix A

Boring/Well Construction Logs

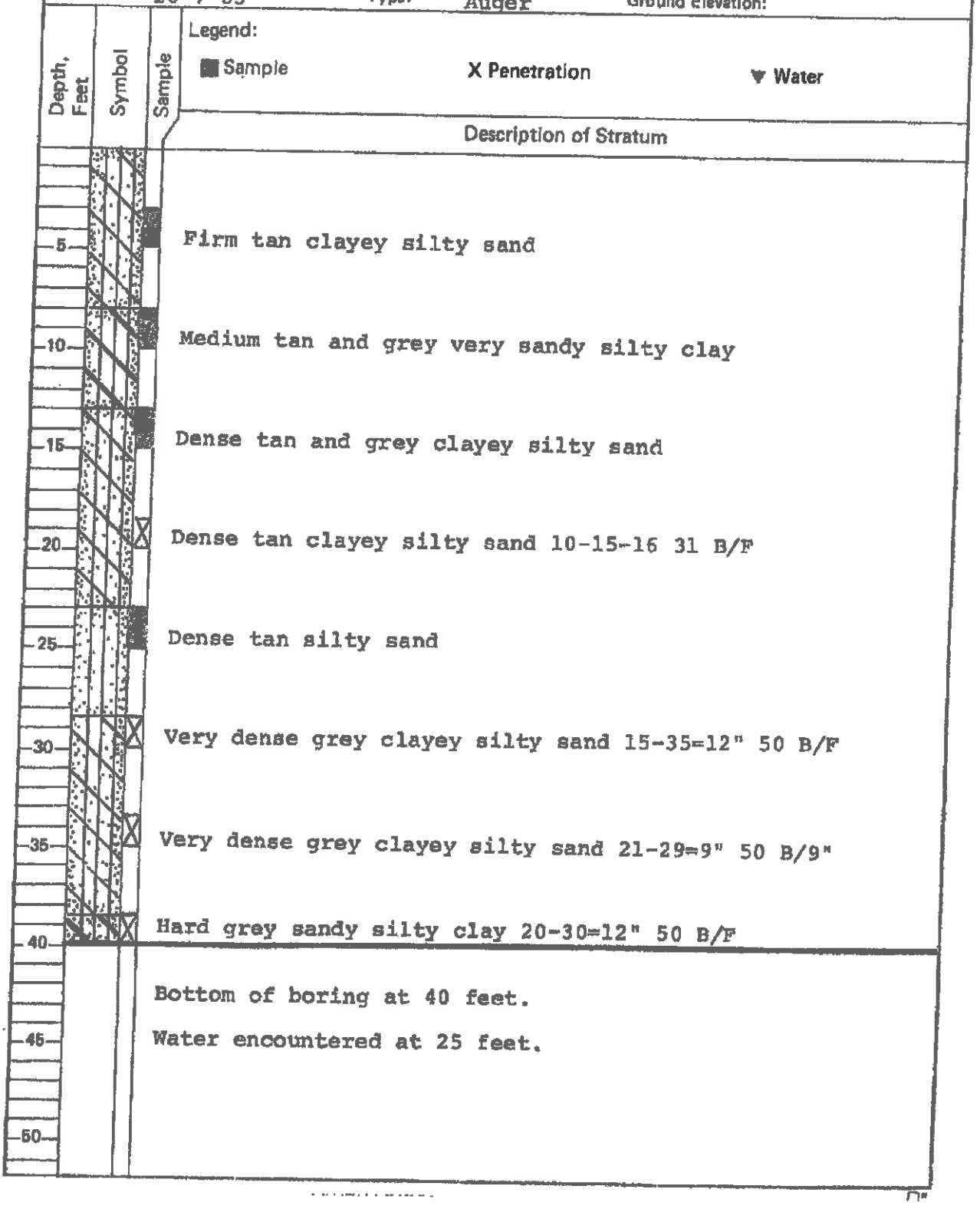
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-2
LOCATION: Hallsville

Date: 10-7-83 Type: Auger Ground Elevation:



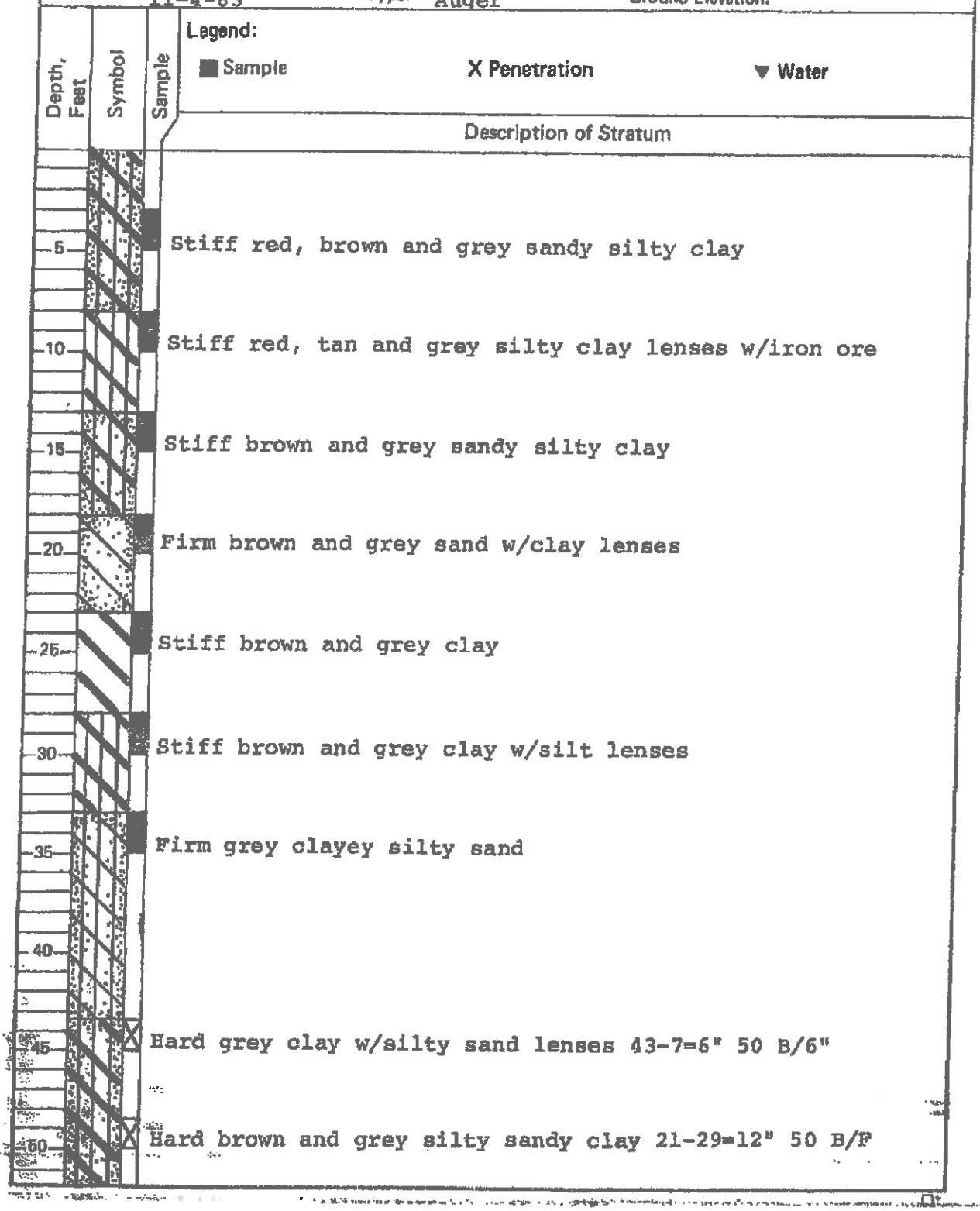
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-3
LOCATION: Hallsville, TX

Date: 11-4-83 Type: Auger Ground Elevation:



832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-3
LOCATION: Hallsville, TX

Date: 11-4-83 Type: Auger Ground Elevation:

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
55			Hard grey silty sandy clay 28-22=10" 50 B/10"
			Bottom of boring at 57 feet.
			Water encountered at 42 feet.
60			
65			
70			
75			
80			
85			
90			
95			
100			

832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-4
LOCATION: Hallsville

Date: 10-10-83 Type: Auger Ground Elevation:

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Stiff tan and grey silty sandy clay w/iron ore
10			Very stiff tan and grey clay
15			Very stiff tan and grey clay w/iron ore seam
20			Stiff tan and grey silty sandy clay lenses
25			Firm grey silty sand
30			Very dense grey silty sand 30-20=12" 50 B/F
35			Hard grey silty sandy clay 30-20=8" 50 B/8"
40			Hard grey silty sandy clay 25-25=8" 50 B/8"
45			Hard grey silty sandy clay 25-25=10½" 50 B/10½"
50			Bottom of boring at 46 feet.

APEX PROJECT NO.: 110-089 ☐ BORING BORING NUMBER: ____ ■ MONITOR WELL MONITOR WELL NUMBER: AD-18

FACILITY NAME: AEP- Pirkey Power Plant FACILITY ID NO.: N/A

FACILITY ADDRESS: Hallsville, Texas

DRILLING COMPANY/METHOD/RIG: Apex Geoscience Inc. / Hollow-stem Augers/ CME-55 Track Rig

DRILLER: Ed Wilson, Apex Geoscience Inc. COMPLETION DATE: 1/3/2011

PREPARED BY: Jeff Sammons LOGGED BY: Matt Lyon/Jeff Sammons

LATITUDE: N 32°28.154' Datum: WGS-84
LONGITUDE: W94°29.108' WELL LOCATION: Northeast of Bottom Ash Pond #1

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1-7				0-7	SM	Sandy Silt, some clay, very fine grained, gray, light brown, light brownish red, yellowish brown	None	Dry
8-16				7-16	CL	Clay, some sand, light gray, reddish gray, stiff, yellowish brown -iron oxide fracture at 9.5'	None	Dry
						-increasing sand content at 14', thin lenses of iron-oxide cemented sand at 14.5', 15', 15.5', stiff		Moist
17-25			▽	16-25	SM	Silty sand, some clay, gray, yellowish brown, dense, abundant gypsum crystals, abundant iron oxide cemented sandstone gravel in layers, saturated 19-21'	None None	Moist to V. Moist Saturated
						-dark gray at 21' -clayey at 21-23'	None	
						-greenish gray, trace clay, at 23'	None	
						-clay lense, hard, dry, (shale), at 24.5-25'	None	Dry
26-40						Boring Terminated at 25'		

Cement | Bentonite | Filter Sand | ▽ Water Level

Apex geoscience inc.

Total Depth: 25 feet
Filter Sand (Size/Interval): 13-25'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-13'
Surface Completion ☐ Flush ■ Above Ground

Riser Interval: +3 (ags)-15'
Screen Interval: 15-25'
Water level:
3'

Note: This log is not to be used separate from this report.

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-31

PROJECT INFORMATION

PROJECT:	Pinkey Power Plant
PROJECT NO.:	I-84-1021
LOGGED BY:	Jeffrey D. Sammons, P.G.
SUPERVISING PG:	Jeffrey D. Sammons, P.G.
COMPLETION:	12/08/2015
DEVELOPMENT:	12/16/2015
SITE LOCATION:	3400 FM 3251, Hallsville, Texas
WELL OWNER:	AEP

DRILLING INFORMATION

DRILLER:	Buford Collier
DRILLER'S LICENSE NO.:	60089
RIG TYPE:	Geoprobe 3230DT
METHOD OF DRILLING:	Hollow Stem Auger
SAMPLING METHODS:	Split Core
SURFACE ELEVATION:	360.76 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 25' 2.48"
LONGITUDE	94 39' 29.99"

STATE OF TEXAS — JEFFREY D. SAMMONS — GEOLOGY #10070 — LICENSED PROFESSIONAL GEOSCIENTIST — 1-21-16

▼ Water Level Upon Installation ▽ Water Level at Time of Drilling ■ Geotechnical Lab Sample TBPG No. 50027

DESCRIPTION	USCS	% MOISTURE	% FINES	LL	PL	PI
SANDY CLAY AND GRAVEL: dark reddish brown, moist	CH					
FAT CLAY WITH SAND: some laminations of very fine to fine sand, reddish brown and light gray	CH	22	81	51	15	36
FAT CLAY: some silt with trace very fine to fine sand laminations, reddish brown, yellowish brown and light gray	CH					
- light gray with laminations of light reddish brown silt and very fine sand at 11'		26	85	66	31	37
CLAYEY SAND: very fine to fine sand, light reddish brown and light gray, very moist to saturated	SC					
- dark gray and gray clay with thin seams of light reddish brown very fine sand at 22' to 23'		28	44	36	21	15
SILTY SAND: fine to very fine sand, some clay lenses and thin layers of partially cemented sandstone, gray and dark gray with light reddish brown, very moist to saturated - dark gray and reddish brown at 29', saturated - trace clay, light brown at 30'	SM					
		24	5	24	NP	-
CLAYEY SAND: very fine sand, dark gray, very moist to saturated	SC					

WELL CONSTRUCTION

- Locking Well Casing Cover
- Locking Well Cap
- Protective Well Casing
- Concrete Pad
- Ground Surface
- Cement
- Bentonite
- 2" Sch. 40 PVC Riser
- 20/40 Silica Sand
- 0.010" Slotted Sch. 40 PVC Well Screen
- PVC Bottom Cap

NOTES: This log should not be used seperately from the original report. Not all USCS descriptors were laboratory verified.

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-32

PROJECT INFORMATION

PROJECT:	Pirkey Power Plant
PROJECT NO.:	I-04-1021
LOGGED BY:	Jeffrey D. Sammons, P.G.
SUPERVISING PG:	Jeffrey D. Sammons, P.G.
COMPLETION:	12/11/2015
DEVELOPMENT:	12/16/2015
SITE LOCATION:	2400 FM 3251, Hallsville, Texas
WELL OWNER:	AEP

DRILLING INFORMATION

DRILLER:	Buford Collier
DRILLER'S LICENSE NO.:	60089
RIG TYPE:	Geoprobe 3230DT
METHOD OF DRILLING:	Hollow Stem Auger
SAMPLING METHODS:	Split Core
SURFACE ELEVATION:	388.18 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 27' 58.20" LONGITUDE 94 29' 11.96"

STATE OF TEXAS — JEFFREY D. SAMMONS — GEOLOGY #10070 — LICENSED PROFESSIONAL GEOSCIENTIST — JDS 1-21-16

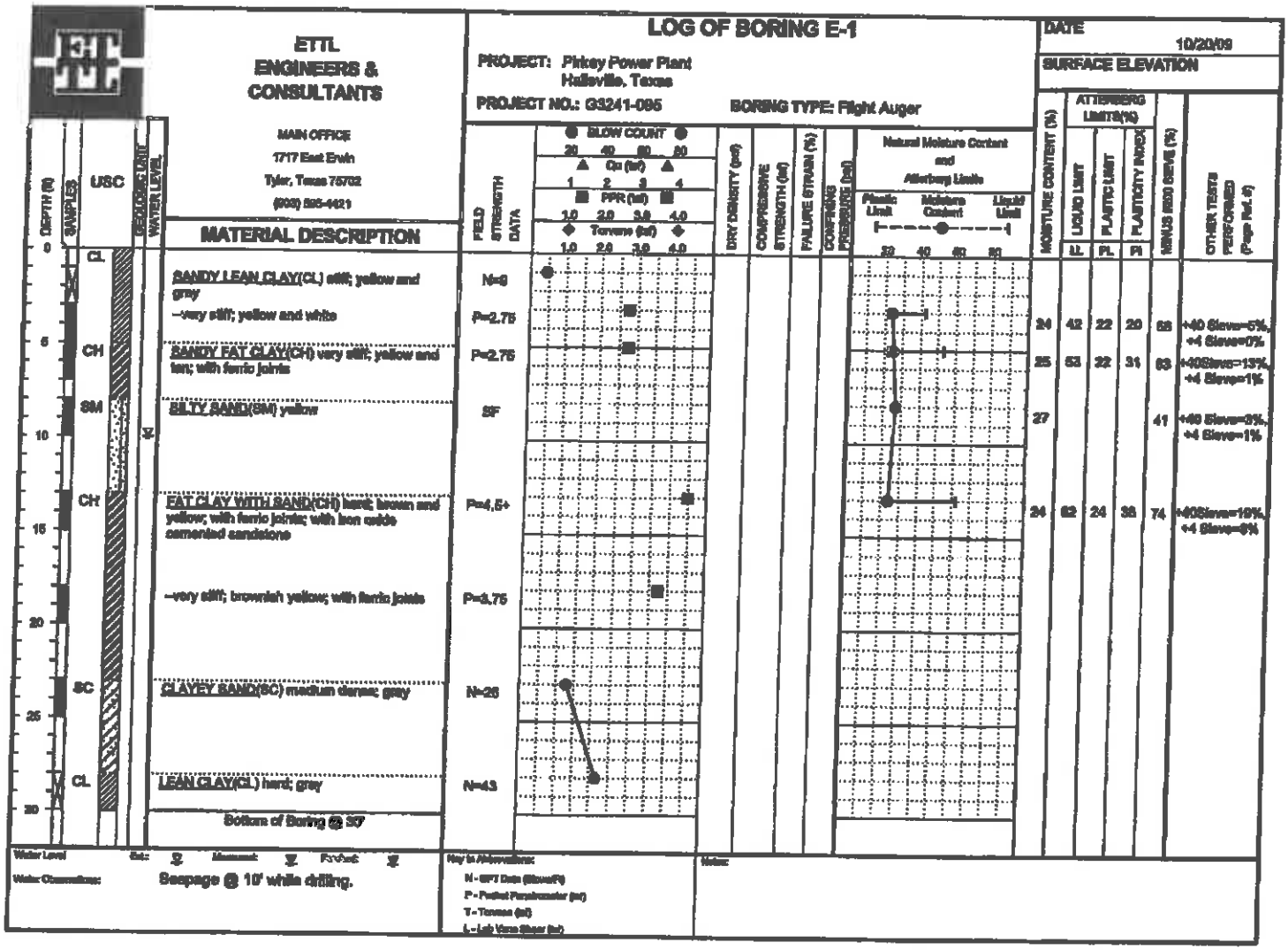
▼ Water Level Upon Installation ▽ Water Level at Time of Drilling ■ Geotechnical Lab Sample TBPG No. 50027

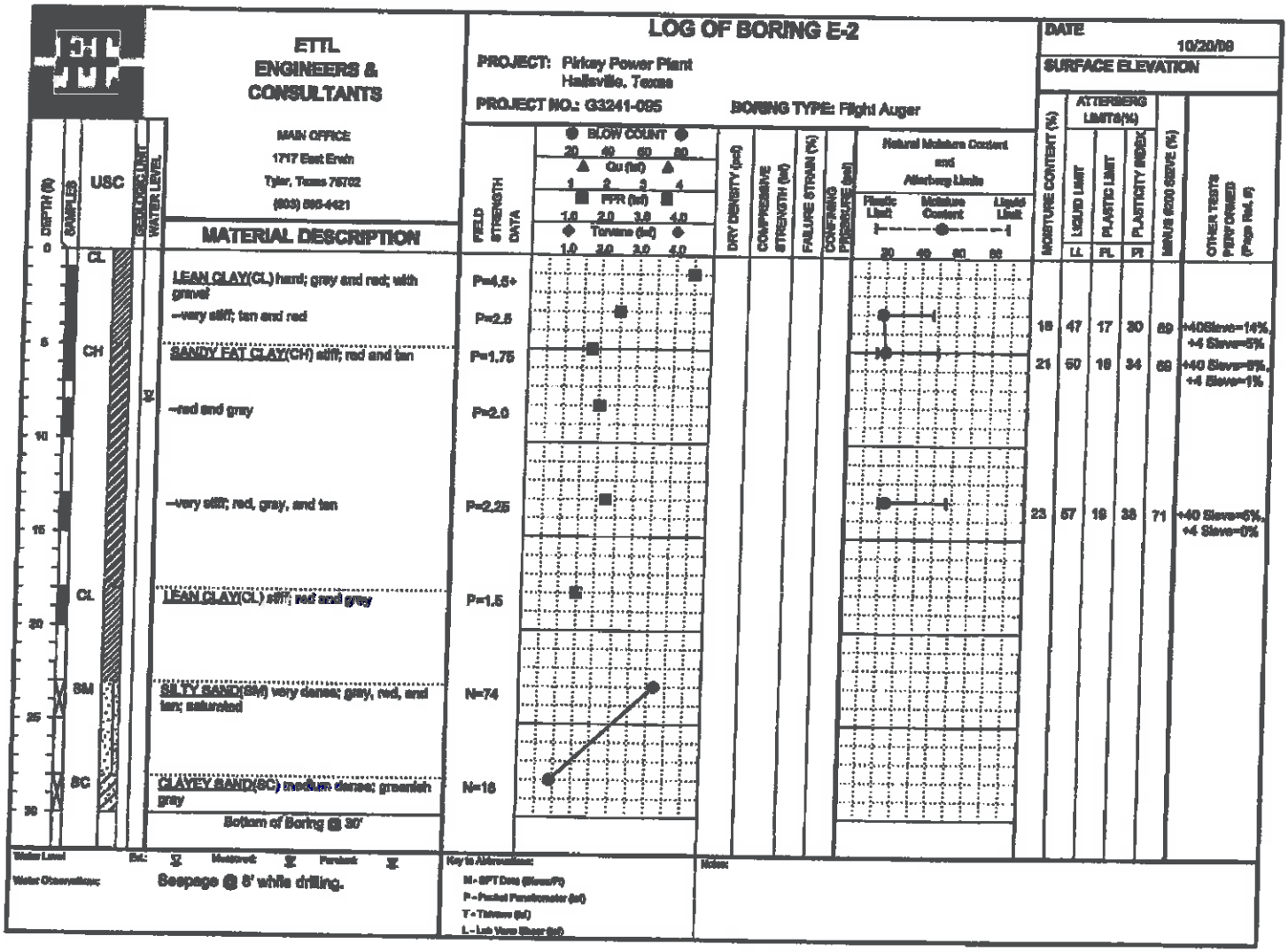
DESCRIPTION	USCS	DEPTH	SAMPLE	% MOISTURE	% FINES	LL	PL	PI
CLAYEY SAND: very fine to fine sand, dark reddish brown, moist - interbeds of sand and clay, yellowish brown and light gray at 1' - reddish brown and light gray at 2' - light gray and yellowish brown at 4', - grayish brown and light gray at 6' - grayish brown, light gray, and reddish brown at 7'	SC	0–12	25	46	35	22	13
			26	44	37	20	17
SANDY LEAN CLAY: some gravel seams and thin interbeds of cemented sand, light yellowish brown and light gray, moist to saturated within gravel seams - some iron ore gravel at 16', very moist to saturated	CL	12–18	28	54	37	22	15
SILTY SAND: very fine to fine sand, trace clay, brownish gray and dark brownish gray, saturated - reddish brown and brown at 20'	SM	18–20					
SANDY LEAN CLAY: gray and dark gray, very moist	CL	20–25	26	61	37	24	13
CLAYEY SAND: fine to very fine sand, gray and dark gray, very moist to saturated	SC	25–30	28	47	41	22	19
SANDY LEAN CLAY: gray and dark gray, very moist	CL	30–33	26	59	35	21	14

WELL CONSTRUCTION

- Locking Well Casing Cover
- Locking Well Cap
- Protective Well Casing
- Concrete Pad
- Ground Surface
- Cement
- Bentonite
- 2" Sch. 40 PVC Riser
- 20/40 Silica Sand
- 0.010" Slotted Sch. 40 PVC Well Screen
- PVC Bottom Cap

NOTES: This log should not be used separately from the original report. Not all USCS descriptors were laboratory verified.


ETTL
ENGINEERS & CONSULTANTS
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING E-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Qu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (psf)
FAILURE STRAIN (%)
CONFINING PRESSURE (psi)
Natural Moisture Content and Atterberg Limits
Plastic Limit
Moisture Content
Liquid Limit
MOISTURE CONTENT (%)
ATTERBERG LIMITS(%)
LIQUID LIMIT
PLASTIC LIMIT
PLASTICITY INDEX
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Page Ref. #)
CL
SANDY LEAN CLAY(CL) stiff; yellow and gray
--very stiff; yellow and white
N=8
P=2.75
CH
SANDY FAT CLAY(CH) very stiff; yellow and tan; with ferric joints
P=2.75
SM
SILTY SAND(SM) yellow
SF
CH
FAT CLAY WITH SAND(CH) hard; brown and yellow; with ferric joints; with iron oxide cemented sandstone
P=4.5+
--very stiff; brownish yellow; with ferric joints
P=3.75
SC
CLAYEY SAND(SC) medium dense; gray
N=26
CL
LEAN CLAY(CL) hard; gray
N=43
Bottom of Boring @ 30'
24 42 22 20 58 +40 Sieve=5%, +4 Sieve=0%
25 53 22 31 83 +40Sieve=13%, +4 Sieve=1%
27 41 +40 Sieve=3%, +4 Sieve=1%
24 82 24 38 74 +40Sieve=16%, +4 Sieve=6%
Water Level
Date:
Seepage @ 10' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes:



ETTL
ENGINEERS &
CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING E-2

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095

BORING TYPE: Flight Auger

DATE: 10/20/09

SURFACE ELEVATION:

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page No.#)
0		CL			LEAN CLAY(CL) hard; gray and red; with gravel	P=4.5+											
					--very stiff; tan and red	P=2.5						19	47	17	30	69	#40Sieve=14%, #4 Sieve=5%
5		CH			SANDY FAT CLAY(CH) stiff; red and tan	P=1.75						21	50	19	34	69	#40 Sieve=9%, #4 Sieve=1%
					--red and gray	P=2.0											
10																	
15					--very stiff; red, gray, and tan	P=2.25						23	57	19	38	71	#40 Sieve=6%, #4 Sieve=0%
		CL			LEAN CLAY(CL) stiff; red and gray	P=1.5											
20																	
25		SM			SILTY SAND(SM) very dense; gray, red, and tan; saturated	N=74											
		SC			CLAYEY SAND(SC) medium dense; greenish gray	N=16											
30					Bottom of Boring @ 30'												

Water Level Obs.: ▽ Encount. ▽ Measured ▽ Perched ▽

Water Observations: Seepage @ 8' while drilling.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:

832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-4
LOCATION: Hallsville,TX

Date: 9-14-83 Type: Ground Elevation: 347.3

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Red and grey sandy silty clay Red and grey sandy silty clay Red and grey sandy silty clay w/iron ore
10			Bottom of boring at 6 feet. No water encountered.
15			
20			
25			
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

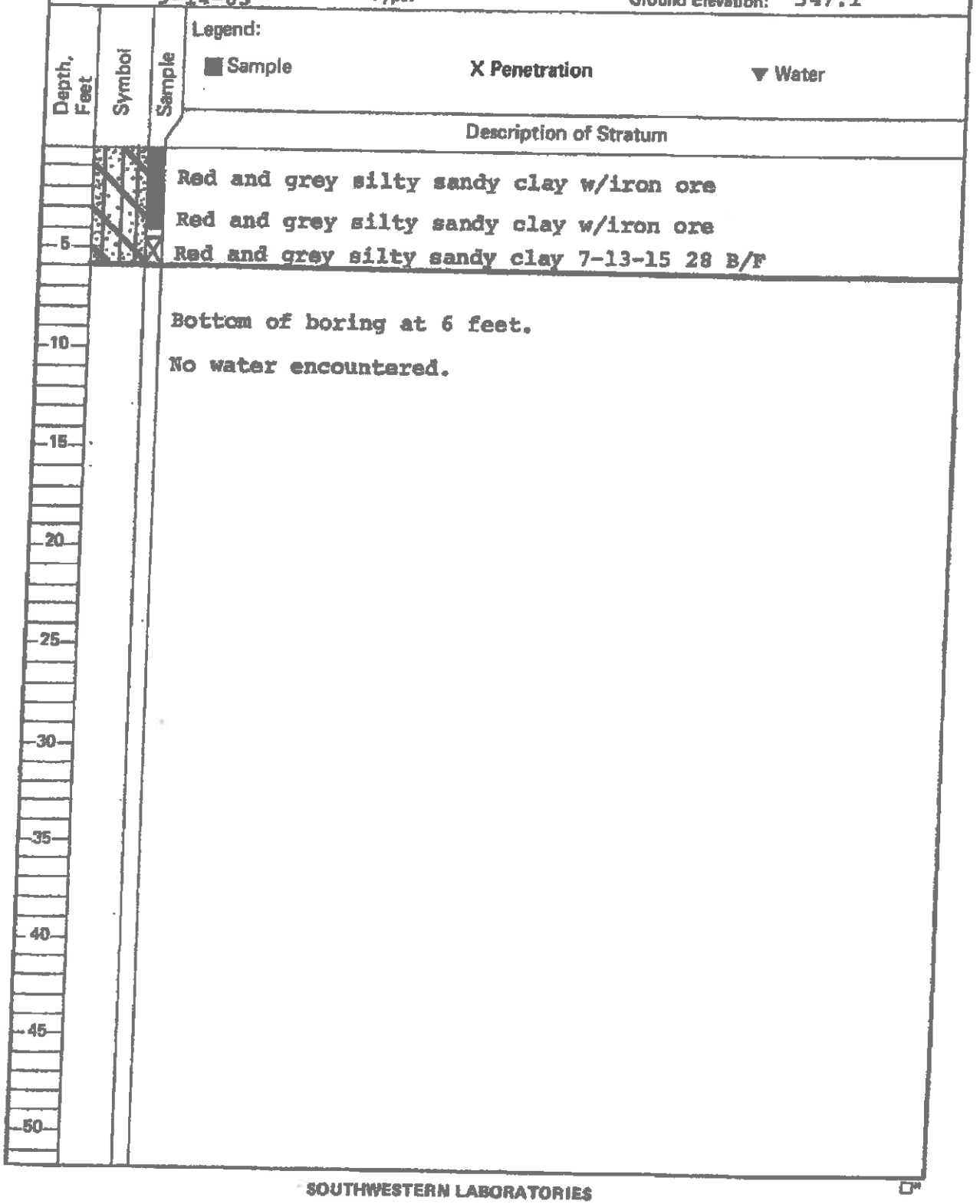
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-5
LOCATION: Hallsville,TX

Date: 9-14-83 Type: Ground Elevation: 347.1



Red and grey silty sandy clay w/iron ore

Red and grey silty sandy clay w/iron ore

Red and grey silty sandy clay 7-13-15 28 B/F

Bottom of boring at 6 feet.

No water encountered.

832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-6
LOCATION: Hallsville, TX

Date: 9-14-83 Type: Ground Elevation: 353.6

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Red and grey silty clay lenses w/iron ore Red and grey silty sandy clay w/iron ore Red and grey silty clay
10			Bottom of boring at 6 feet. No water encountered.
15			
20			
25			
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-7
LOCATION: Hallsville, TX

Date: 9-14-83 Type: Ground Elevation: 346.9

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Red, brown and grey silty clay Red, brown and grey silty clay w/silt lenses and iron ore Red, brown and grey silty sandy clay
10			Bottom of boring at 6 feet. No water encountered.
15			
20			
25			
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

Appendix B

Photographic Log

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
1	8/19/2015

Direction Photo Taken:

South

Description:

P8190374
Vegetative strip adjacent to East Ash Pond. Under new rule this potential wetland is likely non-jurisdictional.

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
2	8/19/2015

Direction Photo Taken:

Description:

P8190372
AD- 4 Ground water monitoring well. East Bottom Ash Pond embankment in background.

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
3	8/19/2015

Direction Photo Taken:

South

Description:

P8190378
View across East and West Botton Ash Pond.

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
4	8/19/2015

Direction Photo Taken:

Southeast

Description:

P8190379
Road side ditch, not considered a wetland, due to lack of hydric vegetation and connectivity.

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
5	8/19/2015

Direction Photo Taken:

North

Description:

P8190380
AD-18 Ground water monitoring well.

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – Pirkey Power Plant	Hallsville, Harrison County, Texas	OH015976.0001

Photo No.	Date:
6	8/19/2015

Direction Photo Taken:

North

Description:

P8190381
AD-18 Ground water monitoring well.