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American Electric Power Service Corporation

West Bottom Ash Pond - CCR Location Restriction Evaluation

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

July 6, 2016

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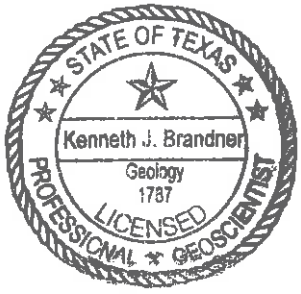

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Harrison County
Hallsville, Texas

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AEP

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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 West Bottom Ash Pond (BAP) 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 BAP, East BAP, Stack Out Area, and Landfill (**Figure 2**). This report summarizes the evaluation of the location restriction criteria at the West BAP (Site). The evaluation of the groundwater monitoring well network in the uppermost aquifer for the West 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 West 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 West 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 West BAP CCR unit is located at the north end of the Plant and approximately 3,000 feet northwest of Brandy Branch Reservoir (**Figures 1** and **2**).

2.2 Description of West BAP CCR Unit

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

2.2.1 Embankment Configuration

The West BAP embankments have a maximum height of approximately 25 feet and are constructed of compacted clay on a slope ranging from 2.5:1 (2.5 feet horizontal, 1 foot vertical) to 3:1 (Sargent & Lundy, 1983). The elevation at the top of the embankment around the perimeter of the West BAP is approximately 357 feet amsl, and the normal operating level is approximately 354 feet amsl (Johnson & Pace, 2011). The interior bottom elevation of the West BAP is approximately 347 feet amsl (Sargent & Lundy, 1983; Akron Consulting, 2012).

2.2.2 Area/Volume

The West BAP is approximately 30.9 acres in size. The design maximum ash storage capacity of the West BAP is 188 acre feet at an elevation of 354 feet amsl (normal operating level) and 216.5 acre feet at an elevation of 355 feet amsl (maximum operating level) (Sargent & Lundy, 1983; Akron Consulting, 2012).

2.2.3 Construction and Operational History

The H.W. Pirkey Power Plant West 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 West 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 West BAP discharges into the Clearwater Pond located southeast of the West

BAP. Bottom ash and economizer ash are periodically excavated from the West BAP and hauled by truck to either the on-site landfill for disposal, or for beneficial re-use.

The base of the West BAP was constructed in 1983 with a compacted clay liner (Sargent & Lundy, 1983). Following installation of the compacted clay liner, soil borings S-8 through S-11 were advanced below the base of the West BAP to total depths of six feet in September 1983 (Southwestern Laboratories, 1984). The lithologic data from soil borings S-8 through S-11 confirm at least six feet of clay is present below the base of the West BAP (Sargent & Lundy, 1984).

2.2.4 Surface Water Control

Surface water elevation in the West BAP is controlled by a weir box and a manually operated gate valve on a 36-inch-diameter discharge pipe at the southeast corner of the pond. Clear water overflow from the West BAP discharges through the 36-inch-diameter pipe into the 2.7- acre Clearwater Pond located southeast of the West 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 West 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 West BAP. As discussed above in Section 2.2.3, the design included installation of a clay liner below the West BAP.

In September-October 1983, Southwestern Laboratories conducted a soil investigation at the Plant, including advancement of four soil borings (S-8 through S-11) below the West BAP (Southwestern Laboratories, 1984).

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

In 2009, ETTL Engineers & Consultants (ETTL) conducted a geotechnical investigation of the West BAP earthen embankment. The investigation included installation of two soil borings through the embankment (W1, W3) and two soil borings along the outer toe of the embankment (W2, W4), completion of soil borings W1 and W3 as

piezometers PW-1 and PW-3, 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 West 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 West BAP is hydraulically adequate (Johnson & Pace, 2011).

In 2015, Auckland Consulting further expanded 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 West 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 West 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 West BAP is west-southwesterly at an average hydraulic gradient of approximately 0.01 foot per foot.

The West BAP is located approximately 3,000 feet 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 West 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 southeast (sidegradient) of the West 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 south (side gradient) of the West 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 West 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 West BAP is at an elevation of 347 feet amsl. Therefore the separation distance between the uppermost water-bearing unit and the base of the West BAP is approximately seven feet. This separation distance is further illustrated on cross section A-A' (**Figure 4)** and cross section D-D' (**Figure 7**).

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 West 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 West BAP meets the regulatory definition of an aquifer. As shown on the cross-sections presented on **Figures 4** and **7**, the base of the West BAP is seven 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-8 through S-11) were advanced six feet below the base of the West BAP in 1983 following installation of the clay liner, and these four soil borings confirm the presence of the clay liner below the West 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 West BAP is not located within an area that exhibited wetland characteristics that might be classified as a regulated wetland. Photos of the West 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 West 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 (USGS) 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 within 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 West BAP design report was prepared by Sargent & Lundy in 1983 (Sargent & Lundy, 1983). The West BAP was constructed in 1983 using compacted clay. The specifications included installation of clay embankments 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 West BAP earthen embankment in 2009. The investigation included installation of two soil borings through the embankment (W1, W3) and two soil borings along the outer toe of the embankment (W2, W4), completion of soil borings W1 and W3 as piezometers PW-1 and PW-3, respectively, and collection of soil samples for geotechnical analyses. The report concluded the embankment was constructed with layers of cohesive soils consisting primarily of lean clay and/or fat clay with no obvious seams of soft or loose soils, and 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 West 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 West 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 West BAP is not located within unstable areas. Therefore, this CCR unit complies with the requirement of not being located within 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 West 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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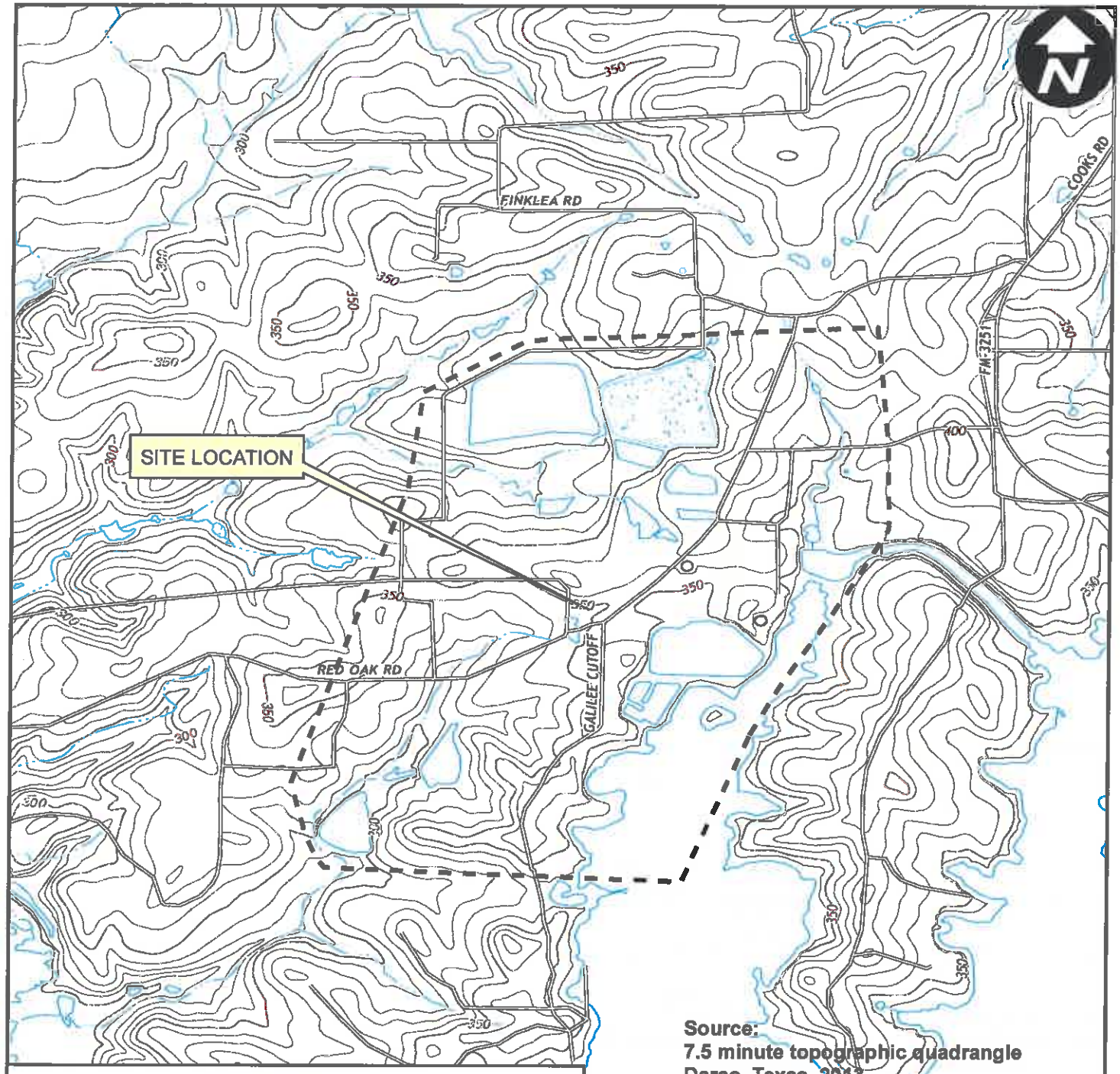
Table 1
Water Level Data
AEP Pirkey Power Plant - CCR Storage Areas
Hallsville, Harrison County, Texas

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



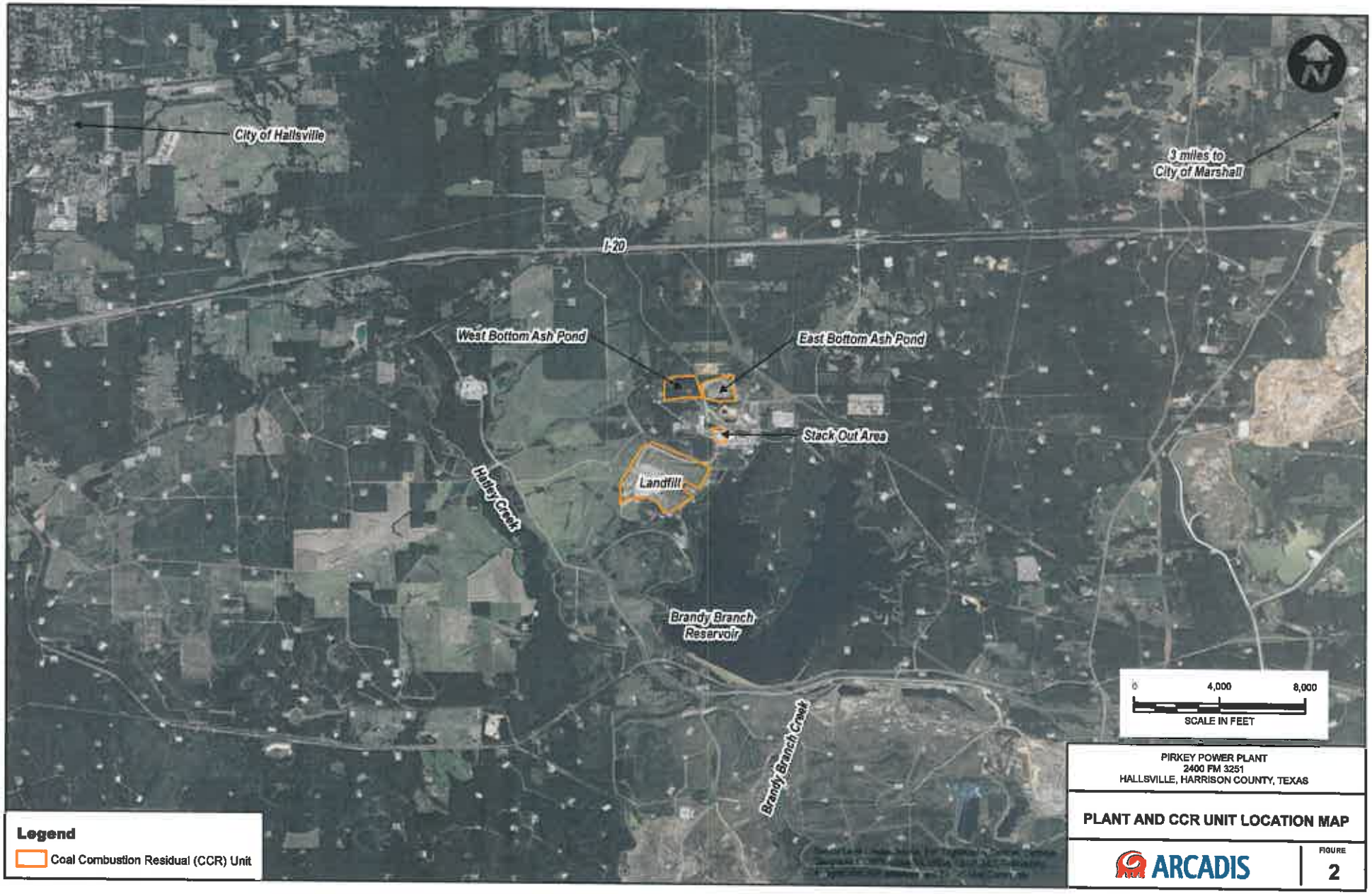
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

SITE LOCATION MAP

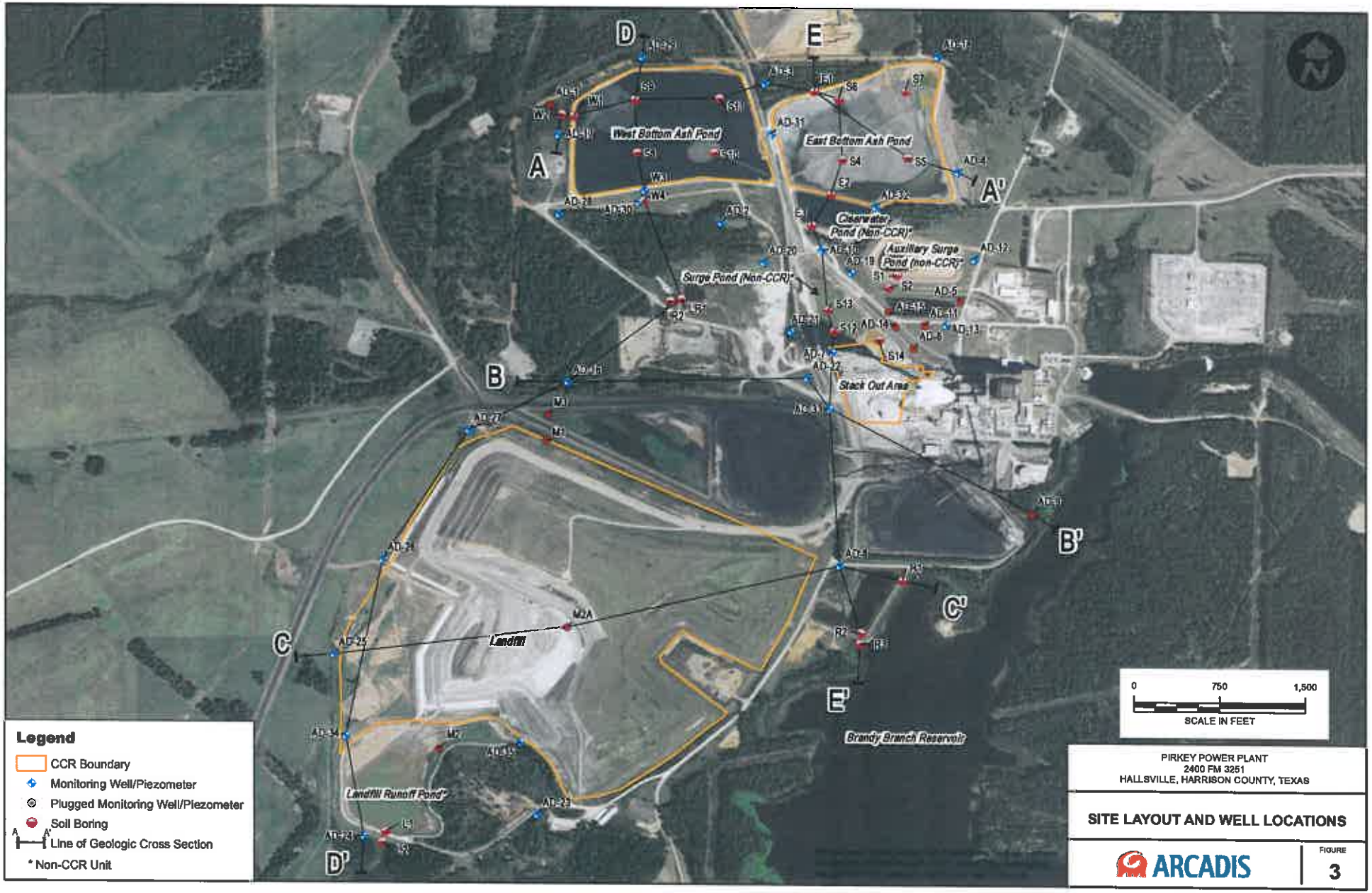
ARCADIS

FIGURE 1

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



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



Legend

- CCR Boundary
- Monitoring Well/Piezometer
- Plugged Monitoring Well/Piezometer
- Soil Boring
- A A' Line of Geologic Cross Section
- * Non-CCR Unit

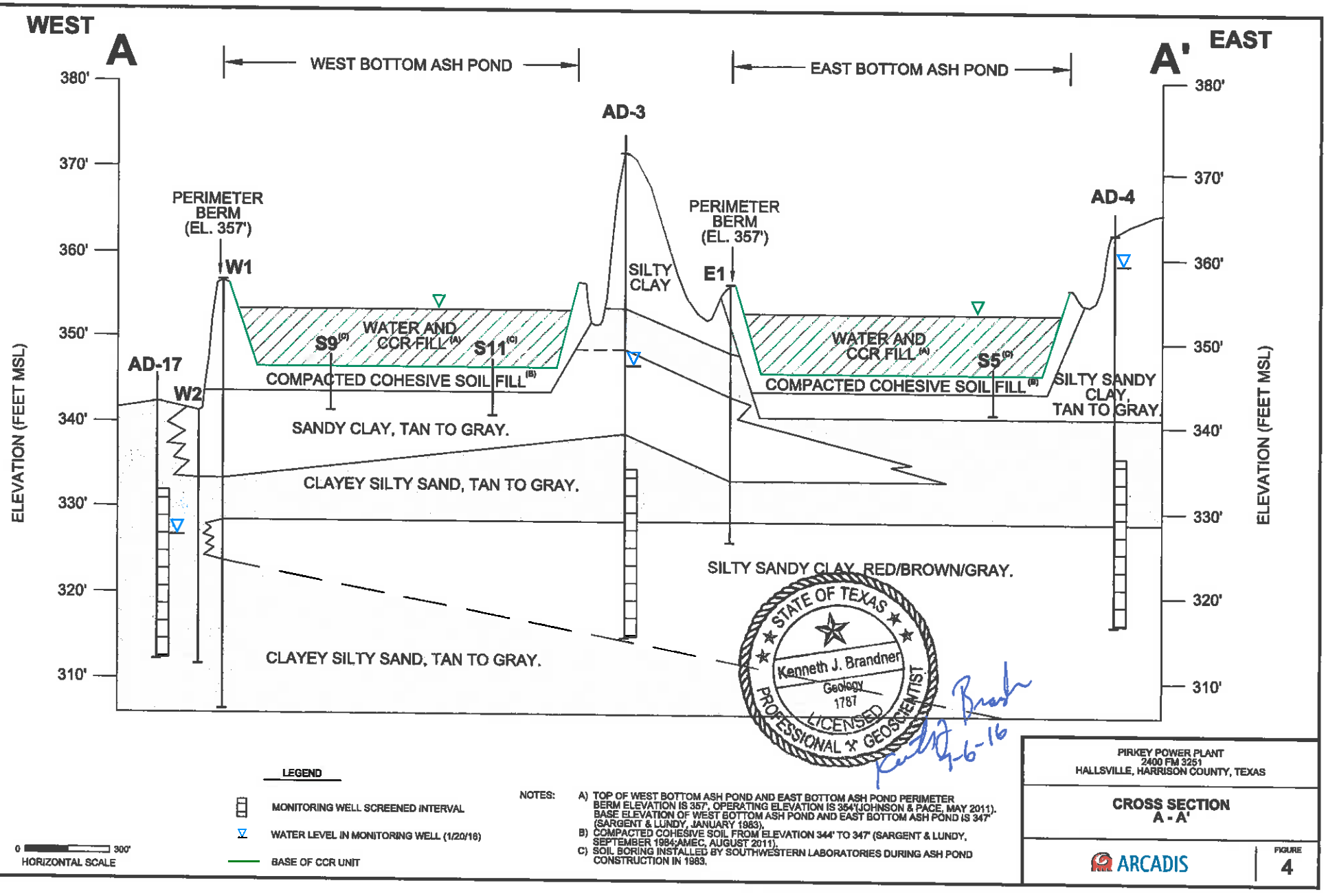
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

SITE LAYOUT AND WELL LOCATIONS

ARCADIS

FIGURE 3

Document Path: Z:\GIS\PROJECTS_ENVAEP\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.
CLAYEY SILTY SAND, TAN TO GRAY.
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.
STATE OF TEXAS
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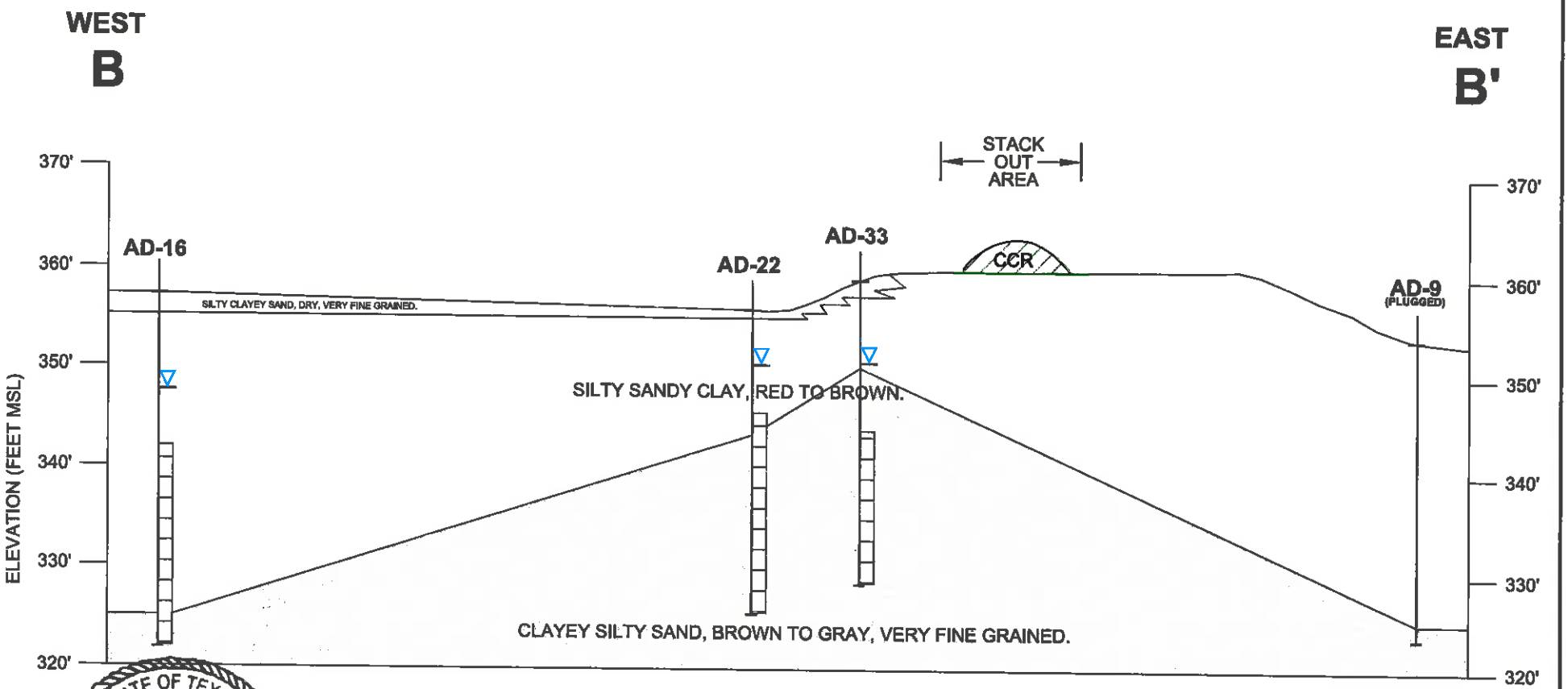
Geology
1787
LICENSED
PROFESSIONAL GEOSCIENTIST
4-6-16
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
CROSS SECTION
A - A'
ARCADIS
FIGURE
4



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LICENSED
PROFESSIONAL GEOSCIENTIST

7-6-16

LEGEND

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

0 300'
HORIZONTAL SCALE

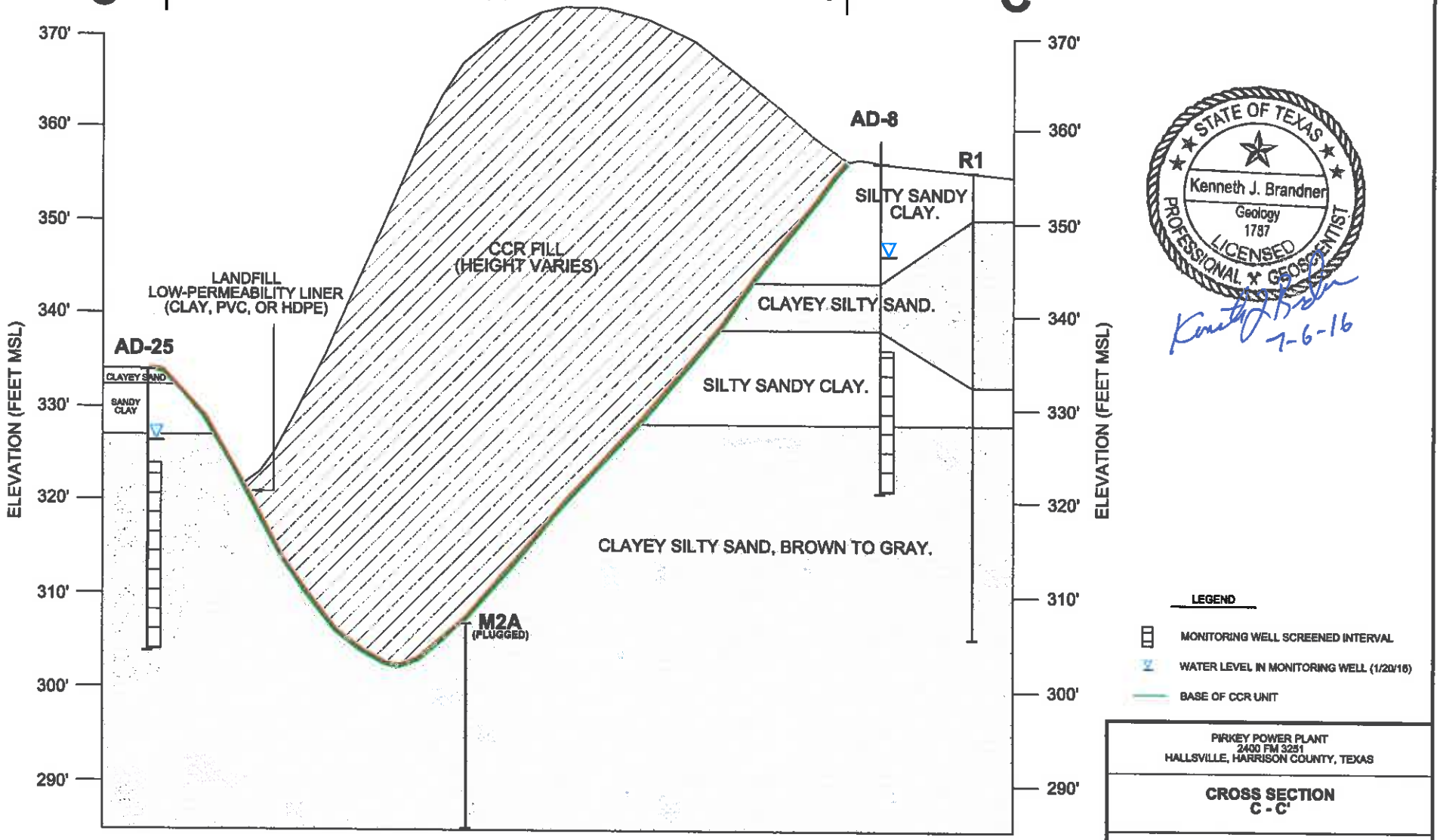
NOTES:
A) BASE OF STACK OUT AREA CCR UNIT LOCATED AT GRADE, ELEVATION TAKEN FROM MAY 2012 AND JUNE 23, 2015 TOPOGRAPHIC SURVEYS BY BEACON AVIATION.
B) ELEVATION OF CCR MATERIAL ABOVE STACK OUT AREA VARIES.

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

CROSS SECTION
B - B'

ARCADIS

FIGURE
5



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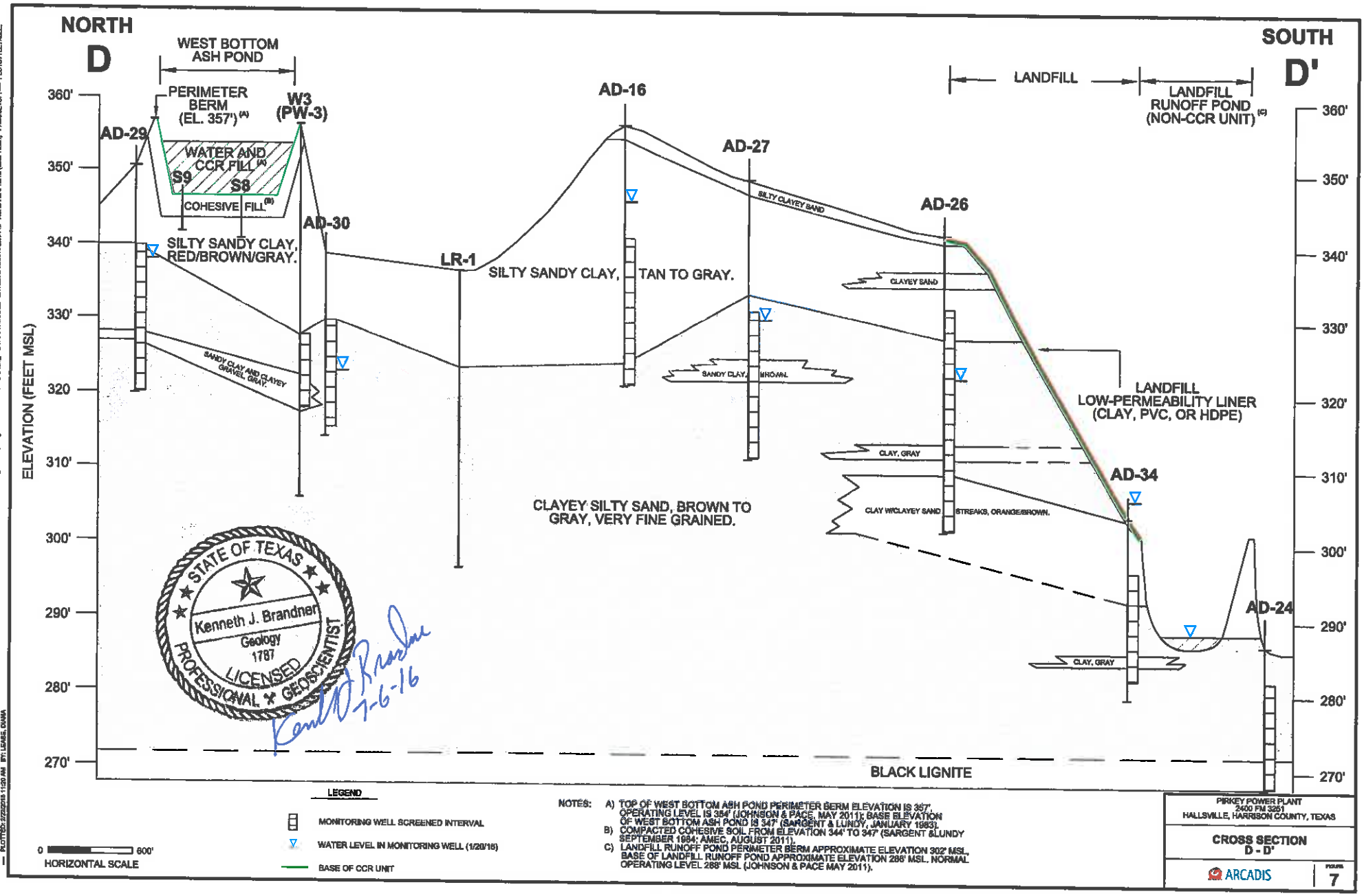
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

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
SILTY SANDY CLAY, RED/BROWN/GRAY.
SANDY CLAY AND CLAYEY GRAVEL, GRAY.
LR-1
AD-16
SILTY SANDY CLAY, TAN TO GRAY.
AD-27
SILTY CLAYEY SAND
SANDY CLAY, BROWN
CLAYEY SILTY SAND, BROWN TO GRAY, VERY FINE GRAINED.
LANDFILL
LANDFILL RUNOFF POND (NON-CCR UNIT)(C)
AD-26
CLAYEY SAND
CLAY, GRAY
CLAY W/CLAYEY SAND STREAKS, ORANGE/BROWN.
LANDFILL LOW-PERMEABILITY LINER (CLAY, PVC, OR HDPE)
AD-34
AD-24
CLAY, GRAY
BLACK LIGNITE
ELEVATION (FEET MSL)
360'
350'
340'
330'
320'
310'
300'
290'
280'
270'
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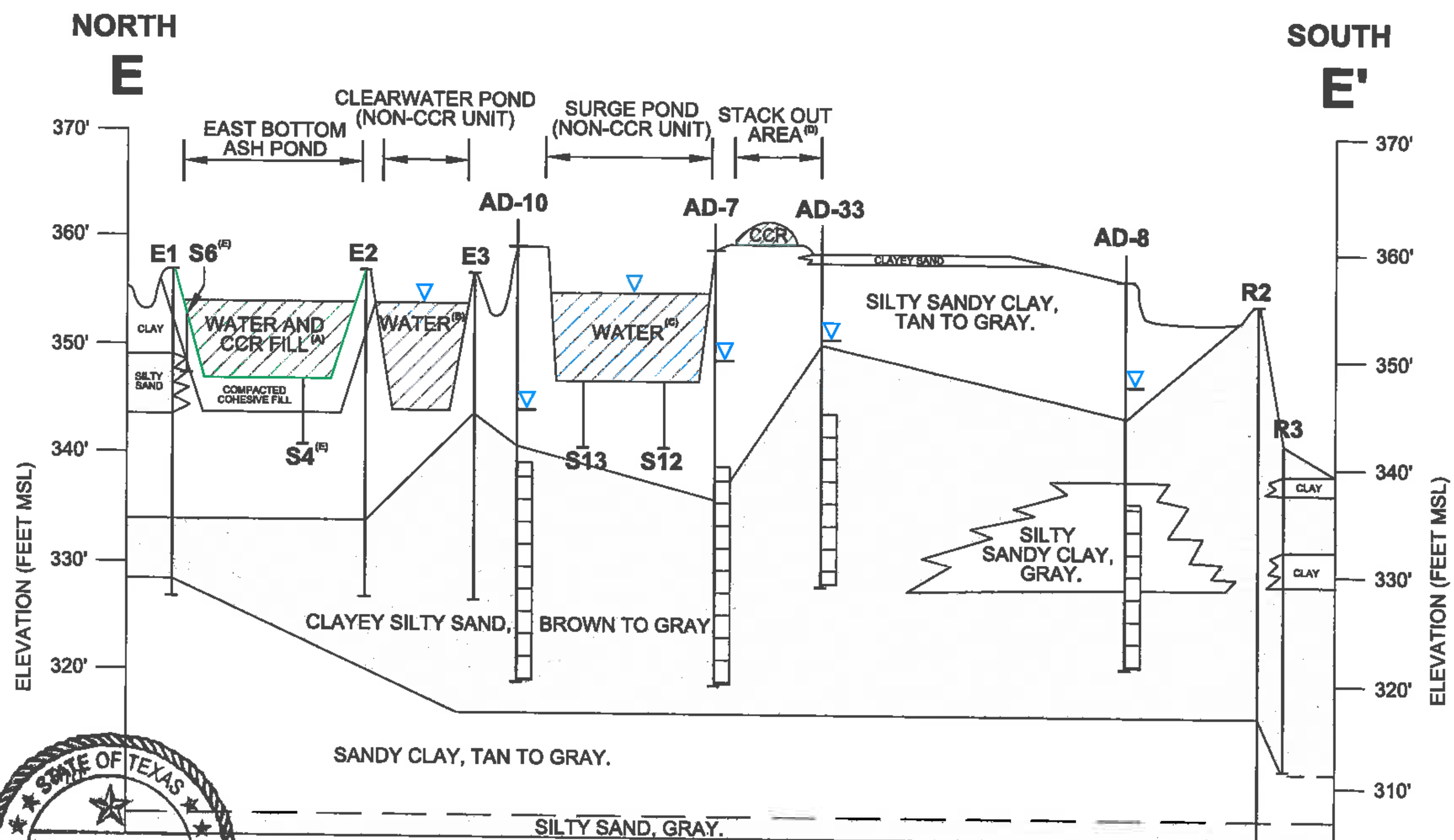
7-6-16
LEGEND
MONITORING WELL SCREENED INTERVAL
WATER LEVEL IN MONITORING WELL (1/20/16)
BASE OF CCR UNIT
0
600'
HORIZONTAL SCALE
NOTES:
A) TOP OF WEST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357'. OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF WEST BOTTOM ASH POND IS 347' (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 288' MSL (JOHNSON & PACE MAY 2011).
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
CROSS SECTION
D - D'
ARCADIS
FIGURE
7



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Kenneth Brandner 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:

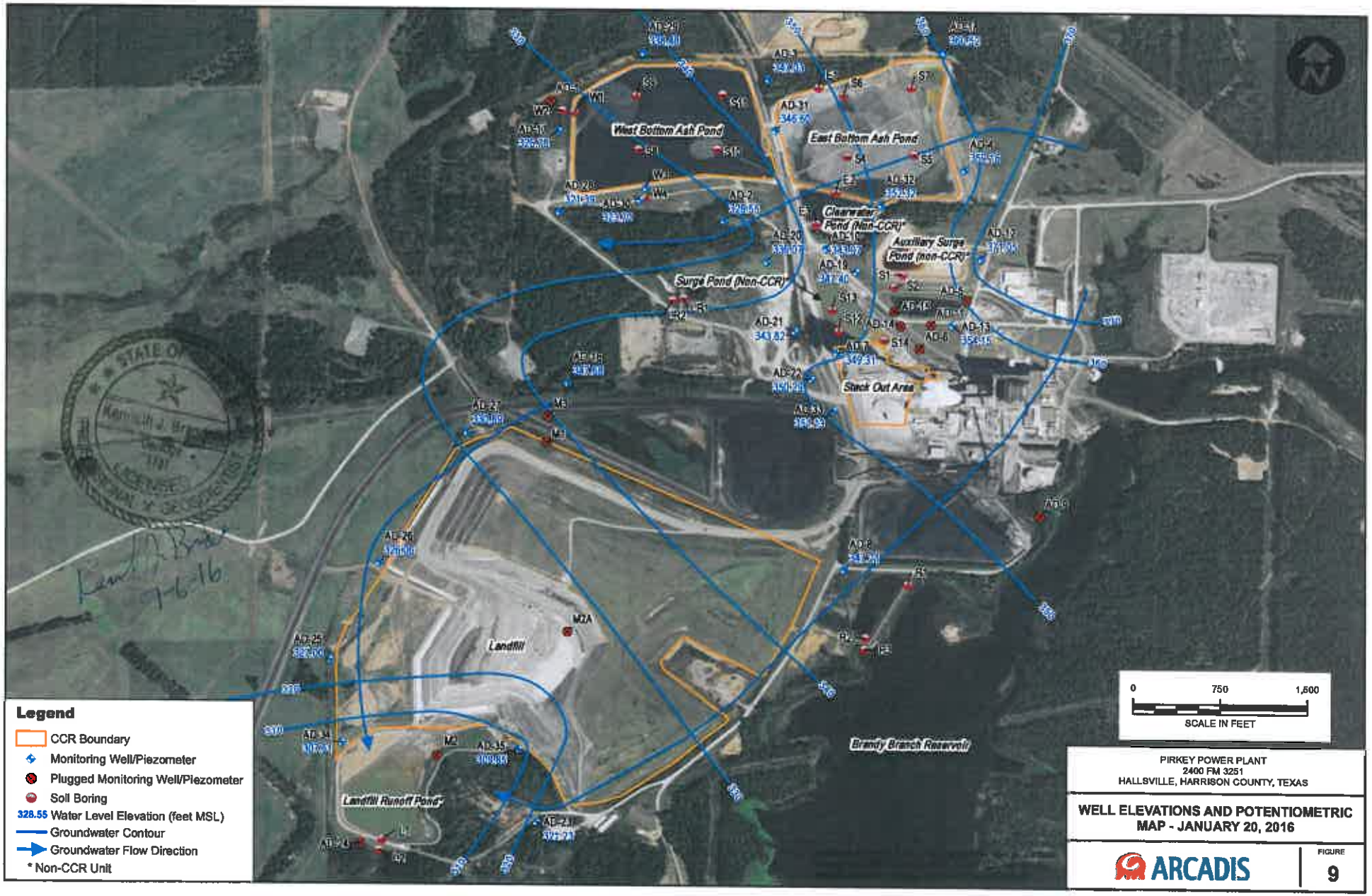
A) TOP OF EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) TOP OF CLEARWATER POND PERIMETER BERM ELEVATION IS 357', OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 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



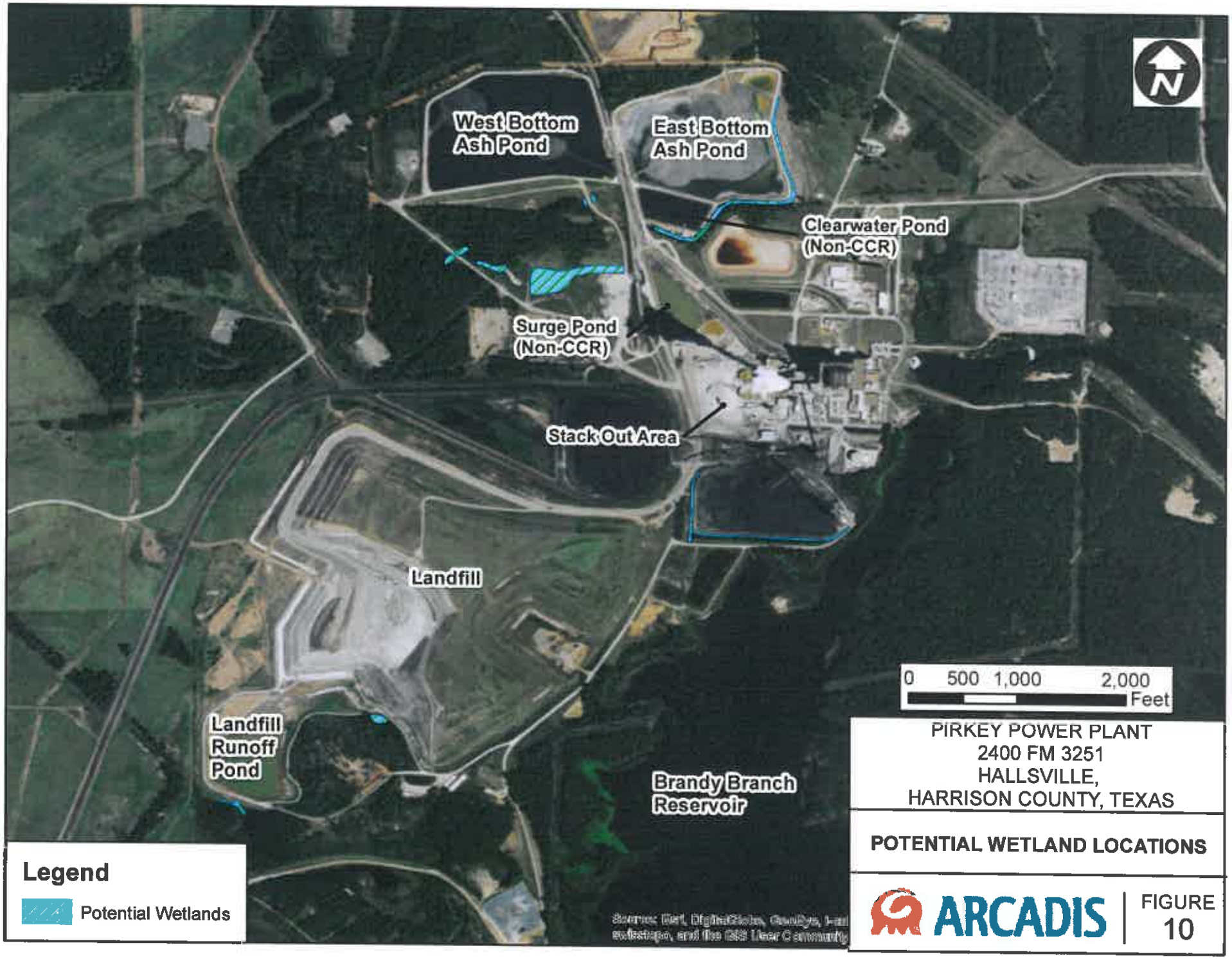
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

WELL ELEVATIONS AND POTENTIOMETRIC MAP - JANUARY 20, 2016

ARCADIS

FIGURE 9

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

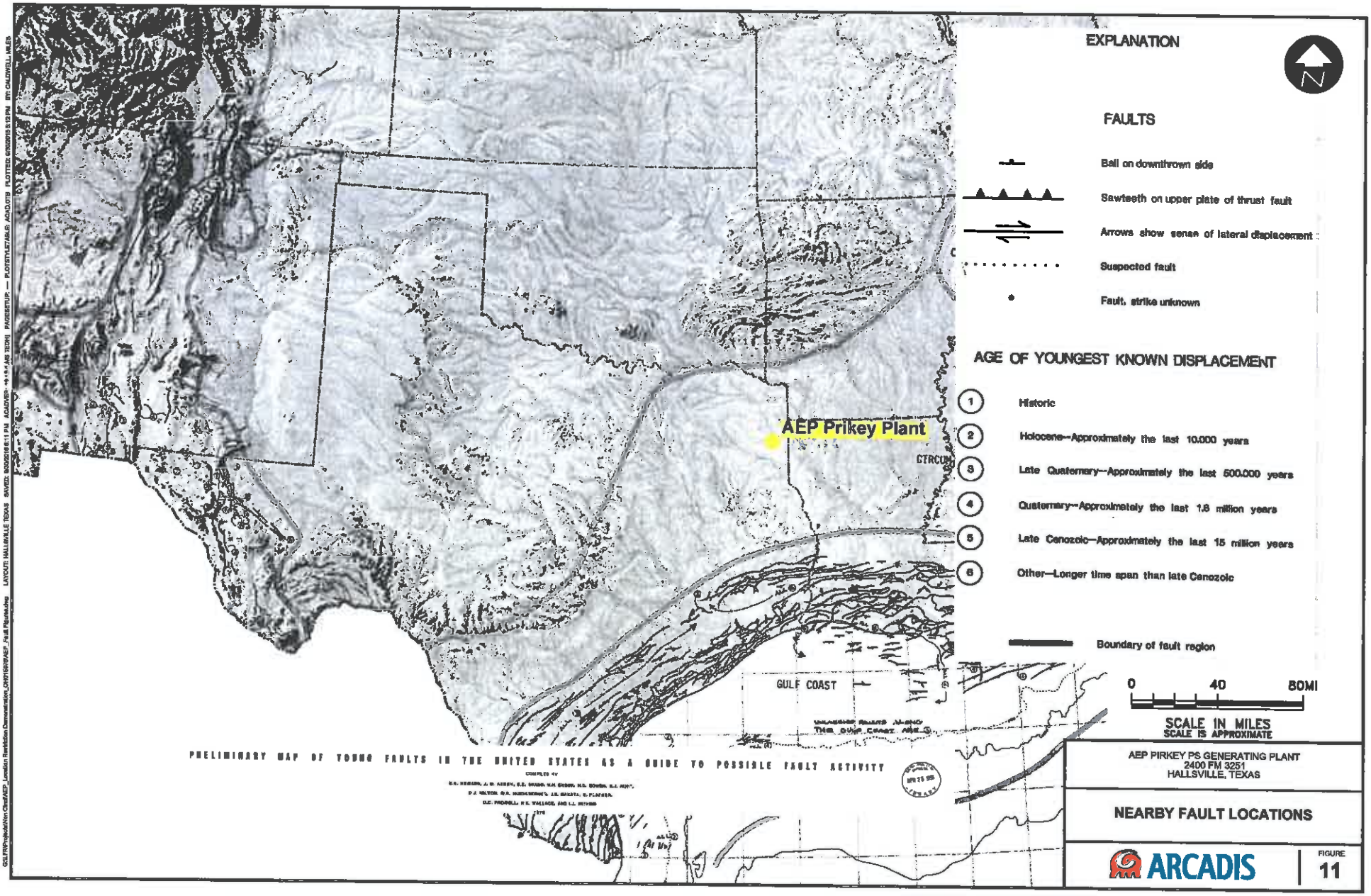


PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE,
HARRISON COUNTY, TEXAS

POTENTIAL WETLAND LOCATIONS

ARCADIS

FIGURE
10

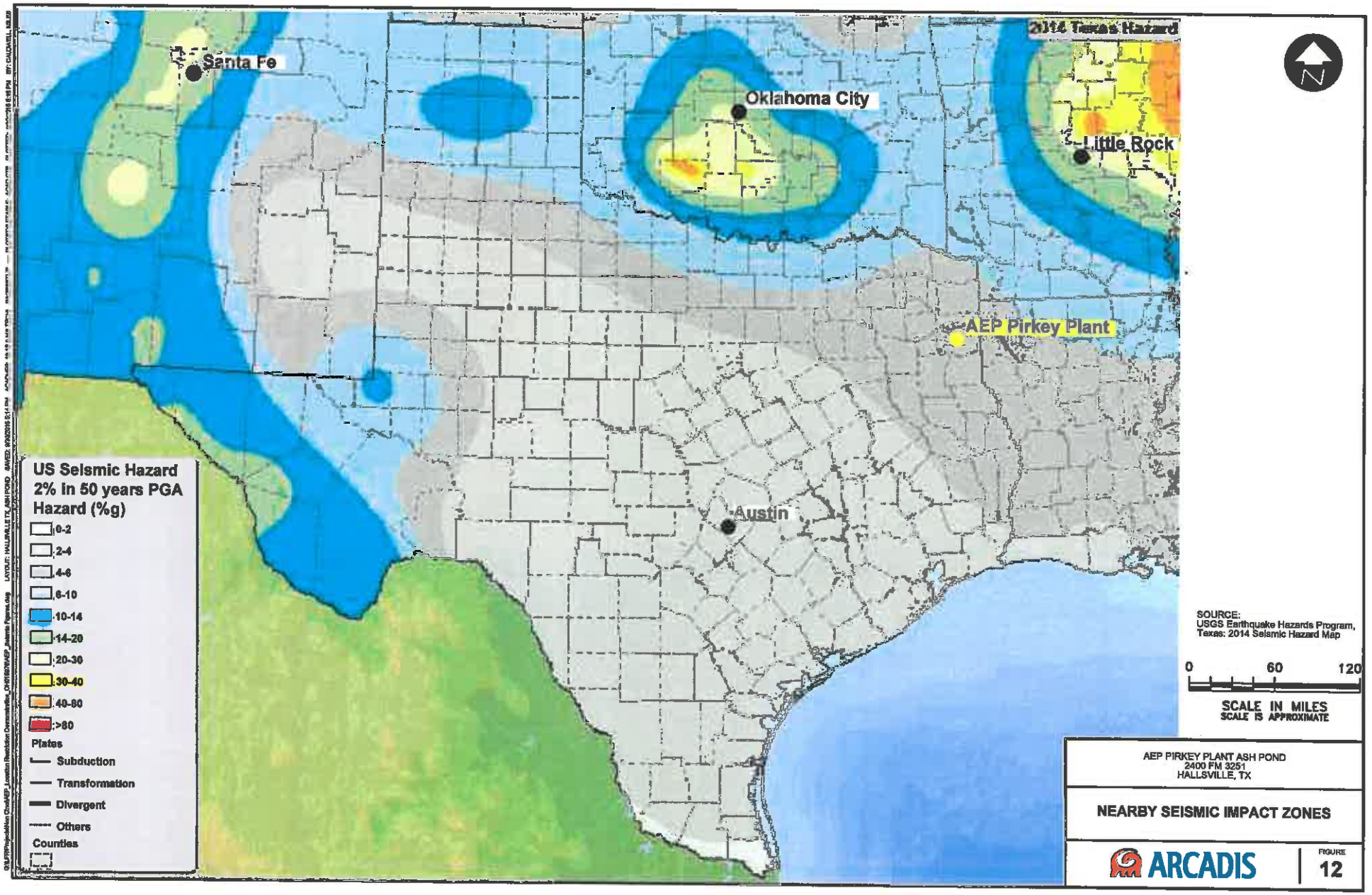


AEP PIRKEY PS GENERATING PLANT
2400 FM 3251
HALLSVILLE, TEXAS

NEARBY FAULT LOCATIONS

ARCADIS

FIGURE 11


2014 Texas Hazard
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

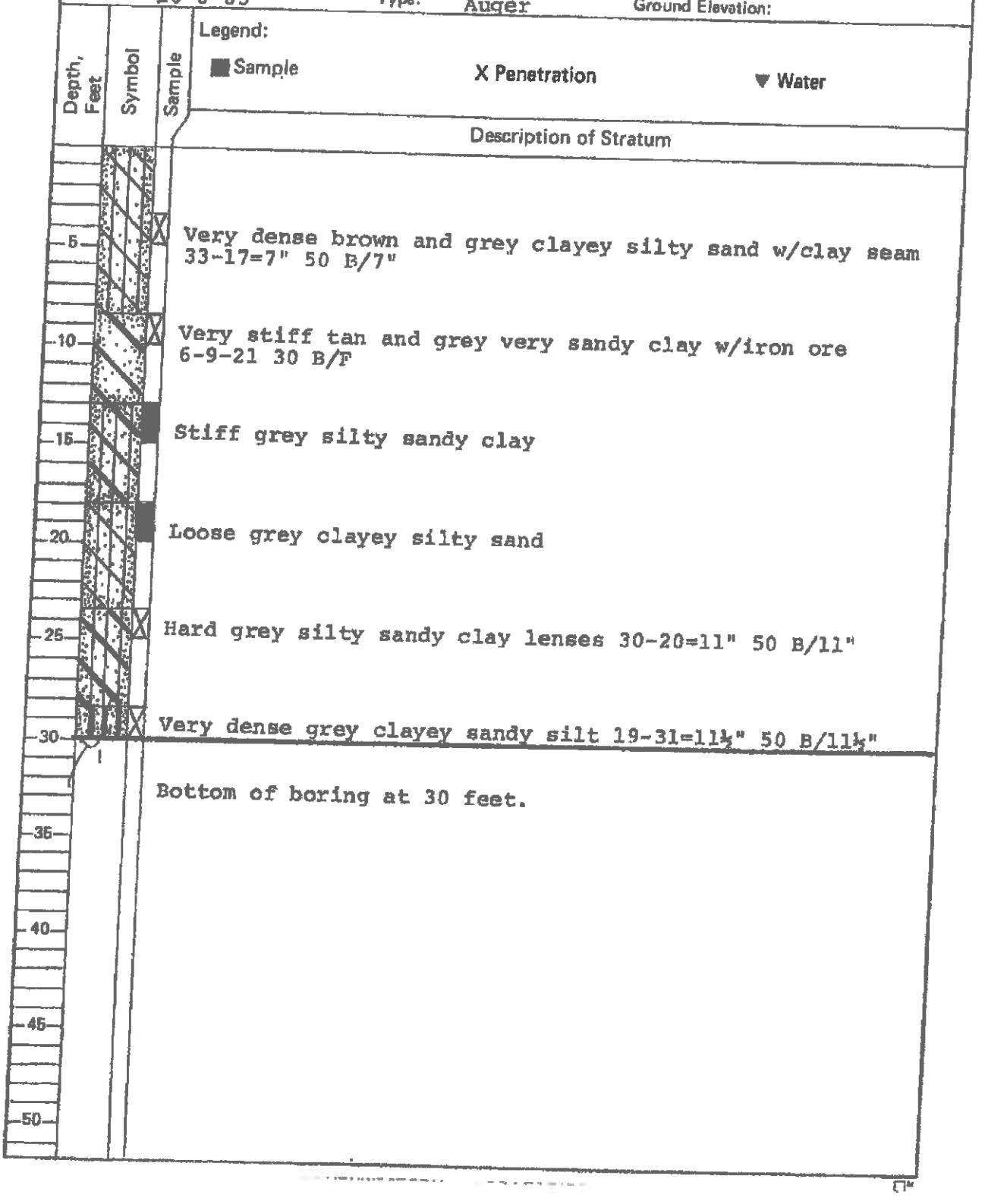
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-1
LOCATION: Hallsville

Date: 10-6-83 Type: Auger Ground Elevation:



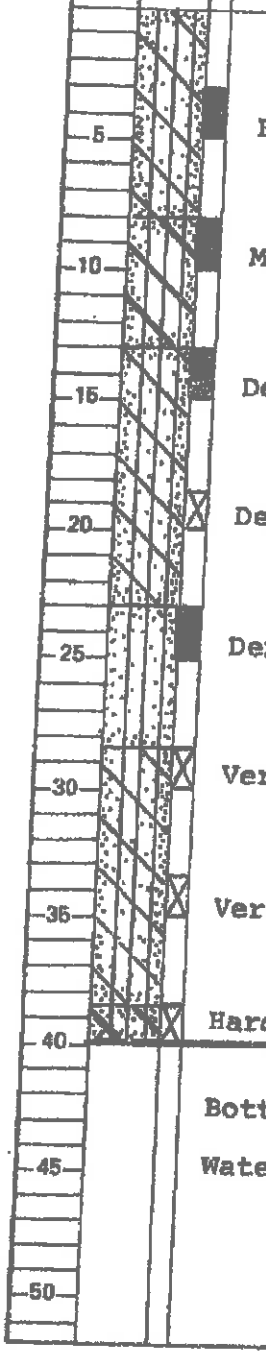
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-2
LOCATION: Hallsville

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



Legend: ■ Sample X Penetration ▼ Water

Description of Stratum
Firm tan clayey silty sand
Medium tan and grey very sandy silty clay
Dense tan and grey clayey silty sand
Dense tan clayey silty sand 10-15-16 31 B/F
Dense tan silty sand
Very dense grey clayey silty sand 15-35=12" 50 B/F
Very dense grey clayey silty sand 21-29=9" 50 B/9"
Hard grey sandy silty clay 20-30=12" 50 B/F
Bottom of boring at 40 feet.
Water encountered at 25 feet.

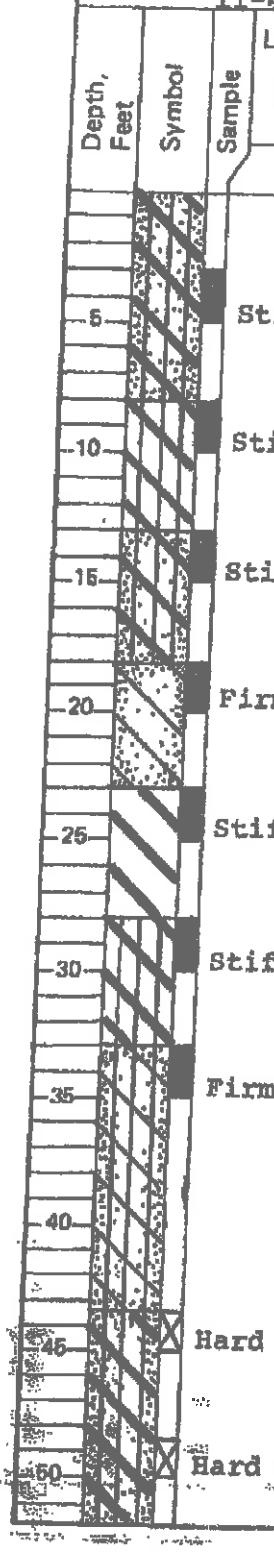
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

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

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



Stiff red, brown and grey sandy silty clay

Stiff red, tan and grey silty clay lenses w/iron ore

Stiff brown and grey sandy silty clay

Firm brown and grey sand w/clay lenses

Stiff brown and grey clay

Stiff brown and grey clay w/silt lenses

Firm grey clayey silty sand

Hard grey clay w/silty sand lenses 43-7=6" 50 B/6"

Hard brown and grey silty sandy clay 21-29=12" 50 B/F

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 × Penetration ▼ Water

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

APEX PROJECT NO.: 110-089 ☐ BORING BORING NUMBER: ☐ ■ MONITOR WELL MONITOR WELL NUMBER: AD-17

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: 12/30/2010

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

LATTITUDE: N 32°28.039 Datum: WGS-84 WELL LOCATION: West of Bottom Ash Pond #2
LONGITUDE: W94°29.659'

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1 2 3 4 5			0-5.5	SM	Silty sand, trace clay, reddish brown, brown, light gray, loose to dense -clayey at 0.5-1.5'	None	Moist
6 7 8 9 10			5.5-10	SC	Clayey sand, reddish brown, yellowish brown, laminated iron ore, iron ore concretions	None	Moist
11 12 13 14 15 16 17 18			10-18.5	SM	Silty sand, light reddish brown, yellowish brown, dense, some clay -trace clay, yellowish brown, 15-16' -iron ore concretions at 16' -light yellowish brown, light gray at 17' -laminated iron ore at 18.5'	None	V. Moist
19 20 21 22 23 24 25 26 27 28 29 30			18.5-30	SC	Clayey sand, yellowish brown, light gray, saturated sand lenses -gravelly at 21' -laminated ironstone at 22.5' -very dense, gray, light gray at 25' -some clay at 27.5, greenish gray, gray, to boring termination	None	Saturated Dry to Moist
31 32 33 34 35 36 37 38 39 40					Boring Terminated at 30'		

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 30 feet
Filter Sand (Size/Interval): 8-30'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-8'
Surface Completion ☐ Flush ■ Above Ground

Riser Interval: +3 (ags)-10'
Screen interval: 10-30'
Water level: 23.26
3'

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

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

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

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1 2 3 4 5 6 7			0-7	SM	Sandy Silt, some clay, very fine grained, gray, light brown, light brownish red, yellowish brown	None	Dry
8 9 10 11 12 13 14 15 16			7-16	CL	Clay, some sand, light gray, reddish gray, stiff, yellowish brown -iron oxide fracture at 9.5' -increasing sand content at 14', thin lenses of iron-oxide cemented sand at 14.5', 15', 15.5', stiff	None	Dry Moist
17 18 19 20 21 22 23 24 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' -dark gray at 21' -clayey at 21-23' -greenish gray, trace clay, at 23' -clay lense, hard, dry, (shale), at 24.5-25'	None None None None None	Moist to V. Moist Saturated Dry
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40					Boring Terminated at 25'		

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 25 feet Riser Interval: +3 (ags)-15'
Filter Sand (Size/Interval): 13-25' Screen Interval: 15-25'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-13' Water level: ____
Surface Completion ☐ Flush ■ Above Ground 3'

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

APEX PROJECT NO.: 110-089 ☐ BORING BORING NUMBER: ____ ■ MONITOR WELL MONITOR WELL NUMBER: AD-28

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: 12/28/2010

PREPARED BY: Jeff Sammons LOGGED BY: Jeff Sammons

LATTITUDE: N 32°27.926' Datum: WGS-84 WELL LOCATION: Southwest of Primary Bottom Ash Pond #2
LONGITUDE: W94°29.658'

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1			0-0.5	SM	Silty sand, light brown, very fine grained, loost	None	Moist
2			0.5-10	CL	Sandy clay, reddish brown, yellowish brown, stiff, hard, some iron ore gravel at .5-1.5'	None	Dry
3							
4							
5					-light gray, dark reddish brown at 5'		
6					-iron oxide cemented stone at 6.5'		
7							
8							
9							
10							
11				10-16	SM	Silty sand, very fine grained, some clay, light yellowish brown, light gray, medium dense	None	Moist to V. Moist
12					-light yellowish brown at 11.5'		
13							
14							
15							
16							
17				16-40	SC	Clayey sand, dark gray, medium dense	None	Moist
18							
19							
20			▽		-dark gray at 20'		
21					-cemented sandstone at 21'		
22					-no recovery from 22' to 35'		
23							
24							V. Moist to Saturated
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35					-1.5" layer of cemented sandstone at 35'		
36							Dry to Moist
37							
38							
39							
40							
					Boring Terminated at 40'		

Cement | Bentonite | Filter Sand | ▽ Water Level

Apex geoscience inc.

Total Depth: 40 feet Riser Interval: +3 (ags)-15'
Filter Sand (Size/Interval): 13-35' Screen Interval: 15-35'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-13' Water level: 19.98'
Surface Completion ☐ Flush ■ Above Ground 3.5'

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

APEX PROJECT NO.: 110-089 ☐ BORING BORING NUMBER: ____ ■ MONITOR WELL MONITOR WELL NUMBER: AD-29

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: Jeff Sammons

LATTITUDE: N 32°28.139' Datum: WGS-84 WELL LOCATION: North of Bottom Ash Pond #2

LONGITUDE: W94°29.534

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1				0-0.5 SM	Silty sand, brown, light brown, very fine grained	None	Moist
2 3 4 5				0.5-5 CL	Clay, some sand, red, reddish brown, light gray, stiff	None	Dry
6 7 8 9 10				5-10 CL	Sandy clay, light gray, light red -abundant iron ore, yellowish brown, yellow, dry	None	Dry
11 12 13 14 15 16 17 18				10-18 SC	Clayey sand, yellowish brow, reddish brown, light gray, medium dense -light gray, yellow, at 11' -4" saturated sand seam, trace clay at 13' -purple, yellowish brown, reddish brown, medium dense to loose	None	Moist
19 20 21			▽	18-22 SM	Silty sand, reddish brown to red -some iron ore gravel, some clay, saturated, gypsum crystals, at 20'	None	V. Moist
22				22-22.5 CL	Sandy clay, dark gray, stiff	None	Dry
23 24 25 26 27 28				22.5-28 SM	Silty sand, saturated, greenish gray, loose	None	Dry to Moist
29 30				28-30 SC	Clayey sand, greenish gray, dark gray, dark brown, dry, very dense, slightly cemented	None	Dry to Moist
31 32 33 34 39 40					Boring Terminated at 30'		

Cement Bentonite Filter Sand ▽ Water Level

☒Apex geoscience inc.

Total Depth: 30 feet
Filter Sand (Size/Interval): 8-30'
Grout (Type/Interval): Grout from 0-2', Bentonite from 2-8'
Surface Completion ☐ Flush ■ Above Ground

Riser Interval: +3 (ags)-10'
Screen Interval: 10-30'
Water level: ____
3'

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

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-30

PROJECT INFORMATION

PROJECT:	Pirkey Power Plant
PROJECT NO.:	I-04-1921
LOGGED BY:	Jeffrey D. Sammons, P.G.
SUPERVISING PG:	Jeffrey D. Sammons, P.G.
COMPLETION:	12/08/2015
DEVELOPMENT:	12/16/2015
SITE LOCATION:	2400 FM 3251, Hallsville, Texas
WELL OWNER:	AEP

DRILLING INFORMATION

DRILLER:	Buford Collier
DRILLER'S LICENSE NO.:	50088
RIG TYPE:	Geoprobe 3230DT
METHOD OF DRILLING:	Hollow Stem Auger
SAMPLING METHODS:	Split Core
SURFACE ELEVATION:	342.02 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 27' 56.49" LONGITUDE 94 29' 32.53"

STATE OF TEXAS — JEFFREY D. SAMMONS — GEOLOGY #10070 — LICENSED PROFESSIONAL GEOSCIENTIST — 1-29-16

▽ Water Level Upon Installation ▽ Water Level at Time of Drilling ■ Geotechnical Lab Sample

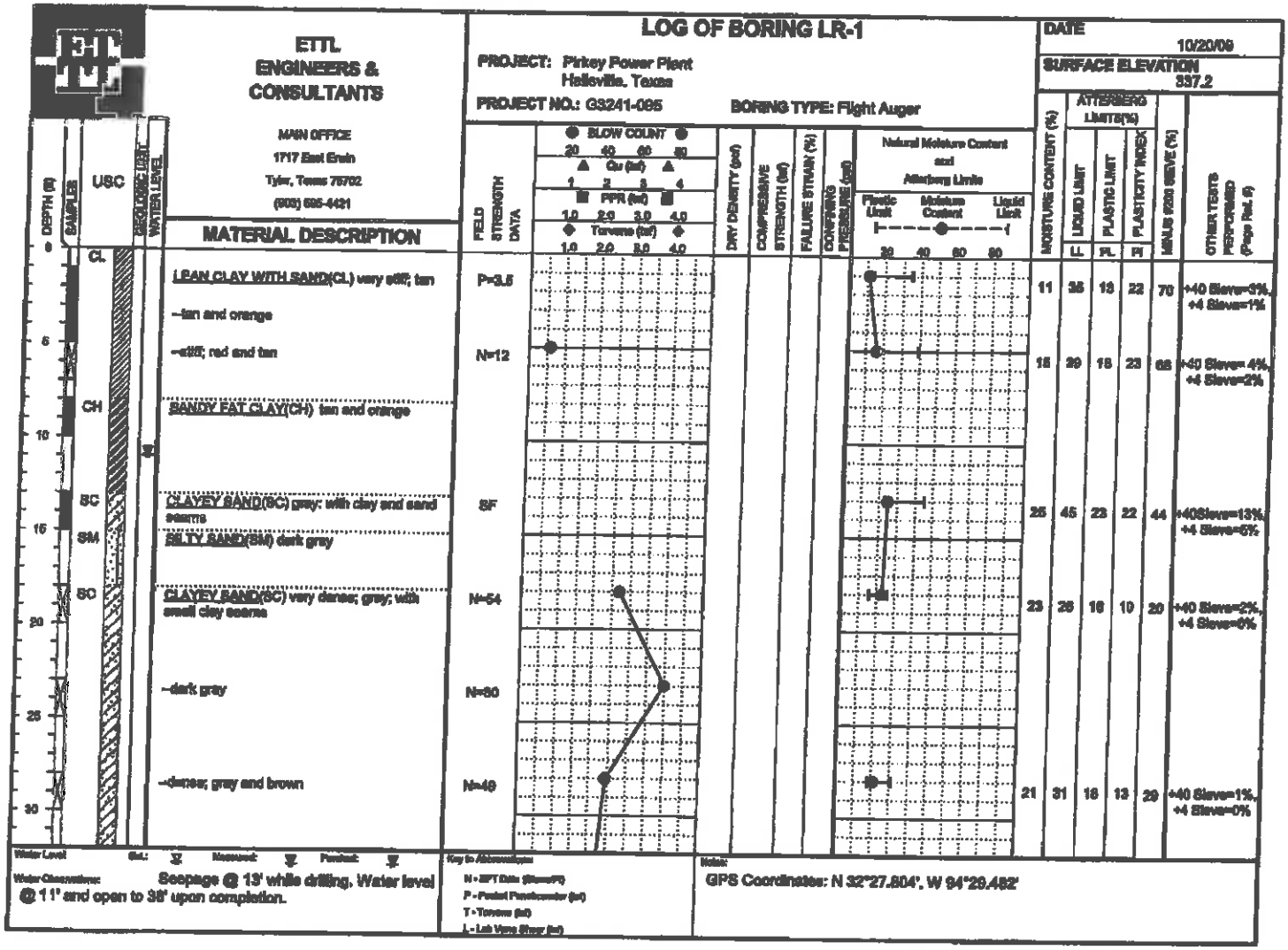
TBPG No. 50027

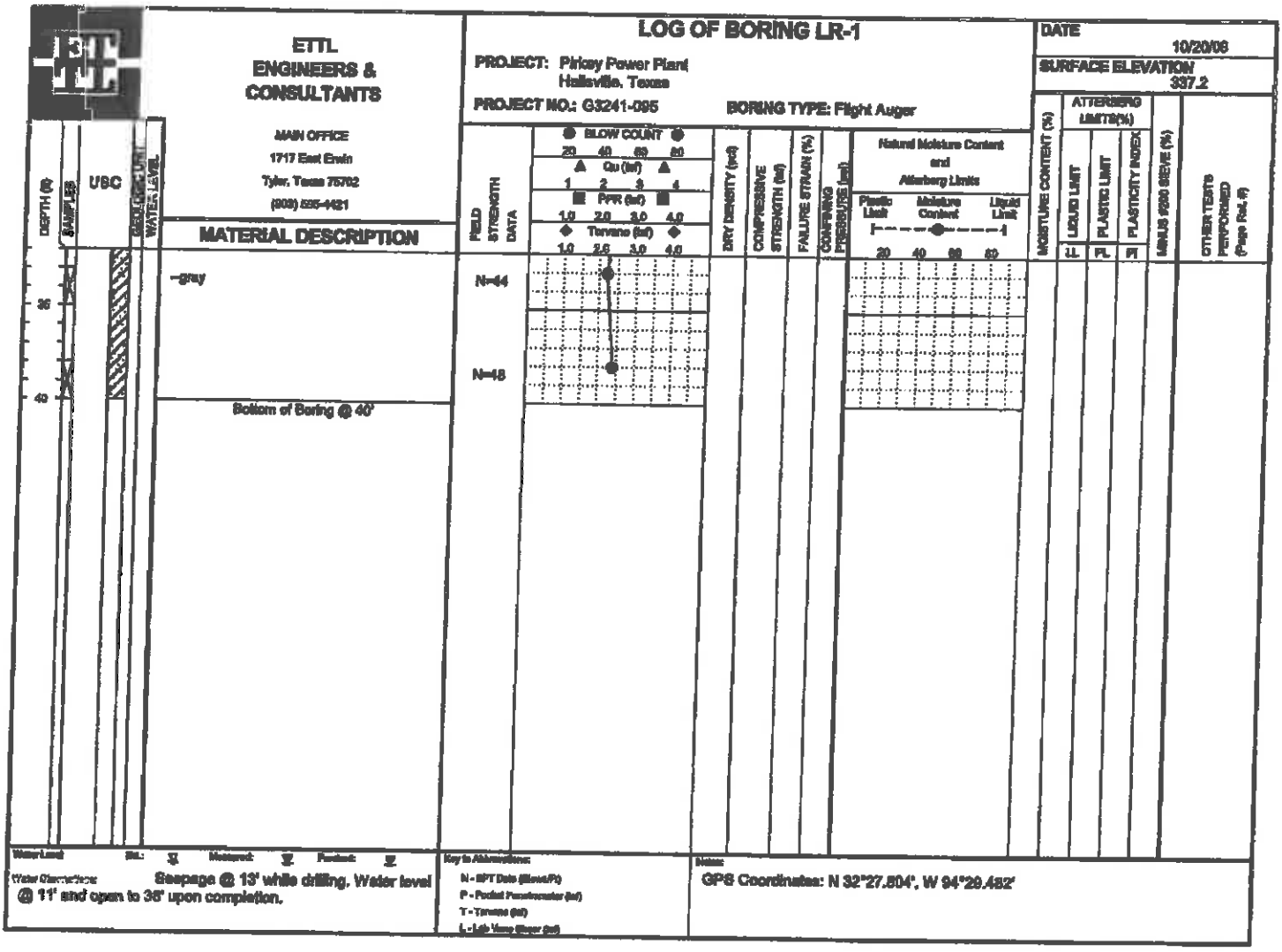
DESCRIPTION	USCS	% MOISTURE	% FINES	LL	PL	PI
SANDY LEAN CLAY: light reddish brown and light gray	CL	17	84	24	17	7
- trace sand and silt at 3.0' to 3.5', light reddish brown						
- some iron ore gravel at 7', light gray, reddish brown, light reddish brown, increasing sand content with depth		14	53	38	24	14
CLAYEY SILTY SAND: very fine to fine sand, reddish brown, light brown, and light gray	SM-SC					
SILTY SAND: very fine to fine sand, some lenses of clay and partially cemented sand, reddish brown and light gray, moist	SM	10	13	28	NP	-
CLAYEY SAND: very fine to fine sand with some fine to coarse iron ore gravel and partially cemented sand, reddish brown and light gray, moist	SC	20	26	34	24	10
SILTY SAND: very fine to fine sand, some clay, light gray and reddish brown, saturated	SM					
- some iron ore gravel at 19', gray and reddish brown, increasing clay content with depth, very moist						
SILTY CLAYEY SAND: fine to very fine sand, some clay lenses, gray and dark gray, moist	SM-SC	20	49	30	22	8

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 LR-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
337.2
MATERIAL DESCRIPTION
DEPTH (ft)
SAMPLE
USC
GROUNDWATER WATER LEVEL
FIELD STRENGTH DATA
BLOW COUNT
Cu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (tsf)
FAILURE STRAIN (%)
CONFINING PRESSURE (psi)
Natural Moisture Content and Atterberg Limits
Plastic Limit
Moisture Content
Liquid Limit
MOISTURE CONTENT (%)
ATTERBERG LIMITS(%)
LIQUID LIMIT
LL
PLASTIC LIMIT
PL
PLASTICITY INDEX
PI
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Page Ref. #)
CL
LEAN CLAY WITH SAND(CL) very stiff; tan
--tan and orange
--stiff; red and tan
CH
SANDY FAT CLAY(CH) tan and orange
SC
CLAYEY SAND(SC) grey; with clay and sand seams
SM
SILTY SAND(SM) dark gray
SC
CLAYEY SAND(SC) very dense; gray; with small clay seams
--dark gray
--dense; gray and brown
P=3.5
N=12
SF
N=54
N=80
N=49
11 35 13 22 70 +40 Sieve=3%, +4 Sieve=1%
18 39 16 23 68 +40 Sieve= 4%, +4 Sieve=2%
25 45 23 22 44 +40Sieve=13%, +4 Sieve=6%
23 29 16 10 20 +40 Sieve=2%, +4 Sieve=0%
21 31 16 13 29 +40 Sieve=1%, +4 Sieve=0%
Water Level
Dat.:
Measured:
Pended:
Water Observations:
Seepage @ 13' while drilling. Water level @ 11' and open to 38' upon completion.
Key to Abbreviations
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes:
GPS Coordinates: N 32°27.804', W 94°29.482'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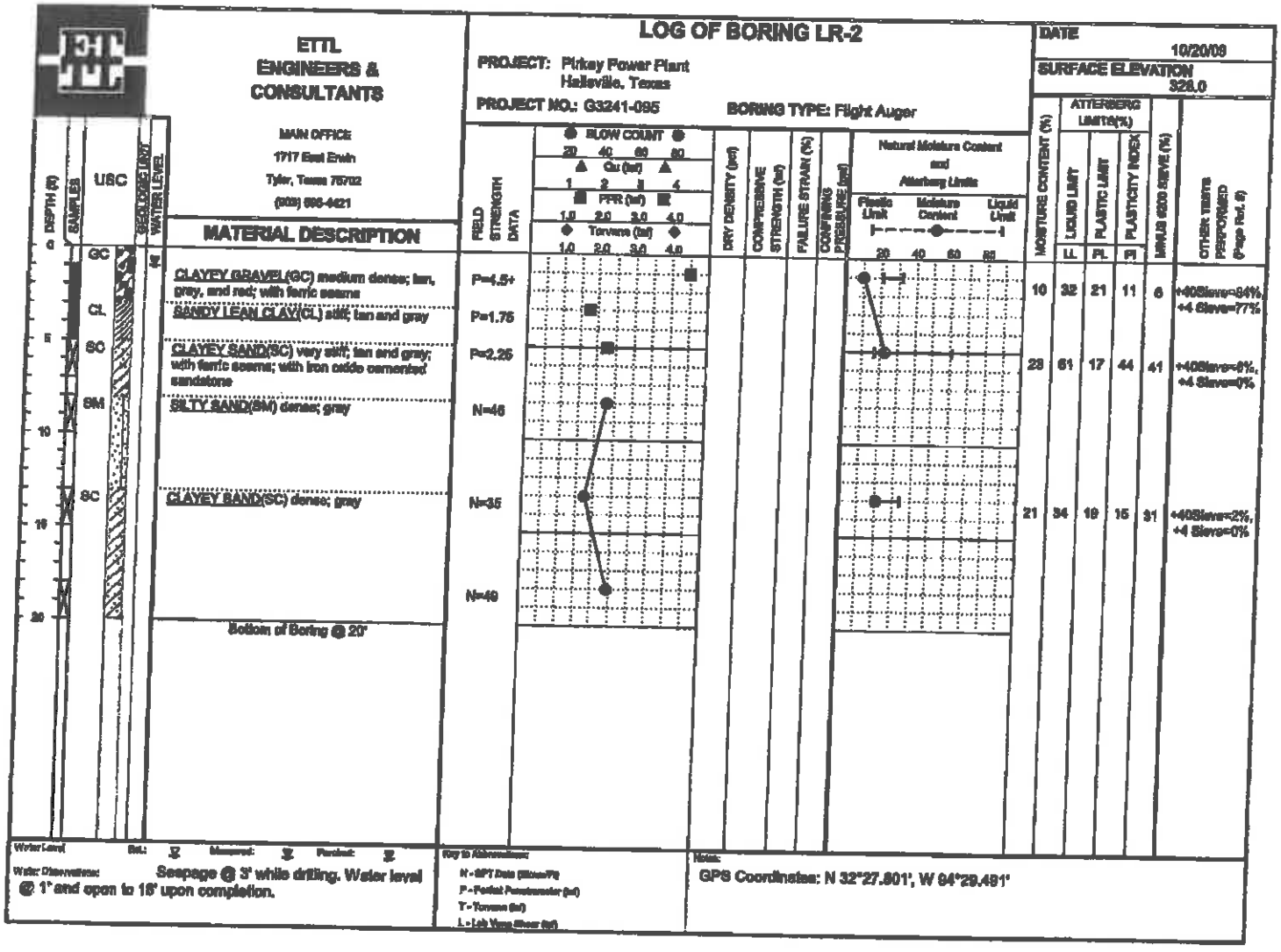
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING LR-1
PROJECT: Pilgrim Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/06
SURFACE ELEVATION
337.2
DEPTH (ft)
SAMPLES
USC
GROUNDWATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Cu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (tsf)
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 (Pass Ref. #)
-gray
N=44
N=48
Bottom of Boring @ 40'
Water Level
Water Observations
Seepage @ 13' while drilling. Water level @ 11' and open to 36' upon completion.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
Notes:
GPS Coordinates: N 32°27.804', W 94°29.482'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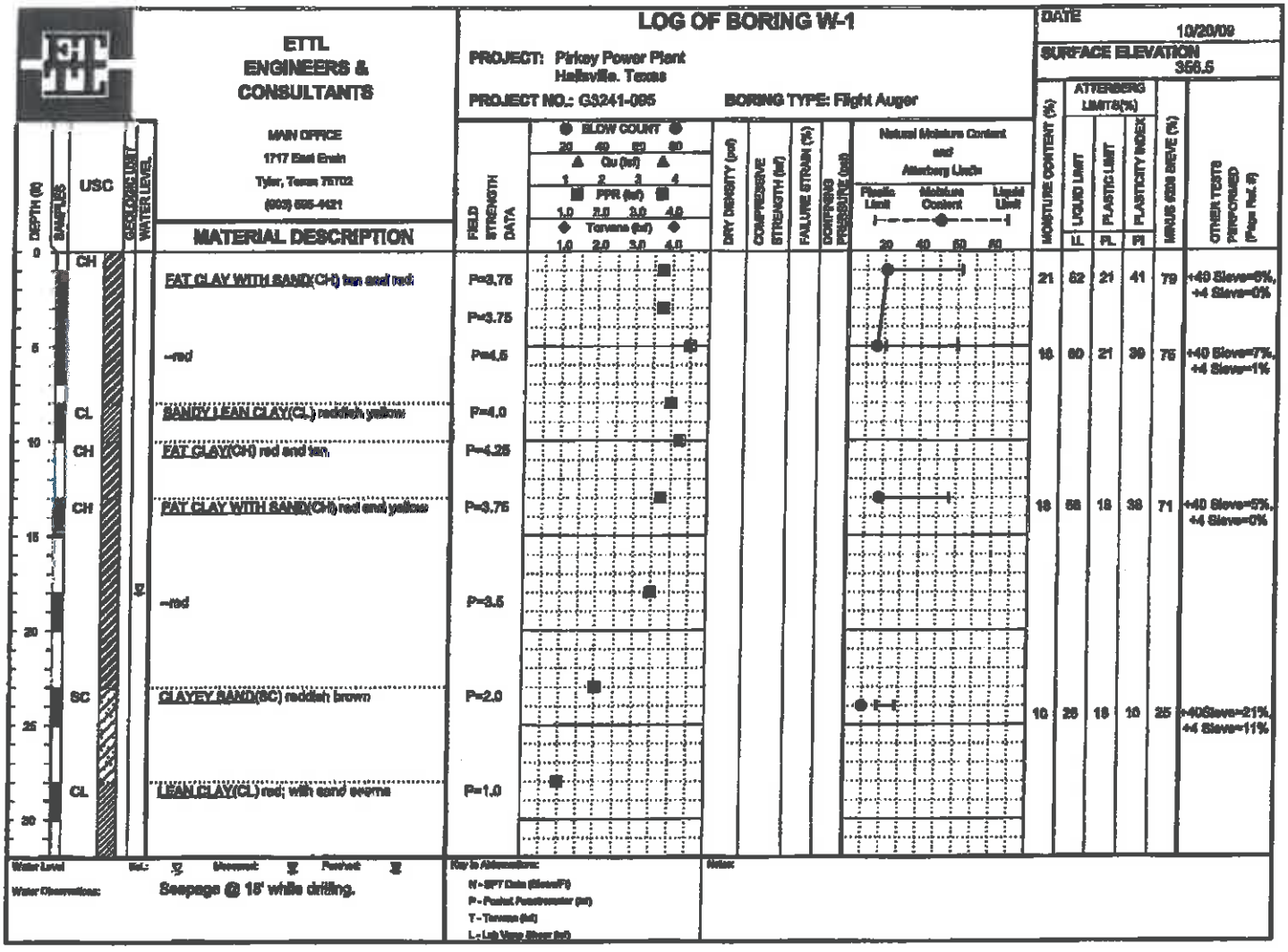
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING LR-2
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
328.0
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Qu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (tsf)
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
LL
PL
PI
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Page Ref. #)
GC
CL
SC
SM
SC
CLAYEY GRAVEL(GC) medium dense; tan, grey, and red; with ferric seams
SANDY LEAN CLAY(CL) stiff; tan and grey
CLAYEY SAND(SC) very stiff; tan and grey; with ferric seams; with iron oxide cemented sandstone
SILTY SAND(SM) dense; grey
CLAYEY SAND(SC) dense; grey
Bottom of Boring @ 20'
P=4.5+
P=1.75
P=2.25
N=46
N=35
N=49
10 32 21 11 6 +40Sieve=94%, +4 Sieve=77%
23 61 17 44 41 +40Sieve=6%, +4 Sieve=0%
21 34 19 15 31 +40Sieve=2%, +4 Sieve=0%
Water Level
Init.:
Measured:
Perched:
Water Observations:
Seepage @ 3' while drilling. Water level @ 1' and open to 15' upon completion.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes:
GPS Coordinates: N 32°27.801', W 94°29.491'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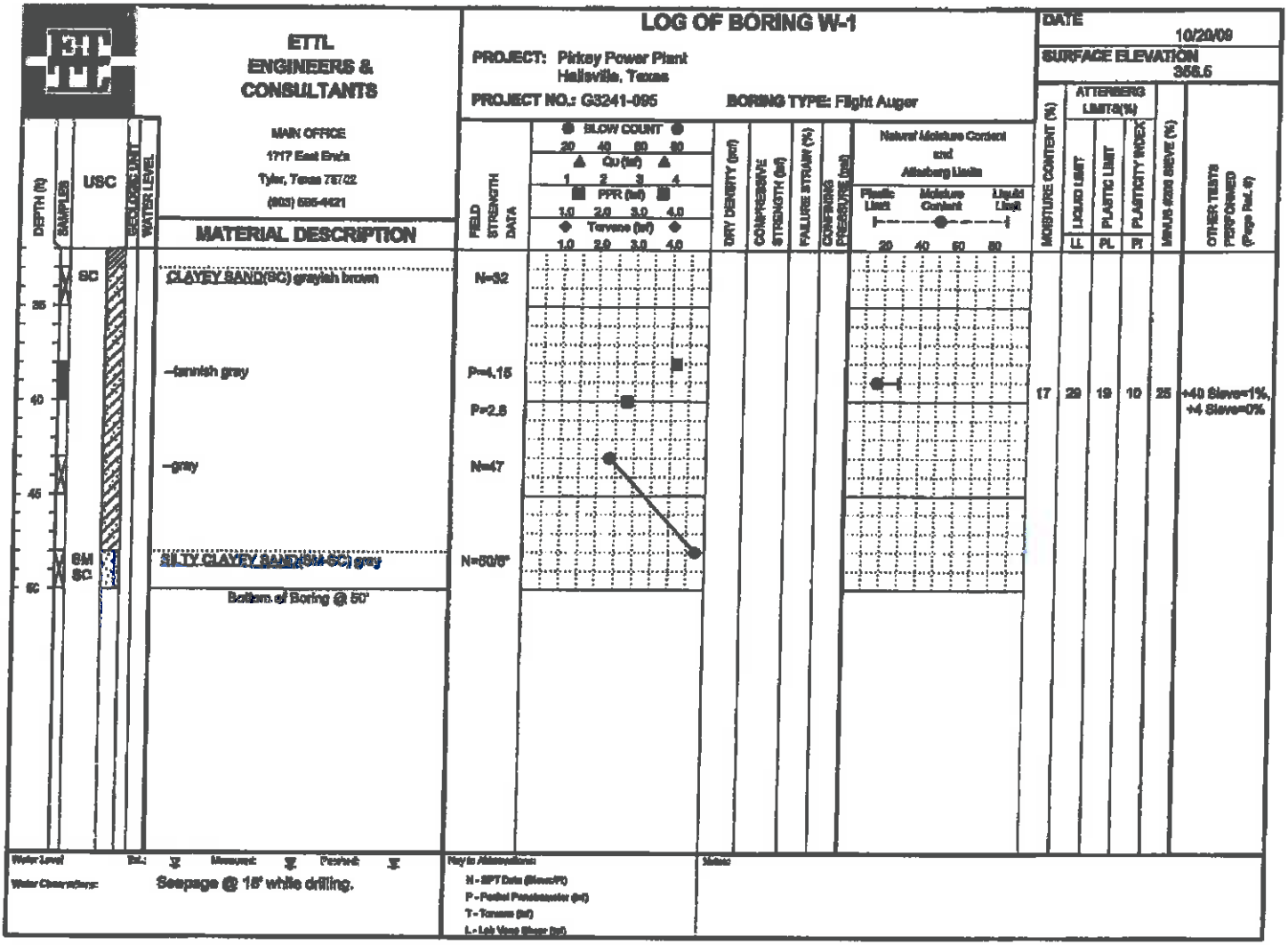
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING W-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
356.5
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Qu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (tsf)
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. #)
CH
FAT CLAY WITH SAND(CH) tan and red
P=3.75
21 62 21 41 79 +40 Sieve=6%, +4 Sieve=0%
P=3.75
-red
P=4.5
18 60 21 39 76 +40 Sieve=7%, +4 Sieve=1%
CL
SANDY LEAN CLAY(CL) reddish yellow
P=4.0
CH
FAT CLAY(CH) red and tan
P=4.25
CH
FAT CLAY WITH SAND(CH) red and yellow
P=3.75
18 58 19 39 71 +40 Sieve=5%, +4 Sieve=0%
-red
P=3.5
SC
CLAYEY SAND(SC) reddish brown
P=2.0
10 28 18 10 25 +40Sieve=21%, +4 Sieve=11%
CL
LEAN CLAY(CL) red; with sand seams
P=1.0
Water Level
Water Observations:
Seepage @ 15' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
Notes: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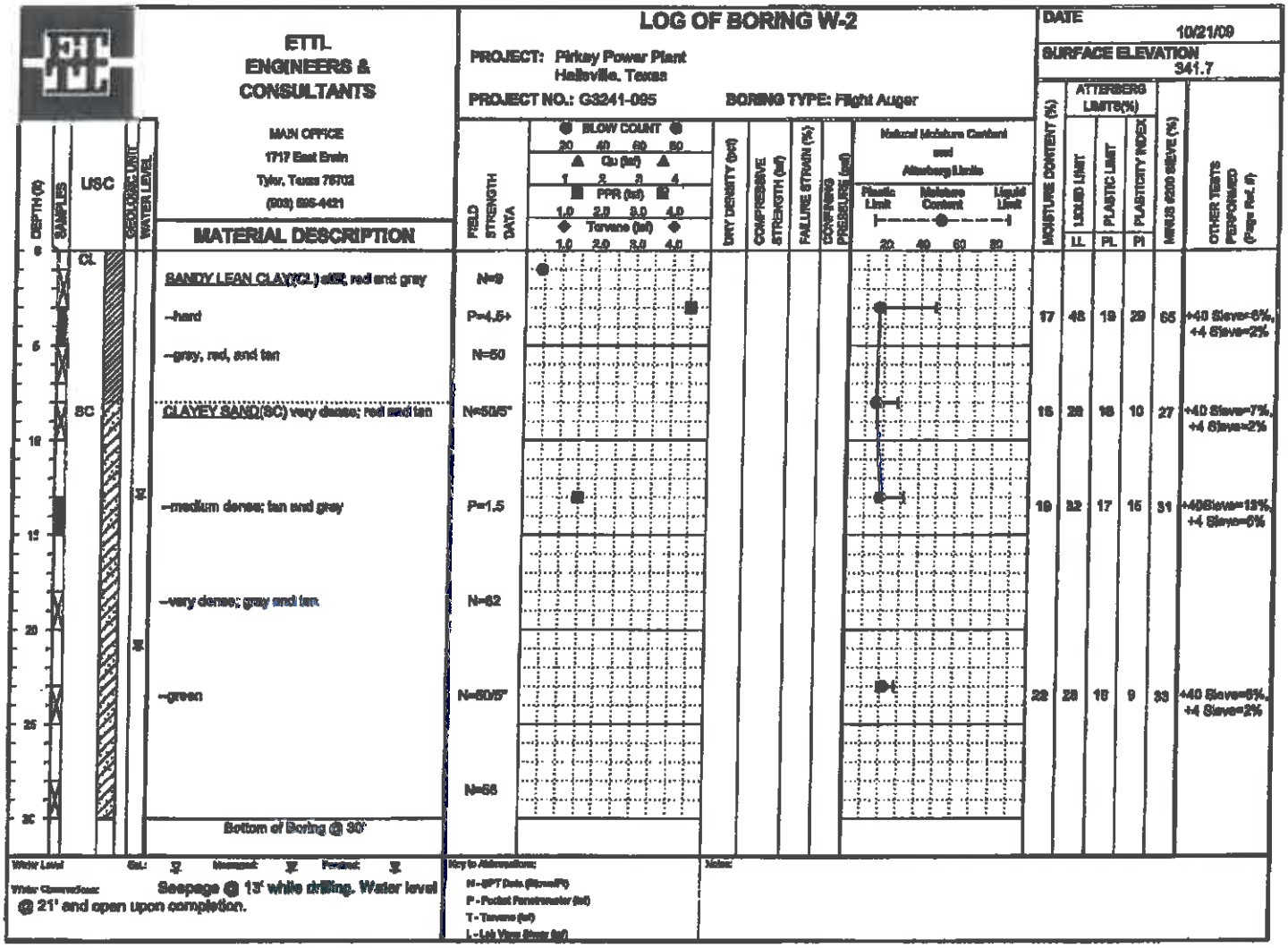
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING W-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
358.5
DEPTH (ft)
SAMPLES
USC
GROUNDUNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Qu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (psf)
FAILURE STRAIN (%)
CONFINING PRESSURE (psi)
Natural Moisture Content and Attaburg Limits
Plastic Limit
Moisture Content
Liquid Limit
MOISTURE CONTENT (%)
ATTERBERG LIMITS(%)
LIQUID LIMIT
PLASTIC LIMIT
PLASTICITY INDEX
LL
PL
PI
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Prep Ref. #)
SC
CLAYEY SAND(SC) grayish brown
N=32
--tannish gray
P=4.15
P=2.8
--gray
N=47
SM SC
SILTY CLAYEY SAND(SM-SC) gray
N=50/5"
Bottom of Boring @ 50'
17
29
19
10
25
+40 Sieve=1%, +4 Sieve=0%
Water Level
Water Observations:
Seepage @ 15' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
Notes: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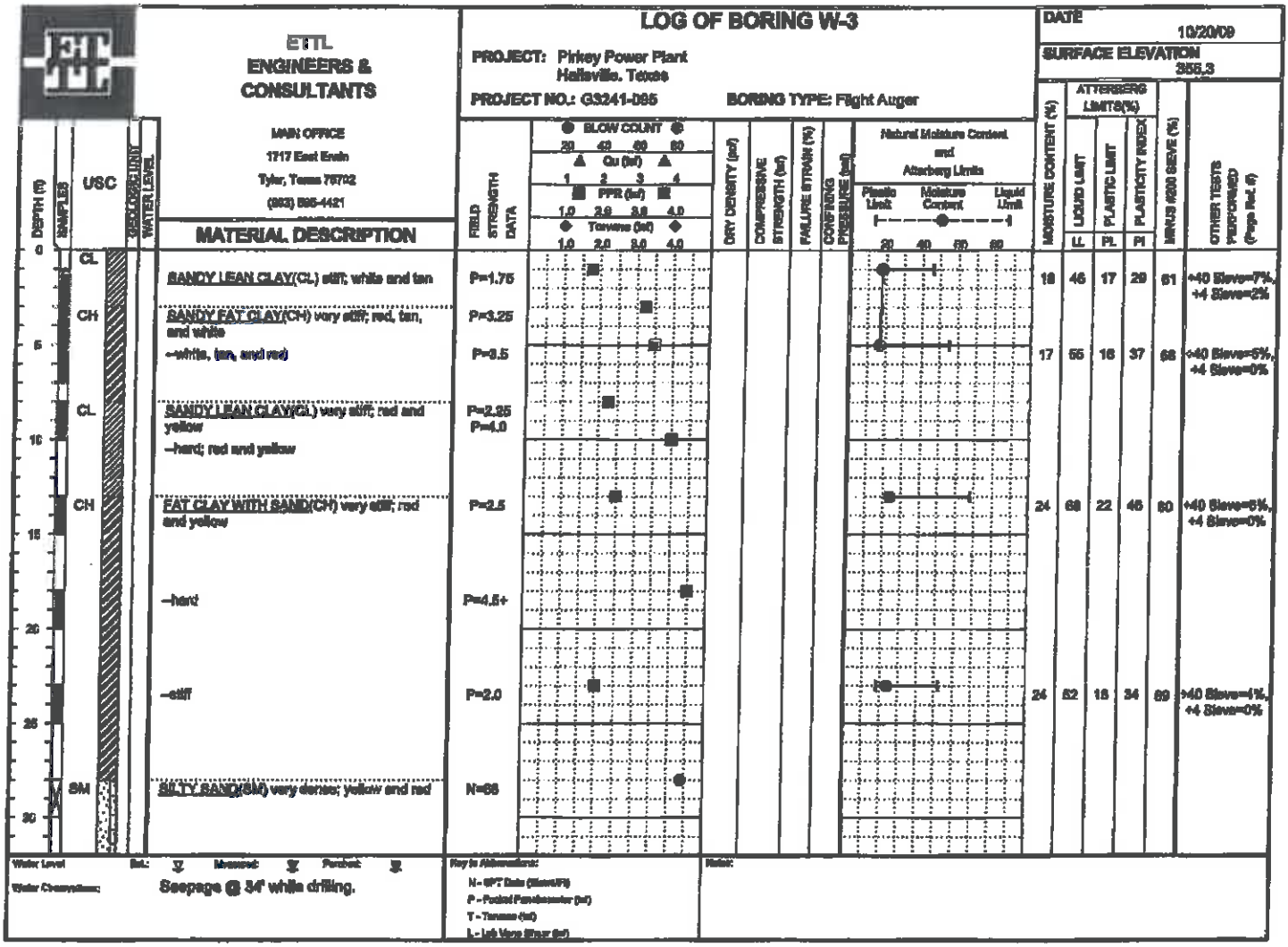
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING W-2
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/21/09
SURFACE ELEVATION
341.7
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD STRENGTH DATA
BLOW COUNT
Cu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (psf)
FAILURE STRAIN (%)
CONFINING PRESSURE (psf)
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. #)
SANDY LEAN CLAY(CL) stiff; red and gray
--hard
--gray, red, and tan
CL
CLAYEY SAND(SC) very dense; red and tan
--medium dense; tan and gray
--very dense; gray and tan
--green
SC
N=9
P=4.5+
N=50
N=50/5"
P=1.5
N=62
N=50/5"
N=56
17 48 19 29 65 +40 Sieve=6%, +4 Sieve=2%
16 26 16 10 27 +40 Sieve=7%, +4 Sieve=2%
19 32 17 15 31 +40Sieve=13%, +4 Sieve=6%
22 28 19 9 33 +40 Sieve=6%, +4 Sieve=2%
Bottom of Boring @ 30'
Water Level
Dry:
Encountered:
Pended:
Water Observations:
Seepage @ 13' while drilling. Water level @ 21' and open upon completion.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
Notes:



ETTL
ENGINEERS & CONSULTANTS

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

LOG OF BORING W-3

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: GS241-095

BORING TYPE: Flight Auger

DATE: 10/20/09

SURFACE ELEVATION: 356.3

DEPTH (ft)	SAMPLES	USC	GROUNDWATER WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (psf)	COMPRESSIVE STRENGTH (psf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) stiff; white and tan	P=1.75					18	46	17	29	61	+40 Sieve=7%, +4 Sieve=2%
		CH		SANDY FAT CLAY(CH) very stiff; red, tan, and white	P=3.25										
5				--white, tan, and red	P=3.5					17	55	18	37	68	+40 Sieve=5%, +4 Sieve=0%
		CL		SANDY LEAN CLAY(CL) very stiff; red and yellow	P=2.25										
10				--hard; red and yellow	P=4.0										
		CH		FAT CLAY WITH SAND(CH) very stiff; red and yellow	P=2.5					24	68	22	46	80	+40 Sieve=5%, +4 Sieve=0%
15				--hard	P=4.5+										
20				--stiff	P=2.0					24	52	18	34	69	+40 Sieve=1%, +4 Sieve=0%
25		SM		SILTY SAND(SM) very dense; yellow and red	N=66										
30															

FIELD STRENGTH DATA: BLOW COUNT (20, 40, 60, 80); Cu (tsf) (1, 2, 3, 4); PPR (tsf) (1.0, 2.0, 3.0, 4.0); Torvane (tsf) (1.0, 2.0, 3.0, 4.0)

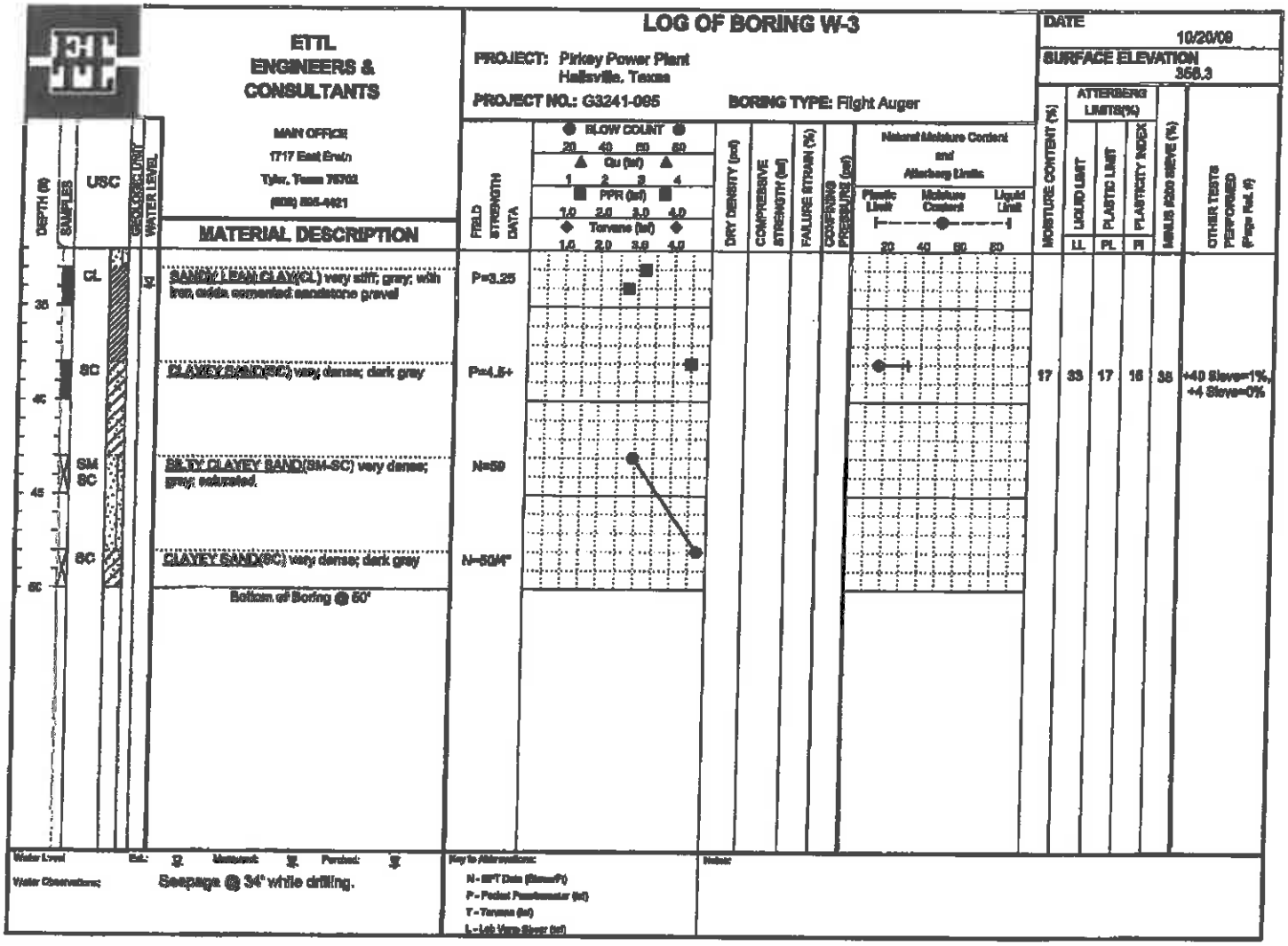
Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20, 40, 60, 80)

Water Level Data: ▽ Measured ▽ Perched ▽

Water Observations: Seepage @ 34' 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 W-3
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/20/09
SURFACE ELEVATION
358.3
MATERIAL DESCRIPTION
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
FIELD STRENGTH DATA
BLOW COUNT
Qu (tsf)
PPR (tsf)
Torvane (tsf)
DRY DENSITY (pcf)
COMPRESSIVE STRENGTH (tsf)
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. #)
LL
PL
PI
CL
SANDY LEAN CLAY(CL) very stiff; gray; with iron oxide cemented sandstone gravel
P=3.25
SC
CLAYEY SAND(SC) very dense; dark gray
P=4.5+
17
33
17
16
35
+40 Sieve=1%, +4 Sieve=0%
SM SC
SILTY CLAYEY SAND(SM-SC) very dense; gray; saturated.
N=59
SC
CLAYEY SAND(SC) very dense; dark gray
N=50/4"
Bottom of Boring @ 60'
Water Level
Water Observations:
Seepage @ 34' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes:

ENVIRONMENTAL LOG

Client: Pirkey Power Plant

Project No: G3241-095 **Phase** **Task**

Well No. PW-3 (MW-3)

Location Hallsville, Texas

Surface Elev.

Depth Feet	Sampler	Overburden/Lithologic Description
0		Ground Surface
		SANDY LEAN CLAY(CL) stiff; white and tan
5		SANDY FAT CLAY(CH) very stiff; red, tan, and white
		--white, tan, and red
10		SANDY LEAN CLAY(CL) very stiff; red and yellow
		--hard; red and yellow
15		FAT CLAY WITH SAND(CH) very stiff; red and yellow
20		
25		
30		SILTY SAND(SM) very dense; yellow and red
35		SANDY LEAN CLAY(CL) very stiff; gray; with iron oxide cemented sandstone gravel
40		CLAYEY SAND(SC) very dense; dark gray
45		SILTY CLAYEY SAND(SM-SC) very dense; gray; saturated
50		CLAYEY SAND(SC) very dense; dark gray
		Bottom of Boring @ 50'

FID (ppm) | Graphic Log | Well Construction Graphics

Depth Feet	Well Construction Details
0	T.O.C. Elev. .
5	
10	
15	
20	
25	
30	
35	
40	
45	
50	

Driller Doug Hinds

Logged By Blake Hobbs

Drilling Started 10/20/09

Drilling Completed

Construction Completed

Development Completed

Type of Well

Drilling Method Flight Augers

Borehole Diameter 6.5"

Well Casing 2.0" **Dia.** 0.0' **to** 28.0'

Casing Type PVC

Well Screen 2.0" **Dia.** 28.0' **to** 38.0'

Screen Type Slotted

Slot Size 0.010"

Grout Type Bentonite

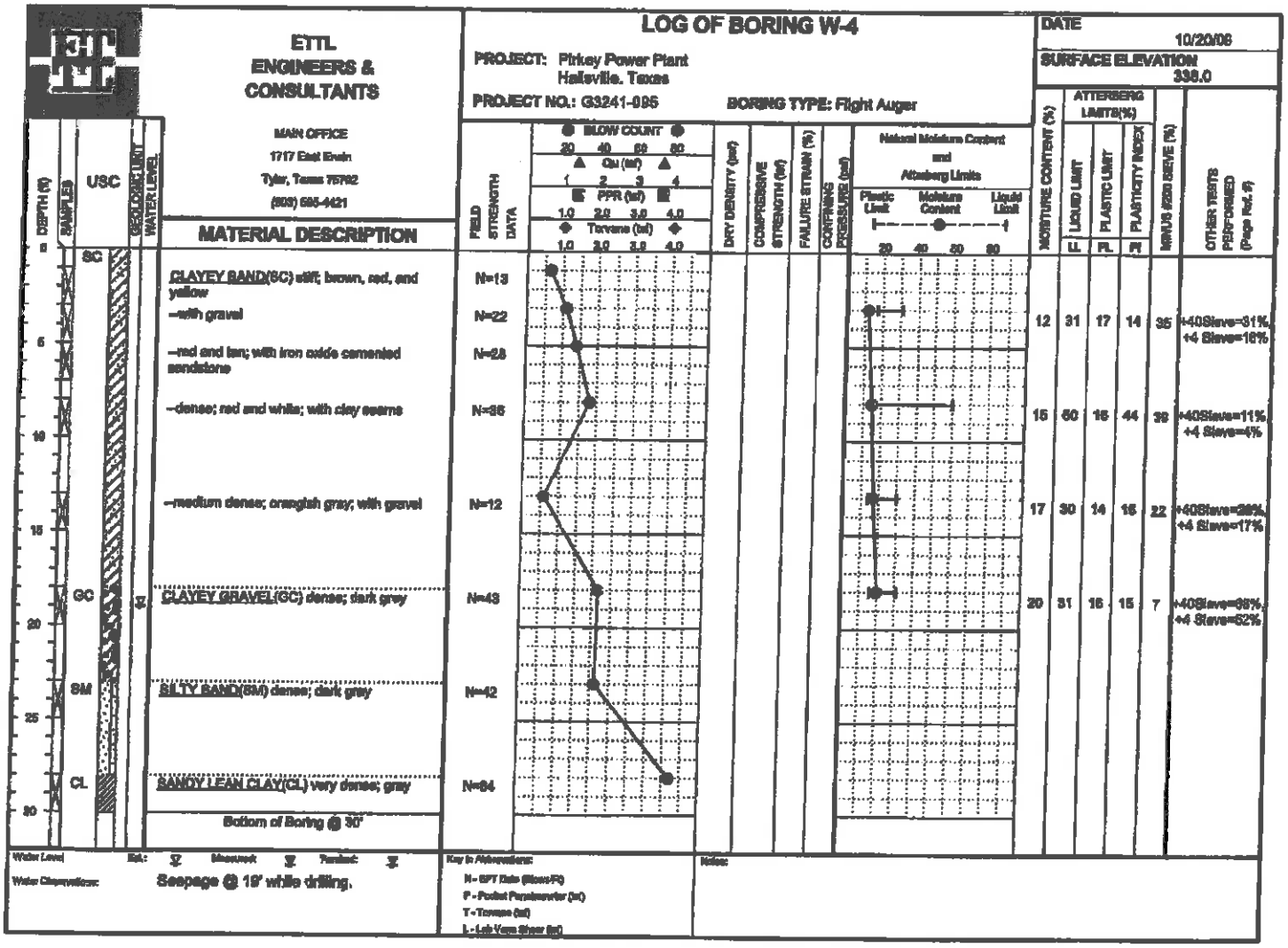
Bentonite Seal 1-26' & 38-50'

Filter Pack Qty. 26-38'

Filter Pack Type 20/40 Sand

Static Water Level

Notes:



ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING W-4

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095

BORING TYPE: Flight Auger

DATE: 10/20/09

SURFACE ELEVATION: 338.0

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT / WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SC		CLAYEY SAND(SC) stiff; brown, red, and yellow	N=13						
				--with gravel	N=22	12	31	17	14	35	+40Sieve=31%, +4 Sieve=16%
5				--red and tan; with iron oxide cemented sandstone	N=28						
				--dense; red and white; with clay seams	N=66	15	60	16	44	39	+40Sieve=11%, +4 Sieve=4%
10											
				--medium dense; orangish gray; with gravel	N=12	17	30	14	16	22	+40Sieve=39%, +4 Sieve=17%
15											
		GC		CLAYEY GRAVEL(GC) dense; dark grey	N=43	20	31	16	15	7	+40Sieve=68%, +4 Sieve=52%
20											
		SM		SILTY SAND(SM) dense; dark grey	N=42						
25											
		CL		SANDY LEAN CLAY(CL) very dense; gray	N=84						
30				Bottom of Boring @ 30'							

Water Level Obs.: ▽ Measured ▽ Perched ▽

Water Observations: Seepage @ 15' while drilling.

Key to Abbreviations:
N - SPT Rate (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-8
LOCATION: Hallsville, TX

Date: 9-15-83 Type: Ground Elevation: 347.1

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
0			Red and brown slightly sandy silty clay
			Red and brown silty clay with silt lenses
5			Red and brown silty sandy clay
			Bottom of boring at 6 feet.
10			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-9
LOCATION: Hallsville,TX

Date: 9-15-83 Type: Ground Elevation: 348.1

Legend: ■ Sample X Penetration ▼ Water

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

SOUTHWESTERN LABORATORIES

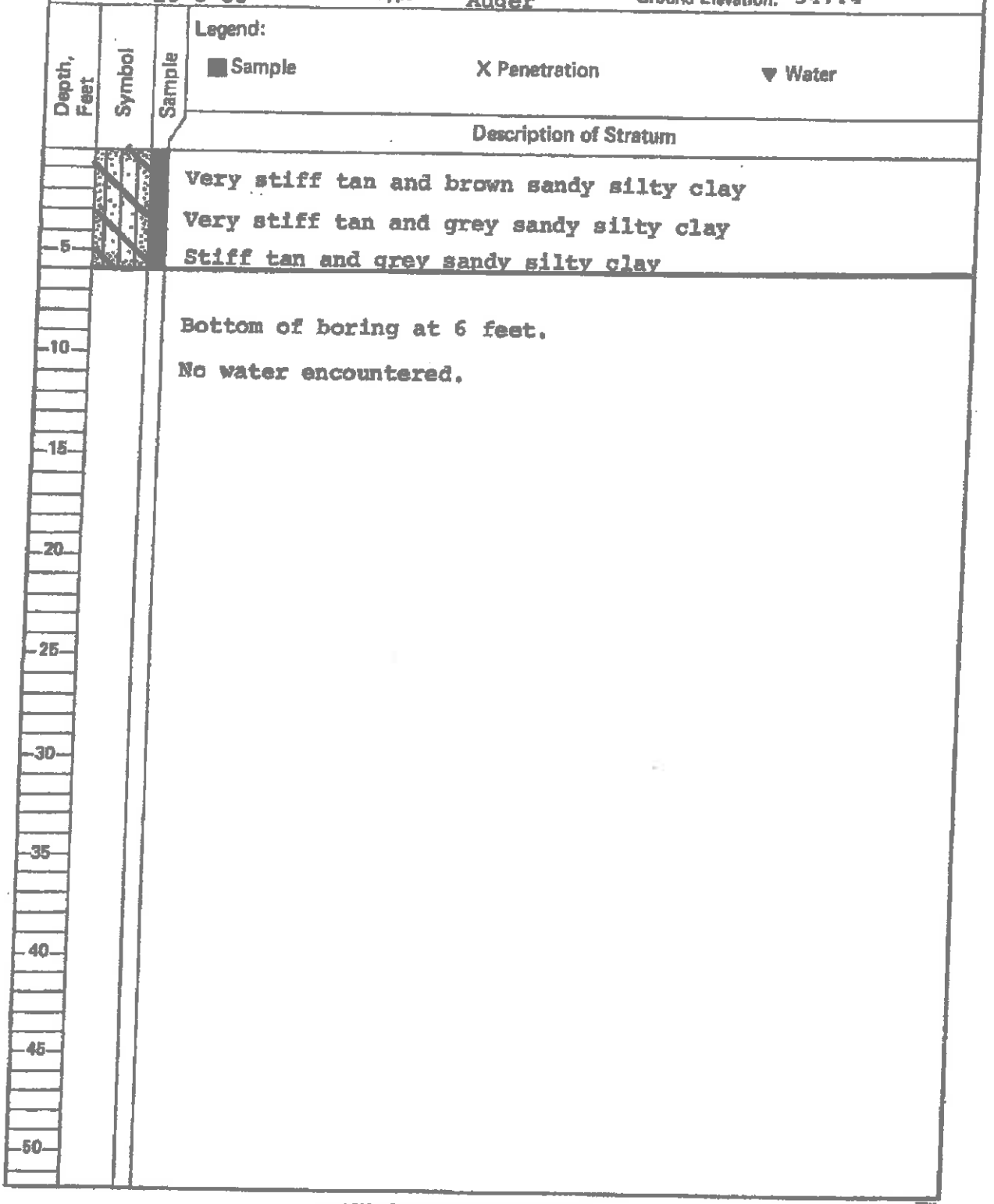
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-10
LOCATION: Hallsville

Date: 10-6-83 Type: Auger Ground Elevation: 347.4



Very stiff tan and brown sandy silty clay

Very stiff tan and grey sandy silty clay

Stiff tan and grey sandy silty clay

Bottom of boring at 6 feet.

No water encountered.

SOUTHWESTERN LABORATORIES

832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: S-11
LOCATION: Hallsville

Date: 10-6-83 Type: Auger Ground Elevation: 347.0

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
0			Very stiff tan and grey sandy silty clay lenses
			Very stiff tan and grey silty clay lenses
5			Very stiff tan and grey silty clay lenses
			Bottom of boring at 6 feet.
			No water encountered.
10			
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:

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:
2	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:
3	8/19/2015

Direction Photo Taken:

Northeast

Description:

P8190383
Upland forest bordering north of West Bottom 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:

P8190385
Pizometer along West Bottom Ash Pond perimeter embankment road.

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:

Southeast

Description:

P8190386
Pizometer along West Bottom Ash Pond perimeter embankment road.

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:

P8190387

AD-3 in the wooded area east of West Bottom Ash Pond

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
7	8/19/2015

Direction Photo Taken:

Description:

P8190390
Dry (non-wetland) ditch adjacent to railroad and West Bottom Ash Pond.

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
8	8/19/2015

Direction Photo Taken:

West Northwest

Description:

P8190392
West Bottom Ash Pond.

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
9	8/19/2015

Direction Photo Taken:

East Southeast

Description:

P8190396
West Bottom Ash Pond

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
10	8/19/2015

Direction Photo Taken:

Northeast

Description:

P8190399
Upland drainage at the toe of the West Bottom Ash Pond.

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
11	8/19/2015

Direction Photo Taken:

Northeast

Description:

P8190403
Vegetated strip around culvert that drains East and West BAPs. This potential wetland may be jurisdictional and is associated with an intermittent stream.

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
12	8/19/2015

Direction Photo Taken:

Southwest

Description:

P8190411
Small vegetated strip adjacent to access road south of southeast corner of 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:
13	8/19/2015

Direction Photo Taken:

West Northwest

Description:

P8190414
Looking across West Bottom Ash Pond

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
14	8/19/2015

Direction Photo Taken:

South Southeast

Description:

P8190417
West Bottom Ash Pond

ARCADIS

PHOTOGRAPHIC LOG

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

Photo No.	Date:
15	8/19/2015

Direction Photo Taken:

Southeast

Description:

P8190419
Small vegetated strip in outside corner of access road south of southeast corner of West Botton Ash Pond.