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American Electric Power Service Corporation

2018 Landfill Lateral Expansion - CCR Location Restriction Evaluation

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

October 26, 2018

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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
BGL	below ground surface
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations

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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 2018 Lateral Expansion of the existing on-site Landfill 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 zone, 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**). The initial CCR Location Restriction Evaluation for the existing Landfill was prepared in 2016 (Arcadis, 2016). This report has been prepared for the 2018 Lateral Expansion of the existing Landfill (Site) and includes an updated evaluation of the location restriction criteria. The evaluation of the groundwater monitoring well network in the uppermost aquifer for the 2018 Lateral Expansion of the existing Landfill 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 Landfill CCR unit, as well as publicly-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 Landfill.

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 (**Figure 1**). The existing Landfill CCR unit is currently approximately 130 acres in size and is located in the southern portion of the Plant. The 2018 Landfill Lateral Expansion will cover approximately 15 acres directly south of the existing Landfill (**Figures 2** and **3**). Following completion of the 2018 Lateral Expansion, the Landfill will be approximately 145 acres in size.

2.2 Description of Landfill CCR Unit

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

2.2.1 Embankment Configuration

The Landfill was constructed in the southwestern portion of the Plant, and as shown on the U.S. Geological Survey 1983 topographic map (**Figure 1**), the southwestern portion of the Plant contained an unnamed intermittent tributary of Hatley Creek prior to Landfill construction in 1984. The Landfill was constructed within the unnamed tributary creek which had a bottom elevation ranging from approximately 290 feet amsl on the south side of the Landfill to 300 feet amsl on the north side of the Landfill. The native soil sidewalls of the tributary creek at the Landfill location have a maximum elevation of approximately 355 feet amsl. Therefore, as shown on Geologic Cross Section C-C' (**Figure 6**), the Landfill is partially incised within the tributary creek, and the tributary creek native soil sidewalls serve as a natural embankment for the lower portion of the Landfill.

The original Landfill design included emplacement of CCR materials in the Landfill with 3:1 slopes (3 feet horizontal, 1 foot vertical) with an approximate 10 foot wide bench for every 20 foot vertical rise of CCR material (VFL Technology Corporation, 1984). Apex Geoscience conducted a geotechnical investigation of the Landfill CCR materials in 2012, and concluded the CCR material embankments would be stable on 3:1 slopes (Apex Geoscience, 2013).

In addition to the Landfill CCR material embankments, earthen embankments are present around portions of the Landfill to control storm water flow. The earthen embankments are constructed using compacted clay on 3:1 slopes. ETTL Engineers & Consultants Inc (ETTL) conducted a geotechnical evaluation of the perimeter

embankments in 2005 and concluded the perimeter embankments would be stable on slopes no steeper than 3:1 unless the slopes are stabilized with geogrid reinforcement (ETTL, 2005).

The Landfill Stormwater Runoff Pond (non-CCR Unit) was constructed downslope (south) of the Landfill in 1993 and 1994. The Landfill Stormwater Runoff Pond has perimeter compacted soil embankments up to approximately 19 feet in height. Apex Geoscience conducted a geotechnical investigation of the Landfill Stormwater Runoff Pond embankments in 2011. Apex Geoscience recommended raising the elevation of the Landfill Stormwater Runoff Pond embankments to an elevation of 302 feet amsl using soils compacted to at least 95% standard proctor density, with an emergency spillway at a crest elevation of 298 feet amsl. The Apex Geoscience report concluded the Landfill Stormwater Runoff Pond embankments would be stable (Apex Geoscience, April 2011).

The 2018 Landfill Lateral Expansion will cover approximately 15 acres directly south of the existing Landfill. In 2016, Auckland Consulting conducted a stability assessment of the 2018 Lateral Expansion area and concluded the embankments would be stable on slopes no steeper than 3:1 (Auckland, November 2016). The 2016 Auckland Consulting report stated the northern and eastern extents of the 2018 Lateral Expansion will be constructed contiguous to the existing Landfill disposal area, and ash disposal will be completed in multiple lifts, each with an approximate height of 20 feet, integrated with safety benches, and maximum side slopes of 3:1 to a maximum waste height of 120 feet.

2.2.2 Area/Volume

The existing Landfill is approximately 130 acres in size and was designed to receive 12,207,000 cubic yards (7,566 acre feet) of CCR materials including fly ash, bottom ash, economizer ash, and stabilized FGD sludge (VFL Technology Corporation, 1984). The design maximum CCR material height in the existing Landfill is approximately 140 feet (Apex Geoscience, 2013). As discussed above in Section 2.2.1, the 2018 Landfill Lateral Expansion will cover an area of approximately 15 acres to a maximum waste height of 120 feet. The design capacity of the CCR materials to be placed within the 2018 Lateral Expansion is approximately 2,200,000 cubic yards.

2.2.3 Construction and Operational History

The H.W. Pirkey Power Plant 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, stabilized FGD sludge) have been generated. The CCR materials that are not taken offsite for beneficial reuse are disposed of in the Landfill. The Landfill was constructed in several phases beginning with the northeast portion (Phase 1) in 1984. The Landfill was expanded (east-central portion) in 1985 and 1987. The Landfill was subsequently expanded to the west and south during the 1990's, including

construction of the Landfill Stormwater Runoff Pond (non-CCR unit) directly south of the Landfill in 1993 and 1994. The Landfill was further expanded to the west between 2005 and 2015 to its current size of approximately 130 acres as shown on **Figure 3**.

In 2005, ETTL conducted a geotechnical evaluation of the Landfill and Landfill Stormwater Runoff Pond, including installation of 30 soil borings, ten cone penetration test (CPT) borings, and geotechnical testing of soil samples. The ETTL report concluded the Landfill CCR materials would be stable at 3:1 slopes; and foundation settlement would be within acceptable limits (ETTL, 2005). The ETTL report recommended that Landfill expansion activities include a composite liner system consisting of a 2-foot-thick compacted clay liner or geosynthetic clay liner (GCL) as the bottom component; and a top liner component consisting of a PVC, high-density polyethylene (HDPE), or a very low density polyethylene (VLDPE) liner. ETTL also recommended Landfill expansion activities include installation of a Landfill leachate collection system consisting of permeable bottom ash emplaced above the Landfill liner. These recommendations were implemented during Landfill expansion phases between 2005 and 2015.

The 2018 Landfill Lateral Expansion design includes emplacement of up to 120 feet of CCR materials with maximum side slopes of 3:1 above the Landfill liner system which will consist of a 60-mil HDPE top liner underlain by a 2-foot-thick compacted clay bottom liner. Prior to installation of the liner system, approximately 10 to 15 feet of cut into the existing soils will occur along the topographically higher southern portion of the Lateral Expansion, and emplacement of these soils (clayey sands, silty clayey sand and/or lean clays) as fill materials below the liner system in the topographically lower central and northern portions of the Lateral Expansion. As detailed below in Section 3, the fill materials emplaced in the topographically lower portions of the Lateral Expansion will extend in height at least five feet above the water table, thereby providing the required separation distance of at least five feet between the base of the CCR unit and the top of the uppermost aquifer.

2.2.4 Surface Water Control

Surface water in the area of the existing Landfill flows in a general southerly direction to the Landfill Stormwater Runoff Pond located directly southwest of the existing Landfill. Surface water in the area of the 2018 Landfill Lateral Expansion flows in a general westerly direction to the Landfill Stormwater Runoff Pond. The Landfill Stormwater Runoff Pond, which is approximately 16 acres in size, also receives (1) Landfill leachate that is gravity drained from the existing Landfill via underground lateral perforated pipes and permeable bottom ash materials that were installed above portions of the existing Landfill liner, (2) Landfill leachate that will gravity drain via underground lateral perforated pipes that will be installed above the 2018 Landfill Lateral Expansion liner system, and (3) shallow groundwater that will gravity drain via underground lateral perforated HDPE underdrain pipes that will be installed in

permeable bottom ash materials approximately seven feet below the 60-mil HDPE liner of the 2018 Landfill Lateral Expansion.

An emergency spillway is present at the southern end of the Landfill Stormwater Runoff Pond at an elevation of approximately 298 feet amsl. The top of the Landfill Stormwater Runoff Pond is located at an elevation of approximately 302 feet amsl, therefore the Landfill Stormwater Runoff Pond has approximately four feet of freeboard (Apex Geoscience, April 2011). Water in the Landfill Stormwater Runoff Pond discharges into an unnamed intermittent tributary of Hatley Creek via Outfall 004 in accordance with Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0002496000.

2.3 Previous Investigations

The initial soils investigation and design of the Plant 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, including the Landfill Area.

A soils investigation of the Landfill was conducted by Southwestern Laboratories in 1984. The investigation included installation of 45 soil borings and geotechnical analyses of soil samples. The report recommended installation of three feet of compacted clay as the bottom liner for the Landfill (Southwestern Laboratories, July 1984).

An engineering design report for the Landfill was prepared by VFL Technology Corporation in 1984. The Landfill design included a bottom compacted clay liner three feet in thickness, and Landfill side slopes of 3:1 (VFL Technology Corporation, 1984).

In 1985, Southwestern Laboratories conducted a geotechnical evaluation of the clay liner that was installed at the base of the Landfill, including installation of four soil borings and permeability testing of soil samples. The report concluded the clay liner was three feet thick with a permeability less than 1×10^{-7} centimeters per second (cm/sec) (Southwestern Laboratories, 1985).

In 1993, Alliance Inc. conducted a geotechnical investigation of the clay liner installed at the base of the Landfill following a Landfill expansion phase in 1993. The report concluded the clay liner was three feet or more in thickness, and the clay liner met the permeability specifications of $<1 \times 10^{-7}$ cm/sec (Alliance Inc., 1993).

In 1995, Central and South West Services prepared design specifications for Landfill expansion to the west and south. The design specifications included a geosynthetic clay liner overlain by a 0.060 inch (60 mil) HDPE liner (Central and South West Services, 1995).

In 2005, ETTL conducted a geotechnical evaluation of the Landfill and Landfill Stormwater Runoff Pond, including installation of 30 soil borings, ten CPT borings, and geotechnical testing of soil samples. The geotechnical data was obtained to design Landfill expansions in 2005 through 2007. The ETTL report concluded the Landfill CCR materials would be stable at 3:1 slopes; and foundation settlement would be within acceptable limits (ETTL, 2005). The ETTL report recommended the Landfill expansion include a composite liner system consisting of a 2-foot-thick compacted clay liner or GCL as the bottom component; and a top liner component consisting of a PVC, HDPE, or a VLDPE liner. ETTL also recommended the Landfill expansion include a leachate collection system consisting of permeable bottom ash emplaced above the Landfill liner. These recommendations were implemented during Landfill expansion phases between 2005 and 2015.

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, March 2011).

In 2011, Apex Geoscience conducted a geotechnical investigation of the Landfill Stormwater Runoff Pond. The report recommended raising the elevation of the Landfill Stormwater Runoff Pond embankments to an elevation of 302 feet amsl using soils compacted to at least 95% standard proctor density, and an emergency spillway with a crest elevation of 298 feet amsl (Apex Geoscience, April 2011). These recommendations were implemented during subsequent Landfill Stormwater Runoff Pond construction activities.

In 2012, Apex Geoscience conducted a geotechnical investigation for Landfill expansion activities at the western portion of the Landfill where surface lignite mining operations had previously been conducted to a depth of 50 to 100 feet using a dragline, and the spoils (reclaimed soil) were returned to the excavation. The report concluded the Landfill embankments would be stable with side slopes of 3:1 (Apex Geoscience, 2013).

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).

In 2016, Auckland Consulting conducted a geotechnical evaluation of the 2018 Landfill Lateral Expansion area, including installation of eight soil borings (B1 through B8) with total depths ranging from 40 to 62 feet below ground level (bgl). Soil boring locations are shown on **Figure 11**, and copies of the soil boring logs are provided in **Appendix C.** Based on the results of the 2016 geotechnical evaluation, including slope stability modeling and settlement analysis, Auckland Consulting concluded the 2018 Landfill Lateral Expansion will be structurally stable with maximum side slopes of 3:1 to a maximum disposal height of 120 feet (Auckland, November 2016).

In 2018, Auckland Consulting installed seven piezometers (PZ-1 through PZ-7) within the 2018 Landfill Lateral Expansion area to obtain detailed depth to groundwater and groundwater flow direction data prior to construction of the Lateral Expansion. The piezometers were completed in the uppermost water-bearing unit with total depths ranging from 14 to 20 feet bgl. Piezometer locations are shown on **Figure 11**, and piezometer completion data is provided in **Appendix C.**

2.4 Hydrogeologic Setting

2.4.1 General

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 Site in the area of the Landfill Stormwater Runoff Pond. The Carrizo Sand consists of fine to medium grained sand interbedded with silt and clay, and attains a thickness of up to approximately 100 feet in Harrison county, Texas (Broom, 1966). As shown on Geologic Cross Sections C-C' (**Figure 6**) and D-D' (**Figure 7**), a thick sand stratum is located below and adjacent to the Landfill between an elevation of approximately 270 feet and 330 feet amsl. This sand stratum likely corresponds to the Carrizo Sand based on geologic maps of the Site area (Broom, 1966; Flawn, 1965).

The Carrizo Sand is underlain by the Eocene-age Wilcox Formation, which outcrops in topographically low areas near the Sabine River to the south and southeast of the Plant (Flawn, 1965). The Wilcox Formation consists of interbedded sand and clay with seams of lignite and attains a thickness of approximately 700 feet (Broom, 1966). As shown on Geologic Cross Section D-D' (**Figure 7**), a lignite seam was encountered below an elevation of approximately 270 feet amsl during drilling of monitoring well AD-24 at the south end of the Site. This lignite seam likely corresponds to the top of the Wilcox Formation based on geologic maps of the Site area (Broom, 1966; Flawn, 1965).

These features are further illustrated on five lines of cross section that were prepared through the existing Landfill 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').

2.4.2 2018 Landfill Lateral Expansion Area

Based on the hydrogeologic data obtained from soil borings, monitoring wells, and piezometers installed in the 2018 Landfill Lateral Expansion area, three lines of cross section were prepared through the 2018 Landfill Lateral Expansion area. The cross section location map is included as **Figure 11** and the lines of cross section are included as **Figure 12** (F-F'), **Figure 13** (G-G'), and **Figure 14** (H-H').

As shown on **Figures 12** through **14**, a reddish-brown to gray clayey and silty sand stratum is located below the Lateral Expansion area between an elevation of approximately 280 feet and 330 feet amsl. This sand stratum likely corresponds to the Carrizo Sand based on geologic maps of the Site area (Broom, 1966; Flawn, 1965).

As shown on **Figures 12** through **14**, a clay stratum with an average thickness of approximately 10 feet is located below the sand stratum, and a lignite seam is present below the clay stratum at an elevation of approximately 270 feet amsl. As discussed above in Section 2.4.1, this lignite seam likely corresponds to the top of the Wilcox Formation based on geologic maps of the Site area (Broom, 1966; Flawn, 1965).

2.4.3 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).

2.4.4 Regional and Local Geologic Setting

The central and northern portions of the Plant 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 where the existing Landfill, 2018 Landfill Lateral Expansion, and Landfill Stormwater Runoff Pond are located (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).

2.4.5 Surface Water and Surface Water Groundwater Interactions

Figures 9 and **10** are potentiometric surface maps based on January 2016 and August 2017 water level data, respectively, 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 **Figures 9** and **10**, shallow groundwater flow direction in the Landfill area is southwesterly at an average hydraulic gradient of approximately 0.01 foot per foot.

The Landfill is located approximately 400 feet west 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 **Figures 9** and **10**, 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 Landfill area does not discharge into Brandy Branch Reservoir. Brandy Branch Reservoir likely recharges the uppermost water bearing unit in the southern portion of the Site, 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.

Figure 15 is a current potentiometric surface map for the 2018 Landfill Lateral Expansion area, and water level elevations for the 2018 Landfill Lateral Expansion area piezometers are summarized on **Table 2**. As shown on **Figure 15**, shallow groundwater flow direction in the 2018 Landfill Lateral Expansion area is westerly toward the Landfill Stormwater Runoff Pond at a hydraulic gradient of approximately 0.02 foot per foot. Water level elevations in the 2018 Landfill Lateral Expansion area piezometers are higher than the surface water elevation of the Landfill Stormwater Runoff Pond (approximately 298 feet amsl), which indicates shallow groundwater in the 2018 Landfill Lateral Expansion area discharges into the Landfill Stormwater Runoff Pond.

2.4.6 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 directly east of the Landfill in 2004 by Bennett Drilling for use as a rig supply well. The water well was screened from 330 to 426 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 directly south of the Landfill by Amoco Production Company in 1991 for use as an oil field rig supply well. The water well was screened from 163 to 243 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 third closest water well was reportedly drilled approximately 200 feet southwest of the Landfill by Matador Operating in 2000 for use as an industrial well. The water well

was screened from 340 to 420 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 in the 2018 Landfill Lateral Expansion area show the uppermost aquifer is a reddish-brown to gray clayey and silty sand stratum located between an elevation of approximately 280 feet and 330 feet amsl. As shown on **Figure 15** and **Table 2**, this sand stratum is saturated at an elevation ranging from approximately 298 feet amsl (PZ-1) in the topographically low northwest portion of the Lateral Expansion area to approximately 320 feet amsl (AD-23) in the topographically high southeast portion of the Lateral Expansion area.

As discussed above in Section 2.2.3, the 2018 Landfill Lateral Expansion design includes a liner system which will consist of a 60-mil HDPE top liner underlain by a 2-foot-thick compacted clay bottom liner. Prior to installation of the liner system, approximately 10 to 15 feet of cut into the existing soils will occur along the topographically higher southern portion of the Lateral Expansion, and emplacement of these soils (clayey sands, silty clayey sand and/or lean clays) as fill materials below the liner system in the topographically lower central and northern portions of the Lateral Expansion. The fill materials emplaced in the topographically lower portions of the Lateral Expansion will extend in height at least five feet above the water table, thereby providing the required separation distance of at least five feet between the base of the CCR unit and the top of the uppermost aquifer. This separation distance is illustrated on **Figure 16** which shows the elevation of the HDPE liner at the base of the Lateral Expansion. The elevation of the HDPE liner in the topographically low northwest portion of the Lateral Expansion will range from approximately 311 to 314 feet amsl, which is more than five feet higher than the elevation of the piezometric surface in this area (approximately 298 to 304 feet amsl).

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 1 x 10^{-4} cm/sec (Fetter, 1980). Based on the hydraulic conductivity and saturated thickness (approximately 20 to 30 feet), the yield of the uppermost water-

bearing unit in the Lateral Expansion area is anticipated to exceed the TCEQ non-useable (Class 3) limit of 150 gallons per day (TCEQ, 2010).

Current groundwater elevations in the Lateral Expansion area are summarized on **Table 2**, and a recent piezometric surface map is depicted on **Figure 15**. The piezometric surface map is based on water level elevations measured on June 22, 2018 when water levels were high due to a recent rainfall event. The June 22, 2018 water level elevations are more than 5 feet below the planned Lateral Expansion HDPE liner elevation, indicating the base of the CCR unit is more than 5 feet above the uppermost aquifer.

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 2018 Landfill Lateral Expansion area is the reddish-brown to gray clayey and silty sand stratum located between an elevation of approximately 280 feet and 330 feet amsl.

3.2 Compliance with Isolation Distance

The uppermost water-bearing unit underlying the 2018 Landfill Lateral Expansion meets the regulatory definition of an aquifer. As shown on **Figure 16**, the HDPE liner below the base of the CCR unit will be more than 5 feet above this aquifer. Therefore, this CCR Unit complies with the requirement for placement above the uppermost aquifer. Also, underground lateral perforated HDPE underdrain pipes will be installed in permeable bottom ash materials approximately seven feet below the 60-mil HDPE liner of the 2018 Landfill Lateral Expansion. These undrains will collect shallow groundwater when the water table is seasonally high, and gravity drain the groundwater into the Landfill Stormwater Runoff Pond, which will maintain the separation distance of at least 5 feet below the base of the CCR unit.

4. Wetlands

CCR Rule 40 CFR Part 257.61 requires that new CCR Landfill Lateral Expansions not be located in wetlands.

4.1 Local Wetlands

Based on review of available published information, including the National Hydrography Dataset (NHD) and National Wetland Inventory (NWI) maps, there are no jurisdictional wetlands in the 2018 Landfill Lateral Expansion area (USFWS, 2018; USGS, 2018). The topographically low northwest portion of the Lateral Expansion area has no connections to jurisdictional waters of the U.S. (WOTUS) and is non-jurisdictional. **Figure 17** is a map showing wetlands locations in the CCR unit area.

4.2 Compliance with Wetland Restrictions

Based on review of available information, the 2018 Landfill Lateral Expansion area does not contain wetlands. Therefore, the 2018 Landfill Lateral Expansion complies with the requirement for not being located in a wetland.

5. Fault Areas

CCR Rule 40 CFR Part 257.62 requires that new CCR Landfill Lateral Expansions 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 18**. 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 Landfill Lateral Expansion 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 new CCR Landfill Lateral Expansions 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 19 presents the seismic hazard map for Texas, as published by the USGS. As shown on **Figure 19**, the Site falls within the zone having a maximum horizontal acceleration of 0.04 to 0.06 g. Therefore, the Landfill Lateral Expansion 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 landfills and lateral expansions 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

ETTL conducted a geotechnical investigation and foundation settlement evaluation of the Landfill foundation in 2005. The investigation included evaluation of the western portion of the Landfill where lignite mining operations previously occurred. The ETTL evaluation concluded the predicted Landfill settlement would not exceed approximately 4.3 feet and would not adversely affect the performance of the Landfill liner or leachate collection system, and the Landfill excavation, interim fill, and final cover would be stable on slopes of 3:1 or 4:1 (ETTL, 2005).

Apex Geoscience conducted a geotechnical investigation and foundation settlement evaluation of the Landfill in 2012, including advancement of two CPT borings in the western portion of the Landfill where lignite mining operations had previously occurred. The report predicted estimated settlement of 39.07 inches (3.26 feet) and concluded the Landfill would be stable with side slopes of 3:1 (Apex Geoscience, 2013).

Auckland Consulting conducted geotechnical evaluation of the 2018 Landfill Lateral Expansion area in 2016, including advancement of eight soil borings (B1 through B8) through the Lateral Expansion area, and a settlement analysis based on CCR material loading to the maximum design waste height of 120 feet. The report predicted estimated settlement of up to 43.96 inches (3.66 feet) and concluded the Lateral Expansion would be stable with side slopes of 3:1 (horizontal to vertical) and bench widths of approximately 16 feet (Auckland Consulting, 2016). The report also stated the fill soils to be emplaced below the liner system in the topographically lower central and northern portions of the Lateral Expansion will be placed in loose lifts not exceeding 8 inches and compacted to a minimum 95% of the maximum density as determined by Standard Proctor test ASTM D 698 (Auckland Consulting, 2016).

7.1.3 Mass Movements

Geotechnical evaluations of the Landfill by ETTL in 2005, Apex Geoscience in 2012, and Auckland Consulting in 2016 concluded the Landfill would not be subject to mass movements that could impair the integrity of the Landfill based on side slopes of 3:1 (ETTL, 2005; Apex Geoscience, 2013; Auckland Consulting, 2016).

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 Landfill is not located in a karst area.

7.1.5 Subsurface Mining

Naturally occurring lignite is present in portions of the Site area, and a naturally occurring lignite seam was identified at an elevation of approximately 270 feet amsl at monitoring well AD-24 as shown on Geologic Cross Section D-D' (**Figure 7**). The Texas Water Development Board Ground-Water Resources Report for Harrison County, Texas, states that the Wilcox Formation, which underlies the Carrizo Sand, contains lignite (Broom, 1966).

Lignite mining operations using a drag line had occurred in the western portion of the Landfill prior to Landfill construction in this area (VFL Technology Corporation, 1984). The drag line mining method is a surface mining method. A geotechnical evaluation of the previously mined western portion of the Landfill was conducted by ETTL in 2005. The ETTL report indicated the western portion of the Landfill had been mined in the past to a depth of 50 to 100 feet using a dragline, and the spoils (reclaimed soil) were returned to the excavation. The geotechnical evaluation included installation of 30 soil borings, ten CPT borings, and geotechnical testing of soil samples. The ETTL report concluded the Landfill would be stable based on the Landfill liner system (compacted clay or GCL overlain by HDPE or VLDPE), leachate drainage system (lateral underdrain consisting of permeable bottom ash), and Landfill side slopes no steeper than 3:1 (ETTL, 2005).

No subsurface mining is known to exist below the 2018 Landfill Lateral Expansion area.

7.2 Compliance with Unstable Areas Restriction

Based on our review of available information, including the 2005 geotechnical evaluation of the Landfill by ETTL, the 2012 geotechnical evaluation of the Landfill by Apex Geoscience, and the 2016 geotechnical evaluation of the Lateral Expansion Area by Auckland Consulting, this CCR unit complies with the requirement for 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 2018 Landfill Lateral Expansion complies with the requirements of the location restrictions sections of 40 CFR 257 Subpart D that apply to landfills 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	10-25-18
Registration No.	Registration State	Date

9. References

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ARCADIS

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	1/12/2017	3/1/2017	4/11/2017	8/24/2017
									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	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	327.65	327.96	329.09	327.63
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	344.19	345.53	345.53	343.49
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	353.27	355.38	356.62	353.58
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	347.04	347.96	347.87	347.40
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	345.74	346.00	345.81	346.31
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	365.11	368.79	372.97	367.68
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	352.01	352.81	352.68	352.62
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	343.09	344.54	344.69	342.71
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	324.70	326.27	326.27	324.18
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	357.06	359.21	358.63	358.23
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	347.20	348.52	348.45	347.37
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	320.99	321.00	320.85	320.77
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	330.04	331.59	331.24	330.05
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	320.27	320.51	320.69	320.07
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	322.23	322.85	322.88	322.04
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	343.78	344.53	344.58	343.57
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	347.44	348.44	349.09	349.73
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	348.56	349.32	349.25	349.31
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	307.61	307.61	307.61	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	310.42	310.82	311.27	310.28
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	---	---	---	---	---	---	---	---	---	---	---	---	---

(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.
--- Not Measured

Table 2
Piezometer Water Level Data - 2018 Landfill Lateral Expansion Area
AEP Pirkey Power Plant
Hallsville, Harrision County, Texas

Piezomenter Completion Information

Piezometer ID:	PZ1	PZ2	PZ3	PZ4	PZ5	PZ6	PZ7	AD-23	AD-35
Northing	6871372.73	6871442.96	6871218.9	6871018.52	6870962.73	6870939.86	6871250.41		
Easting	3203056.63	3203345.4	3203322.02	3203009.98	3203281.7	3203544.92	3202996.36		
Screen length	10	10	10	10	10	10	10	20	15
TD (from GS)	14	14	14	14	20	20	14	37.44	18
Sand pack, top (from GS)	3	3	3	3	8	8	3		
Elev, GS								346.72	334.15
Elev, TOC	308.85	312.74	307.35	311.53	328.3	328.78	303.73	350.1	318.95

Piezometer Depth to Water Measurements (feet) below TOC

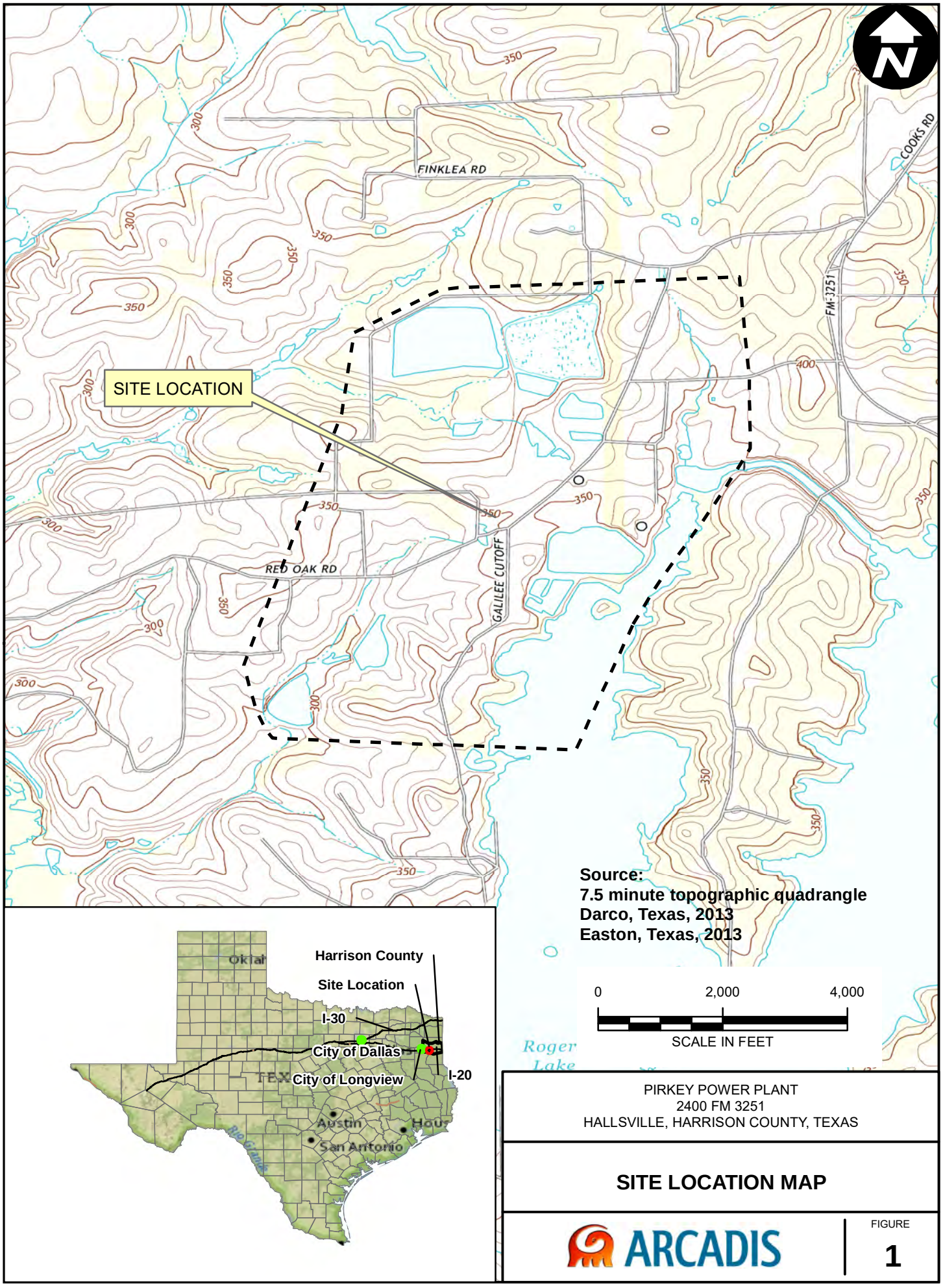
Date	PZ1	PZ2	PZ3	PZ4	PZ5	PZ6	PZ7	AD-23	AD-35
6/20/2018	9.98	9.99	4.29	8.66	20.47	13.23	2.84		
6/21/2018	9.99	9.95	4.07	8.37	20.47	13.24	2.75	29.4	7.95
6/22/2018	9.99	9.91	3.98	8.31	20.47	13.25	2.76	29.42	7.92
6/29/2018	10.01	10.1	4.34	8.85	20.63	13.4	2.98	29.39	8.14
7/6/2018	10.02	10.23	4.45	8.92	20.75	13.52	3.21	29.43	8.23

Piezometer Potentiometric Surface (Water Table) Elevations (feet AMSL)

Date	PZ1	PZ2	PZ3	PZ4	PZ5	PZ6	PZ7	AD-23	AD-35
6/20/2018	298.87	302.75	303.06	302.87	307.83	315.55	300.89		
6/21/2018	298.86	302.79	303.28	303.16	307.83	315.54	300.98	320.70	311.00
6/22/2018	298.86	302.83	303.37	303.22	307.83	315.53	300.97	320.68	311.03
6/29/2018	298.84	302.64	303.01	302.68	307.67	315.38	300.75	320.71	310.81
7/6/2018	298.83	302.51	302.9	302.61	307.55	315.26	300.52	320.67	310.72

Legend

GS	Ground surface	TOC	Top of piezometer casing
TD	Total depth	AMSL	Above mean sea level



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

SITE LOCATION MAP

ARCADIS

FIGURE
1

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

City of Hallsville

3 miles to
City of Marshall

I-20

West Bottom Ash Pond

East Bottom Ash Pond

Stack Out Area

Existing
Landfill

Hatley Creek

Proposed 2018 Landfill
Lateral Expansion

Brandy Branch
Reservoir

Brandy Branch Creek

0 4,000 8,000

SCALE IN FEET

Legend

Coal Combustion Residual (CCR) Unit

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

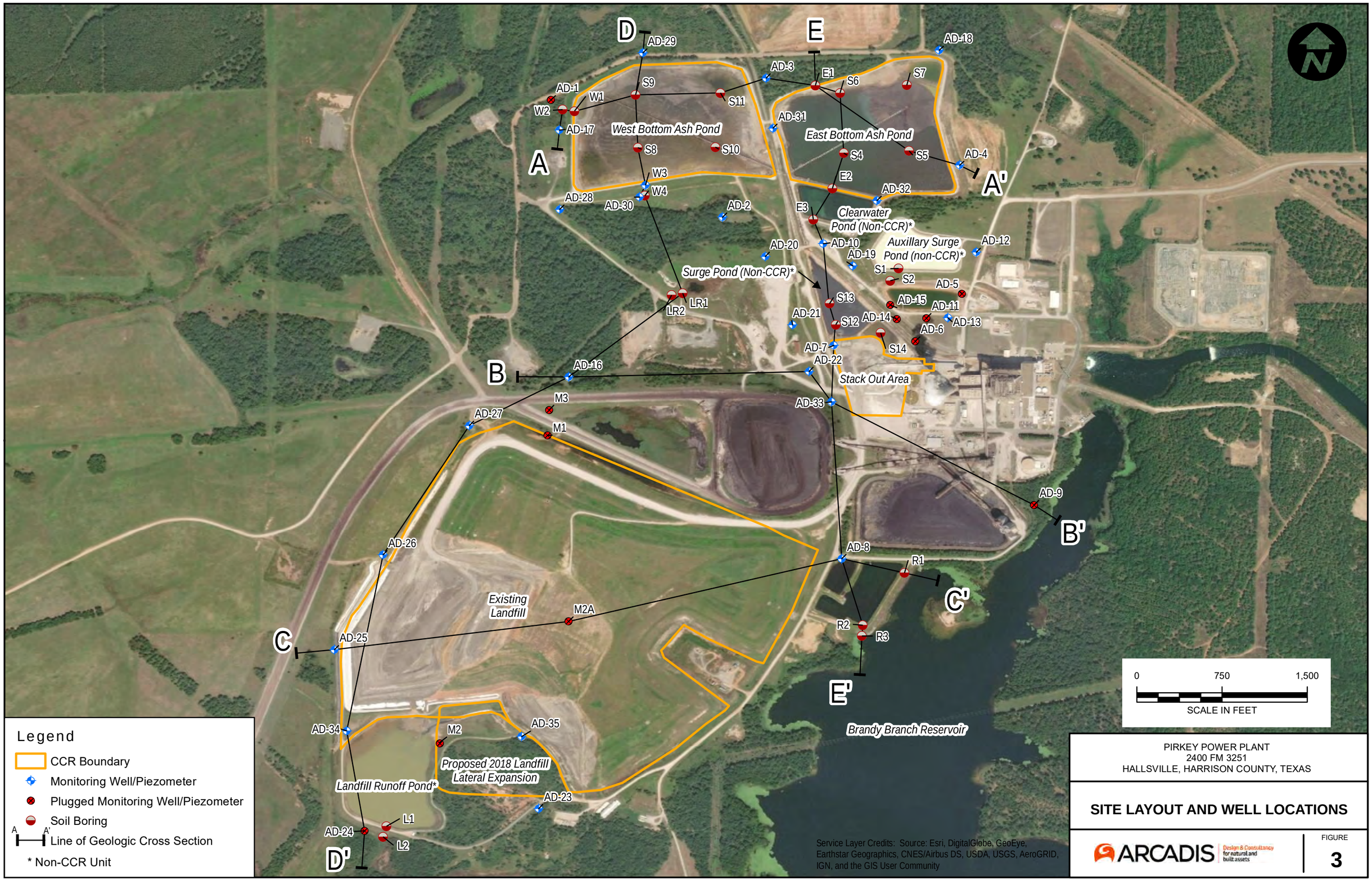
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

PLANT AND CCR UNIT LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

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



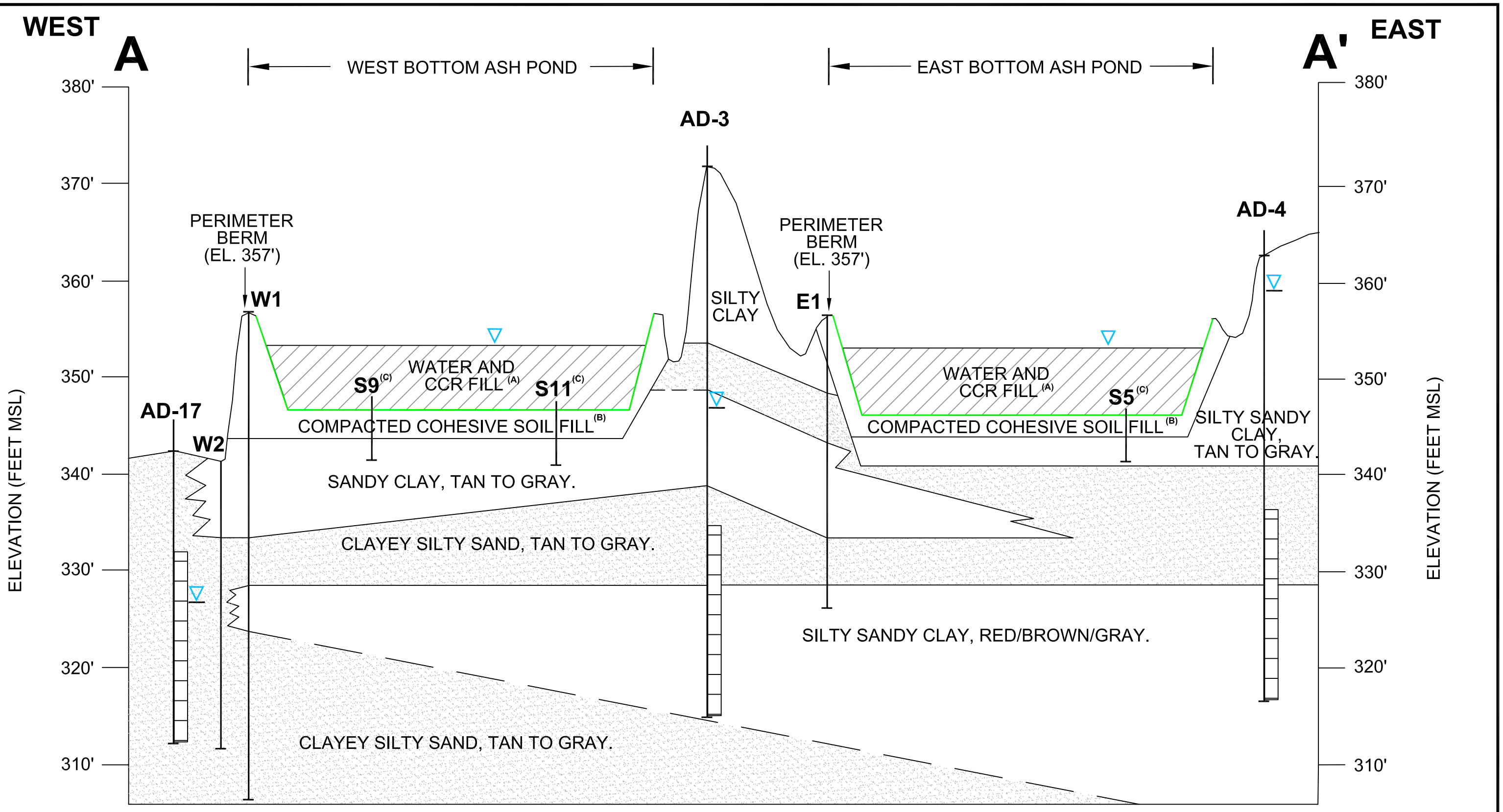
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

SITE LAYOUT AND WELL LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

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



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

WEST

B

EAST

B'

STACK OUT AREA

CCR

AD-16

AD-22

AD-33

AD-9 (PLUGGED)

SILTY CLAYEY SAND, DRY, VERY FINE GRAINED.

SILTY SANDY CLAY, RED TO BROWN.

CLAYEY SILTY SAND, BROWN TO GRAY, VERY FINE GRAINED.

ELEVATION (FEET MSL)

370'
360'
350'
340'
330'
320'

0 300'
HORIZONTAL SCALE

LEGEND

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

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

WEST

C

LANDFILL

EAST

C'

370'

360'

350'

340'

330'

320'

310'

300'

290'

ELEVATION (FEET MSL)

AD-25

CLAYEY SAND

SANDY CLAY

LANDFILL
LOW-PERMEABILITY LINER
(CLAY, PVC, OR HDPE)

CCR FILL
(HEIGHT VARIES)

AD-8

R1

SILTY SANDY CLAY.

CLAYEY SILTY SAND.

SILTY SANDY CLAY.

CLAYEY SILTY SAND, BROWN TO GRAY.

M2A
(PLUGGED)

0 500'

HORIZONTAL SCALE

LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (1/20/16)

BASE OF CCR UNIT

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.

LR-1

AD-16

SILTY SANDY CLAY, TAN TO GRAY.

AD-27

SILTY CLAYEY SAND

AD-26

LANDFILL

LANDFILL RUNOFF POND (NON-CCR UNIT) (C)

CLAYEY SAND

SANDY CLAY, BROWN.

LANDFILL LOW-PERMEABILITY LINER (CLAY, PVC, OR HDPE)

CLAY, GRAY

AD-34

CLAY W/CLAYEY SAND STREAKS, ORANGE/BROWN.

AD-24

CLAY, GRAY

SANDY CLAY AND CLAYEY GRAVEL, GRAY.

CLAYEY SILTY SAND, BROWN TO GRAY, VERY FINE GRAINED.

BLACK LIGNITE

ELEVATION (FEET MSL)

360' 350' 340' 330' 320' 310' 300' 290' 280' 270'

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).

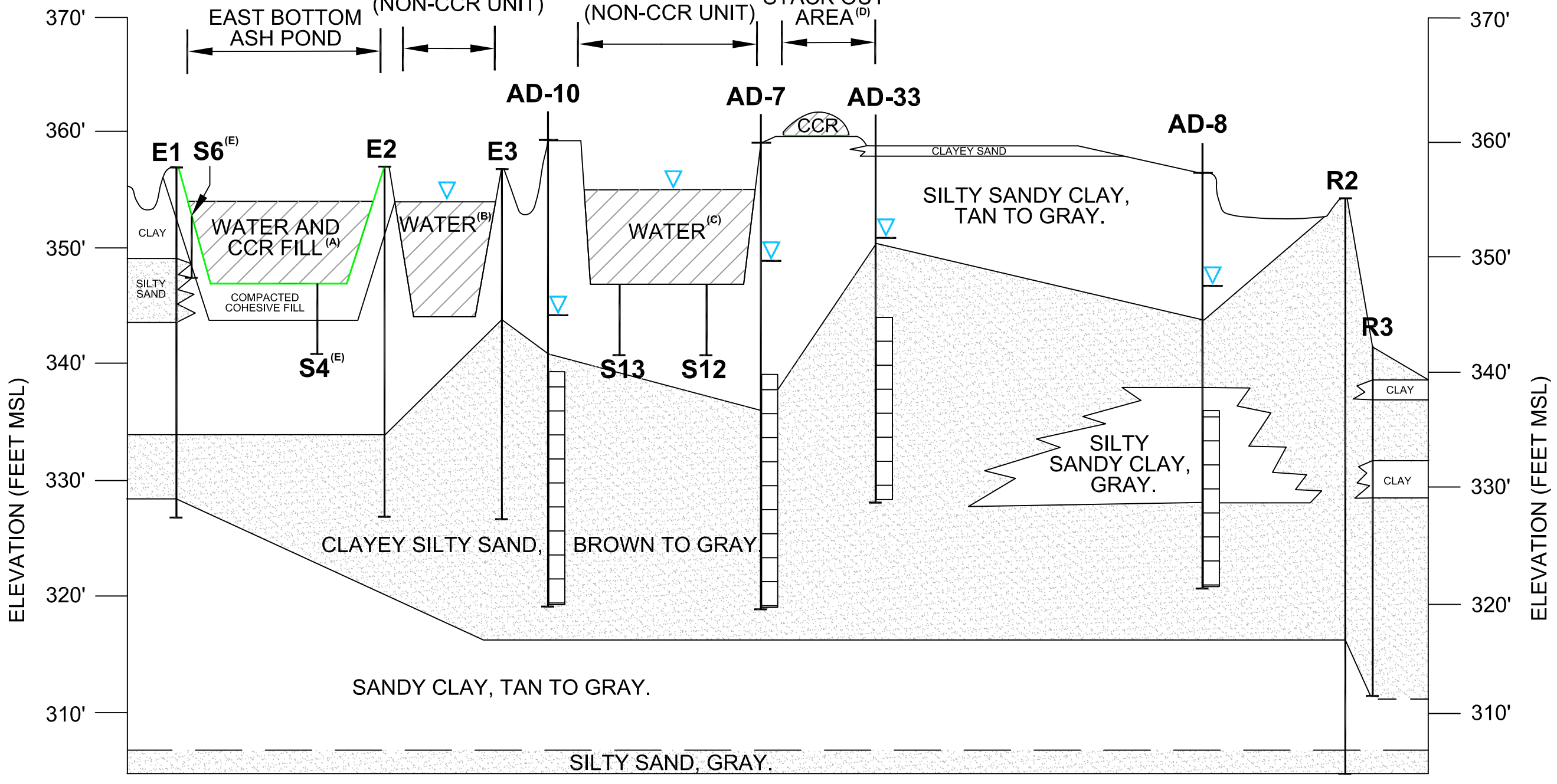
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION D - D'

ARCADIS

FIGURE 7

NORTH E — SOUTH E'



LEGEND

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

0 500'
HORIZONTAL SCALE

NOTES:

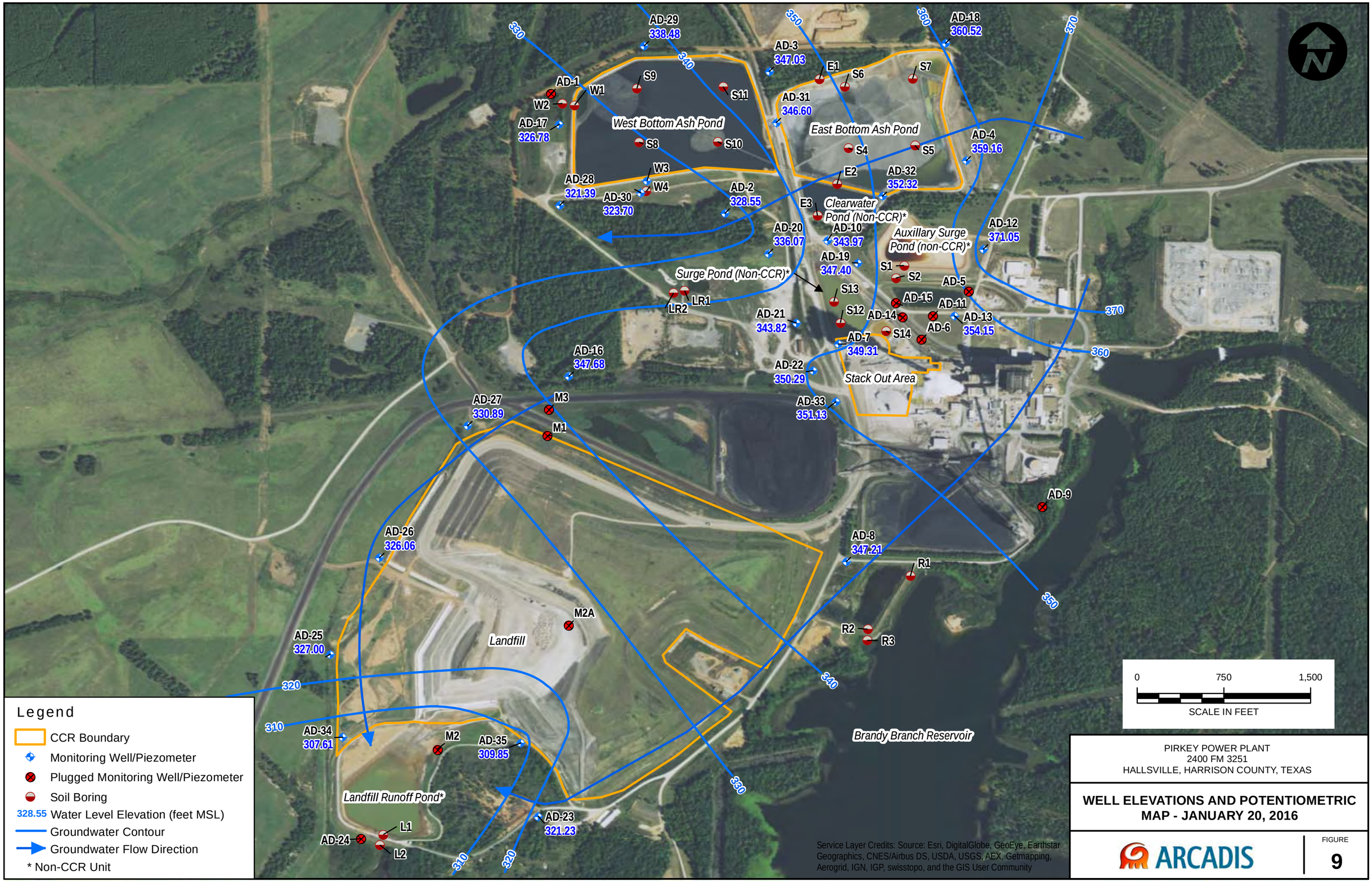
A) TOP OF EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) TOP OF CLEARWATER POND PERIMETER BERM ELEVATION IS 357',OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY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



Legend

- CCR Boundary
- Monitoring Well/Piezometer
- Plugged Monitoring Well/Piezometer
- Soil Boring
- 328.55 Water Level Elevation (feet MSL)
- Groundwater Contour
- Groundwater Flow Direction
- * Non-CCR Unit

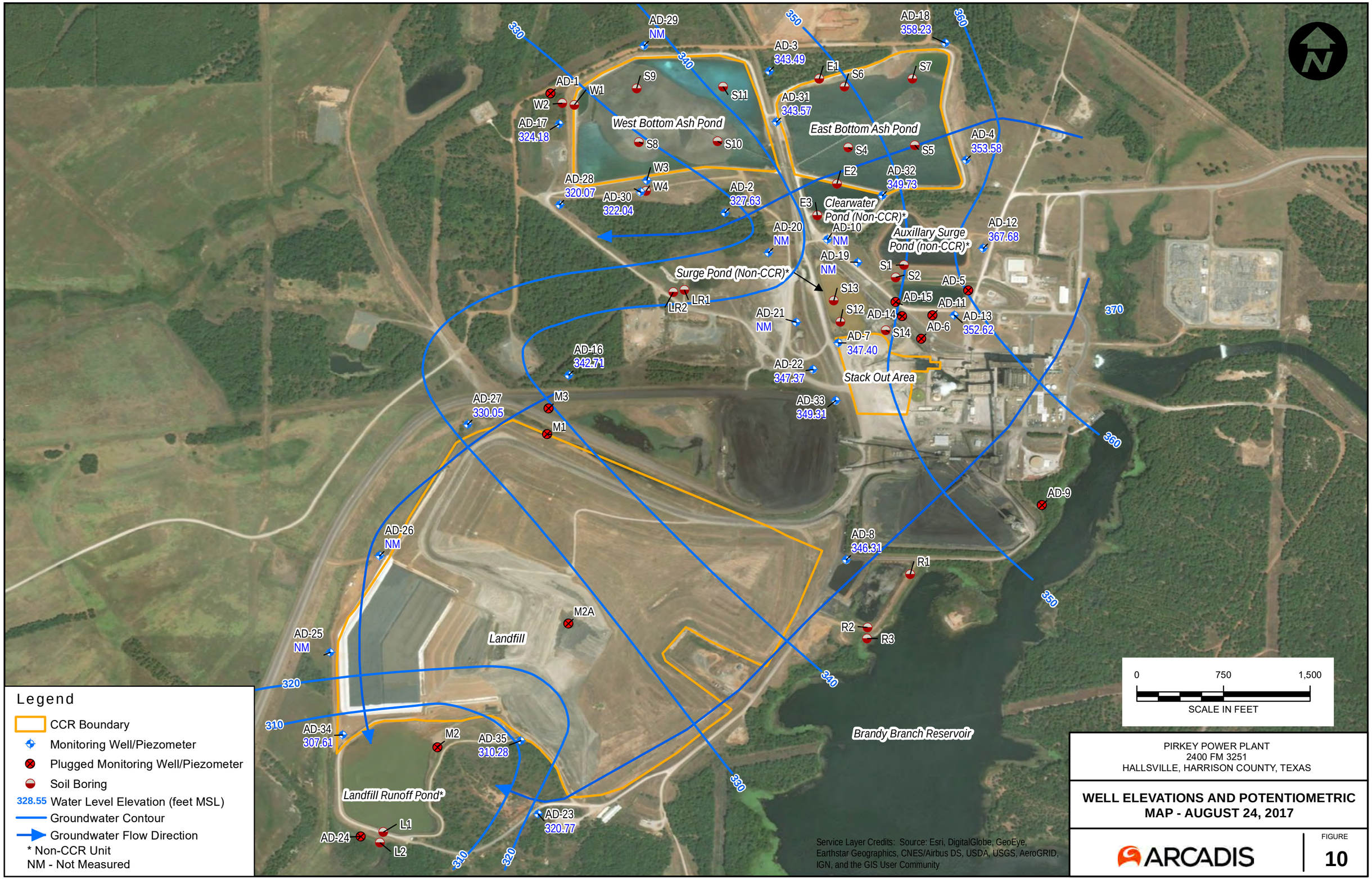
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

WELL ELEVATIONS AND POTENTIOMETRIC MAP - JANUARY 20, 2016

ARCADIS

FIGURE
9

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



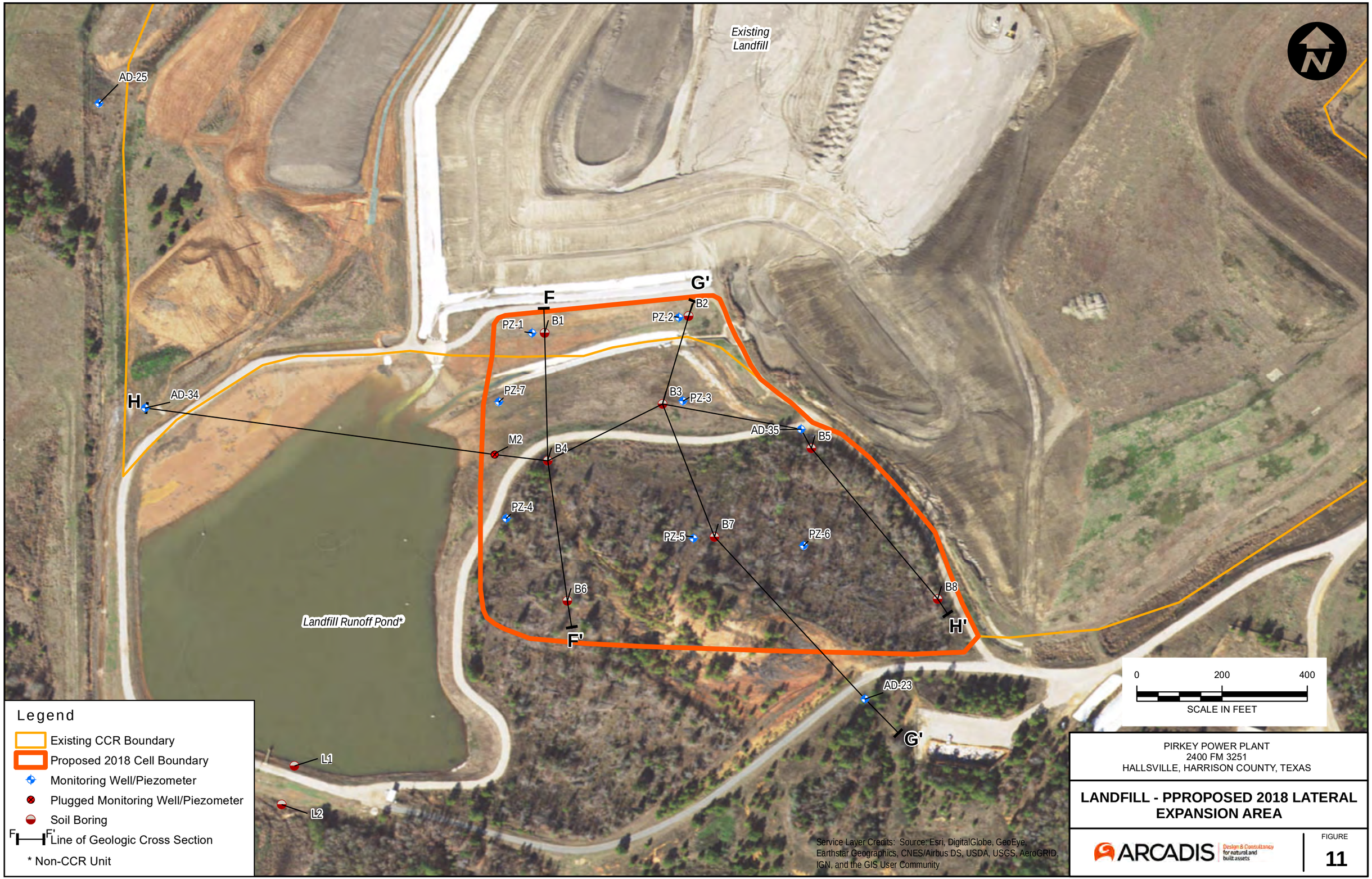
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

WELL ELEVATIONS AND POTENTIOMETRIC MAP - AUGUST 24, 2017

ARCADIS

FIGURE
10

Document Path: Z:\GISProjects_ENVVAEP\Pirkey Plant\MXD\Figure 10 - Well Elevations and Potentiometric Map - August 24, 2017.mxd



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

LANDFILL - PPROPOSED 2018 LATERAL EXPANSION AREA

ARCADIS Design & Consultancy for natural and built assets

FIGURE
11

Document Path: Z:\GISProjects_ENV\AEP\Pirkey Plant\MXD\Figure 11 - Landfill - 2018 Cell Expansion.mxd

NORTH

F

SOUTH

F'

PROPOSED 2018 LANDFILL LATERAL EXPANSION

ELEVATION (FEET MSL)

330'
320'
310'
300'
290'
280'
270'
260'

PZ-1
B-1
B-4
B-6

RED-BROWN AND GRAY, SANDY CLAY (FILL)

GRAY BOTTOM ASH (FILL)

CLAY

REDDISH BROWN TO GRAY CLAYEY AND SILTY SAND

GRAY AND DARK GRAY CLAY

LIGNITE AND CLAY WITH LIGNITE SEAMS

GRAY AND DARK GRAY CLAY WITH LIGNITE MATERIAL

0 100'
HORIZONTAL SCALE

LEGEND

MONITORING WELL /PIEZOMETER SCREENED INTERVAL

WATER LEVEL IN PIEZOMETER/MONITORING WELL (6/22/18)

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

CROSS SECTION F - F'

ARCADIS Design & Consultancy for natural and built assets

FIGURE **12**

NORTH

G

PROPOSED 2018 LANDFILL LATERAL EXPANSION

SOUTH

G'

ELEVATION (FEET MSL)

350'
340'
330'
320'
310'
300'
290'
280'
270'
260'

PZ-2
B-2
B-3
PZ-5
(PROJECTED)
B-7
AD-23

RED-BROWN SANDY CLAY (FILL)

GRAY BOTTOM ASH (FILL)

LIGHT RED AND TAN, CLAY AND SANDY CLAY

REDDISH BROWN TO GRAY CLAYEY SAND SILTSTONE AND SANDY CLAY

ORANGE BROWN TO GRAY SANDY CLAY

BLACK LIGNITE

VERY STIFF TO HARD GRAY CLAY

0 100'
HORIZONTAL SCALE

LEGEND

MONITORING WELL/PIEZOMETER SCREENED INTERVAL

WATER LEVEL IN PIEZOMETER/MONITORING WELL (6/22/18)

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

CROSS SECTION
G - G'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
13

WEST

H

LANDFILL RUNOFF POND
(NON-CCR UNIT)

PROPOSED 2018 LANDFILL LATERAL EXPANSION

EAST

H'

ELEVATION (FEET MSL)

340'
330'
320'
310'
300'
290'
280'
270'
260'

AD-34
B-4
M-2
PZ-3
B-3
AD-35
B-5
B-8

SAND
REDDISH BROWN TO GRAY CLAY
GRAY CLAY
REDDISH BROWN TO GRAY CLAYEY SAND AND SANDY CLAY
RED-GRAY AND BROWN CLAY AND SANDY CLAY
BROWN TO GRAY CLAY AND SANDY CLAY
LIGNITE AND CLAY WITH LIGNITE SEAMS
STIFF TO HARD GRAY CLAY
CLAYEY SAND

LEGEND

MONITORING WELL/PIEZOMETER SCREENED INTERVAL

WATER LEVEL IN PIEZOMETER/MONITORING WELL (6/22/18)

0 200'
HORIZONTAL SCALE

NOTE: 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 H - H'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
14

Existing Landfill

320
315
310
305
300

AD-25
AD-34
AD-35
311.03
AD-23
320.68
PZ-1
298.86
PZ-2
302.83
PZ-3
303.37
PZ-4
303.22
PZ-5
307.83
PZ-6
315.53
PZ-7
300.97
B1
B2
B3
B4
B5
B6
B7
B8
M2
L1
L2

Landfill Runoff Pond*

Legend

- Existing CCR Boundary
- Proposed 2018 Cell Boundary
- Monitoring Well/Piezometer
- Plugged Monitoring Well/Piezometer
- Soil Boring
- 303.22 Water Level Elevation (feet MSL)
- Groundwater Contour
- Groundwater Flow Direction
- * Non-CCR Unit

0 200 400
SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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

POTENTIOMETRIC SURFACE MAP
JUNE 22, 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
15

Document Path: Z:\GISProjects_ENV\AEP\Pirkey Plant\MXD\Figure 15 - Potentiometric Surface Map June 22_2018.mxd

EXISTNG 2012 LANDFILL CELL

EDGE OF EXISTING LANDFILL

EXISTING 100mil LANDFILL DITCH

DETAIL 5

HDPE LINER
ELEV.= 314'
WATER TABLE
ELEV. = 302.83'
SEPARATION
DISTANCE = 11.17'

PZ2

HDPE LINER
ELEV.= 313'
WATER TABLE
ELEV. = 298.86'
SEPARATION
DISTANCE = 14.14'

PZ1

60mil HDPE LINER

EXISTING 1993 LANDFILL CELL

PZ7

HDPE LINER
ELEV.= 311'
WATER TABLE
ELEV. = 300.97'
SEPARATION
DISTANCE = 10.03'

PROPOSED HDPE LINER GRADE

PZ3

HDPE LINER
ELEV.= 314'
WATER TABLE
ELEV. = 303.37'
SEPARATION
DISTANCE = 10.63'

AD-35

HDPE LINER
ELEV.= 322'
WATER TABLE
ELEV. = 311.03'
SEPARATION
DISTANCE = 10.97'

DETAIL 2

PROPOSED 15' WIDE ACCESS ROAD

PHASE 1 CONTACT STORMWATER DITCH

DETAIL 4

DETAIL

PROPOSED PERIMETER NON-CONTACT STORMWATER BYPASS DITCH 12' WIDE BOTTOM W/ 3:1 SIDE SLOPES

PZ4

HDPE LINER
ELEV.= 311'
WATER TABLE
ELEV. = 303.22'
SEPARATION
DISTANCE = 7.78'

PZ5

HDPE LINER
ELEV.= 321'
WATER TABLE
ELEV. = 307.83'
SEPARATION
DISTANCE = 13.17'

PZ6

HDPE LINER
ELEV.= 325'
WATER TABLE
ELEV. = 315.53'
SEPARATION
DISTANCE = 9.47'

EDGE OF EXISTING LANDFILL

EXISTNG LANDFILL POND

2' DEEP CONTACT WATER DITCH TO LANDFILL POND

DETAIL 3

2018 LANDFILL EXPANSION - FINISHED GRADE OF HDPE LINER GRADING PLAN
SCALE 1" = 50'

TEXAS ONE CALL SYSTEM 1-800-245-4545 STOP-CALL BEFORE YOU DIG!

N

0 50' 100'
1"=50'

GENERAL NOTES

LEGEND

- PIEZOMETER
- MONITORING WELL
- 312 — PROPOSED HDPE LINER ELEVATION (FEET AMSL)

REFERENCE DRAWINGS

SHEETS 1-3494 TO 1-3495
ALL SECTION VIEWS ARE SHOWN ON THESE SHEETS

SHEETS 1-3496 TO 1-3498
LEACHATE PIPE FLOWPATH

NOTES:

1. WATER TABLE ELEVATIONS MEASURED 6/22/18
2. SEPARATION DISTANCE BETWEEN HDPE LINER AND UPPERMOST AQUIFFER SHOWN IN FEET.

2018 LANDFILL LATERAL EXPANSION PROPOSED HDPE LINER ELEVATIONS

2018 LF EXPANSION FINISHED GRADE OF HDPE LINER GRADING PLAN

DWG NO: 1-3491

SCALE: AS SHOWN

DR:
CH:
SUP:
ENG:
DATE: APR,13

APPROVED BY

FIGURE 16

THIS DOCUMENT IS RELEASED FOR REVIEW PURPOSES **ONLY** UNDER THE AUTHORITY OF LANDON COLE ALLEN, P.E. 119170 ON SEPTEMBER 12, 2018. IT IS **NOT** TO BE USED FOR CONSTRUCTION. A CERTIFIED PLAN SET WILL BE ISSUED PRIOR TO CONSTRUCTION.

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AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

U.S. Fish and Wildlife Service
National Wetlands Inventory

National Wetlands Inventory Map

September 13, 2018

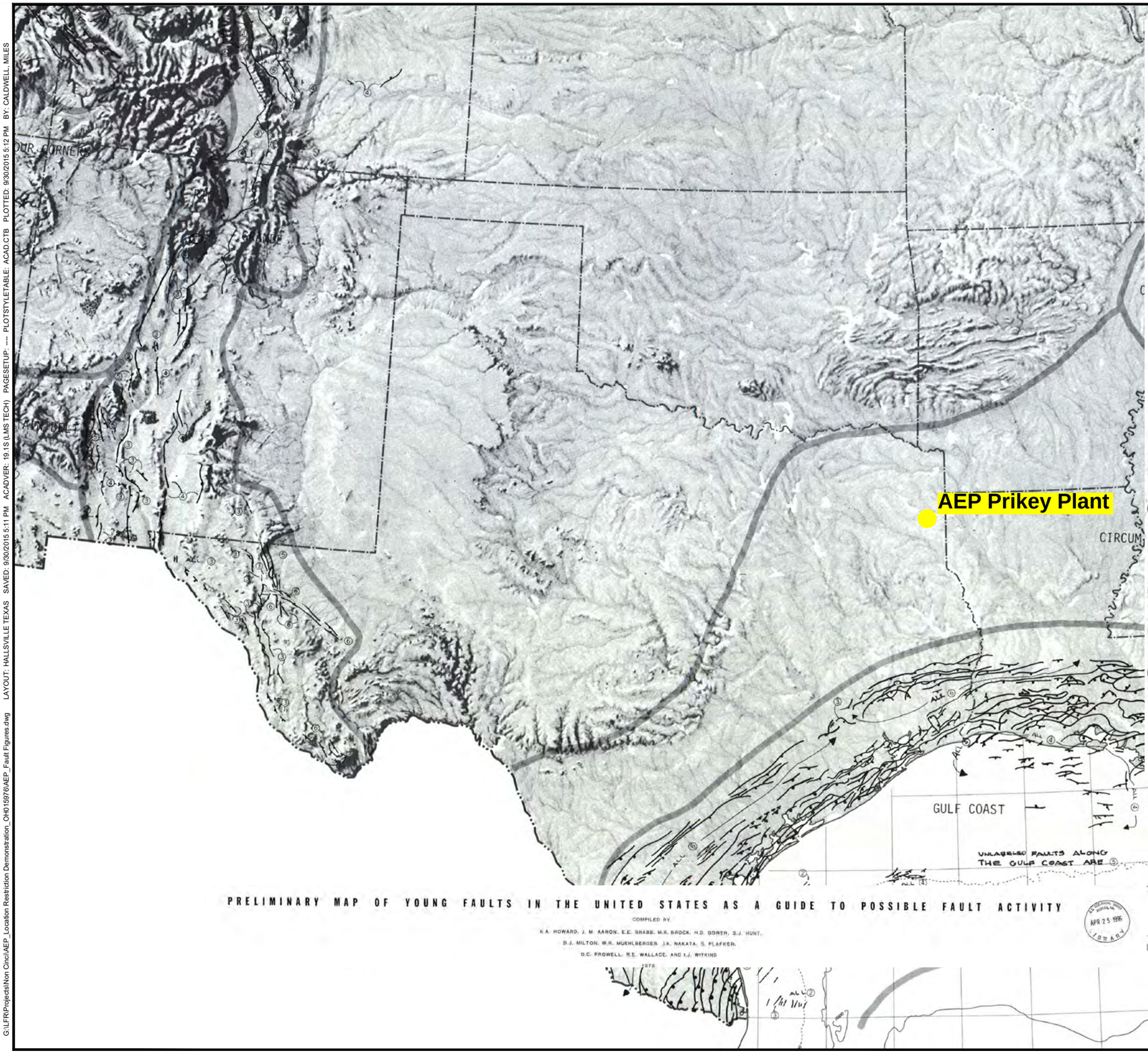
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

FIGURE 17



EXPLANATION

FAULTS

- Ball on downthrown side
- Sawteeth on upper plate of thrust fault
- Arrows show sense of lateral displacement
- Suspected fault
- Fault, strike unknown

AGE OF YOUNGEST KNOWN DISPLACEMENT

1. Historic
2. Holocene—Approximately the last 10,000 years
3. Late Quaternary—Approximately the last 500,000 years
4. Quaternary—Approximately the last 1.8 million years
5. Late Cenozoic—Approximately the last 15 million years
6. Other—Longer time span than late Cenozoic

Boundary of fault region

0 40 80MI

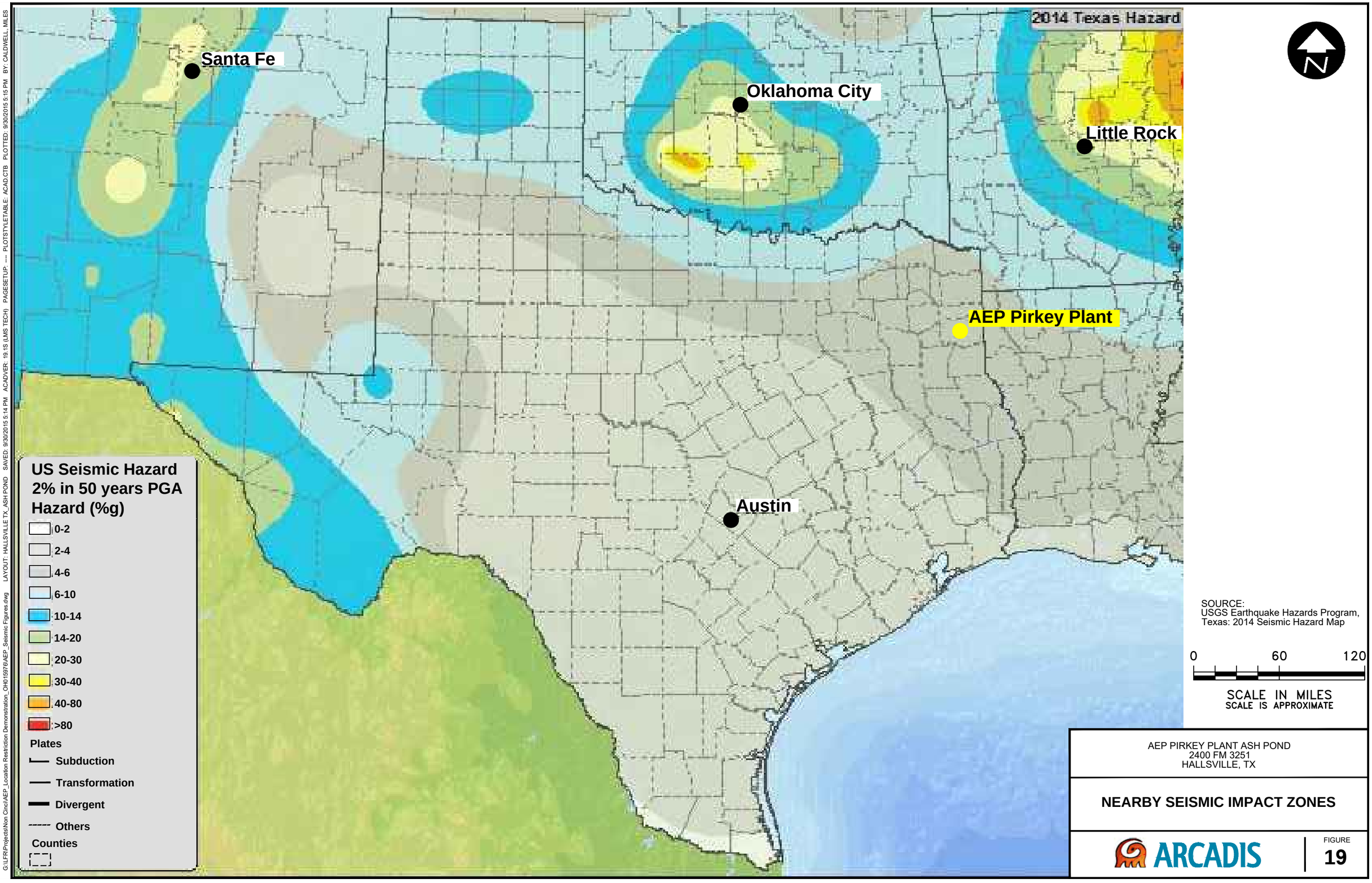
SCALE IN MILES
SCALE IS APPROXIMATE

AEP PIRKEY PS GENERATING PLANT
2400 FM 3251
HALLSVILLE, TEXAS

NEARBY FAULT LOCATIONS

ARCADIS

FIGURE
18



AEP PIRKEY PLANT ASH POND
2400 FM 3251
HALLSVILLE, TX

NEARBY SEISMIC IMPACT ZONES

ARCADIS

FIGURE
19

Appendix A

Boring/Well Construction Logs

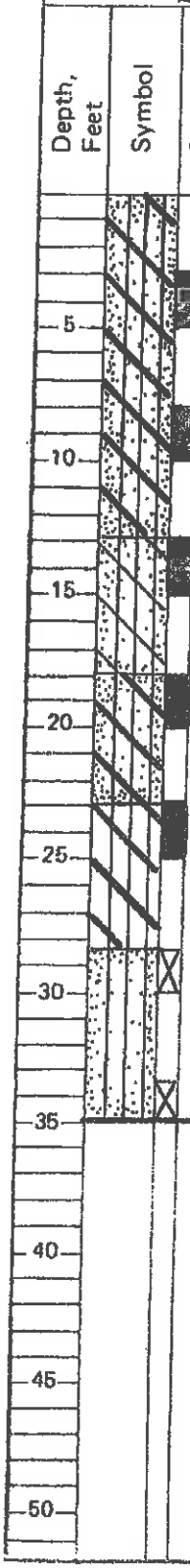
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-8
LOCATION: Hallsville

Date: 10-4-83 Type: Auger Ground Elevation:



Legend:
■ Sample X Penetration ▼ Water

Description of Stratum
Stiff tan silty sandy clay w/iron ore
Stiff tan and grey silty sandy clay w/iron ore
Firm tan and grey clayey silty sand
Medium tan and grey very silty sandy clay w/iron ore
Very stiff grey silty clay lenses
43-7=5½" 50 B/5½"
Very dense tan and grey silty sand 50 B/5½"
Bottom of boring at 35 feet.

APEX PROJECT NO.: 110-089 ☐ BORING BORING NUMBER: ____ ■ MONITOR WELL MONITOR WELL NUMBER: AD-16

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°27.680' Datum: WGS-84 WELL LOCATION: North of Mine Haul Road
LONGITUDE: W94°29.642'

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1 2				0-2 SM	Silty sand, very fine grained, light brown	None	Dry
3 4 5 6 7 8				2-8 CL	Sandy clay, yellowish brown, reddish brown -some iron oxide concretions at 2.5' -light gray at 5'	None	Dry
9 10				8-10 CL	Clay, red, light yellowish brown, gray, fat, hard, some very fine laminated sand seams	None	Dry
11				10-11 CL	Sandy clay, red, light gray, yellowish brown, stiff to hard	None	Dry
12 13 14				11-14.25 CL	Clay, yellowish brown, some sand, reddish brown, light gray, hard -clayey sand seam at 14-14.25', yellowish brown, light gray	None	Dry Moist
15 16 17 18				14.25-18 CL	Sandy clay, red, light gray, gray, very thin sand lenses interbedded in clay	None	Moist to V. Moist
19 20 21 22 23 24 25 26 27 28 29 30 31 32			▽	18-29.5 CL	Clay, reddish gray, light gray, yellowish brown, hard, gray -2" reddish brown iron oxide cemented sand laminations at 19.75' -very moist, 1" gravelly sand lense, very fine gypsum crystals at 21' -sandy 22', 22.5', 24' -gray, yellowish brown at 24-24.5' - dark gray, very fine gypsum crystals, trace sand, hard, dry, at 25'	None	Moist V. Moist Dry
33 34 35				32-35 SC	Clayey sand, greenish gray, light gray, some very fine gypsum crystals, dense	None	Moist
36 37 38 39 40					Boring Terminated at 35'		

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 35 feet
Filter Sand (Size/Interval): 13-35'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-13'
Surface Completion ☐ Flush ■ Above Ground

Riser Interval: +3 (ags)-15'
Screen Interval: 15-35'
Water level: 23.37'
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-23

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

FACILITY ADDRESS: Hallsville, Texas

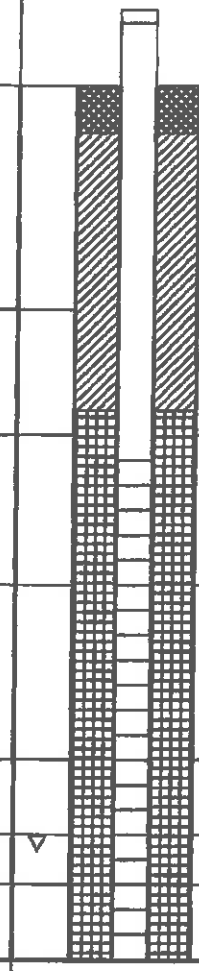
DRILLING COMPANY/METHOD/RIG: Apex Geoscience Inc. / Hollow-stem Augers/ CME-55 Track Rig

DRILLER: Ed Wilson, Apex Geoscience Inc. COMPLETION DATE: 12/15/2010

PREPARED BY: David Bedford LOGGED BY: David Bedford

LATTITUDE: N 32°27'03.3" Datum: WGS-84 WELL LOCATION: ____
LONGITUDE: W94°29'41.3"

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1-9			0-9	SC	Clayey sand, brown, with yellowish brown and orangish brown laminations, very fine grained, very silty, few light gray clay streaks	None	Moist
10-14			9-14	ML	Siltstone with light gray clay streaks, light gray with orangish brown streaks, few small iron ore pebbles	None	Moist
15-20			14-20	SM	Sand, light gray with orangish brown streaks, very silty, very fine grained, few clay laminations	None	Slightly Moist
21-27			20-27	ML	Siltstone, light gray with orangish brown streaks	None None	Very Moist V. Moist
28-30			27-30.5	SM	Sand, light brown mottled with orangish brown, very fine grained, very silty	None	Wet
31-32			30.5-31.5	SC	Slightly sandy clay, orangish brown mottle with orangish brown, silty, very fine grained (30-31.5')	None	Moist
33-35			31.5-35	CL	Lean clay, dense, small sandy streaks, dark gray, very fine grained (31.5-35')	None	Moist
36-40					Boring Terminated at 35'		



Cement Bentonite Filter Sand Water Level

Apex geoscience inc.

Total Depth: 35 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: 30.83
Surface Completion Flush ☐ ■ Above Ground 3'

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

☐ BORING ■ MONITOR WELL

APEX PROJECT NO.: 110-089 BORING NUMBER: ____ MONITOR WELL NUMBER: AD-24

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: 12/27/2010

PREPARED BY: Jeff Sammons LOGGED BY: Jeff Sammons

LATTITUDE: N 32°27.024' Datum: WGS-84 WELL LOCATION: South of LF pond dam

LONGITUDE: W94°29.940'

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1 2			0-1.5	SM	Silty sand, very fine grained, some clay, brown and reddish brown, medium dense	None	Moist
3 4 5 6			1.5-6.5	SC	Clayey sand, silty, gray, yellowish brown, reddish brown, very fine grained, dense -some iron oxide concretions and gravel at 5-6', trace organic matter at 6', gray, dark gray, reddish brown, loose to med. dense	None	Dry Moist
7 8 9 10 11 12 13 14 15 16			6.5-16	SM	Silty sand, very fine grained, red, loose, trace clay -some gravel at 10' -hard cemented sandstone with iron oxide at 11' - some clay at 15-16', medium dense, gray, dark gray	None	Saturated Moist
17 18 19 20			16-20	Lignite	Lignite, black, loose, saturated at 16-17' - medium dense, moist at 17-20'	None	Saturated
21 22 23 24 25 26 27 28 29 30					Boring Terminated @ 20'		

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 20 feet Riser Interval: +3 (ags)-5'

Filter Sand (Size/Interval): 3-20' Screen Interval: 5-20'

Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-3' Water level: 8.4

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-25

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: 12/14/2010

PREPARED BY: David Bedford LOGGED BY: David Bedford

LATTITUDE: N 32°27'17.2" Datum: WGS-84 WELL LOCATION: S. of Diesel ASTs
LONGITUDE: W94°29'59.1"

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1			0-1.5	SC	Clayey sand, brown, silty, very fine grained, moist	None	Moist
2			1.5-7	CH	Fat sandy clay, orangish brown, very fine grained, moist	None	Moist
3							
4							
5							
6							
7							
8			7-30	SC	Clayey sand, orangish brown mottled with dark gray, very fine grained, few light gray clay inclusions	None	Moist
9							
10							
11							
12							
13							
14		▽			Wet @ 14'		Wet
15							
16					15-20' - few pieces of dark gray cystalline rock		
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32					Boring Terminated at 30'		
33							
34							
35							

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 30 feet Riser Interval: +3 (ags)-10'
Filter Sand (Size/Interval): 8-30' Screen Interval: 10-30'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-8' Water level: 12.69'
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-26

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: 12/14/2010

PREPARED BY: David Bedford | LOGGED BY: David Bedford

LATTITUDE: N 32°27'25.3" Datum: WGS-84 | WELL LOCATION: By silt fence and plastic lined trench

LONGITUDE: W94°29'54.8"

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1				0-1 SC	Slightly clayey sand, light brown, very fine grained, silty	None	Moist
2				1-3 CL	Sandy clay, lean, very fine grained, reddish brown	None	Moist
3							
4				3-5 CL	Lean, slightly sandy clay with clayey sand streaks, orangish brown, small coal pieces, very fine grained	None	Moist
5							
6				5-7 SC	Clayey sand, orangish brown, very fine grained, brown clay inclusions	None	Moist
7							
8				7-14 CL	Lean clay, orangish brown mottled with brown/light gray clayey sand streaks, very fine grained, few coal pieces	None	Moist
9							
10							
11							
12							
13							
14							
15				14-28 SC	Clayey sand, dark brown with orangish brown streaks, very fine grained, coal pieces	None	Slightly Wet
16							
17							
18							
19							
20			▽				Wet
21					20-22' - Large clay inclusions, brown		
22							Very Moist
23							
24							
25							
26					Wet from 25-26'		
27							
28							
29				28-30 CL	Lean clay, light gray with orangish brown streaks, few small sandy streaks, very fine grained	None	V. Moist
30							
31				30-32 SC	Clayey sand, light black, very fine grained, small pieces mica Wet from 30-30.5'	None	Wet Moist
32							
33				32-40 CL	Lean clay, orangish brown, small clayey sand streaks, very fine grained, brown streaks	None	Moist
34							
35							Slightly Wet
36							
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)-10'

Filter Sand (Size/Interval): 8-40' | Screen Interval: 10-40'

Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-8' | Water level: 19.45'

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-27

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: 12/15/2010

PREPARED BY: David Bedford LOGGED BY: David Bedford

LATTITUDE: N 32°27'36.8" Datum: WGS-84 WELL LOCATION: By corner lined ditch
LONGITUDE: W94°29'47.3"

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1 2			0-2	SC	Clayey sand, orangish brown with dark gray laminations, very fine grained	None	Slightly Moist
3 4 5 6 7 8 9 10 11 12 13 14 15			2-15.5	CL	Lean clay, dense, few thin sandy streaks, reddish orange, very fine grained, mottled with light brownish gray Orange to brown with orangish brown streaks, at 10' becomes brittle	None	Slightly Moist
16 17 18 19 20 21 22 23			15.5-23	SC	Clayey sand, greenish brown with orangish brown streaks, few thin tan clay streaks, very fine grained	None	Moist
24			23-24	SM	Sand, orangish brown, silty, very fine grained	None	Wet
25 26 27		▽	24-27	CH	Fat clay, brown with orangish brown streaks, many sandy streaks, very fine grained	None	Very Moist
28 29 30			27-30	SM	Sand, greenish gray with orangish brown streaks, very fine to fine grained, wet	None	Wet
31 32 33 34 35 36 37			30-37.5	SC	Clayey sand with clay streaks, light greenish black, very fine grained Wet red brittle shale from 35-35.2	None	Slightly Wet
38 39 40					Boring Terminated at 37.5'		

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 40 feet Riser Interval: +3 (ags)-17.5'
Filter Sand (Size/Interval): 15.5-37.5' Screen Interval: 17.5-37.5'
Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-15.5' Water level: 26.73'
Surface Completion ☐ Flush ■ Above Ground 3'

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

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-34

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:	307.61 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 27' 10.13" LONGITUDE 94 29' 57.93"

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	WELL CONSTRUCTION
		-4 to -1							Locking Well Casing Cover; Locking Well Cap; Protective Well Casing
CLAYEY SAND: very fine to fine sand, some silt, reddish brownish, light reddish brown, light gray, moist	SC	0 to 1							Concrete Pad; Ground Surface; Cement
FAT CLAY: trace sand and silt, some iron oxide concretions, dark reddish brown, reddish brown, and and light gray, moist	CH	2 to 3		31	89	63	23	40	Bentonite
- some silt and very fine to fine sand at 5', light gray, light reddish brown, and light yellowish brown, moist to very moist		4 to 5							
SANDY LEAN CLAY: some very fine to fine sand, dark gray, moist	CL	6 to 9							2" Sch. 40 PVC Riser
- reddish brown, dark reddish brown, dark gray, light gray at 10' to 12.5'		10 to 12							
			▽	23	64	26	18	8	
SILTY SAND: very fine to fine sand, some clay, gray and dark gray, saturated	SM	13 to 15							
				22	29	25	NP	-	20/40 Silica Sand
- increasing clay content with depth		16 to 18							0.010" Slotted Sch. 40 PVC Well Screen
FAT CLAY: trace sand and silt, gray, moist	CH	19 to 20							
				23	90	55	27	28	
CLAYEY SAND: fine to very fine sand, dark gray, moist to very moist	SC	21 to 25							PVC Bottom Cap

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

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-35

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.:	50089
RIG TYPE:	Geoprobe 3230DT
METHOD OF DRILLING:	Hollow Stem Auger
SAMPLING METHODS:	Split Core
SURFACE ELEVATION:	318.95 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 27' 9.64" LONGITUDE 94 29' 42.74"

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, some iron ore gravel, reddish brownish, dark reddish brown, yellowish brown, gray, moist	SC	0–2		13	46	32	15	17
SILTY SAND: very fine to fine sand, trace clay, trace iron ore gravel, light reddish brown, moist, increasing moisture content with depth	SM	2–5		12	26	16	NP	
- saturated at 10' to 11'		10	▽					
CLAYEY SAND: very fine to fine sand, trace iron ore gravel, light reddish brown, very moist - thin seams of saturated very fine sand with trace of clay at 12.25' to 12.5' - light reddish brown and light gray, moist to very moist at 12.5' to 15'	SC	11–15		19	33	31	18	13
LEAN CLAY: intebedded clays and silts with laminations of very fine sand, light gray, gray and light reddish brown, moist to very moist	CL	15–18		21	93	34	20	14
- thin lenses of very moist very fine sand and partially cemented very fine sand at 17.5' and 18', reddish brown		18–20						

WELL CONSTRUCTION

- Locking Well Casing Cover
- Locking Well Cap
- Protective Well Casing
- Concrete Pad
- Ground Surface
- Cement
- 2" Sch. 40 PVC Riser
- Bentonite
- 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.

LOG OF BORING

852164
PROJECT: Monitoring Well Instllation
CLIENT: Southwestern Electric Power Company

BORING NO.: M-1
LOCATION: Hallsville, TX
S 12+32.79; W 35+34.55

Date: 1/29/86 Type: Rotary Ground Elevation: 337.67

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Brown and tan sandy clay
10			Brown and tan sandy clay w/iron ore
15			Brown and tan sandy clay w/iron ore
20			Gray silty sand
25			Gray silty sand
30			Gray silty sand
35			Bottom of Boring at 30 feet. Water encountered at 10 feet.
40			
45			
50			

SOUTHWESTERN LABORATORIES

LOG OF BORING

852164

PROJECT: Monitoring Well Installation
CLIENT: Southwestern Electric Power Company
BORING NO.: M-2
LOCATION: Hallsville, TX
S 38+86.22; W 45+76.41

Date: 1/29/86 Type: Rotary Ground Elevation: 302.19

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Brown silty sand w/iron ore
10			Brown silty sand w/iron ore
15			Brown and gray silty sand
20			Gray silty sand
25			Gray silty sand
30			Bottom of Boring at 27 feet. Water encountered at 11 feet.
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

LOG OF BORING

852164
PROJECT: Sludge Disposal Area
CLIENT: Southwestern Electric Power Company

BORING NO.: M. 2A
LOCATION: Hallsville, TX

Date: 6/20/85 Type: Auger Ground Elevation: 308.40

Legend: ■ Sample X Penetration

Plant Site Coordinates: South S 27+55.45 West W 36+47.44

▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
5			Red-brown clayey sand
10			Gravel
15		■	Gray clayey silty sand
20		■	Gray silty sand
25			Bottom of Boring at 22 feet. Water encountered at 12 feet. Bottom of Casing at 22 feet. Screen length 15 feet.
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

Log of Boring

Number: M-3

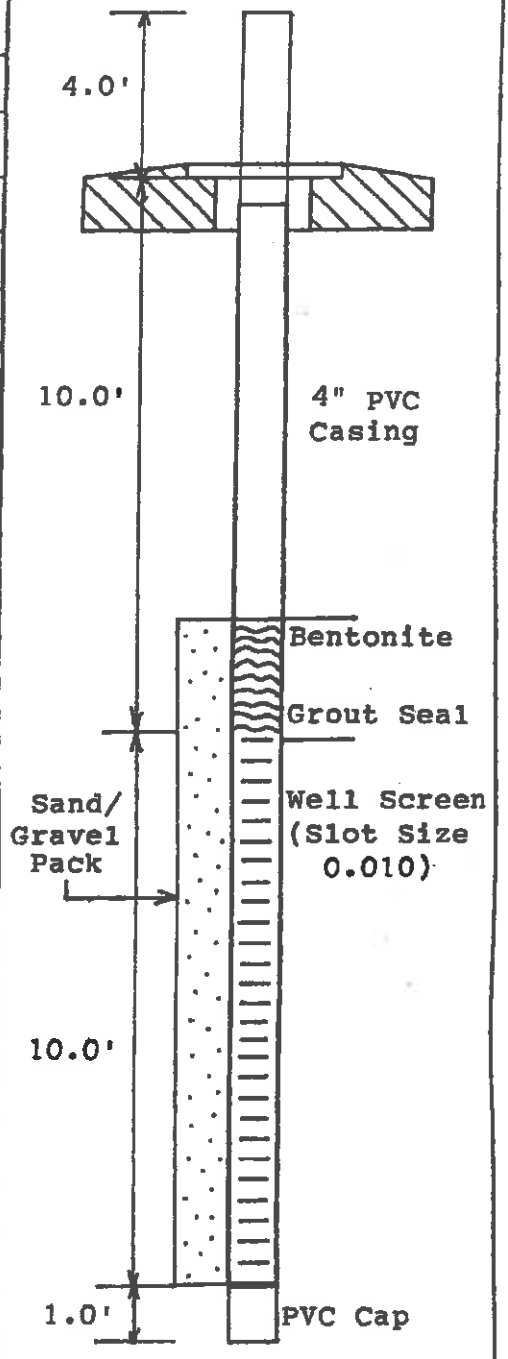
Location: Harrison Co., miles SW Marshall City Ha

Project: New Monitor Well Installation, H.W. Pirkey Power Plant

Type: Groundwater Monitor Well

Surface Elevation: 275.0'

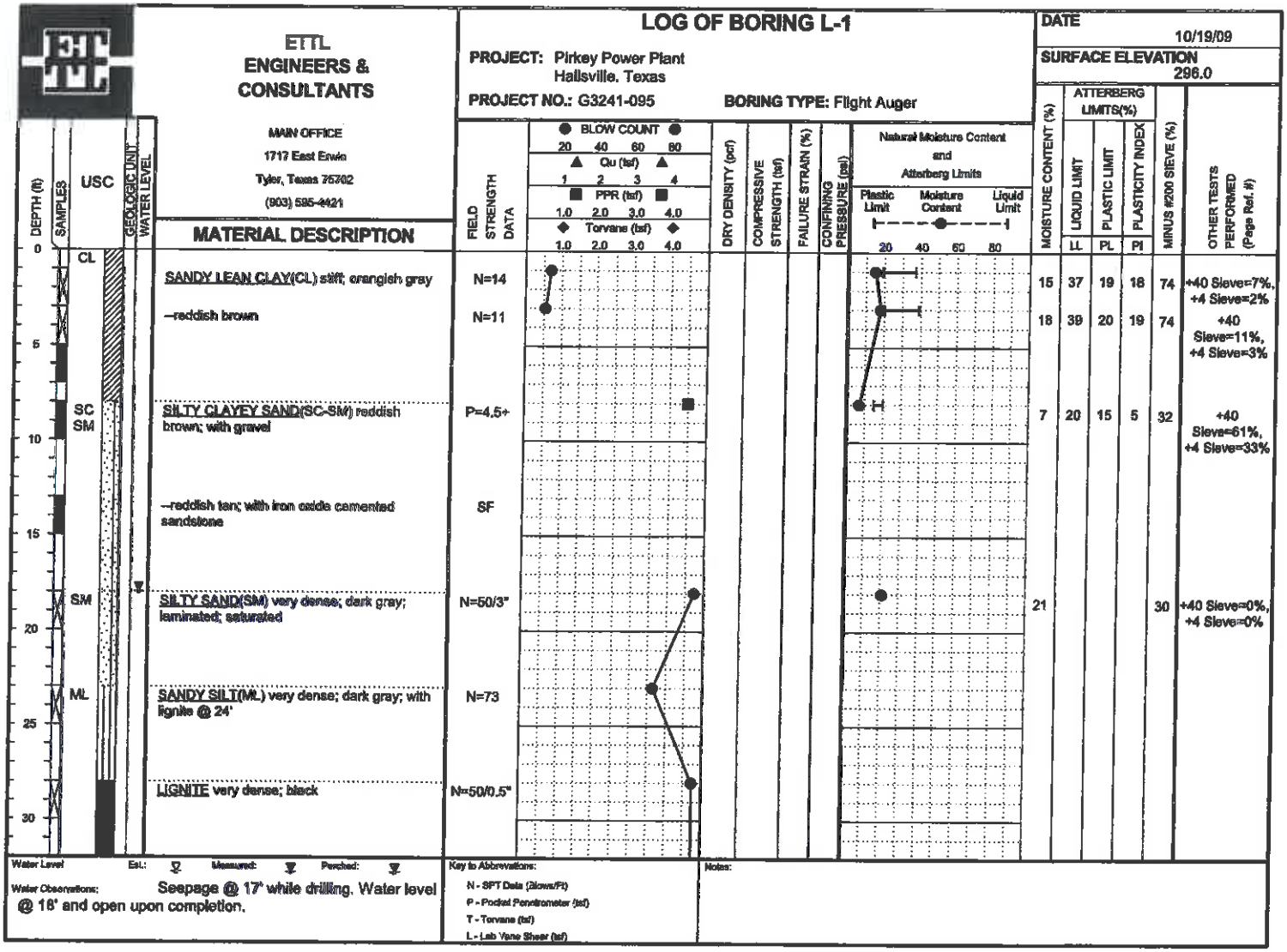
Depth (Feet)	Samples	Hand Penetrometer (Tons/Sq. Ft.)	Standard Penetration (Blows/Foot)	STRATUM DESCRIPTION
				Sod
				Brown Silty Clay
5				Brown Silty Sandy Clay
				Red & Gray Silty Clay
10				
15				Lignite
				Tan Silty Sandy Clay
20				
25				



Completion Depth: 20'

Date: 7-1-93

Water Observations: Water Encountered at 10.0'



ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING L-1

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095 **BORING TYPE:** Flight Auger

DATE 10/19/09

SURFACE ELEVATION 296.0

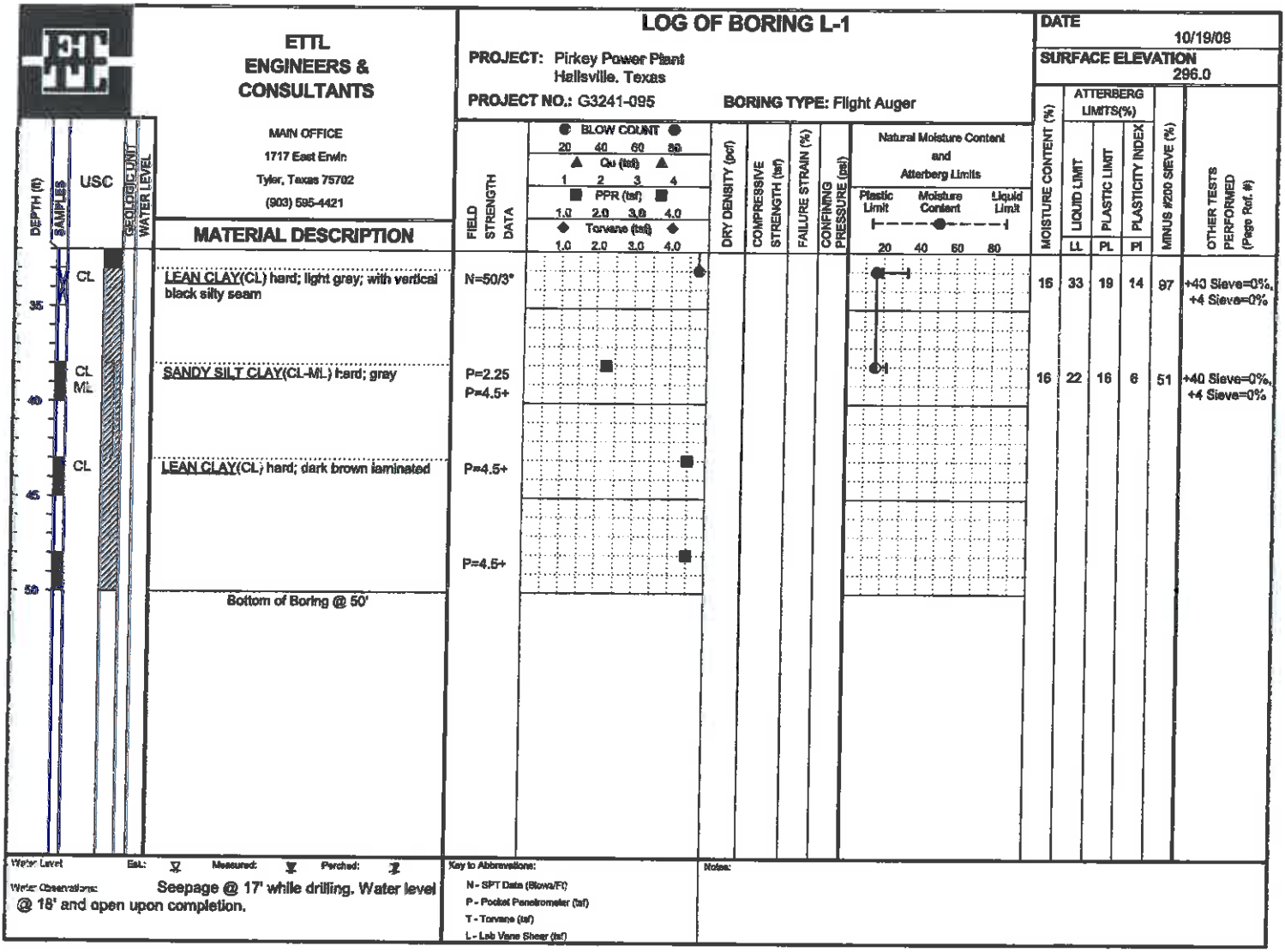
DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			SANDY LEAN CLAY(CL) stiff; orangish gray	N=14	15	37	19	18	74	+40 Sieve=7%, +4 Sieve=2%
5					--reddish brown	N=11	18	39	20	19	74	+40 Sieve=11%, +4 Sieve=3%
10		SC SM			SILTY CLAYEY SAND(SC-SM) reddish brown; with gravel	P=4.5+	7	20	15	5	32	+40 Sieve=61%, +4 Sieve=33%
15					--reddish tan; with iron oxide cemented sandstone	SF						
20		SM			SILTY SAND(SM) very dense; dark gray; laminated; saturated	N=50/3"	21				30	+40 Sieve=0%, +4 Sieve=0%
25		ML			SANDY SILT(ML) very dense; dark gray; with lignite @ 24'	N=73						
30					LIGNITE very dense; black	N=50/0.5"						

Water Level — Est.: ▽ Measured: ▼ Perched: ▽

Water Observations: Seepage @ 17' while drilling. Water level @ 16' and open upon completion.

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

Notes:



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

LOG OF BORING L-1

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095 **BORING TYPE:** Flight Auger

DATE 10/19/09

SURFACE ELEVATION 296.0

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35		CL			LEAN CLAY(CL) hard; light grey; with vertical black silty seam	N=50/3"	16	33	19	14	97	+40 Sieve=0%, +4 Sieve=0%
40		CL ML			SANDY SILT CLAY(CL-ML) hard; gray	P=2.25 P=4.5+	16	22	16	6	51	+40 Sieve=0%, +4 Sieve=0%
45		CL			LEAN CLAY(CL) hard; dark brown laminated	P=4.5+						
50					Bottom of Boring @ 50'	P=4.5+						

BLOW COUNT 20 40 60 80
Qu (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

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

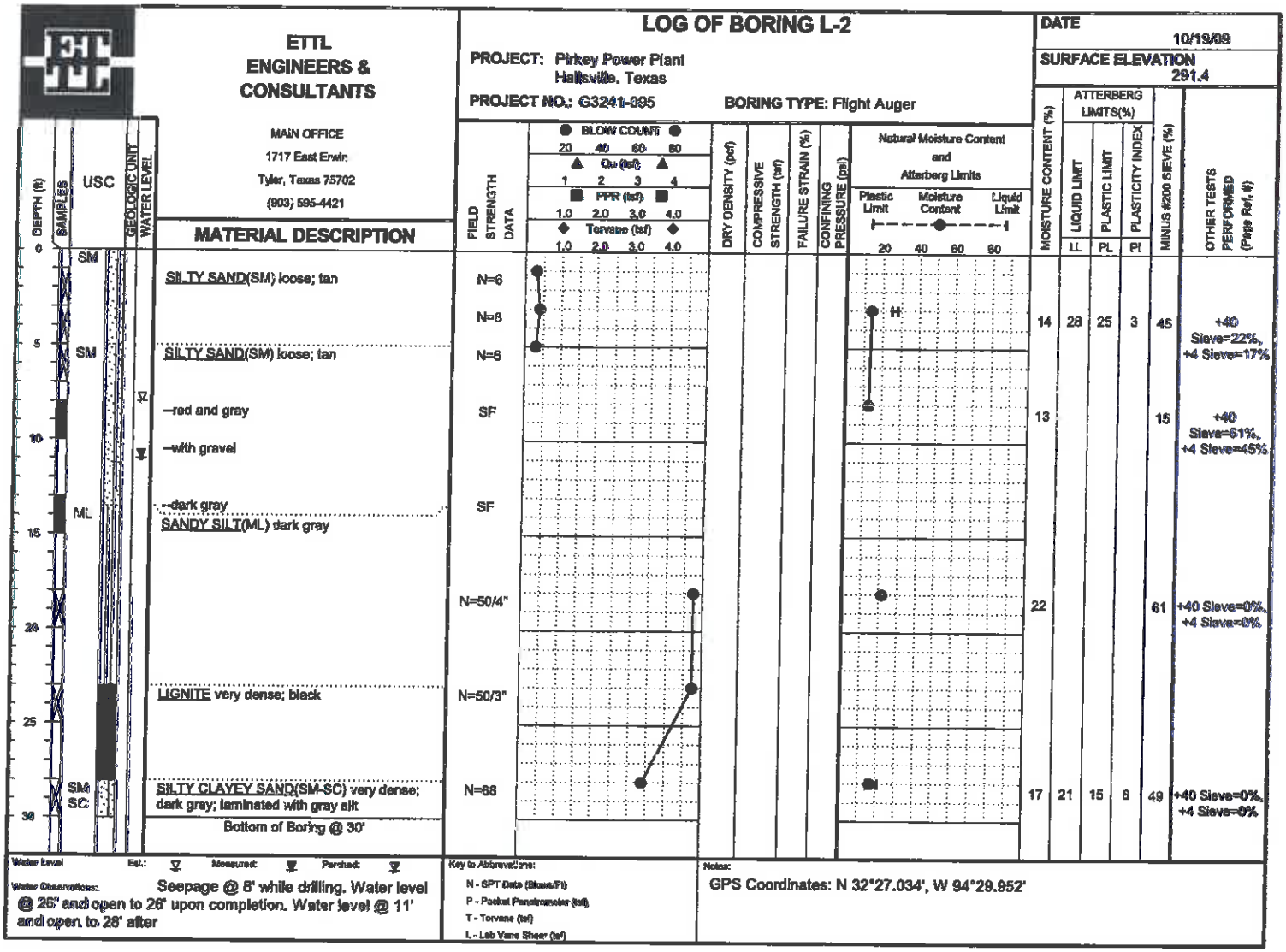
Natural Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
20 40 60 80

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 17' while drilling. Water level @ 18' and open upon completion.

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

Notes:



LOG OF BORING L-2

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095 **BORING TYPE:** Flight Auger

DATE 10/19/09

SURFACE ELEVATION 291.4

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SM			SILTY SAND(SM) loose; tan	N=6						
						N=8	14	28	25	3	45	+40 Sieve=22%, +4 Sieve=17%
5		SM			SILTY SAND(SM) loose; tan	N=6						
					–red and gray	SF	13				15	+40 Sieve=61%, +4 Sieve=45%
10					–with gravel							
		ML			–dark gray SANDY SILT(ML) dark gray	SF						
15												
						N=50/4"	22				61	+40 Sieve=0%, +4 Sieve=0%
20												
					LIGNITE very dense; black	N=50/3"						
25												
		SM SC			SILTY CLAYEY SAND(SM-SC) very dense; dark gray; laminated with gray silt	N=68	17	21	15	6	49	+40 Sieve=0%, +4 Sieve=0%
30					Bottom of Boring @ 30'							

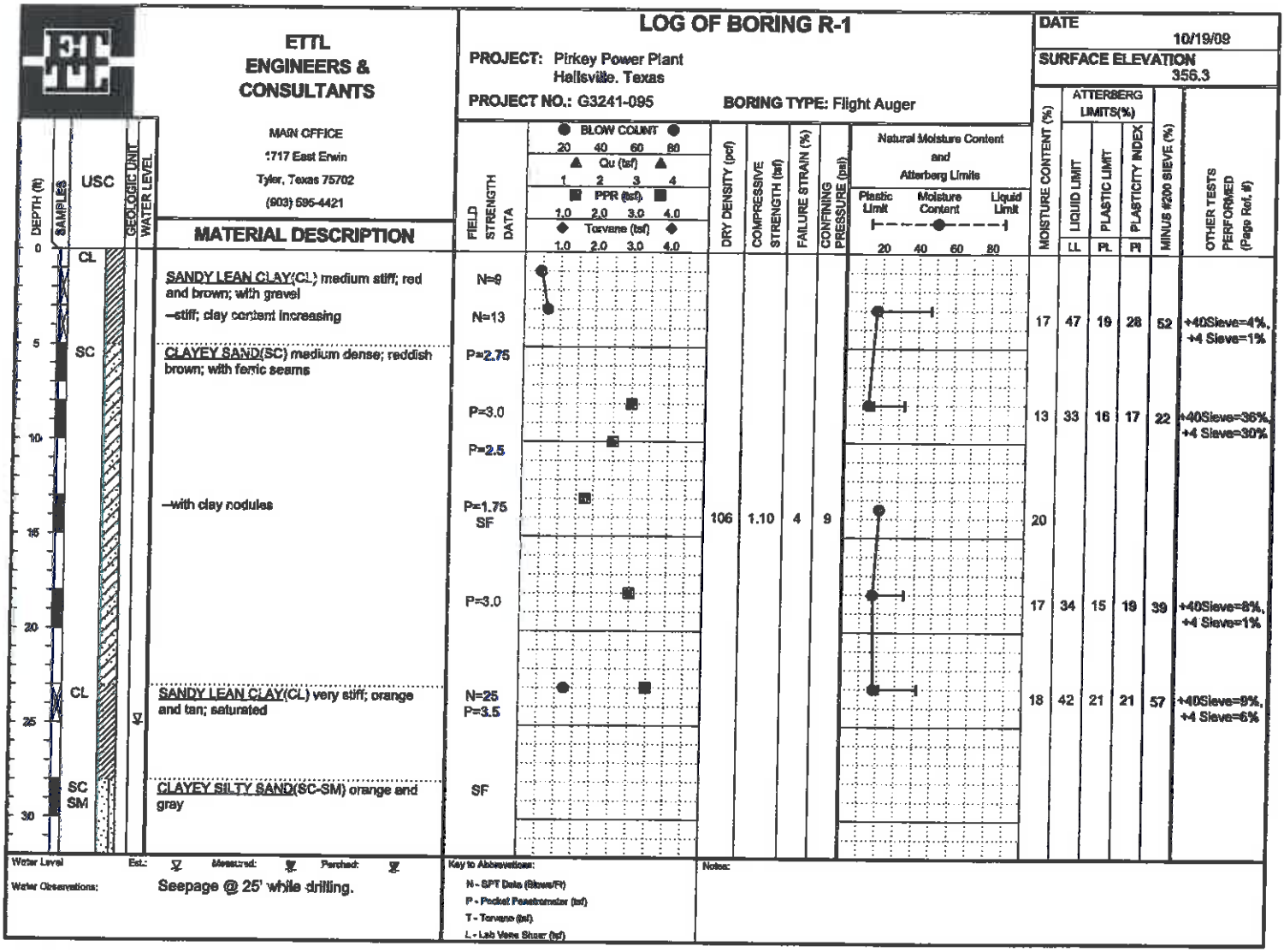
Natural Moisture Content and Atterberg Limits: Plastic Limit – Moisture Content – Liquid Limit (20, 40, 60, 80)

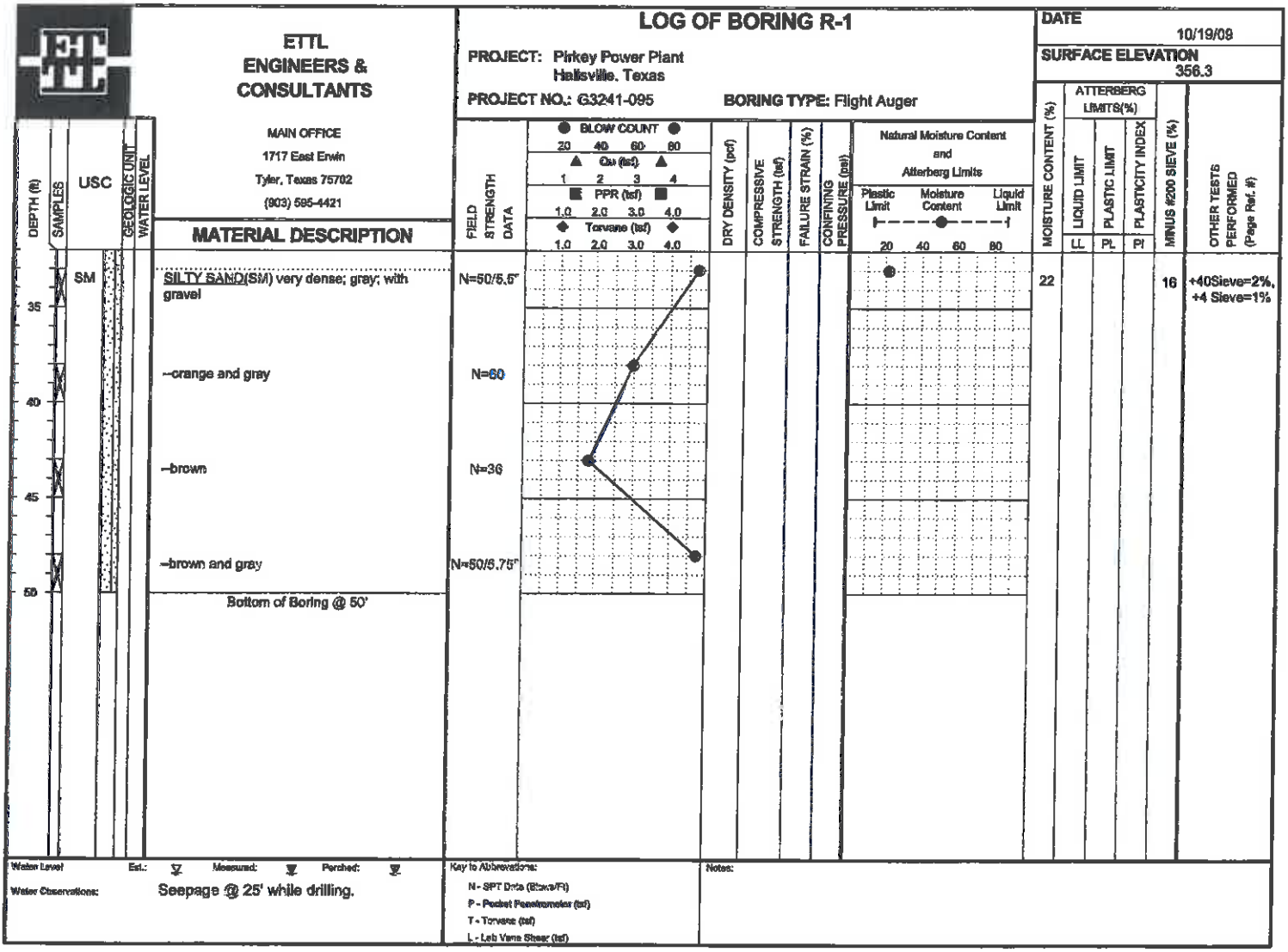
Water Level — Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 8' while drilling. Water level @ 26" and open to 26' upon completion. Water level @ 11' and open to 28' after

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°27.034', W 94°29.952'


ETTL
ENGINEERS &
CONSULTANTS
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING R-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/19/09
SURFACE ELEVATION
356.3
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
LL
PL
PI
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Page Ref. #)
CL
SANDY LEAN CLAY(CL) medium stiff; red and brown; with gravel
–stiff; clay content increasing
SC
CLAYEY SAND(SC) medium dense; reddish brown; with ferric seams
–with clay nodules
CL
SANDY LEAN CLAY(CL) very stiff; orange and tan; saturated
SC
SM
CLAYEY SILTY SAND(SC-SM) orange and gray
N=9
N=13
P=2.75
P=3.0
P=2.5
P=1.75
SF
P=3.0
N=25
P=3.5
SF
106
1.10
4
9
17
47
19
28
52
+40Sieve=4%, +4 Sieve=1%
13
33
16
17
22
+40Sieve=36%, +4 Sieve=30%
20
17
34
15
19
39
+40Sieve=8%, +4 Sieve=1%
18
42
21
21
57
+40Sieve=9%, +4 Sieve=6%
Water Level
Est.:
Measured:
Perched:
Water Observations:
Seepage @ 25' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes: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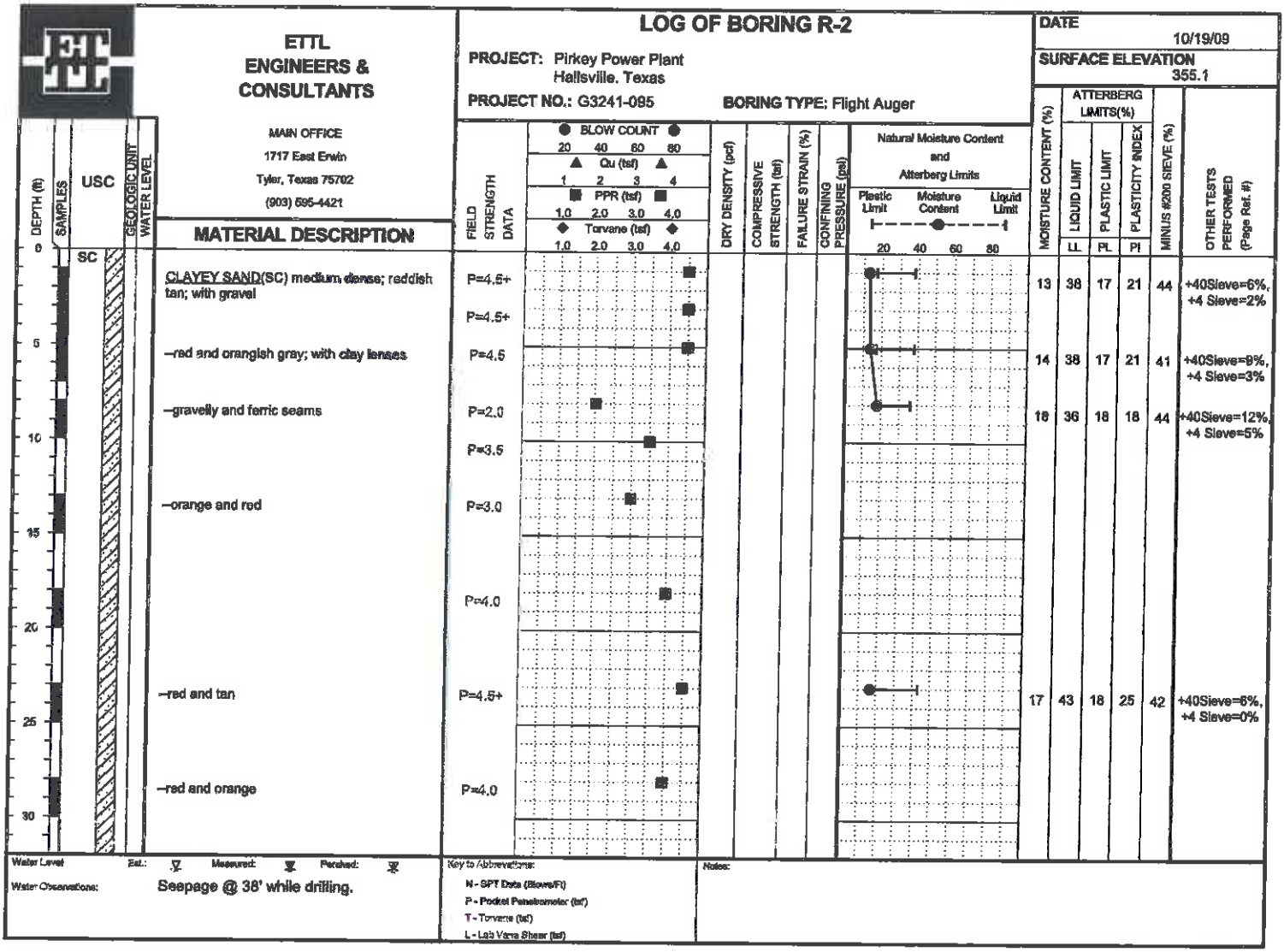
CONSULTANTS
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421
LOG OF BORING R-1
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/19/09
SURFACE ELEVATION
356.3
DEPTH (ft)
SAMPLES
USC
GEOLOGIC UNIT
WATER LEVEL
MATERIAL DESCRIPTION
FIELD 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. #)
SM
SILTY SAND(SM) very dense; gray; with gravel
N=50/5.5"
--orange and gray
N=60
--brown
N=36
--brown and gray
N=50/5.75"
Bottom of Boring @ 50'
22
16
+40Sieve=2%,
+4 Sieve=1%
Water Level
Est.:
Measured:
Perched:
Water Observations:
Seepage @ 25' while drilling.
Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)
Notes:



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING R-2

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095 **BORING TYPE:** Flight Auger

DATE 10/19/09

SURFACE ELEVATION 355.1

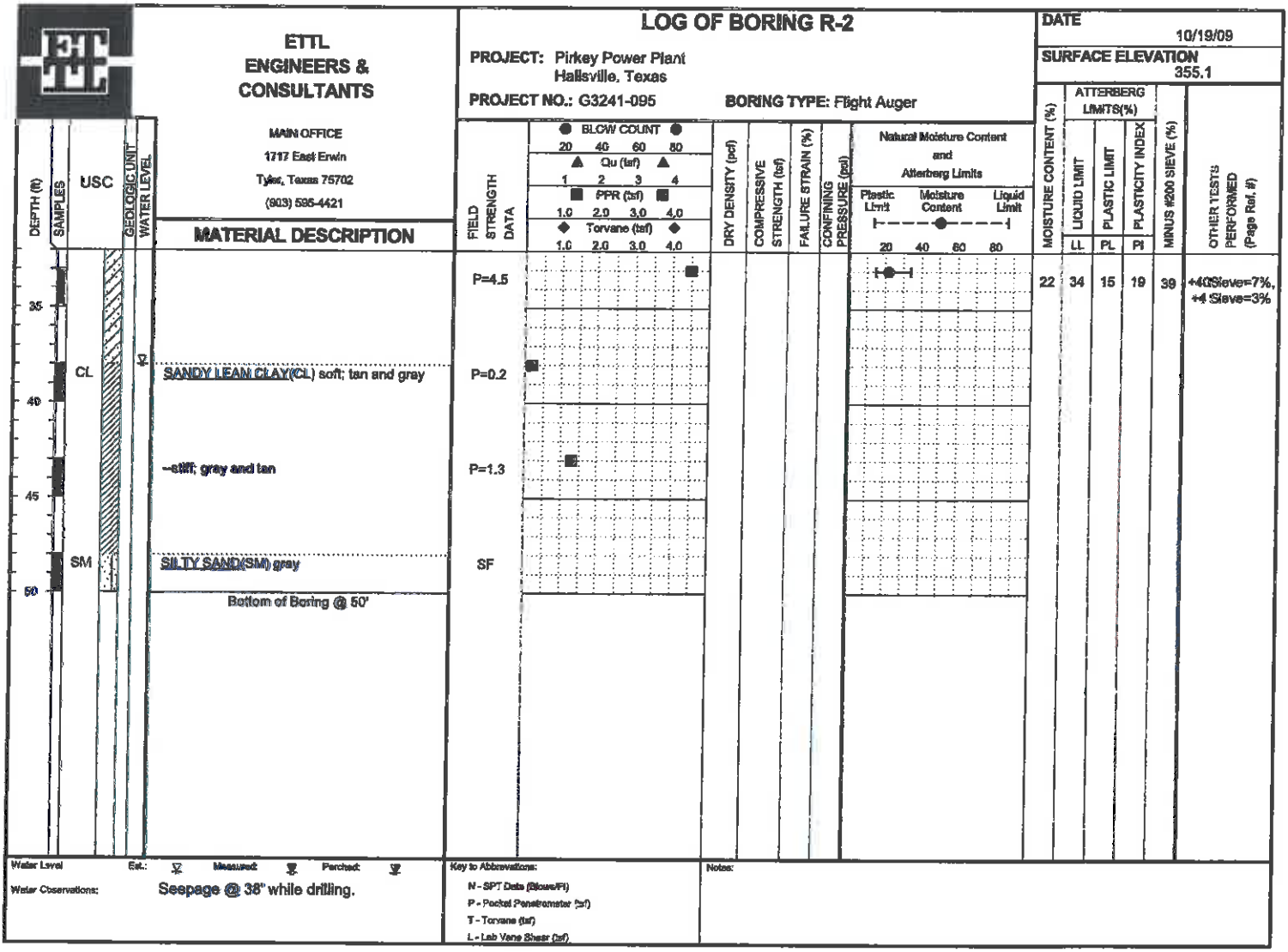
DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC	CLAYEY SAND(SC) medium dense; reddish tan; with gravel	P=4.5+						
			P=4.5+	13	38	17	21	44	+40Sieve=6%, +4 Sieve=2%
5		–red and orangish gray; with clay lenses	P=4.5	14	38	17	21	41	+40Sieve=9%, +4 Sieve=3%
		–gravelly and ferric seams	P=2.0	18	36	18	18	44	+40Sieve=12%, +4 Sieve=5%
10			P=3.5						
		–orange and red	P=3.0						
15			P=4.0						
20		–red and tan	P=4.5+	17	43	18	25	42	+40Sieve=6%, +4 Sieve=0%
25		–red and orange	P=4.0						
30									

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 38' while drilling.

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

Notes:



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING R-2

PROJECT: Pirkey Power Plant
Hallsville, Texas

PROJECT NO.: G3241-095 **BORING TYPE:** Flight Auger

DATE 10/19/09

SURFACE ELEVATION 355.1

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35						P=4.5	22	34	15	19	39	+40Sieve=7%, +4 Sieve=3%
40		CL			SANDY LEAN CLAY(CL) soft; tan and gray	P=0.2						
45					--stiff; gray and tan	P=1.3						
50		SM			SILTY SAND(SM) gray	SF						
					Bottom of Boring @ 50'							

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

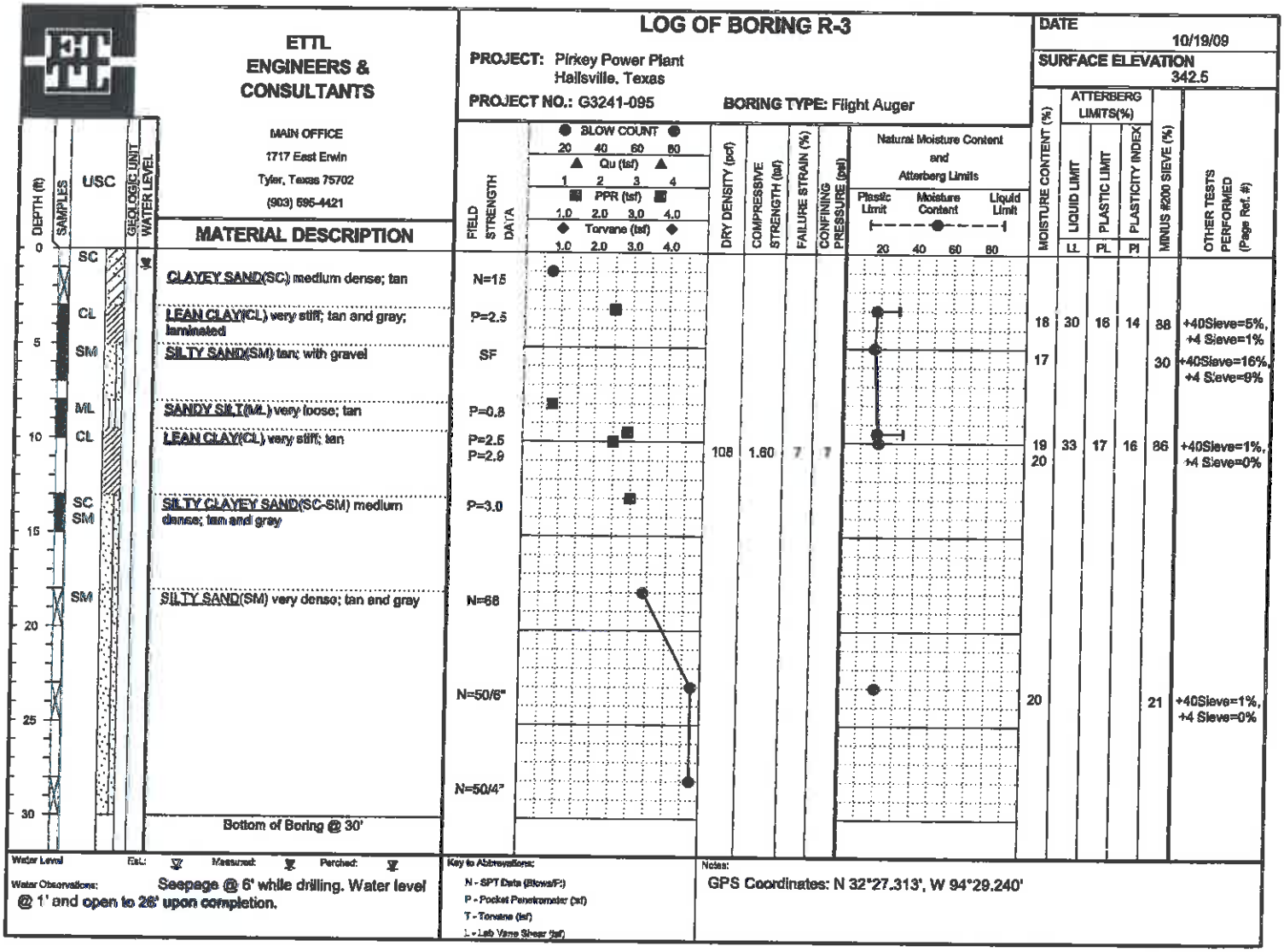
Natural Moisture Content and Atterberg Limits: Plastic Limit | Moisture Content | Liquid Limit

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 38' 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 R-3
PROJECT: Pirkey Power Plant
Hallsville, Texas
PROJECT NO.: G3241-095
BORING TYPE: Flight Auger
DATE
10/19/09
SURFACE ELEVATION
342.5
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
LL
PL
PI
MINUS #200 SIEVE (%)
OTHER TESTS PERFORMED (Page Ref. #)
SC
CLAYEY SAND(SC) medium dense; tan
N=15
CL
LEAN CLAY(CL) very stiff; tan and gray; laminated
P=2.5
18
30
16
14
38
+40Sieve=5%, +4 Sieve=1%
SM
SILTY SAND(SM) tan; with gravel
SF
17
30
+40Sieve=16%, +4 Sieve=9%
ML
SANDY SILT(ML) very loose; tan
P=0.8
CL
LEAN CLAY(CL) very stiff; tan
P=2.5
P=2.9
108
1.60
7
7
19
20
33
17
16
86
+40Sieve=1%, +4 Sieve=0%
SC
SM
SILTY CLAYEY SAND(SC-SM) medium dense; tan and gray
P=3.0
SM
SILTY SAND(SM) very dense; tan and gray
N=68
N=50/6"
20
21
+40Sieve=1%, +4 Sieve=0%
N=50/4"
Bottom of Boring @ 30'
Water Level
Est.:
Measured:
Perched:
Water Observations:
Seepage @ 6' while drilling. Water level @ 1' and open to 26' 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°27.313', W 94°29.240'

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:

P8190454
Upland drainage area along southeastern side of Landfill.

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:

South

Description:

P8190467
Lining for new landfill expansion cell

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:

East Northeast

Description:

P8190470
Lining for new landfill expansion cell

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:

East Northeast

Description:

P8190475
Upland ditch on east side of landfill.

Appendix C

Soil Boring Logs and Piezometers -
2018 Landfill Lateral Expansion Area

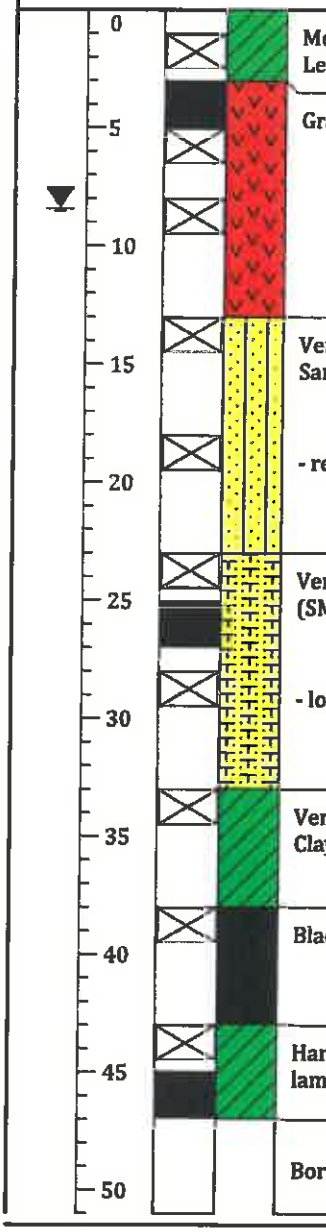
Auckland Consulting LLC

LOG OF BORING B1

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/07/2016

GPS Coordinates: N32° 27' 12.0" W94° 29' 48.6"
Surface Elevation: N/A
Drilling Method: HSA



Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Medium Stiff, red, brown and gray, Sandy Lean Clay (CL), mottled, few gravel	8			52	16	39	13	26	
	5			Gray, Bottom Ash	13	N/A			15				64
▼					6								
	10												
	15			Very Loose, brown, gray and red, Silty Clayey Sand (SC-SM), mottled, with organics (roots)	3			49	24	22	16	6	
	20			- red, tan and gray at 18 ft	1								
	25			Very Loose, light gray, red and tan, Silty Sand (SM), mottled	1	N/A		36	19	NP	NP	NP	
	30			- loose, few clay below 28 ft	10			31	19				
	35			Very Stiff, dark gray and gray, Sandy Lean Clay (CL)	24			55	21	29	13	16	
	40			Black, Lignite	50/2								
	45			Hard, dark gray and gray, Lean Clay (CL), laminated, few lignitic material	61	4.5		97	20	38	20	18	105
	50			Boring terminated at 47 feet.									

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 8 ft during drilling. Water level at 8 feet upon completion.

N/A: Not Attempted

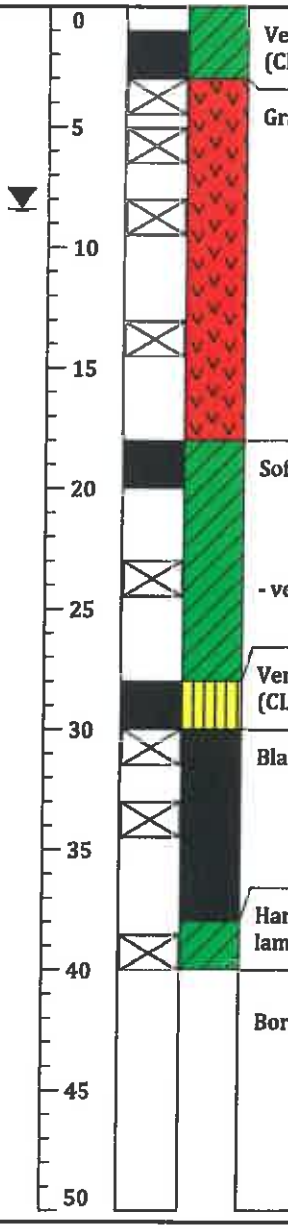
Auckland Consulting LLC

LOG OF BORING B2

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/06/2016

GPS Coordinates: N32° 27' 12.3" W94° 29' 45.3"
Surface Elevation: N/A
Drilling Method: HSA



Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Very Stiff, red and brown, Sandy Lean Clay (CL), mottled, few gravel		2.5		57	18	30	12	18	
	5			Gray, Bottom Ash	4								
▼					3								
	10				1								
	15				2								
	20			Soft, dark gray, Sandy Lean Clay (CL)		0.5		62	20	34	13	21	91
	25			- very soft below 23 ft	1								
	30			Very Stiff, dark gray and gray, Sandy Silty Clay (CL-ML), with lignitic material		3.0		50	15	20	16	4	117
				Black, Lignite	50/3								
	35				50/3								
	40			Hard, gray and dark gray, Lean Clay (CL), laminated, trace gypsum	44			95	22	38	17	21	
				Boring terminated at 40 feet.									
	45												
	50												

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 8 ft during drilling. Water level at 8 feet upon completion.

N/A: Not Attempted

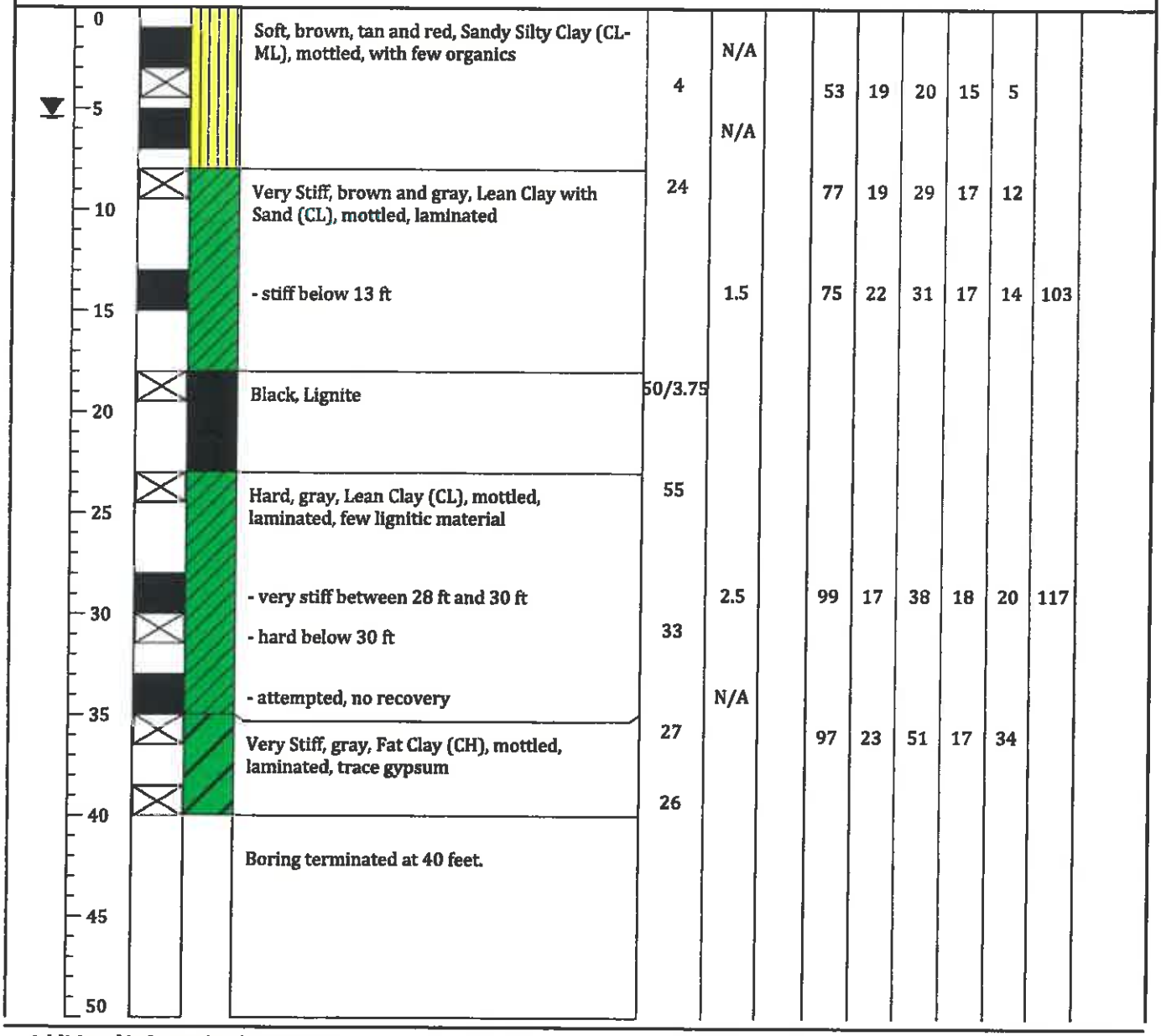
Auckland Consulting LLC

LOG OF BORING B3

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/08/2016

GPS Coordinates: N32° 27' 10.3" W94° 29' 45.9"
Surface Elevation: N/A
Drilling Method: HSA



Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Soft, brown, tan and red, Sandy Silty Clay (CL-ML), mottled, with few organics		N/A							
▼	5				4	N/A		53	19	20	15	5	
	10			Very Stiff, brown and gray, Lean Clay with Sand (CL), mottled, laminated	24			77	19	29	17	12	
	15			- stiff below 13 ft		1.5		75	22	31	17	14	103
	20			Black, Lignite	50/3.75								
	25			Hard, gray, Lean Clay (CL), mottled, laminated, few lignitic material	55								
	30			- very stiff between 28 ft and 30 ft		2.5		99	17	38	18	20	117
				- hard below 30 ft	33								
	35			- attempted, no recovery		N/A							
				Very Stiff, gray, Fat Clay (CH), mottled, laminated, trace gypsum	27			97	23	51	17	34	
	40				26								
				Boring terminated at 40 feet.									
	45												
	50												

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 5 ft during drilling. Water level at 5 feet upon completion.
N/A: Not Attempted

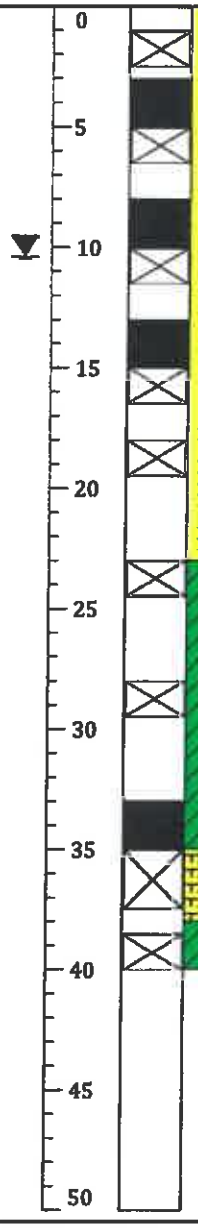
Auckland Consulting LLC

LOG OF BORING B4

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/12/2016

GPS Coordinates: N32° 27' 9.0" W94° 29' 48.6"
Surface Elevation: N/A
Drilling Method: HSA



Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Very Loose, reddish brown, Clayey Sand (SC), mottled	2								
	5			- medium dense between 3 ft and 10 ft - few gravel below 5 ft	15	3.5		27	14	23	14	9	
▼	10			- loose between 10 ft and 15 ft	5	2.5		49	18	28	13	15	115
	15			- medium dense between 15 ft and 18 ft	27	0.5		49	20	29	15	14	
	20			- very dense below 18 ft	60								
	25			Hard, gray and dark gray, Lean Clay (CL), mottled, laminated	32								
	30			- very stiff at 28 ft	17			88	22	45	16	29	
	35			- attempted, no recovery		N/A							
				Very Dense, gray and tan, Silty Sand (SM), with lignitic material	50/2								
	40			Hard, gray, dark gray and black, Lean Clay (CL), mottled, with lignitic material	95/11								
				Boring terminated at 40 feet.									
	45												
	50												

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 10 ft during drilling. Water level at 10 feet upon completion.
N/A: Not Attempted

Auckland Consulting LLC

LOG OF BORING B5

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/09/2016

GPS Coordinates: N32° 27' 9.2" W94° 29' 42.4"
Surface Elevation: N/A
Drilling Method: HSA

Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Loose, reddish brown, Clayey Sand (SC), mottled	8								
	5			Very Stiff, red and brown, Sandy Lean Clay (CL), mottled, few gravel	19	4.0	6.6	51	16	34	14	20	116
	10			Dense, red, tan and brown, Clayey Sand (SC), mottled	34	4.0		40	20				
▼	15			Very Stiff, gray and tan, Lean Clay (CL), mottled, laminated	17			96	21	41	16	25	
	20			Very Stiff, gray and dark gray, Lean Clay with Sand (CL), mottled	38	3.0		55	18	29	17	12	
	25			Black, Lignite	50/6								
	30			Hard, gray and dark gray, Lean Clay (CL), mottled, laminated	39	4.0		99	21				
	35			- very stiff at 33 ft	24								
	40			Medium Dense, gray and dark gray, Clayey Sand (SC)	27	2.5		45	27	36	16	20	
	45			Boring terminated at 42 feet.									
	50												

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 13 ft during drilling. Water level at 13 feet upon completion.

N/A: Not Attempted

Auckland Consulting LLC

LOG OF BORING B6

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Project No.: 2016-011
Drilling Contractor: C&S Lease
Drill Date(s): 09/16/2016

GPS Coordinates: N32° 27' 5.7" W94° 29' 48.0"
Surface Elevation: N/A
Drilling Method: HSA

Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Very Stiff, red and brown, Sandy Fat Clay (CH), mottled	17	4.5		55	19	61	25	36	
	5			Medium Dense, light red, tan and brown, Silty Clayey Sand (SC-SM), mottled	28			48	11				
	10			- tan, light red and gray below 8 ft, with few gravel between 8 ft and 10 ft	19	3.5							
	15			Very Dense, tan, light red and gray, Silty Sand (SM), mottled	88/10	2.5		33	12	19	15	4	
	20			- dense between 18 ft and 23 ft	42								
	25			- medium dense between 23 ft and 28 ft	28								
▼	30			- very dense below 28 ft	85/11			17	22	NP	NP	NP	
	35			Hard, gray and dark gray, Lean Clay (CL), mottled, laminated	72								
	40			- little recovery, few sand between 38 ft and 40 ft	48	N/A		97	22	42	17	25	
	45			- gray, dark gray and black, with lignitic material, laminated between 43 ft and 45 ft	50/3								
	50				40								
	55				60								
	60				40			98	19	42	17	25	
	65			Boring terminated at 60 feet.									

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 28 ft during drilling. Water level at 28 feet upon completion.

N/A: Not Attempted

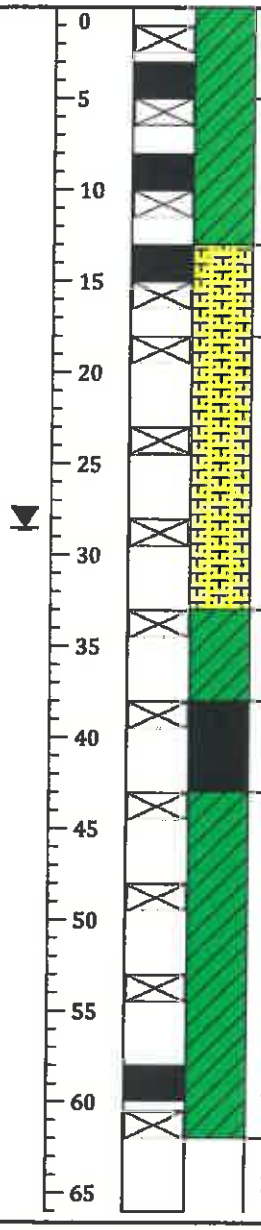
Auckland Consulting LLC

LOG OF BORING B7

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/14/2016

GPS Coordinates: N32° 27' 7.1" W94° 29' 44.6"
Surface Elevation: N/A
Drilling Method: HSA



Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Stiff, light red and tan, Sandy Lean Clay (CL), mottled	13	N/A		51	19				
	5			Very Stiff, light tan, red and brown, Lean Clay (CL), mottled	20	N/A		85	17	29	14	15	
	10				21	N/A							
	15			Very Dense, light gray, Silty Sand (SM)	87/10			45	10	NP	NP	NP	
	20			Very Dense, red, brown and gray, Silty Sand (SM)	60								
▼	25				84/11			18	21				
	30				50/2								
	35			Hard, gray and dark gray, Lean Clay (CL), mottled, laminated	40								
	40			Black, Lignite	50/5								
	45			Hard, dark gray, Lean Clay (CL), mottled, laminated, trace gypsum	81								
	50				64								
	55				35			95	18	43	17	26	
	60			- attempted, no recovery	77	N/A							
	65			Boring terminated at 62 feet.									

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 28 ft during drilling. Water level at 28 feet upon completion.
N/A: Not Attempted

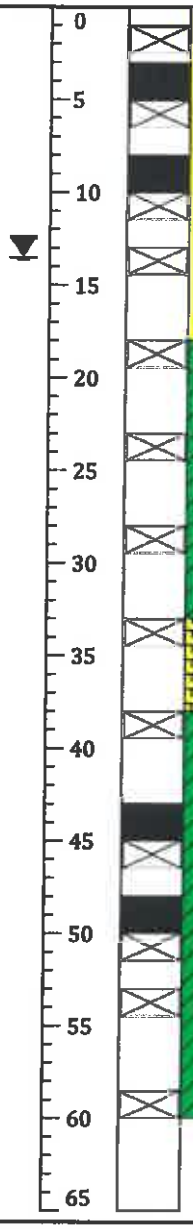
Auckland Consulting LLC

LOG OF BORING B8

Project Name: Pirkey - 2019 Landfill Expansion
Project Location: Hallsville, Texas
Drilling Contractor: C&S Lease

Project No.: 2016-011
Drill Date(s): 09/13/2016

GPS Coordinates: N32° 27' 5.7" W94° 29' 39.6"
Surface Elevation: N/A
Drilling Method: HSA

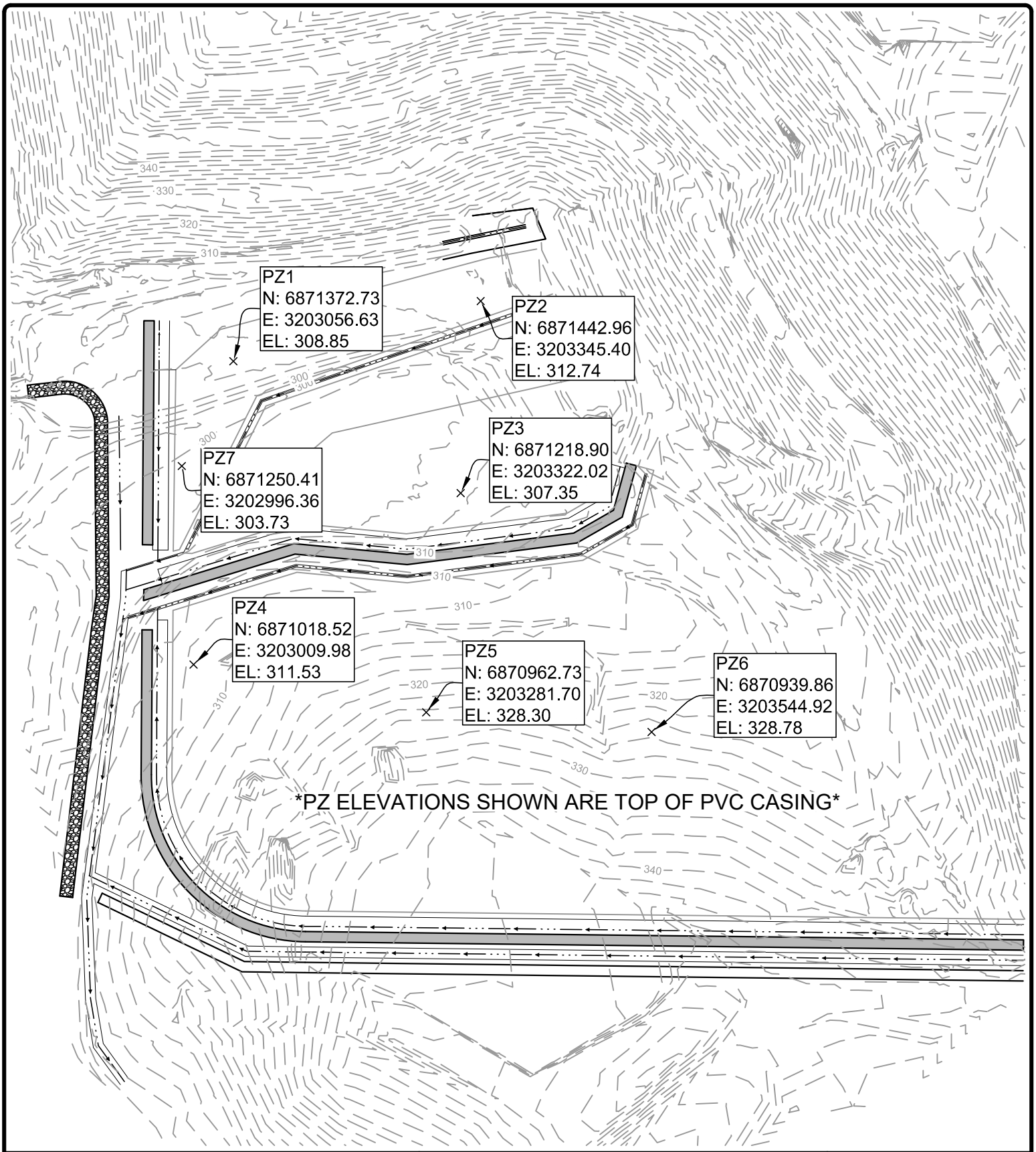


Groundwater Elevation (ft)	Depth (feet)	Sample Type	Graphic Log	Material Description	N-Value (Blows/ft)	Pocket Penetrometer (tsf)	Unconfined Strength (tsf)	Passing #200 Sieve (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight (pcf)
	0			Loose, red, tan, and brown, Clayey Sand (SC)	6	2.0		39	13	19	12	7	
	5				7								
	10			- medium dense, light gray, red and tan below 8 ft	18	N/A		37	23				
▼	15				15								
	20			Very Stiff, gray and brown, Lean Clay (CL), mottled, laminated	22			91	25	42	16	26	
	25			- hard below 23 ft	79								
	30				79/11								
	35			Very Dense, dark gray, Silty Sand (SM)	76/11			43	30	NP	NP	NP	
	40			Very Stiff, gray and dark gray, Lean Clay (CL), mottled, laminated	21			97	23				
	45			Stiff, gray and dark gray, Sandy Lean Clay (CL), mottled, with occasional lignitic seams	22	1.5		59	25	33	18	15	93
	50			- attempted, no recovery	16	N/A		48	30				
	55				22								
	60			- laminated at 58 ft	29			62	25	44	21	23	
	65			Boring terminated at 60 feet.									

Additional Information/Comments:

Logger: D. Diduch

Notes/Comments: Seepage encountered at 13 ft during drilling. Water level at 13 feet upon completion.
N/A: Not Attempted



AKRON CONSULTING, LLC.
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(F) 903-236-9745
www.akron-consulting.com

0 150' 300'

1"=150'

PZ WELL AS-BUILT LOCATIONS

STATE OF TEXAS WELL REPORT for Tracking #482280

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-1**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 11.79" N**
		Longitude:	**094° 29' 48.1" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/14/2018** Drilling End Date: **6/14/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
3	**14**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**3**	**Bentonite 2 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Clay**
5	**10**	**Very Soft Red/Grey Clay**
10	**14**	**Very Soft Brown Sandy Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**4**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**4**	**14**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482283

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-2**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 12.36" N**
		Longitude:	**094° 29' 44.64" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/14/2018** Drilling End Date: **6/14/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
3	**14**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**3**	**Bentonite 2 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Clay**
5	**10**	**Very Soft Red/Grey Clay**
10	**14**	**Very Soft Brown Sandy Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**4**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**4**	**14**

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Austin, TX 78711
(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482286

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-3**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 10.18" N**
		Longitude:	**094° 29' 45.15" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/14/2018** Drilling End Date: **6/14/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
3	**14**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**3**	**Bentonite 2 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Clay**
5	**10**	**Very Soft Red/Grey Clay**
10	**14**	**Very Soft Brown Sandy Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**4**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**4**	**14**

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(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482290

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-4**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 08.3" N**
		Longitude:	**094° 29' 48.73" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/15/2018** Drilling End Date: **6/15/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
3	**14**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**3**	**Bentonite 2 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Clay**
5	**10**	**Very Soft Red/Grey Clay**
10	**14**	**Very Soft Brown Sandy Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**4**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**4**	**14**

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P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482295

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-5**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 07.7" N**
		Longitude:	**094° 29' 45.72" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/15/2018** Drilling End Date: **6/15/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**20**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
8	**20**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**8**	**Bentonite 4 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Sandy Clay**
5	**10**	**Very Soft Red/Brown Clay**
10	**15**	**Very Soft Red/Tan Sandy Clay**
15	**20**	**Tan/Red Silty Sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**10**	**20**

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P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482297

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-6**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 07.69" N**
		Longitude:	**094° 29' 42.56" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/15/2018** Drilling End Date: **6/15/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**20**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
8	**20**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**8**	**Bentonite 4 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Sandy Clay**
5	**10**	**Very Soft Red/Brown Clay**
10	**15**	**Very Soft Red/Tan Sandy Clay**
15	**20**	**Tan/Red Silty Sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**10**	**20**

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P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS WELL REPORT for Tracking #482288

Owner:	**American Electric Power Company**	Owner Well #:	**PZ-7**
Address:	**502 N. Allen Strreet Shreveport, LA 71101**	Grid #:	**35-37-4**
Well Location:	**2400 Farm Road Hallsville, TX 75650**	Latitude:	**32° 27' 10.81" N**
		Longitude:	**094° 29' 48.7" W**
Well County:	**Harrison**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Piezometer**

Drilling Start Date: **6/14/2018** Drilling End Date: **6/14/2018**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8.25	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
3	**14**	**Sand**	**20/40**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**3**	**Bentonite 2 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Alternative Procedure Used** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **C&S Lease**

1873 FM 1252 E
Kilgore, TX 75663

Driller Name: **Buford E. Collier** License Number: **50089**

Apprentice Name: **Michael Aaron Dodson** Apprentice Number: **59693**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**Red Soft Clay**
5	**10**	**Very Soft Red/Grey Clay**
10	**14**	**Very Soft Brown Sandy Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**4**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**4**	**14**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
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