

**American Electric Power Service
Corporation**

**Primary Bottom Ash Pond - CCR
Groundwater Monitoring Well
Network Evaluation**

J. Robert Welsh Power Plant
1187 County Road 4865
Titus County
Pittsburg, Texas

June 29, 2016



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CCR Groundwater Monitoring
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J. Robert Welsh Power Plant
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Pittsburg, Texas

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AEP

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Date:
June 29, 2016

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Acronyms and Abbreviation

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

1. Objective

This report was prepared by ARCADIS U.S., Inc. (ARCADIS) for American Electric Power Service Corporation (AEP) to assess the adequacy of the groundwater monitoring well network included in the Coal Combustion Residual (CCR) requirements, as specified in Code of Federal Regulations (CFR) 40 CFR 257.91, for the Primary Bottom Ash Pond (CCR Unit) at the AEP Generating Plant (Plant) located at 1187 County Road 4865 in Pittsburg, Titus County, Texas (**Figure 1**). One of the CCR requirements includes an evaluation of the adequacy of the groundwater monitoring well network to characterize groundwater quality up and down gradient of the CCR unit.

Three regulated CCR units associated with the Plant were identified for review, which include the Primary Bottom Ash Pond, landfill, and bottom ash storage pond (**Figure 2**). This report summarizes the evaluation of the groundwater monitoring well network in the uppermost aquifer at the Primary Bottom Ash Pond (Site).

This evaluation included a review of AEP-provided data associated with previously completed subsurface investigation activities in the vicinity of the Primary Bottom Ash Pond CCR unit, as well as publically-available geologic and hydrogeologic data. The following report also presents the current Conceptual Site Model based on all documents reviewed and will further describe the uppermost aquifer, include an evaluation of the adequacy of the existing monitoring well network, and provide recommendations for monitoring well augmentation, as necessary.

2. Background Information

The following section provides background information for the AEP Welsh Generating Plant Primary Bottom Ash Pond.

2.1 Facility Location Description

The AEP J. Robert Welsh Plant is located in southern Titus County, approximately 8 miles northeast of Pittsburg, Texas, and approximately two miles northwest of Cason, Texas. The Primary Bottom Ash Pond CCR unit is located southwest of the Plant and directly west of the Welsh Reservoir (Figures 1 and 2).

2.2 Description of Primary Bottom Ash Pond CCR Unit

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

2.2.1 Embankment Configuration

The Primary Bottom Ash Pond was placed into operation in approximately 1977, and is located in a topographically low area that had been an unnamed intermittent tributary of Swauano Creek prior to development of the Site. The Primary Bottom Ash Pond is bounded by natural ground surface (topographically higher areas) to the north and west, and embankment dikes to the south and east. These dikes are constructed of compacted sandy clay and clayey sand. The embankment dike south of the Primary Bottom Ash Pond includes a drainage canal that receives overflow (clear) water from the Primary Bottom Ash Pond. The water level in the Primary Bottom Ash Pond is controlled by a weir box which discharges into the drainage canal. The clear water in the drainage canal flows east and discharges into the clear water pond.

The Primary Bottom Ash Pond embankment is up to approximately 40 ft in height. Discussions of embankment configuration and timeline, including cross sections through the dikes, was provided in a previous report prepared by E TTL Engineers & Consultants Inc. in 2010 (E TTL, 2010).

2.2.2 Area/Volume

Per the *Hydraulic Analysis of Welsh Power Plant Ash Ponds Report*, dated December 2010 (Freese and Nichols, 2010), the bottom elevation of the Primary Bottom Ash Pond is 300 feet above mean sea level (amsl), the high level overflow weir box bottom elevation is 325 feet MSL, and the storage capacity of the Primary Bottom Ash Pond at elevation 325 feet amsl is 304.2 acre-ft (**Figure 3**).

2.2.3 Construction and Operational History

The AEP J. Robert Welsh Plant began operations in 1977 with three coal-fired generating units (Units 1, 2, and 3). Throughout the life of the generating plant, CCR materials (fly ash, bottom ash, economizer ash) have been generated. All of these byproducts were stored in the Primary Bottom Ash Pond and in the adjacent landfill that was constructed in the late 1970's. In 2000, the 22-acre bottom ash storage pond was installed south of the landfill. The bottom ash storage pond was constructed with a 60-mil high-density polyethylene (HDPE) liner, and receives bottom ash and economizer ash dredged and sluiced from the Primary Bottom Ash Pond (**Figure 2**).

Presently bottom ash and economizer ash from the generating plant are sluiced to the Primary Bottom Ash Pond. Solids settle as the clear liquids flow through a drainage canal into the clear water pond (a non-CCR unit). Water in the clear water pond discharges through a weir box into a 36-inch-diameter pipe, and then into the Welsh Reservoir under Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ00018111000 (**Figure 3**).

2.2.4 Surface Water Control

Surface water flow within the Primary Bottom Ash Pond complex is controlled by a weir and emergency spillway located on the south side of the pond below the embankments. Pond elevation is maintained so that surface water flows through the weir box which has a bottom elevation of 325 feet amsl. The emergency spillway is 90 feet wide with a crest elevation of 334 feet amsl. Clear water flows through the weir (and occasionally the emergency spillway during heavy precipitation events) into a drainage canal along the south side of the pond. The drainage canal discharges into the clear water pond located directly southeast of the Primary Bottom Ash Pond (**Figure 3**).

The perimeter embankments on the south and east sides of the Primary Bottom Ash Pond are located at an approximate elevation of 340 feet amsl. Therefore the perimeter embankments have approximately six feet of freeboard above the emergency spillway.

2.3 Previous Investigations

The initial soils investigation for the site was provided in a 1973 report prepared by McClelland Engineers, Inc. entitled "*Soils Investigation, Welsh Power Plant, Cason, Texas*". This investigation included advancement of soil borings in the Primary Bottom Ash Pond area, and geotechnical soil testing to characterize the area encompassed by the Primary Bottom Ash Pond.

In 2001, five monitoring wells (AD-1 through AD-5) were installed in the area of the Primary Bottom Ash Pond and Bottom Ash Storage Pond to obtain hydrologic data for the uppermost water-bearing unit. Twelve additional monitoring wells (AD-4a, AD-4b, AD-4c, AD-6 through AD-14) were installed in the area of the Primary Bottom Ash Pond, Bottom Ash Storage Pond, and landfill by Eagle Environmental Services in 2009 to obtain more detailed hydrologic data for the uppermost water-bearing unit.

In 2010, E TTL prepared a report entitled "*Geotechnical Investigation, Welsh Power Station, Existing Ash Storage Ponds Embankment Investigation, Pittsburg, Texas*". The objective of this report was to evaluate the stability of the earthen embankments for the Primary Bottom Ash Pond and non-CCR clear water pond (aka "Secondary Ash Pond"). The principal finding of this investigation was that slope stability would be acceptable following a proposed repair to the embankment of the clear water pond. The repair of the embankment of the clear water pond was completed during September 2010.

In 2010, Freese and Nichols performed a *Hydraulic Analysis of the Welsh Power Plant Ash Ponds* (Freese and Nichols, 2010). The report concluded the spillways for the Primary Bottom Ash Pond, clear water pond, and are hydraulically adequate for the full range of storm events from the 10-year to the 100-year storm events.

In December 2015, Auckland Consulting further expanded the groundwater monitoring well system at the Plant by installation of monitoring wells AD-15 through AD-18 (Auckland Consulting, 2016). Monitoring well completion diagrams are provided in **Appendix A**.

2.4 Hydrogeologic Setting

The site area is located within the West Gulf Coastal Plain. Cretaceous formations crop out in belts that extend in a northeasterly direction parallel to the Gulf of Mexico, and dip gently southeast. The Site is located on the outcrop of the Eocene-age Recklaw Formation, which consists of very fine to fine grained sand and clay (Flawn, 1966).

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

2.4.1 Climate and Water Budget

The climate of Titus County, Texas is moist subhumid. The average January temperature is 45° Fahrenheit (F), and the average July temperature is 82.9°F. The mean annual growing season is 228 days (Broom, 1965). Average annual precipitation (including liquid water equivalent from snowfall) is approximately 47 inches according to weatherdb.com.

2.4.2 Regional and Local Geologic Setting

The Site is located on the outcrop of the Eocene-age Recklaw Formation, which consists of very fine to fine grained sand and clay (Flawn, 1966). The Recklaw Formation attains a thickness of approximately 110 feet in Titus County, and is underlain by the Eocene-age Carrizo Sand which consists of fine to coarse sand, silt, and clay (Broom, 1965). In the topographically low areas underlying the Welsh Reservoir to the east of the Primary Bottom Ash Pond, Quarternary alluvial sediments associated with Swauano Creek are present (Flawn, 1966).

Detailed regional geologic characterization can be found in several published reports including Texas Water Commission Bulletin 6517 "*Ground-Water Resources of Camp, Franklin, Morris and Titus Counties, Texas*" (Broom, 1965), and The University of Texas at Austin Bureau of Economic Geology "*Geologic Atlas of Texas – Texarkana Sheet*" (Flawn, 1966).

Detailed regional and site geologic characterization can be found in the 2010 E TTL report entitled "*Geotechnical Investigation, Welsh Power Station, Existing Ash Storage Ponds Embankment Investigation, Pittsburg, Texas*" (E TTL, 2010).

2.4.3 Surface Water and Surface Water Groundwater Interactions

The Site is generally less than one-half mile from Swauano Creek, which was dammed near the southern end of the Site during plant development to form the Welsh Reservoir. Groundwater flow direction at the Site is generally from west to east, following surface topography towards the Welsh Reservoir. The Welsh Reservoir is likely a gaining surface water feature, and groundwater elevations on site are higher than the normal stage elevation of the Welsh Reservoir (approximately 320 feet amsl).

The Primary Bottom Ash Pond normal operating level is near the weir box which has a bottom elevation of 325 feet amsl. **Figure 9** is a potentiometric surface map based on March 2016 water level data for the uppermost water bearing unit at the Site, and water level elevations in the Site monitoring wells are summarized on **Table 1**. As shown on **Figure 9**, shallow groundwater flow direction in the area of the Primary Bottom Ash Pond is easterly toward the Welsh Reservoir at an average hydraulic gradient of approximately 0.01 foot per foot.

2.4.4 Water Users

A water well inventory conducted by Banks Information Solutions showed one water well within a ½-mile radius of the Site (Banks, 2013). The water well is located on-site to the southwest (side gradient) of the Primary Bottom Ash Pond, and was installed for Southwestern Electric Company in 1974 with screens from 515 to 535 feet below ground surface, and plugged at a later date.

3. Groundwater Monitoring Well Network Evaluation

The existing monitoring well network present at the Site was evaluated to determine if any of the wells were viable for continued use as part of the groundwater monitoring well network or also retained as part of a larger groundwater hydraulic monitoring well network. The hydrogeologic conditions were also evaluated to determine if the uppermost aquifer unit has an effective well network. The evaluation was completed in accordance with 40 CFR 257.91 to have an established monitoring well network that effectively monitors the uppermost aquifer up gradient and down gradient of the Site. The up gradient wells represent background groundwater quality and the down gradient wells are to be placed down gradient of the CCR unit boundary to monitor water quality.

3.1 Hydrostratigraphic Units

3.1.1 Horizontal and Vertical Position Relative to CCR Unit

Geologic data from soil borings and monitoring wells installed at the Site show the uppermost aquifer in the area of the Primary Bottom Ash Pond is a fine to medium grained clayey and silty sand stratum with an average thickness of approximately 10 feet that is located between an elevation of approximately 310 and 320 feet amsl (**Appendix A**). The base of the Primary Bottom Ash Pond ranges in elevation from approximately 330 feet amsl on the west to 300 feet amsl on the east. Therefore the uppermost aquifer appears to be in contact with the Primary Bottom Ash Pond and is further illustrated on cross section A-A' (**Figure 4**) and cross section D-D' (**Figure 7**).

3.1.2 Overall Flow Conditions

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

Available groundwater elevations are summarized on **Table 1** for 2011 through 2016. The most recent comprehensive groundwater data set from March 2016 is depicted on **Figure 9**. The groundwater flow is generally easterly towards the Welsh Reservoir.

3.2 Uppermost Aquifer

3.2.1 CCR Rule Definition

Per 40 CFR 257.60(a), new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five ft) above the upper limit of the uppermost aquifer, or must demonstrate there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high conditions).

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.

3.2.1.1 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.

3.2.2 Identified Onsite Hydrostratigraphic Unit

The identified on-Site hydrostratigraphic unit in the area of the Primary Bottom Ash Pond is the fine to medium grained clayey and silty sand stratum that is located between an elevation of approximately 310 and 320 feet amsl. This unit is not used locally for groundwater supply or industrial water use, but meets the TCEQ definition of a useable aquifer.

3.3 Review of Existing Monitoring Well Network

3.3.1 Overview

The Site was visited by ARCADIS and AEP personnel on August 20, 2015 to review existing well network conditions and locations. A well construction table that summarizes the location, ground surface elevation, borehole depth, installation date, and associated well construction details of the monitoring well network is included as **Table 2**. Photo documentation of the located wells during the August 20, 2015 site visit is provided in **Appendix B**.

Monitoring wells AD-5 through AD-9 were previously installed at the Site to monitor the uppermost aquifer (fine to medium grained clayey and silty sand stratum) associated with the Primary Bottom Ash Pond. As discussed above in Section 3.1.1, the uppermost aquifer below the Primary Bottom Ash Pond is approximately 10 feet thick and is located between an elevation of approximately 310 and 320 feet amsl. In addition to these five monitoring wells, one piezometer (B-2) was installed directly down gradient (east) of the Primary Bottom Ash Pond in 2009 as part of the E TTL geotechnical investigation of the Primary Bottom Ash Pond embankments (E TTL, 2010).

3.3.2 Gaps in Monitoring Network

As shown on Geologic Cross Sections A-A' (**Figure 4**) and E-E' (**Figure 8**), existing monitoring well AD-5 is screened in the uppermost aquifer up gradient (northwest) of the Primary Bottom Ash Pond, and existing monitoring wells AD-8 and AD-9 are screened in the uppermost aquifer down gradient (east) of the Primary Bottom Ash Pond. These three monitoring wells will be utilized as part of the groundwater monitoring system for the Primary Bottom Ash Pond.

Monitoring well AD-18 was completed in the uppermost aquifer west of the Primary Bottom Ash Pond during December 2015. As shown on Geologic Cross Section A-A' (**Figure 4**) and the March 2016 potentiometric surface map (**Figure 9**), monitoring well AD-18 is located hydraulically up gradient of the Primary Bottom Ash Pond. Therefore monitoring well AD-18 will also be utilized as an up gradient monitoring well for the Primary Bottom Ash Pond.

As shown on the soil boring log in **Appendix A** and Geologic Cross Section E-E' (**Figure 8**), piezometer B-2 is located down gradient of the Primary Bottom Ash Pond,



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but is screened in a clay stratum above the top of the uppermost aquifer. Therefore piezometer B-2 will not be utilized as part of the groundwater monitoring system for the Primary Bottom Ash Pond. This data gap was addressed by installation of new down gradient monitoring well AD-15 adjacent to piezometer B-2 during December 2015 as shown on **Figure 9** and **Figure 10**. With the addition of monitoring wells AD-15 and AD-18 during December 2015, there are no gaps remaining in the groundwater monitoring network for the Primary Bottom Ash Pond.

4. Recommended Monitoring Network and PE Certification

The recommended modifications to the existing groundwater monitoring well network are intended to meet specifications stated in 40 CFR 257.91. Recommended wells are further discussed with respect to location to the Primary Bottom Ash Pond (up gradient or down gradient), well depth, and well construction. The recommended network would provide an improved understanding of groundwater quality, hydraulics, and groundwater flow at the Primary Bottom Ash Pond.

4.1 Recommended Monitoring Well Network Distribution

A total of three down gradient well locations (existing monitoring wells AD-8, AD-9, and AD-15) and two up gradient well locations (existing monitoring wells AD-5 and AD-18) are recommended to establish a groundwater quality monitoring well network for the Primary Bottom Ash Pond. In addition, existing monitoring wells AD-6 and AD-7 may be utilized as piezometers to obtain additional groundwater flow direction and gradient data for the Primary Bottom Ash Pond.

4.1.1 Location

The recommended monitoring well network for groundwater quality of the uppermost aquifer at the Primary Bottom Ash Pond is summarized on **Table 3** and illustrated on **Figure 10**.

4.1.2 Depth

The screen depths for the monitoring wells recommended for inclusion in the monitoring network are within the shallow saturated sand stratum (uppermost aquifer) that occurs between an elevation of approximately 310 and 320 feet amsl as shown on Geologic Cross Sections A-A' (**Figure 4**) and E-E' (**Figure 8**). The screen elevations are presented in **Table 3**.

4.1.3 Well Construction

As discussed above in Section 3.3.2, the gap in the monitoring well network for the uppermost aquifer at the Primary Bottom Ash Pond was addressed by installation of monitoring wells AD-15 and AD-18 during December 2015. Monitoring wells AD-15 and AD-18 were installed by a Texas Department of Licensing and Regulation (TDLR)-licensed water well driller. Well construction data for the monitoring well network are



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summarized on **Tables 2** and **3**, and the monitoring well completion diagrams are provided in **Appendix A**.

4.2 Professional Engineer's Certification

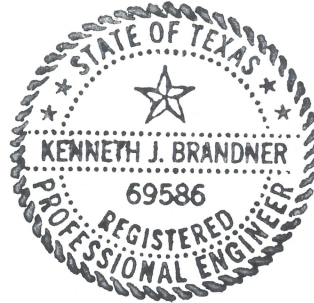
I, Kenneth J. Brandner, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, the proposed groundwater monitoring system will be adequate to meet the requirements of 40 CFR Part 257.91.

Kenneth J. Brandner

Printed Name of Registered Professional Engineer

Kent J Brandner

Signature



69586

Registration No.

Texas

Registration State

6-29-16

Date

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Tables

**Table 1
Water Level Data
AEP J. Robert Welsh Power Plant - CCR Storage Areas
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Well ID	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole depth ft. bls	Date Installed	Screen Material	Well diameter inches	Top of Screen		Bottom of Screen		6/7/2011	12/6/2011	5/2/2012	11/1/2012	5/14/2013	11/19/2013	5/12/2014	11/16/2014	5/12/2015	3/4/2016
									Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl
Monitoring Wells																						
AD-1 ^(c)	33° 02' 48"	94° 50' 47"	355.57	357.57	25.0	1/11/01	Sch. 40 PVC	2	15.0	340.57	25.0	330.57	338.46	334.92	337.88	337.18	337.43	336.73	338.03	337.64	340.82	342.83
AD-2 ^(c)	33° 02' 37"	94° 50' 44"	344.16	346.16	25.0	4/26/01	Sch. 40 PVC	2	15.0	329.16	25.0	319.16	330.16	329.07	330.00	329.26	329.83	329.70	330.09	329.69	332.56	332.32
AD-3 ^(c)	33° 02' 38"	94° 50' 37"	331.10	333.10	17.0	4/26/01	Sch. 40 PVC	2	7.0	324.10	17.0	314.10	323.81	323.19	323.99	323.29	323.77	323.98	324.12	323.28	325.58	325.12
AD-4 ^(c)	33° 02' 43"	94° 50' 33"	340.61	342.61	30.0	4/26/01	Sch. 40 PVC	2	19.0	321.61	29.0	311.61	324.81	324.84	324.62	324.40	324.74	325.52	325.44	325.13	327.00	326.90
AD-4a ^(a)	33.04527	94.84258	340.19	342.85	30.0	9/22/09	Sch. 40 PVC	2	20.0	320.19	30.0	310.19	325.01	324.19	325.24	322.90	324.86	324.68	325.64	325.34	327.19	327.12
AD-4b ^(a)	33.04531	94.84230	329.55	333.23	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.55	15.0	314.55	324.35	324.32	324.50	324.30	324.30	325.21	325.22	324.90	326.58	326.67
AD-4c ^(a)	33.04507	94.84244	329.15	333.28	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.15	15.0	314.15	324.18	324.50	324.64	324.37	324.11	325.06	325.01	324.71	326.50	326.19
AD-5 ^(c)	33° 03' 13"	94° 51' 00"	349.00	351.00	30.0	1/11/01	Sch. 40 PVC	2	20.0	329.00	30.0	319.00	336.34	336.58	336.82	336.99	336.78	336.47	336.80	336.01	339.07	338.04
AD-6 ^(a)	33.05235	94.84757	343.31	346.33	33.0	9/23/09	Sch. 40 PVC	2	23.0	320.31	33.0	310.31	333.04	333.02	332.83	333.02	333.11	332.81	333.11	332.81	333.38	334.00
AD-7 ^(a)	33.05257	94.84219	347.86	350.82	38.0	9/24/09	Sch. 40 PVC	2	28.0	319.86	38.0	309.86	334.32	334.12	334.19	334.20	334.13	334.58	333.77	333.98	334.09	333.61
AD-8 ^(a)	33.05187	94.84026	337.53	340.01	29.0	9/21/09	Sch. 40 PVC	2	16.0	321.53	26.0	311.53	325.41	324.09	325.69	325.15	325.79	325.75	325.98	325.77	326.05	325.70
AD-9 ^(a)	33.04995	94.84196	340.32	343.09	35.0	9/21/09	Sch. 40 PVC	2	20.0	320.32	35.0	305.32	328.46	328.53	328.63	328.44	328.74	329.38	NM	330.18	329.98	329.74
AD-10 ^(a)	33.04881	94.84047	340.23	343.01	35.0	9/22/09	Sch. 40 PVC	2	20.0	320.23	35.0	305.23	323.44	322.55	323.27	323.35	323.51	323.76	323.57	323.88	323.95	323.55
AD-11 ^(a)	33.04824	94.84177	339.61	342.18	20.0	9/22/09	Sch. 40 PVC	2	10.0	329.61	20.0	319.61	327.99	328.37	327.82	327.93	327.94	328.13	328.20	327.97	328.96	328.13
AD-12 ^(a)	33.04901	94.84977	366.27	369.33	30.0	9/24/09	Sch. 40 PVC	2	20.0	346.27	30.0	336.27	348.30	348.29	349.86	349.56	349.99	349.65	349.89	350.01	350.65	350.39
AD-13 ^(a)	33.04918	94.84275	344.12	347.00	20.0	9/22/09	Sch. 40 PVC	2	6.0	338.12	16.0	328.12	332.36	332.24	333.09	332.26	332.68	333.25	333.35	332.01	337.58	334.76
AD-14 ^(a)	33.04715	94.84256	342.32	345.43	19.0	9/22/09	Sch. 40 PVC	2	8.0	334.32	18.0	324.32	330.40	329.80	331.67	330.34	330.94	331.69	332.12	330.17	336.63	334.83
AD-15 ^(d)	33° 03' 04"	94° 50' 27"	340.21	343.29	46.0	12/12/15	Sch. 40 PVC	2	25.5	314.71	45.5	294.71	---	---	---	---	---	---	---	---	---	322.14
AD-16 ^(d)	33° 02' 49"	94° 50' 29"	350.86	353.97	21.0	12/10/15	Sch. 40 PVC	2	11.0	339.86	21.0	329.86	---	---	---	---	---	---	---	---	---	337.09
AD-17 ^(d)	33° 02' 57"	94° 51' 06"	353.99	357.10	40.0	12/10/15	Sch. 40 PVC	2	24.0	329.99	39.0	314.99	---	---	---	---	---	---	---	---	---	334.64
AD-18 ^(d)	33° 03' 03"	94° 51' 03"	346.17	349.28	29.0	12/11/15	Sch. 40 PVC	2	14.0	332.17	29.0	317.17	---	---	---	---	---	---	---	---	---	343.66
Piezometers																						
B-2 ^(b)	33° 03.078'	94° 50.449'	339.7	339.7	50.0	10/28/09	Sch. 40 PVC	2	10.0	329.70	20.0	319.70	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-4 ^(b)	33° 03.011'	94° 50.462'	340.6	340.6	50.0	10/27/09	Sch. 40 PVC	2	8.0	332.60	18.0	322.60	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-5 ^(b)	33° 02.964'	94° 50.428'	340.0	340.0	50.0	10/27/09	Sch. 40 PVC	2	10.0	330.00	20.0	320.00	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-6 ^(b)	33° 02.912'	94° 50.462'	340.1	340.1	50.0	10/28/09	Sch. 40 PVC	2	12.0	328.10	22.0	318.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

NM - Not measured.

(a) Source: Eagle Environmental Services Well Logs (2009).

(b) Source: ETTL Engineers & Consultants Inc. (June 21, 2010).

(c) Source: Southwest Electric Power, State of Texas Well Report (2001).

(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.

Groundwater Elevation Source: AEP, Shallow Groundwater Data Summary through March 2016.

Table 2
Well Construction Details
AEP J. Robert Welsh Power Plant - CCR Units
Pittsburg, Titus County, Texas

Well ID	Latitude	Longitude	Ground Surface Elevation	Borehole depth ft. bls	Date Installed	Screen Material	Well diameter inches	Top of Filter Pack		Bottom of Filter Pack		Top of Screen		Bottom of Screen	
								Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl
Monitoring Wells															
AD-1 ^(c)	33° 02' 48"	94° 50' 47"	355.57	25.0	1/11/2001	PVC	2	13	343	25	331	15.0	340.57	25.0	330.57
AD-2 ^(c)	33° 02' 37"	94° 50' 44"	344.16	25.0	4/26/2001	PVC	2	12	332	25	319	15.0	329.16	25.0	319.16
AD-3 ^(c)	33° 02' 38"	94° 50' 37"	331.10	17.0	4/26/2001	PVC	2	5	326	17	314	7.0	324.10	17.0	314.10
AD-4 ^(c)	33° 02' 43"	94° 50' 33"	340.61	30.0	4/26/2001	PVC	2	16	325	30	311	19.0	321.61	29.0	311.61
AD-4a ^(a)	33.04527	94.84258	340.19	30.0	9/22/2009	PVC	2	17	323	30	310	20.0	320.19	30.0	310.19
AD-4b ^(a)	33.04531	94.84230	329.55	15.0	9/23/2009	PVC	2	4	326	15	315	5.0	324.55	15.0	314.55
AD-4c ^(a)	33.04507	94.84244	329.15	15.0	9/23/2009	PVC	2	4	325	15	314	5.0	324.15	15.0	314.15
AD-5 ^(c)	33° 03' 13"	94° 51' 00"	349.00	30.0	1/11/2001	PVC	2	16	333	30	319	20.0	329.00	30.0	319.00
AD-6 ^(a)	33.05235	94.84757	343.31	33.0	9/23/2009	PVC	2	21	322	33	310	23.0	320.31	33.0	310.31
AD-7 ^(a)	33.05257	94.84219	347.86	38.0	9/24/2009	PVC	2	26	322	38	310	28.0	319.86	38.0	309.86
AD-8 ^(a)	33.05187	94.84026	337.53	29.0	9/21/2009	PVC	2	14	324	29	309	16.0	321.53	26.0	311.53
AD-9 ^(a)	33.04995	94.84196	340.32	35.0	9/21/2009	PVC	2	18	322	35	305	20.0	320.32	35.0	305.32
AD-10 ^(a)	33.04881	94.84047	340.23	35.0	9/22/2009	PVC	2	18	322	35	305	20.0	320.23	35.0	305.23
AD-11 ^(a)	33.04824	94.84177	339.61	20.0	9/22/2009	PVC	2	8	332	20	320	10.0	329.61	20.0	319.61
AD-12 ^(a)	33.04901	94.84977	366.27	30.0	9/24/2009	PVC	2	18	348	30	336	20.0	346.27	30.0	336.27
AD-13 ^(a)	33.04918	94.84275	344.12	20.0	9/22/2009	PVC	2	4	340	20	324	6.0	338.12	16.0	328.12
AD-14 ^(a)	33.04715	94.84256	342.32	19.0	9/22/2009	PVC	2	6	336	18	324	8.0	334.32	18.0	324.32
AD-15 ^(d)	33° 03' 04"	94° 50' 27"	340.21	46.0	12/12/15	PVC	2	22	318	45.5	295	25.5	314.71	45.5	294.71
AD-16 ^(d)	33° 02' 49"	94° 50' 29"	350.86	21.0	12/10/15	PVC	2	9	342	21	330	11.0	339.86	21.0	329.86
AD-17 ^(d)	33° 02' 57"	94° 51' 06"	353.99	40.0	12/10/15	PVC	2	22	332	39	315	24.0	329.99	39.0	314.99
AD-18 ^(d)	33° 03' 03"	94° 51' 03"	346.17	29.0	12/11/15	PVC	2	12	334	29	317	14.0	332.17	29.0	317.17
Piezometers															
B-2 ^(b)	33° 03.078'	94° 50.449'	339.7	50.0	10/28/2009	PVC	2	8	332	20	320	10.0	329.70	20.0	319.70
B-4 ^(b)	33° 03.011'	94° 50.462'	340.6	50.0	10/27/2009	PVC	2	8	333	18	323	8.0	332.60	18.0	322.60
B-5 ^(b)	33° 02.964'	94° 50.428'	340.0	50.0	10/27/2009	PVC	2	5	335	20	320	10.0	330.00	20.0	320.00
B-6 ^(b)	33° 02.912'	94° 50.462'	340.1	50.0	10/28/2009	PVC	2	4	336	22	318	12.0	328.10	22.0	318.10

General Notes:
Elevation in feet above mean sea level.

Footnotes:
(a) Source: Eagle Environmental Services Well Logs (2009).
(b) Source: E TTL Engineers & Consultants Inc. (June 21, 2010).
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.

Acronyms and Abbreviations:
NA = Data not available
ft = feet
bls = below land surface
msl = mean sea level

Table 3
Proposed Well Network
AEP J. Robert Welsh Power Plant - Primary Bottom Ash Pond
Pittsburg, Titus County, Texas

Well ID	Existing/ Proposed	Hydrostratigraphic Unit Target	Location Description		Screen Top Target Elevation ^(a) (ft amsl)	Screen Bottom Target Elevation ^(a) (ft amsl)	Screen Length (ft)	Comments
Upgradient								
AD-5	Existing	Uppermost Water-Bearing Unit	NW of Primary Bottom Ash Pond	Upgradient	329.0	319.0	10	Existing well installed in 2001; well will be utilized to establish background water quality
AD-18	Existing	Uppermost Water-Bearing Unit	W of Primary Bottom Ash Pond	Upgradient	332.2	317.2	15	New monitoring well installed during December 2015 in uppermost shallow aquifer west of Primary Bottom Ash Pond - upgradient; well will be utilized to establish background water quality
Downgradient								
AD-8	Existing	Uppermost Water-Bearing Unit	E of Primary Bottom Ash Pond	Down gradient	321.5	311.5	10	Existing well installed in 2009; uppermost shallow aquifer adjacent to the Primary Bottom Ash Pond - downgradient
AD-9	Existing	Uppermost Water-Bearing Unit	E of Primary Bottom Ash Pond	Down gradient	320.3	305.3	15	Existing well installed in 2009; uppermost shallow aquifer adjacent to the Primary Bottom Ash Pond - downgradient
AD-15	Existing	Uppermost Water-Bearing Unit	E of Primary Bottom Ash Pond	Down gradient	314.7	294.7	20	New monitoring well installed during December 2015 in uppermost shallow aquifer adjacent to the Primary Bottom Ash Pond - downgradient
Piezometers								
AD-6	Existing	Uppermost Water-Bearing Unit	N of Primary Bottom Ash Pond	Side gradient	320.3	310.3	10	Existing well installed in 2009; and utilized to obtain water level data for uppermost water-bearing unit
AD-7	Existing	Uppermost Water-Bearing Unit	N of Primary Bottom Ash Pond	Side gradient	319.9	309.9	10	Existing well installed in 2009; and utilized to obtain water level data for uppermost water-bearing unit

Footnotes:

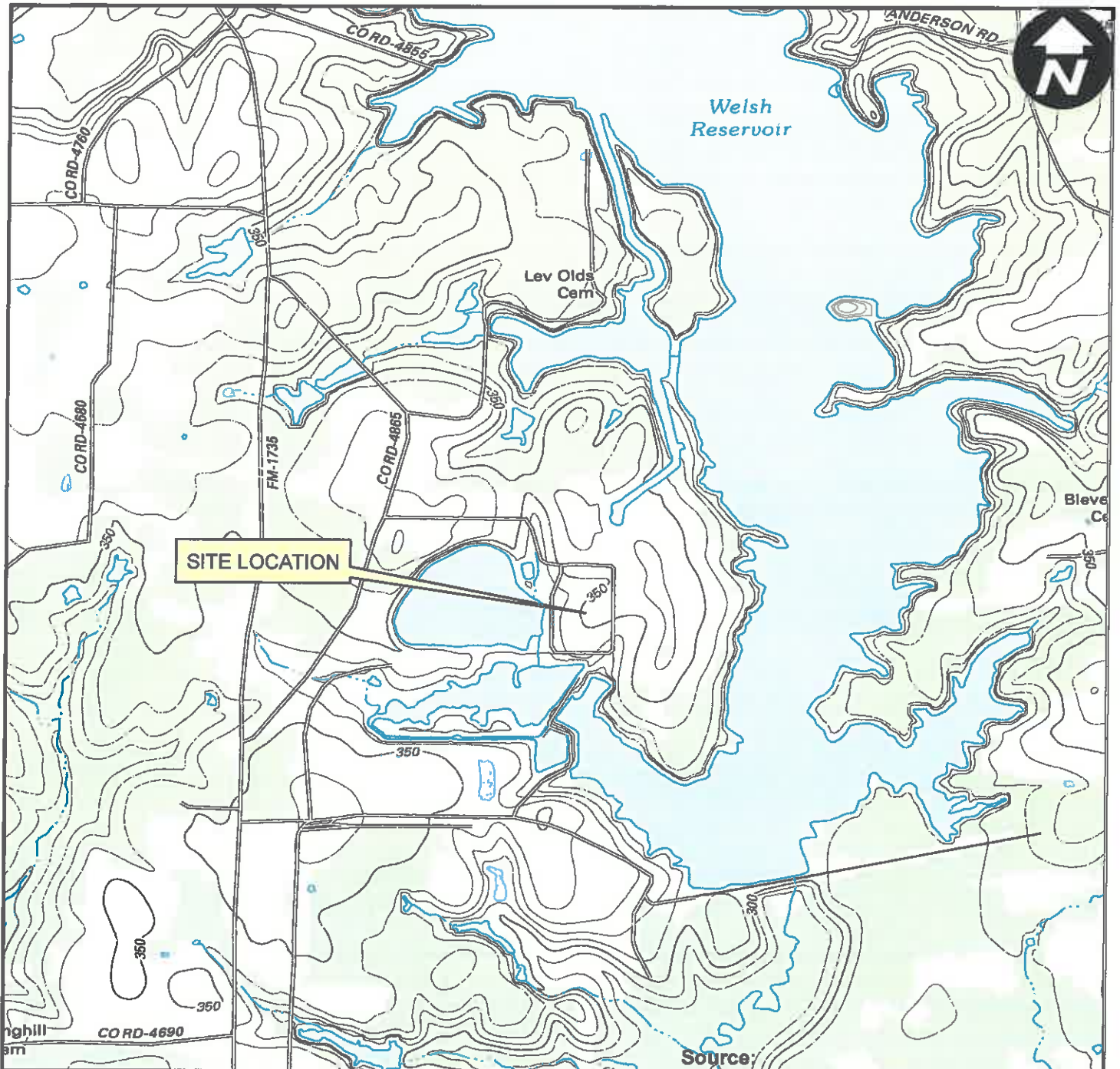
a. Target elevations are an estimated range.

Acronyms and Abbreviations:

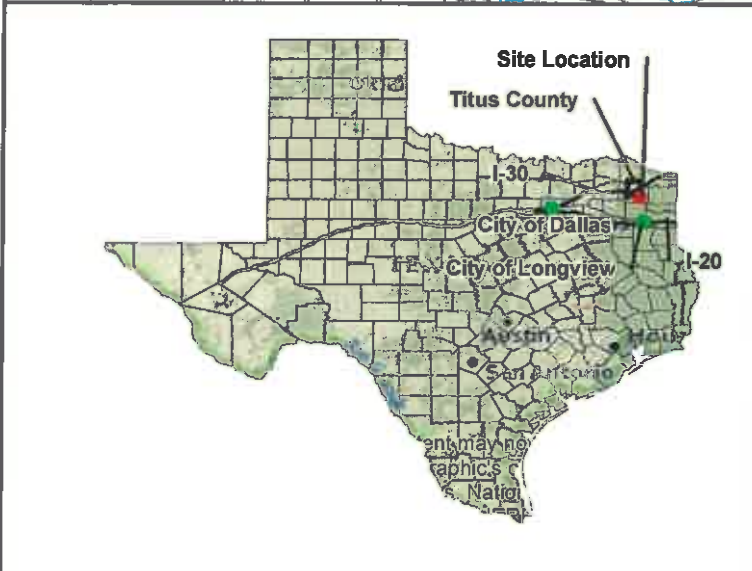
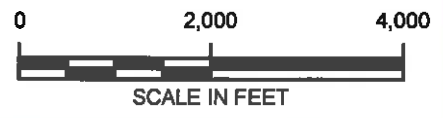
U=Upgradient
D=Downgradient
ft = feet
amsl = above mean sea level



Figures

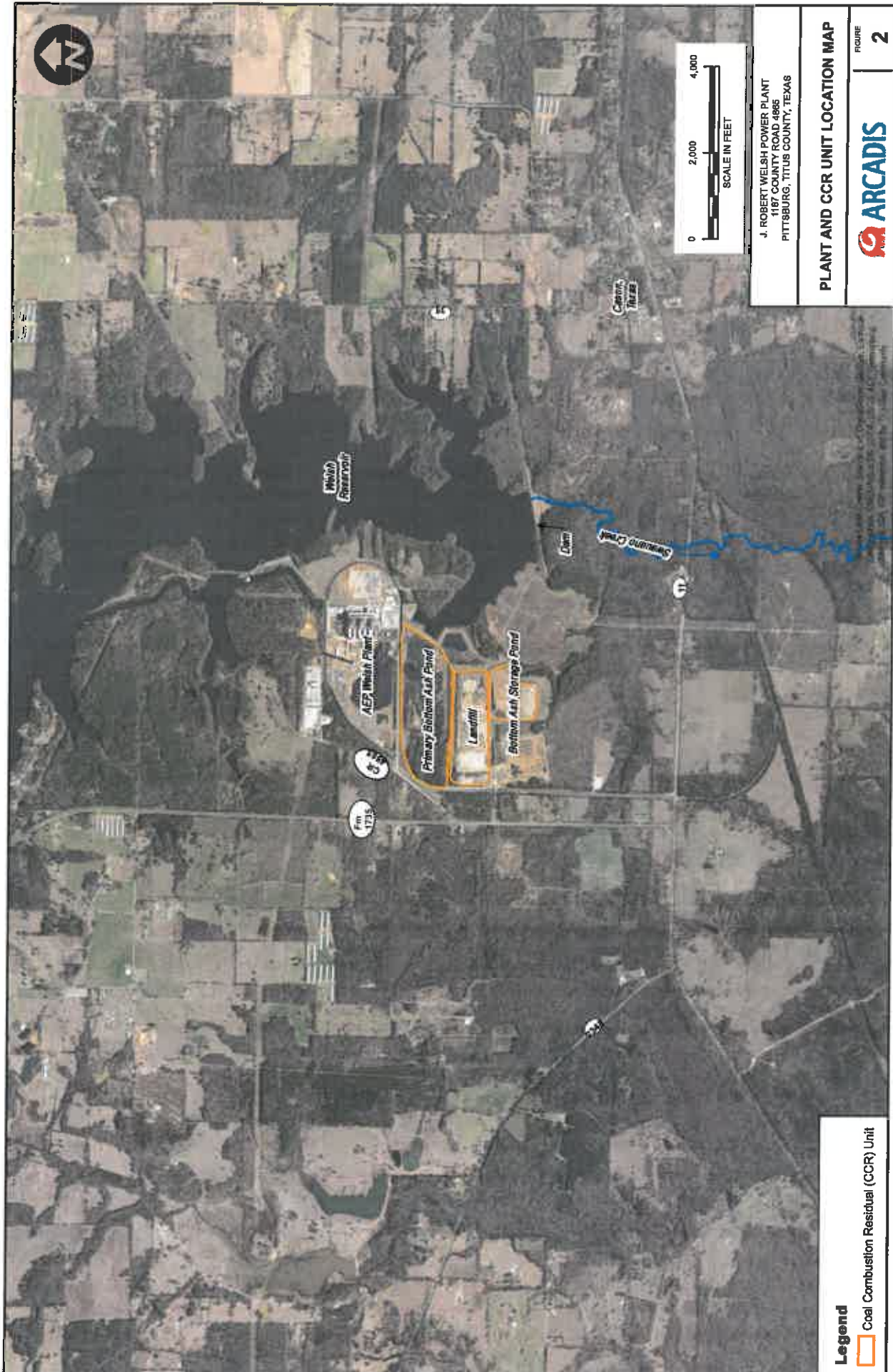


Source:
7.5 minute topographic quadrangle
Cason, Texas, 2013



J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

SITE LOCATION MAP



J. ROBERT WELSH POWER PLANT
 1187 COUNTY ROAD 4685
 PITTSBURG, TITUS COUNTY, TEXAS

PLANT AND CCR UNIT LOCATION MAP

ARCADIS

FIGURE
2

Legend
 Coal Combustion Residual (CCR) Unit



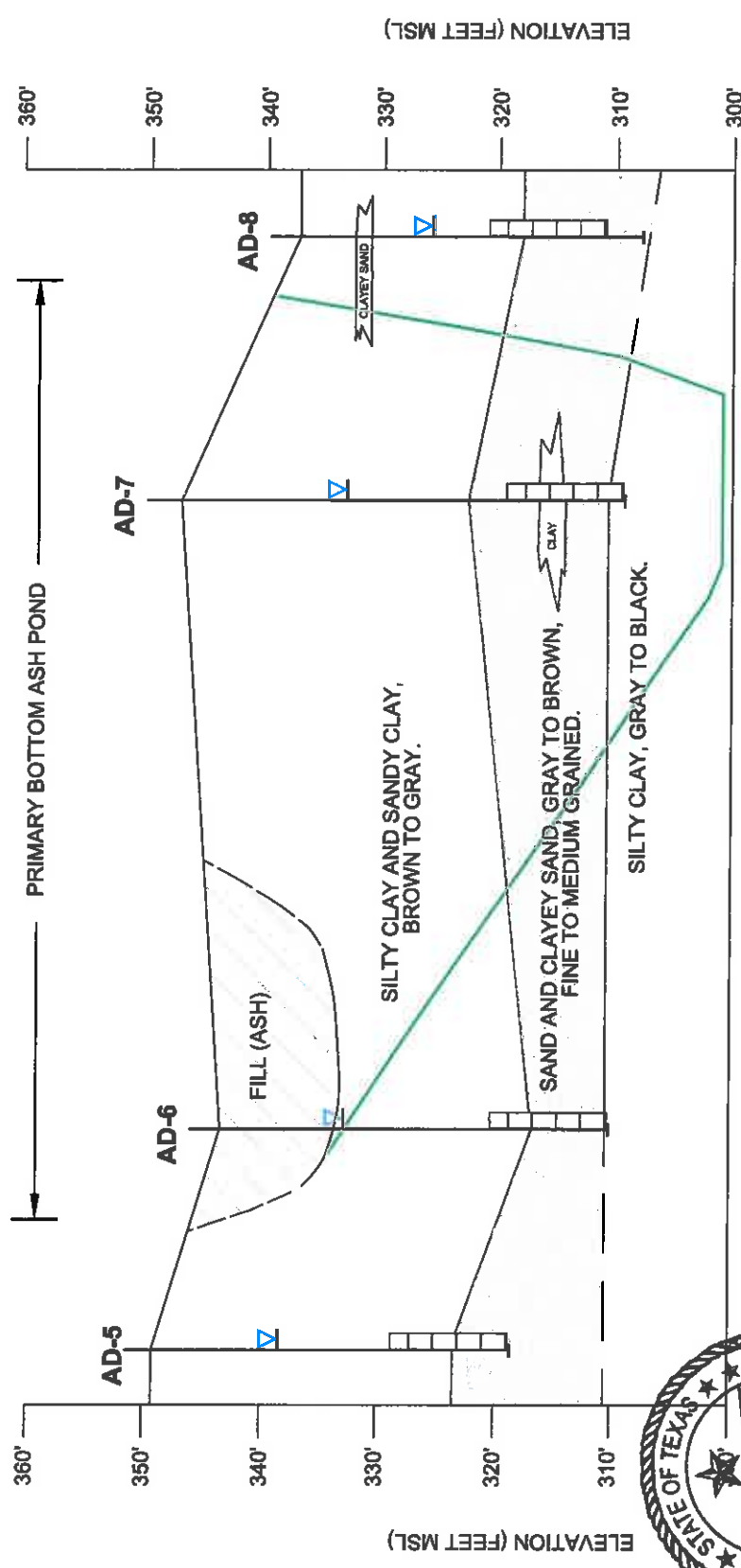
- Legend**
- Monitoring Well Location
 - Piezometer Location
 - Plugged Monitoring Well/Piezometer
 - Soil Boring
 - Line of Geologic Cross Section
 - Site Features



J. ROBERT WELSH POWER PLANT
 1187 COUNTY ROAD 4686
 PITTSBURG, TITUS COUNTY, TEXAS

SITE LAYOUT AND WELL LOCATIONS

WEST EAST
A' A'



- LEGEND**
- ☐ MONITORING WELL SCREENED INTERVAL
 - ▽ WATER LEVEL IN MONITORING WELL (5/12/15)
 - PROJECTED BASE OF ASH POND (SEE NOTE)

NOTE: BASE OF PRIMARY BOTTOM ASH POND TAKEN FROM "WELSH POWER PLANT UNIT
 1 FLY ASH STORAGE AREA PHASE I" DRAWING ID WEPX-38, DATED 10-2-76, AND U.S.
 GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX
 QUADRANGLE, 1984 (PHOTO REVISSED 1980).



Handwritten signature and date: Kenneth J. Brandner 5-29-16

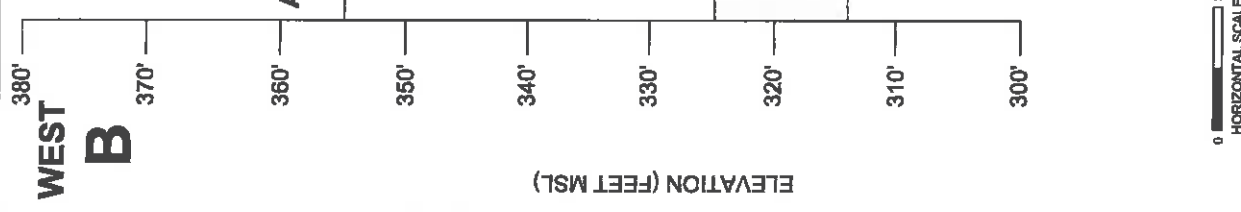


J. ROBERT WELSH POWER PLANT
 1167 COUNTY ROAD 4995
 PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION A - A'

ARCADIS

FIGURE **4**



J. ROBERT WELSH POWER PLANT
 1187 COUNTY ROAD 4865
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION
 B - B'**

ARCADIS

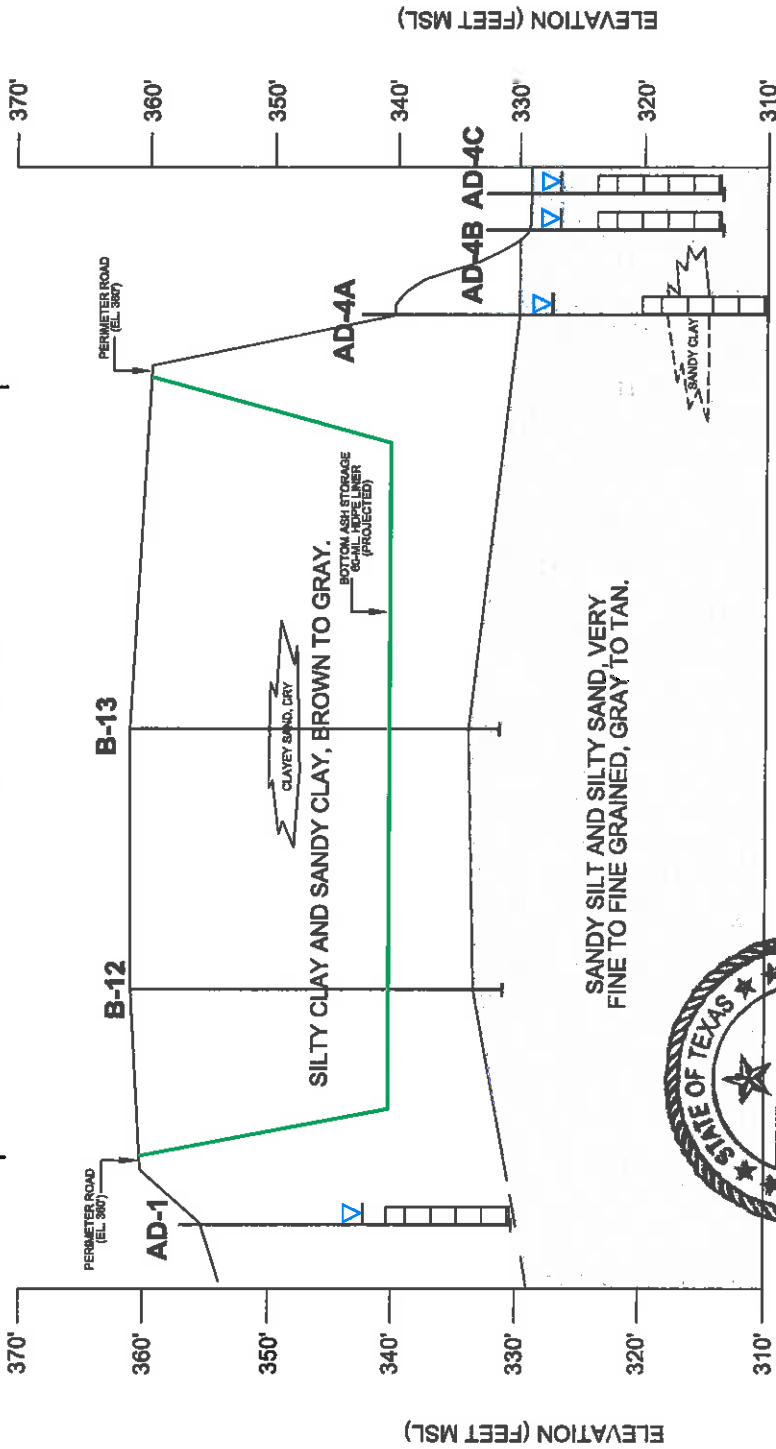
FIGURE **5**

CITY: DALLAS; DIST: 12; MAP: PLOT: THE LYNNON-2774106; PROJECT: PLEASANT POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I; DRAWING ID: WEP-PA-68; DATE: 12/3/76; SCALE: AS SHOWN; DESIGNED BY: KJB; CHECKED BY: JTB; DRAWN BY: JTB; PLOTTED BY: JTB; PRINTED BY: JTB; FILED BY: JTB; APPROVED BY: JTB; TITLE: CROSS SECTION B-B' OF LANDFILLS AD-10, AD-12, AND AD-13.

WEST
C

EAST
C'

BOTTOM ASH STORAGE



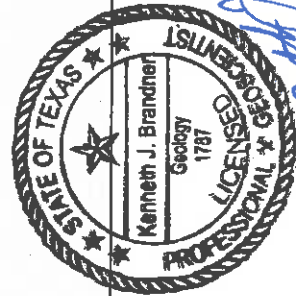
ELEVATION (FEET MSL)

ELEVATION (FEET MSL)

LEGEND

- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (3/4/16)
- PROJECTED BASE OF ASH STORAGE (SEE NOTE)

NOTE: BASE OF BOTTOM ASH STORAGE HAS A 60-MIL HDPE LINER AT ELEVATION 340.0'. TAKEN FROM FREEZE AND NICHOLS' HYDRAULIC ANALYSIS OF WELSH POWER PLANT ASH PONDS, AMERICAN ELECTRIC POWER COMPANY, DATED DECEMBER 2010.



Handwritten signature and date: Kenneth J. Brandtner 6-29-16

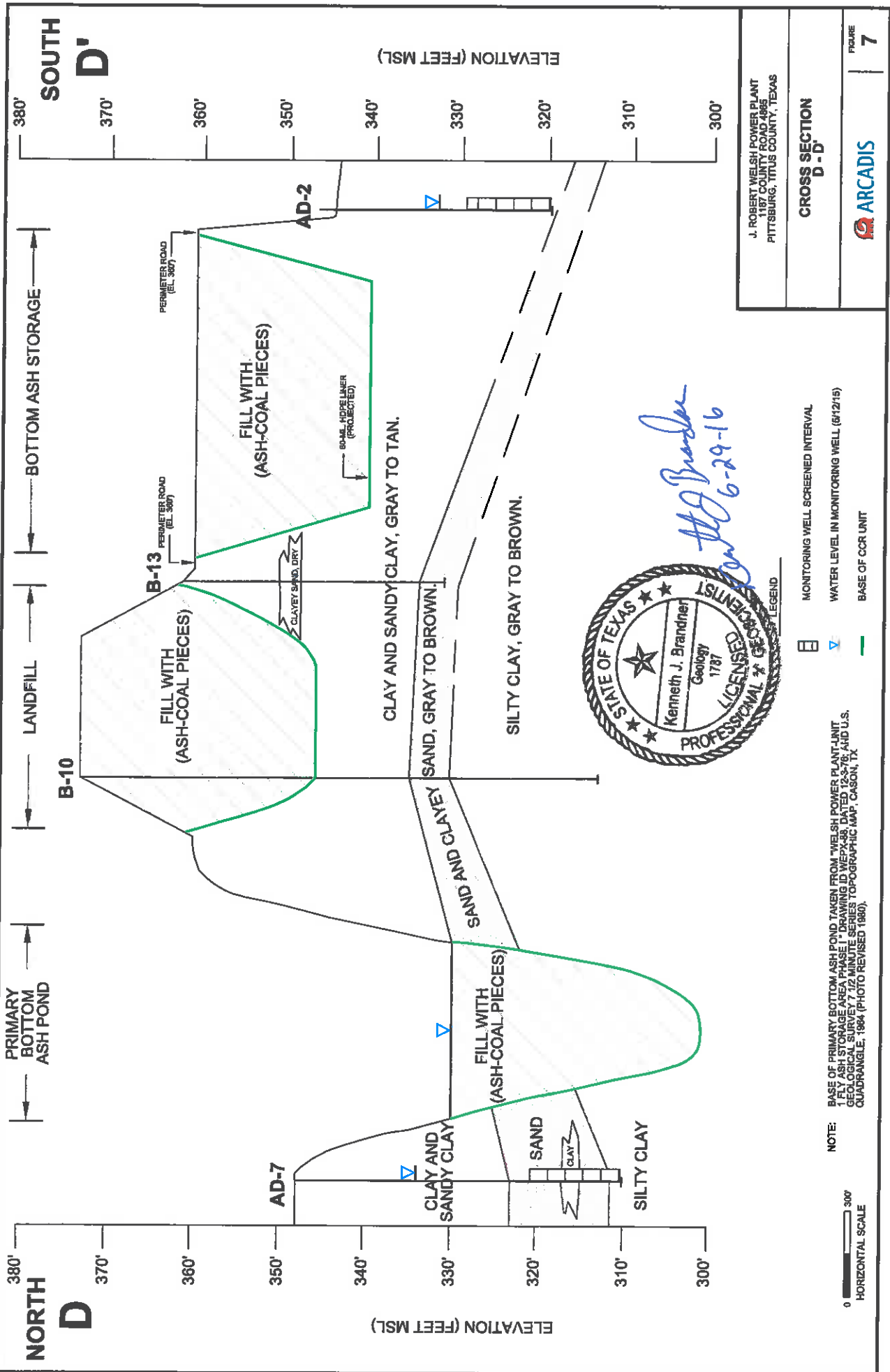
0 200'
HORIZONTAL SCALE

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4895
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
C - C'



FIGURE
6



J. ROBERT WELSH POWER PLANT
 1187 COUNTY ROAD 4885
 PITTSBURG, TITUS COUNTY, TEXAS

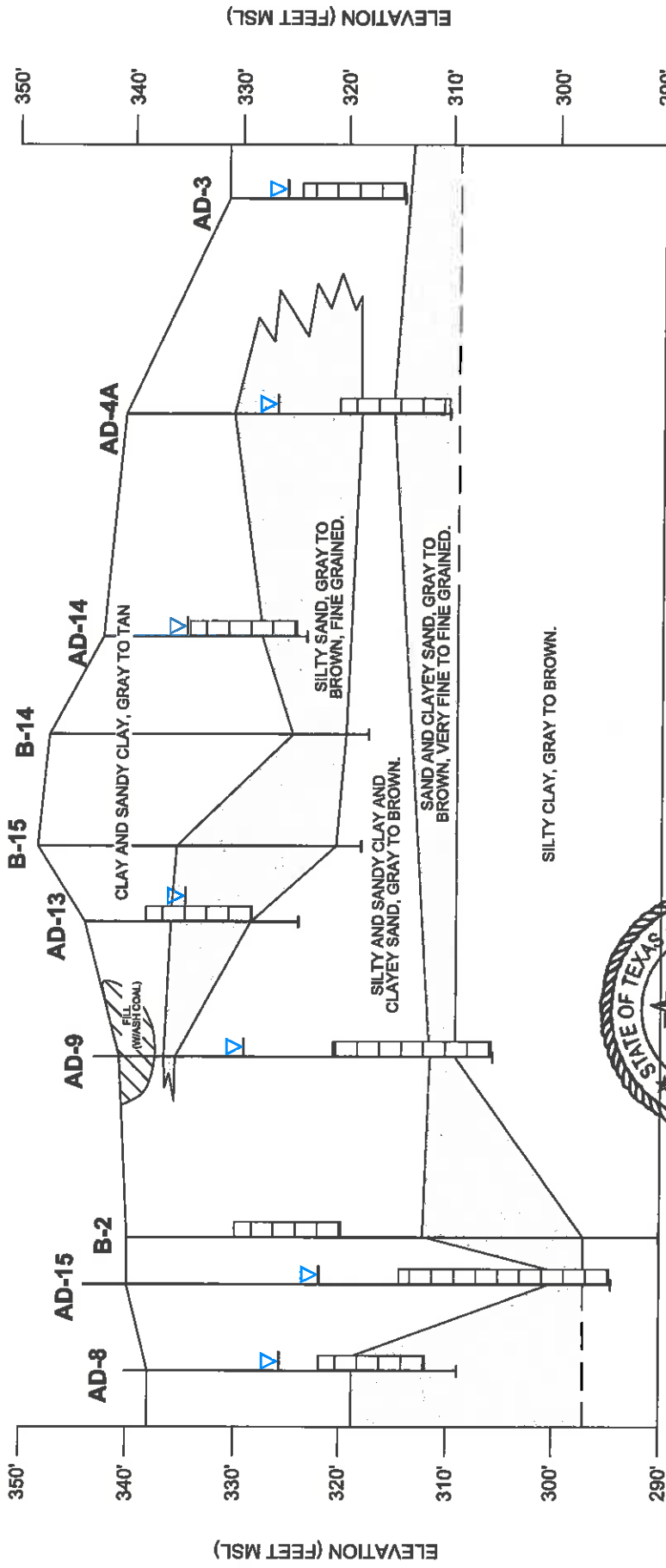
ARCADIS

FIGURE 7

DATE: 06/12/15 10:30 AM BY: LEASE, DMM
 DRAWING: 62422015 1030 AM
 PROJECT: WELSH POWER PLANT UNIT 1 FLY ASH STORAGE AREA PHASE 1
 LAYOUT: MODEL, SWAC, 6/29/15 10:37 AM, ACAD, 18.19 (AS TECH), PLOT: 1/1/15

NORTH
SOUTH

E
E



- LEGEND
- MONITORING WELL SCREENED INTERVAL
 - WATER LEVEL IN MONITORING WELL (3/4/16)
 - PROJECTED BASE OF ASH STORAGE (SEE NOTE)



Kenneth J. Brandner
 16-29-16
Kenneth J. Brandner

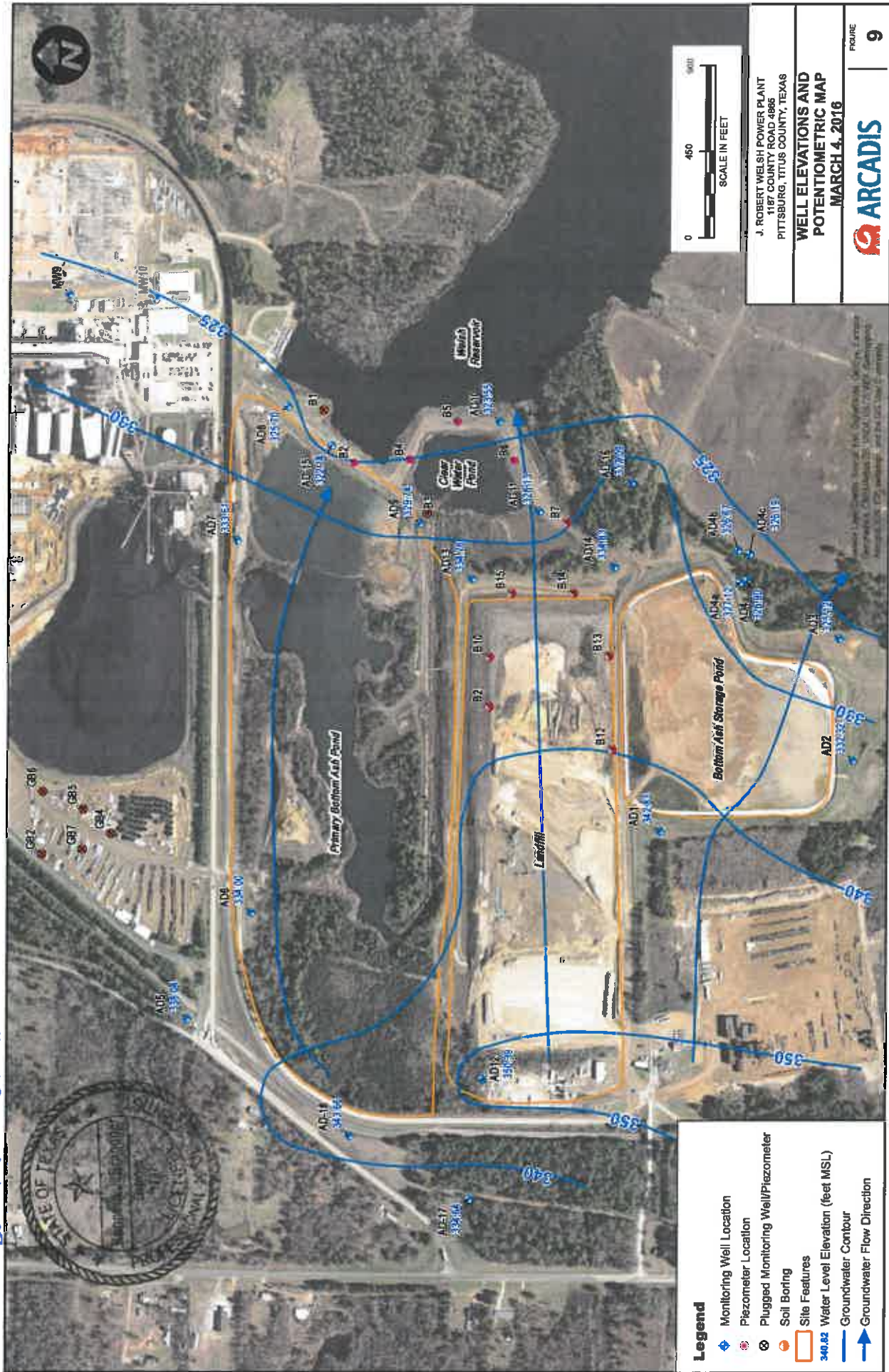
J. ROBERT WELSH POWER PLANT
 1167 COUNTY ROAD 4865
 PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
E-E

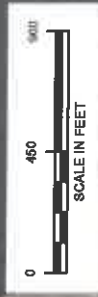
FIGURE
8



Vista 7 Budor 6-29-16



- Legend**
- Monitoring Well Location
 - Piezometer Location
 - Plugged Monitoring Well/Piezometer
 - Soil Boring
 - Site Features
 - 340.82 Water Level Elevation (feet MSLL)
 - Groundwater Contour
 - Groundwater Flow Direction



J. ROBERT WELSH POWER PLANT
 1187 COUNTY ROAD 688
 PITTSBURG, TITUS COUNTY, TEXAS

**WELL ELEVATIONS AND
 POTENTIOMETRIC MAP**
 MARCH 4, 2016



Visit 1 Borden
6-29-16



Legend

- Monitoring Well Location
- Proposed Existing CCR Unit Upgradient Monitoring Well
- Proposed Existing CCR Unit Downgradient Monitoring Well
- Site Features



J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 488E
PITTSBURG, TITUS COUNTY, TEXAS

**PROPOSED MONITORING WELL
NETWORK MAP - PRIMARY BOTTOM ASH POND**

FIGURE
10

ARCADIS



Appendix A

Boring/Well Construction Logs

AD-1

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side		State of Texas WELL REPORT		Texas Water Well Drillers Advisory Council P.O. Box 13087 Austin, TX 78711-3087 512-239-0630	
1) OWNER <u>Southwestern Electric Power</u> ADDRESS <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u>		(Name) (Street or RFD) (City) (State) (Zip)			
2) ADDRESS OF WELL: County <u>Camp</u> <u>Titus</u> <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u> GRID # <u>16-58-4</u>		(Street, RFD or other) (City) (State) (Zip)			
3) TYPE OF WORK (Check): <input checked="" type="checkbox"/> New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Reconditioning <input type="checkbox"/> Plugging		4) PROPOSED USE (Check): <input checked="" type="checkbox"/> Monitor <input type="checkbox"/> Environmental Soil Boring <input type="checkbox"/> Domestic <input type="checkbox"/> Industrial <input type="checkbox"/> Irrigation <input type="checkbox"/> Injection <input type="checkbox"/> Public Supply <input type="checkbox"/> De-watering <input type="checkbox"/> Testwell If Public Supply well, were plans submitted to the TNRCC? <input type="checkbox"/> Yes <input type="checkbox"/> No		5) GPS <u>33° 02' 48" N</u> <u>94° 50' 47" W</u>	
6) WELL LOG: Date Drilling: Started <u>1-11</u> to <u>2001</u> Completed <u>1-11</u> to <u>2001</u>		DIAMETER OF HOLE Dia. (in.) From (ft.) To (ft.) <u>8 1/4</u> Surface <u>25</u>		7) DRILLING METHOD (Check): <input type="checkbox"/> Driven <input type="checkbox"/> Air Rotary <input type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Bored <input type="checkbox"/> Air Hammer <input type="checkbox"/> Cable Tool <input type="checkbox"/> Jetted <input type="checkbox"/> Other	
From (ft.) To (ft.) Description and color of formation material <u>0 - 25</u> <u>gray silty clay with some hard red streaks</u>		8) Borehole Completion (Check): <input type="checkbox"/> Open Hole <input type="checkbox"/> Straight Wall <input type="checkbox"/> Underreamed <input checked="" type="checkbox"/> Gravel Packed <input type="checkbox"/> Other If Gravel Packed give interval from <u>1.9</u> ft. to <u>2.5</u> ft.			
		CASING, BLANK PIPE, AND WELL SCREEN DATA:			
		Dia. (in.) New or Used Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial		Setting (ft.) From To Casing Screen	
<u>AP-2</u>		<u>2 N riser</u>		<u>+ 2 15 sch 40</u>	
		<u>2 N #105/67 screen</u>		<u>15 25 sch 40</u>	
		9) CEMENTING DATA [Rule 338.44(1)] Cemented from <u>13</u> ft. to <u>0</u> ft. No. of sacks used <u>6-50#</u> ft. to _____ ft. No. of sacks used _____ Method used <u>ben tonite</u> Cemented by _____ Distance to septic system field lines or other concentrated contamination _____ ft. Method of verification of above distance _____			
13) TYPE PUMP: <u>NA</u> <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input type="checkbox"/> Submersible <input type="checkbox"/> Cylinder <input type="checkbox"/> Other _____ Depth to pump bowls, cylinder, jet, etc. _____ ft.		10) SURFACE COMPLETION <input checked="" type="checkbox"/> Specified Surface Slab Installed [Rule 338.44(2)(A)] <input checked="" type="checkbox"/> Specified Steel Sleeve Installed [Rule 338.44(3)(A)] <input type="checkbox"/> Filter Adapter Used [Rule 338.44(3)(b)] <input type="checkbox"/> Approved Alternative Procedure Used [Rule 338.71]			
14) WELL TESTS: <u>NA</u> Type test: <input type="checkbox"/> Pump <input type="checkbox"/> Bailer <input type="checkbox"/> Jetted <input type="checkbox"/> Estimated Yield: _____ gpm with _____ ft. drawdown after _____ hrs.		11) WATER LEVEL: Static level <u>12' 8"</u> ft. below land surface Date <u>1-11-01</u> Artesian flow _____ gpm. Date _____			
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, submit "REPORT OF UNDESIRABLE WATER" Type of water? _____ Depth of strata _____ Was a chemical analysis made? <input type="checkbox"/> Yes <input type="checkbox"/> No		12) PACKERS: <u>NA</u> Type _____ Depth _____			
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete Items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.					
COMPANY NAME _____ (Type or print)		WELL DRILLER'S LICENSE NO. <u>TX-52694-M</u>			
ADDRESS _____ (Street or RFD) (City) (State) (Zip)					
(Signed) <u>Dwight M. Ralls</u> (Licensed Well Driller)		(Signed) _____ (Registered Driller Trainee)			

Please attach electric log, chemical analysis, and other pertinent information, if available.

AD-2

Please use black ink

Send original copy by certified mail to: TNRCC, P.O. Box 13067, Austin, TX 78711-3067

Texas Water Well Drillers Advisory Council
P.O. Box 13067
Austin, TX 78711-3067
512-234-0530

ATTENTION OWNER: Confidentially
Privilege Notice on Reverse Side

State of Texas WELL REPORT

1) OWNER Southwestern Electric (Name) ADDRESS Rt. 4, Box 221 Pittsburg Tx (Street or RFD) (City) (State) (Zip) 75686

2) ADDRESS OR WELL: County Camp (County) Rt. 4 Box 221 Pittsburg Tx (Street, RFD or other) (City) (State) (Zip) 75686 GRID # 16-58-4

3) TYPE OF WORK (Check):
 New Well Deepening
 Reconditioning Plugging

4) PROPOSED USE (Check): Monitor Environmental Soil Boring Domestic
 Industrial Irrigation Injection Public Supply De-watering Testwell
 If Public Supply well, were plans submitted in the TNRCC? Yes No

5) GPS
33°02'37"N
94°50'44"W
 N

6) WELL LOG:
 Date Drilling: _____
 Started 4/26 2001
 Completed 4/26 2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8 1/4	Surface	25

7) DRILLING METHOD (Check): Driven
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other _____

From (ft.)	To (ft.)	Description and color of formation material
0	2	top soil
2	5	red & gray clay w/ silt
5	10	red & gray clay w/ silt
10	25	gray silty clay w/ tan streaks

8) Borehole Completion (Check): Open Hole Straight Wall
 Undersized Gravel Packed Other _____
 If Gravel Packed give interval ... from 12 ft. to 25 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
2	N	1 1/2" cas	+2	15	Set to
2	N	#10 slot screen	15	25	Set to

AP-2

(Use reverse side if necessary)

9) CEMENTING DATA [Rule 338.44(1)]
 Cemented from 12 ft. to 2 ft. No. of sacks used 5-50#
 Method used bestwite pellets
 Cemented by _____
 Distance to septic system field lines or other concentrated contamination _____ ft.
 Method of verification of above distance _____

13) TYPE PUMP: NA
 Turbine Jet Submersible Cylinder
 Other _____
 Depth to pump bowls, cylinder, jet, etc. _____ ft.

10) SURFACE COMPLETION
 Specified Surface Slab Installed [Rule 338.44(2)(A)]
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
 Pileless Adapter Used [Rule 338.44(3)(b)]
 Approved Alternative Procedure Used [Rule 338.71]

14) WELL TESTS: NA
 Type test: Pump Bailor Jetted Estimated
 Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:
 Static level _____ ft. below land surface Date _____
 Artesian flow _____ gpm. Date _____

15) WATER QUALITY:
 Did you knowingly penetrate any strata which contained undesirable constituents?
 Yes No If yes, submit "REPORT OF UNDESIRABLE WATER"
 Type of water? _____ Depth of strata _____
 Was a chemical analysis made? Yes No

12) PACKERS: NA Type _____ Depth _____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmission.

COMPANY NAME _____ (Type or print) WELL DRILLER'S LICENSE NO. TX-52694-M

ADDRESS _____ (City) (State) (Zip)

(Signed) Michael M. Kelly (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

AD-3

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-238-0536

ATTENTION OWNER: Confidentiality
Privilege Notice on Reverse Side

State of Texas WELL REPORT

1) OWNER Southwestern Electric ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: Rt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-58-4
County Camp (City) (State) (Zip)

3) TYPE OF WORK (Check):
 New Well Deepening
 Reconditioning Plugging

4) PROPOSED USE (Check): Monitor Environmental Soil Boring Domestic
 Industrial Irrigation Injection Public Supply De-watering Testwell
If Public Supply well, were plans submitted to the TNRCC? Yes No

5) WELL LOG:
Date Drilling: _____
Started 4/26 ^{to} 2001
Completed 4/26 ^{to} 2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
<u>8 1/4</u>	Surface	<u>17</u>

7) DRILLING METHOD (Check): Driven
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other _____

8) GPS
33°02'38"N
94°50'37"W

From (ft.)	To (ft.)	Description and color of formation material
<u>0</u>	<u>12</u>	<u>gray silty clay w/ tan streaks</u>
<u>12</u>	<u>15</u>	<u>very stiff gray/blued red clay</u>
<u>15</u>	<u>17</u>	<u>Very stiff gray clay w/ red nodules and tan streaks</u>

8) Borehole Completion (Check): Open Hole Straight Wall
 Underreamed Gravel Packed Other _____
If Gravel Packed give interval ... from 5 ft. to 17 ft.

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>7</u>	<u>Sch 40</u>
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>7</u>	<u>17</u>	<u>Sch 40</u>

AP-3

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 2 ft. to 5 ft. No. of sacks used 2 1/2 - 50
Method used bentonite pellets
Cemented by _____
Distance to septic system field lines or other concentrated contamination _____ ft.
Method of verification of above distance _____

13) TYPE PUMP: NA
 Turbine Jet Submersible Cylinder
 Other _____
Depth to pump bowls, cylinder, jet, etc. _____ ft.

14) SURFACE COMPLETION
 Specified Surface Slab Installed [Rule 338.44(2)(A)]
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
 Pileless Adaptor Used [Rule 338.44(3)(b)]
 Approved Alternative Procedure Used [Rule 338.71]

14) WELL TESTS: NA
Type test: Pump Bailor Jetted Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:
Static level: _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
 Yes No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? Yes No

12) PACKERS: NA Type _____ Depth _____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME _____ (Type or print) WELL DRILLER'S LICENSE NO. TX 52694-M

ADDRESS _____ (City) _____ (State) _____ (Zip)

(Signed) Robert M. [Signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

AD-4

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-239-4530

ATTENTION OWNER: Confidentiality
Privilege Notice on Reverse Side

State of Texas WELL REPORT

1) OWNER Southwestern Electric Power ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: Pt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-5B-4
County Titus (Street, RFD or other) (City) (State) (Zip)

3) TYPE OF WORK (Check):
 New Well Deepening
 Reconditioning Plugging

4) PROPOSED USE (Check): Monitor Environmental Soil Boring Domestic
 Industrial Irrigation Injection Public Supply De-watering Testwell
If Public Supply well, were plans submitted to the TNRCC? Yes No

GPS
33° 02' 43" N
94° 50' 33" W
N

6) WELL LOG:
Date Drilling: _____
Started 4/26 to 2001
Completed 4/26 to 2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8 1/4	Surface	30

7) DRILLING METHOD (Check): Driven
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other _____

From (ft.)	To (ft.)	Description and color of formation material
0	5	red silty clay with gray streaks

8) Borehole Completion (Check): Open Hole Straight Wall
 Underreamed Gravel Packed Other _____
If Gravel Packed give interval ... from 16 ft. to 30 ft.

From (ft.)	To (ft.)	Description and color of formation material
5	30	gray silty clay with red streaks

AP-4

CASING, BLANK PIPE, AND WELL SCREEN DATA:					
Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gauge Casing Screen
			From	To	
2	N	riser	16	19	Sch 40
2	N	#10 slot screen	19	29	Sch 40

13) TYPE PUMP:
 Turbine Jet Submersible Cylinder
 Other NA
Depth to pump bowls, cylinder, jet, etc., _____ ft.

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 16 ft. to 2 ft. No. of sacks used 8-50
ft. to _____ ft. No. of sacks used _____
Method used bentonite pellets
Cemented by _____
Distance to septic system field lines or other concentrated contamination _____ ft.
Method of verification of above distance _____

14) WELL TESTS: NA
Type test: Pump Baker Jetted Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

10) SURFACE COMPLETION
 Specified Surface Slab Installed [Rule 338.44(2)(A)]
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
 Pileas Adapter Used [Rule 338.44(3)(b)]
 Approved Alternative Procedure Used [Rule 338.71]

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
 Yes No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? Yes No

11) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS: NA Type _____ Depth _____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME _____ (Type or print) WELL DRILLER'S LICENSE NO. TX 52694-M

ADDRESS _____ (City) _____ (State) _____ (Zip)

(Signed) S. M. [Signature] (Signed) _____ (Registered Driller/Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.



SOIL BORING LOG

BORING/WELL NO.: AD-4A
 TOTAL DEPTH: 30'
 TOP OF CASING ELEV.: 342.85 ft. NGVD
 GROUND SURFACE ELEV.: 340.19 ft. NGVD

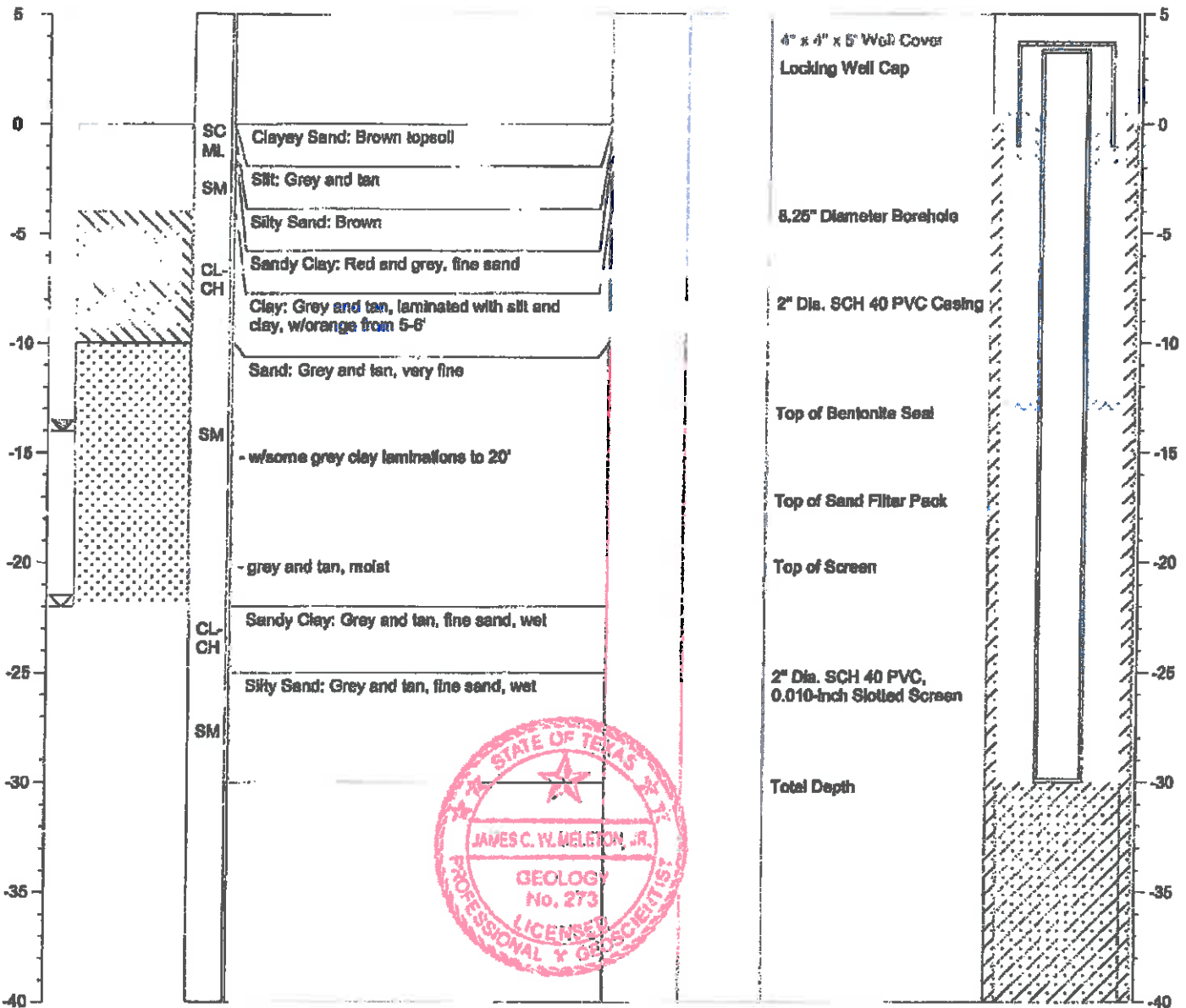
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04527
 Longitude: 94.84258

☒ Water level during drilling
 ☒ Water level in completed well
 Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-4B
 TOTAL DEPTH: 15'
 TOP OF CASING ELEV.: 333.23 ft. NGVD
 GROUND SURFACE ELEV.: 329.55 ft. NGVD

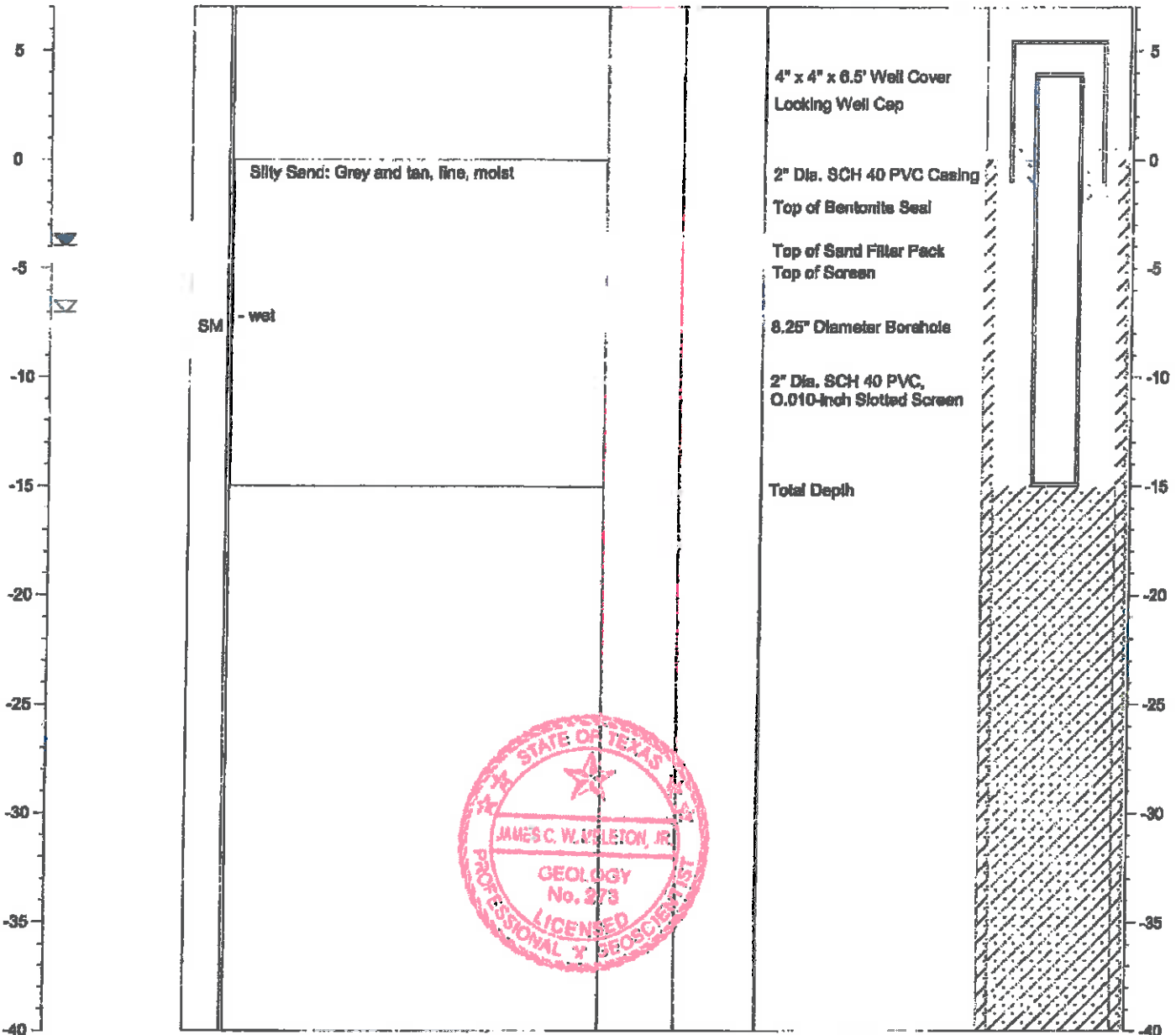
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.04531
 Longitude: 94.84230

≈ Water level during drilling
 ≈ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-4C
TOTAL DEPTH: 15'
TOP OF CASING ELEV.: 333.28 ft. NGVD
GROUND SURFACE ELEV.: 329.15 ft. NGVD

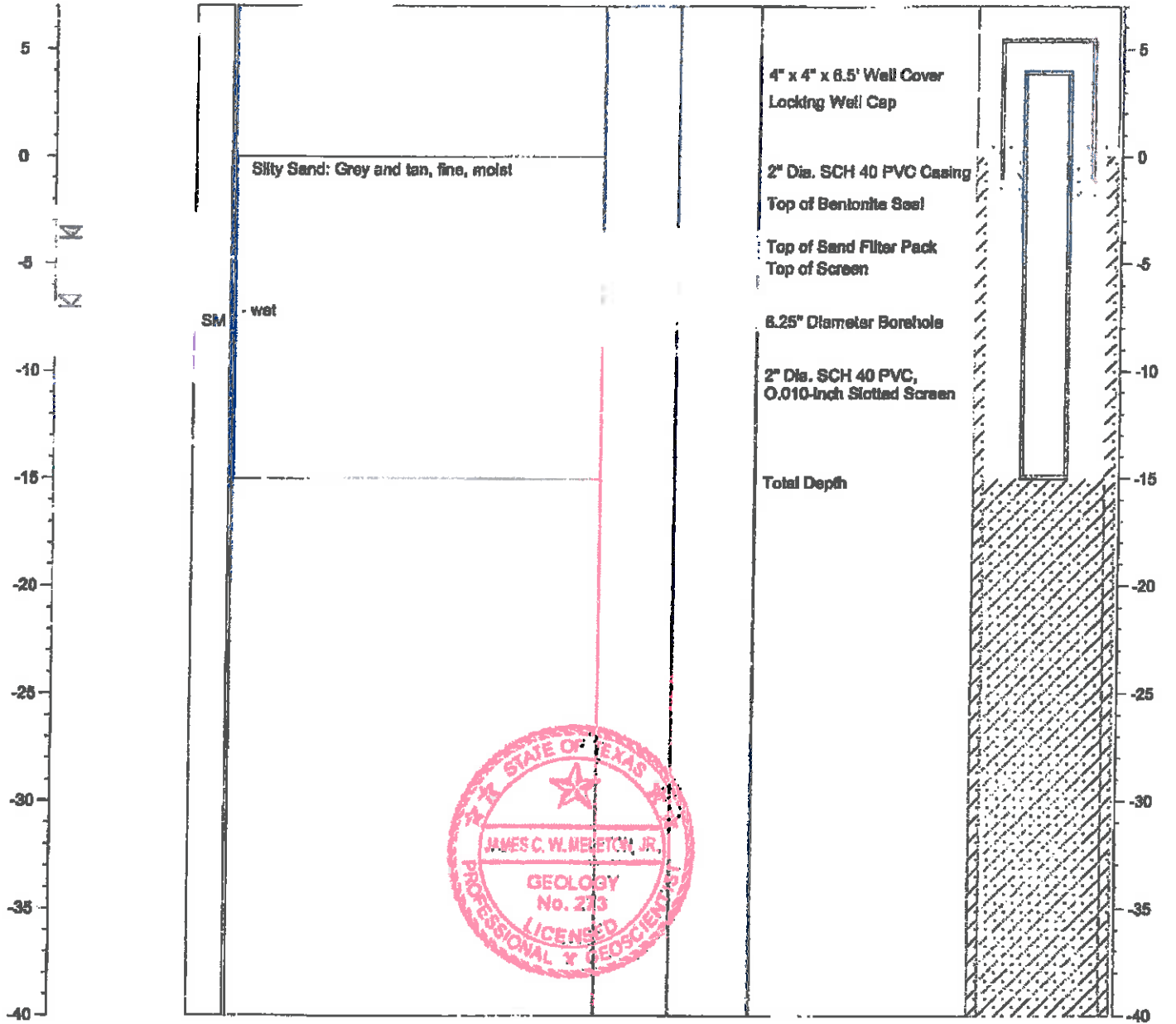
CLIENT: AEP
PROJECT: Ash Disposal Area
SITE LOCATION: Welsh Power Plant
PROJECT NO.: S-08-0109
LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
DRILLER: Tom McCullough
METHOD OF DRILLING: Hollow-stem Auger
SAMPLING METHODS: Split-spoon
DATE DRILLED: 9/23/09

NOTES: Latitude: 33.04507
 Longitude: 94.84244

≍ Water level during drilling
 ≍ Water level in completed well

DEPTH	SOIL SYMBOLS	USGS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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AD-5

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

**State of Texas
WELL REPORT**

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-230-8530

1) OWNER Southwestern Electric Power ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: County: Tarrant Rt. 4, Box 221 Pittsburg Tx 75686 GRID # 16-58-4
(City) (State) (Zip)

3) TYPE OF WORK (Check):
 New Well Deepening
 Reconditioning Plugging

4) PROPOSED USE (Check): Monitor Environmental Soil Boring Domestic
 Industrial Irrigation Injection Public Supply De-watering Testwell
 If Public Supply well, were plans submitted to the TNRCC? Yes No

5) 33°03'13"N
94°51'00"W

6) WELL LOG:
 Date Drilling: _____
 Started 1-11-2001
 Completed 1-11-2001

DIAMETER OF HOLE		
Dis. (in.)	From (ft.)	To (ft.)
<u>8 1/4</u>	Surface	<u>30</u>

7) DRILLING METHOD (Check): Driven
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other _____

8) Borehole Completion (Check): Open Hole Straight Well
 Underreamed Gravel Packed Other _____
 If Gravel Packed give interval ... from 16 ft. to 30 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dis. (in.)	New or Used	Steel, Plastic, etc. Port., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Cage Casting Screen
			From	To	
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>20</u>	<u>sch 40</u>
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>20</u>	<u>30</u>	<u>sch 40</u>

9) CEMENTING DATA [Rule 338.44(1)]
 Cemented from 16 ft. to 0 ft. No. of sacks used _____
 ft. to _____ ft. No. of sacks used _____
 Method used pentonite
 Cemented by _____
 Distance to septic system field lines or other concentrated contamination _____ ft.
 Method of verification of above distance _____

10) SURFACE COMPLETION
 Specified Surface Slab Installed [Rule 338.44(2)(A)]
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
 Piless Adapter Used [Rule 338.44(3)(b)]
 Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:
 Static level 11' 9" ft. below land surface Date 1-11-01
 Artesian flow _____ gpm. Date _____

12) PACKERS: NA Type _____ Depth _____

13) TYPE PUMP:
 Turbine Jet Submersible Cylinder
 Other _____
 Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
 Type test: Pump Boiler Jetted Estimated
 Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
 Did you knowingly penetrate any strata which contained undesirable constituents?
 Yes No If yes, submit "REPORT OF UNDESIRABLE WATER"
 Type of water? _____ Depth of strata _____
 Was a chemical analysis made? Yes No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME _____ (Type or print) WELL DRILLER'S LICENSE NO. TX 52694-M

ADDRESS _____ (City) (State) (Zip)

(Signed) [Signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.



SOIL BORING LOG

BORING/WELL NO.: AD-6
 TOTAL DEPTH: 33'
 TOP OF CASING ELEV.: 346.33 ft. NGVD
 GROUND SURFACE ELEV.: 343.31 ft. NGVD

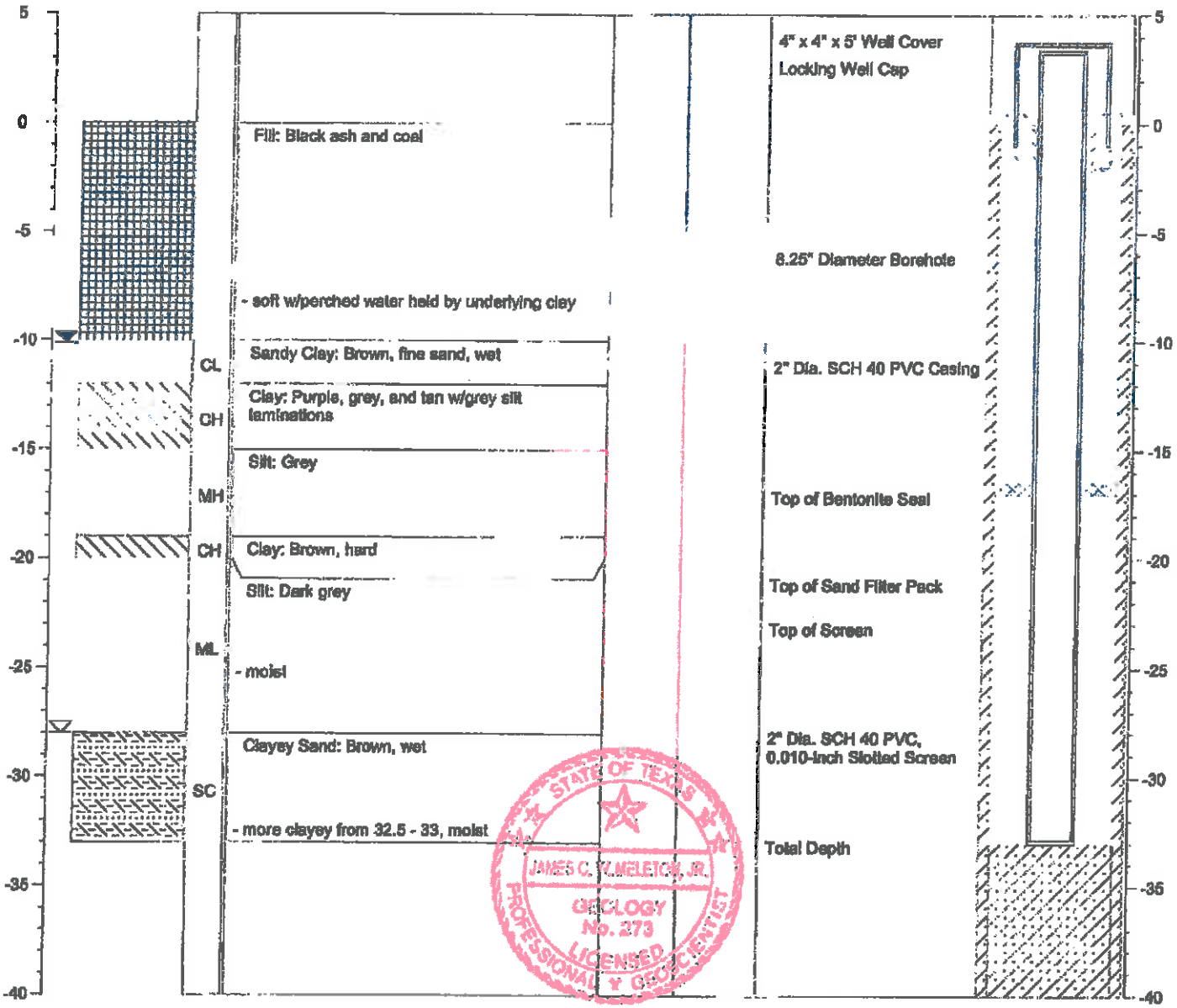
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split- Spoon
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.05235
 Longitude: 94.84757

☒ Water level during drilling
 ☒ Water level in completed well
 Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-7
 TOTAL DEPTH: 38'
 TOP OF CASING ELEV.: 350.82 ft. NGVD
 GROUND SURFACE ELEV.: 347.86 ft. NGVD

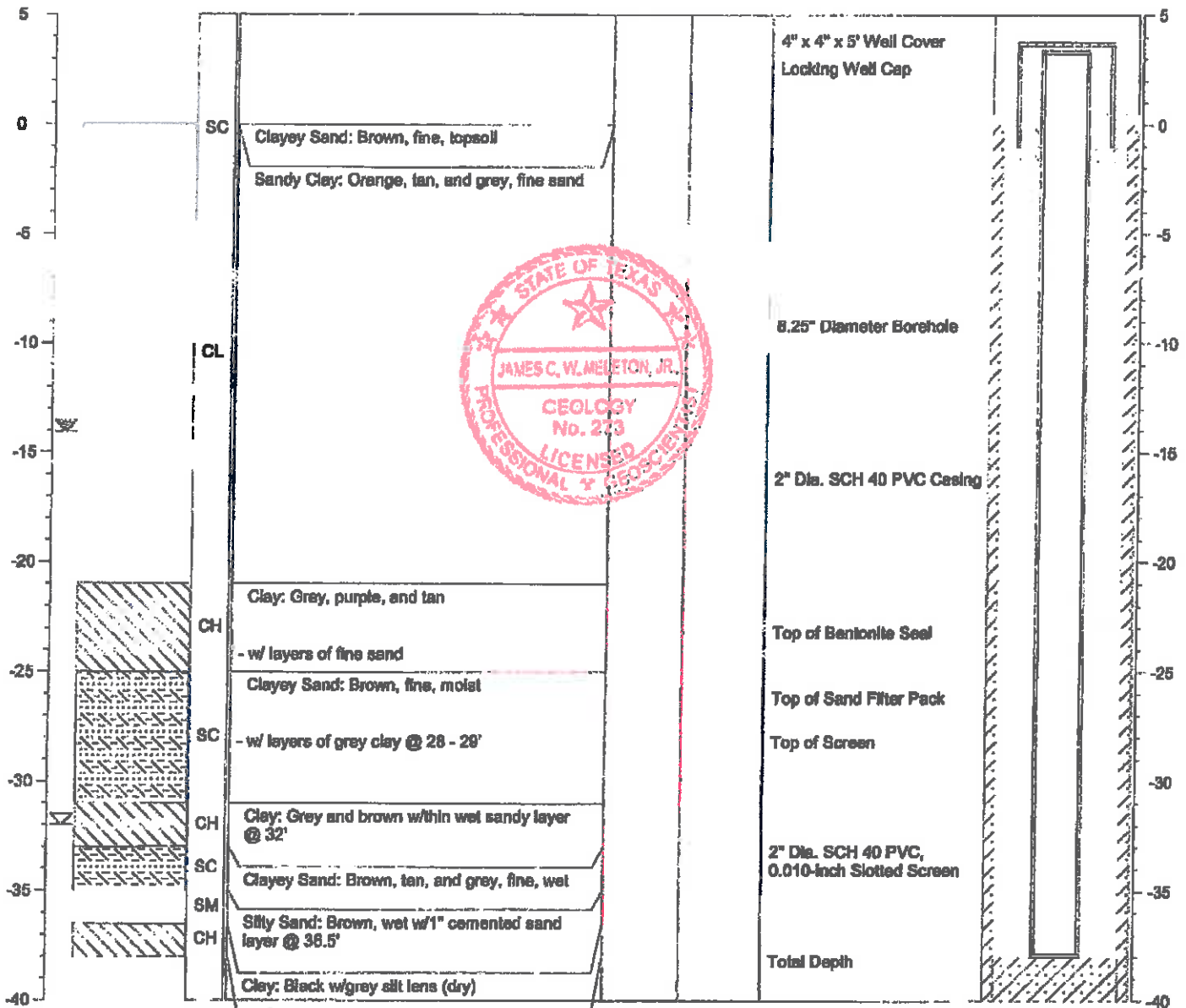
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/24/09

NOTES: Latitude: 33.05257
 Longitude: 94.84219

≡ Water level during drilling
 ≡ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-8
 TOTAL DEPTH: 29'
 TOP OF CASING ELEV.: 340.01 ft. NGVD
 GROUND SURFACE ELEV.: 337.53 ft. NGVD

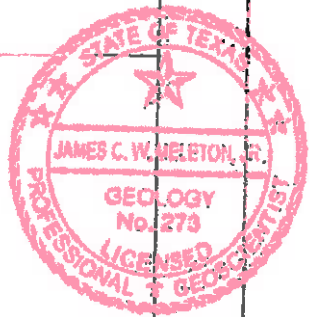
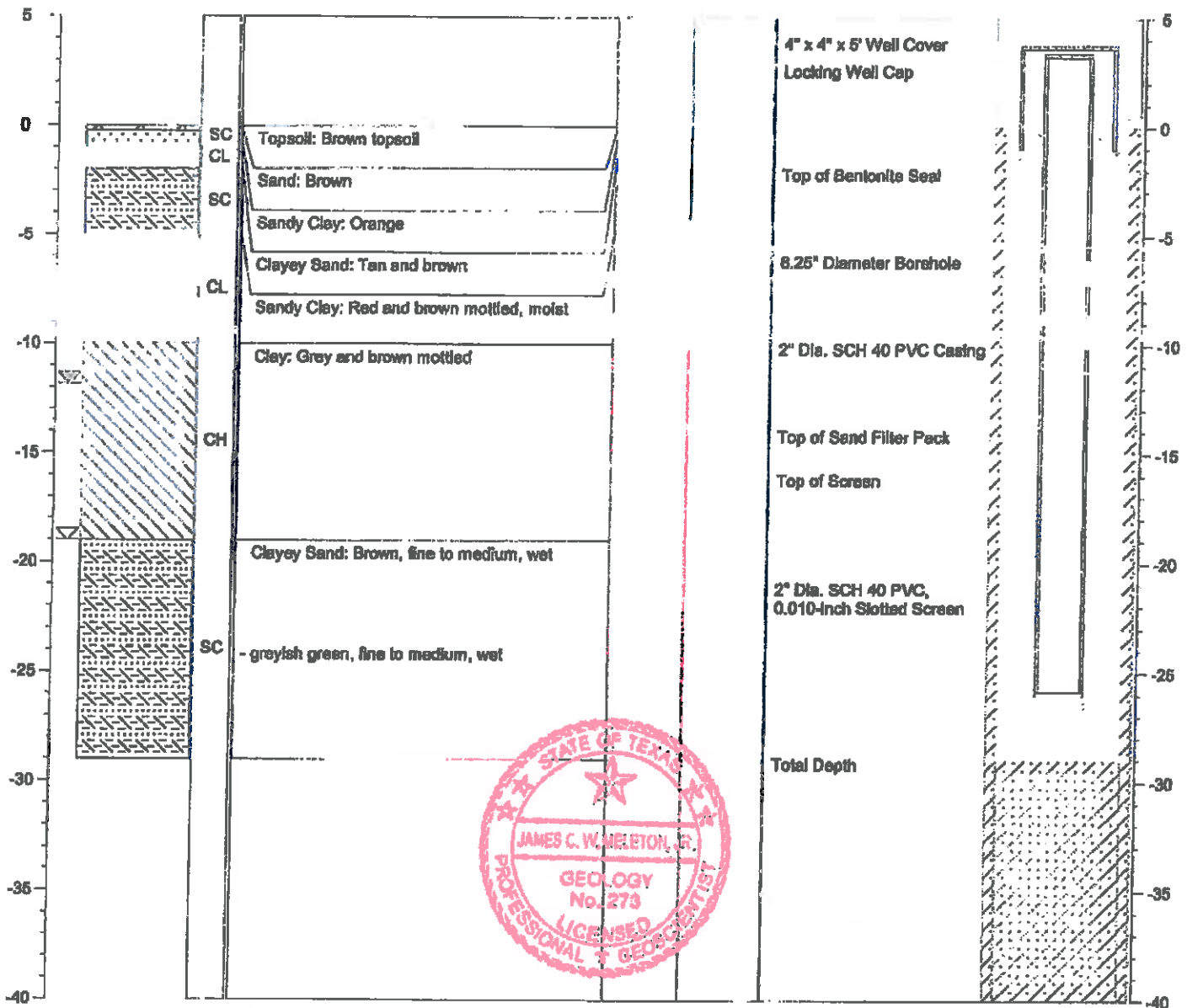
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.05187
 Longitude: 94.84026

☒ Water level during drilling
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-9
 TOTAL DEPTH: 35'
 TOP OF CASING ELEV.: 343.09 ft. NGVD
 GROUND SURFACE ELEV.: 340.32 ft. NGVD

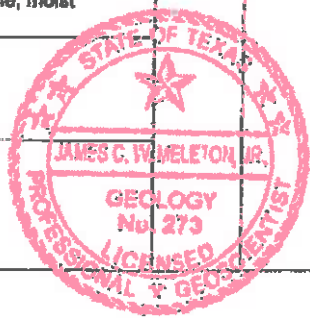
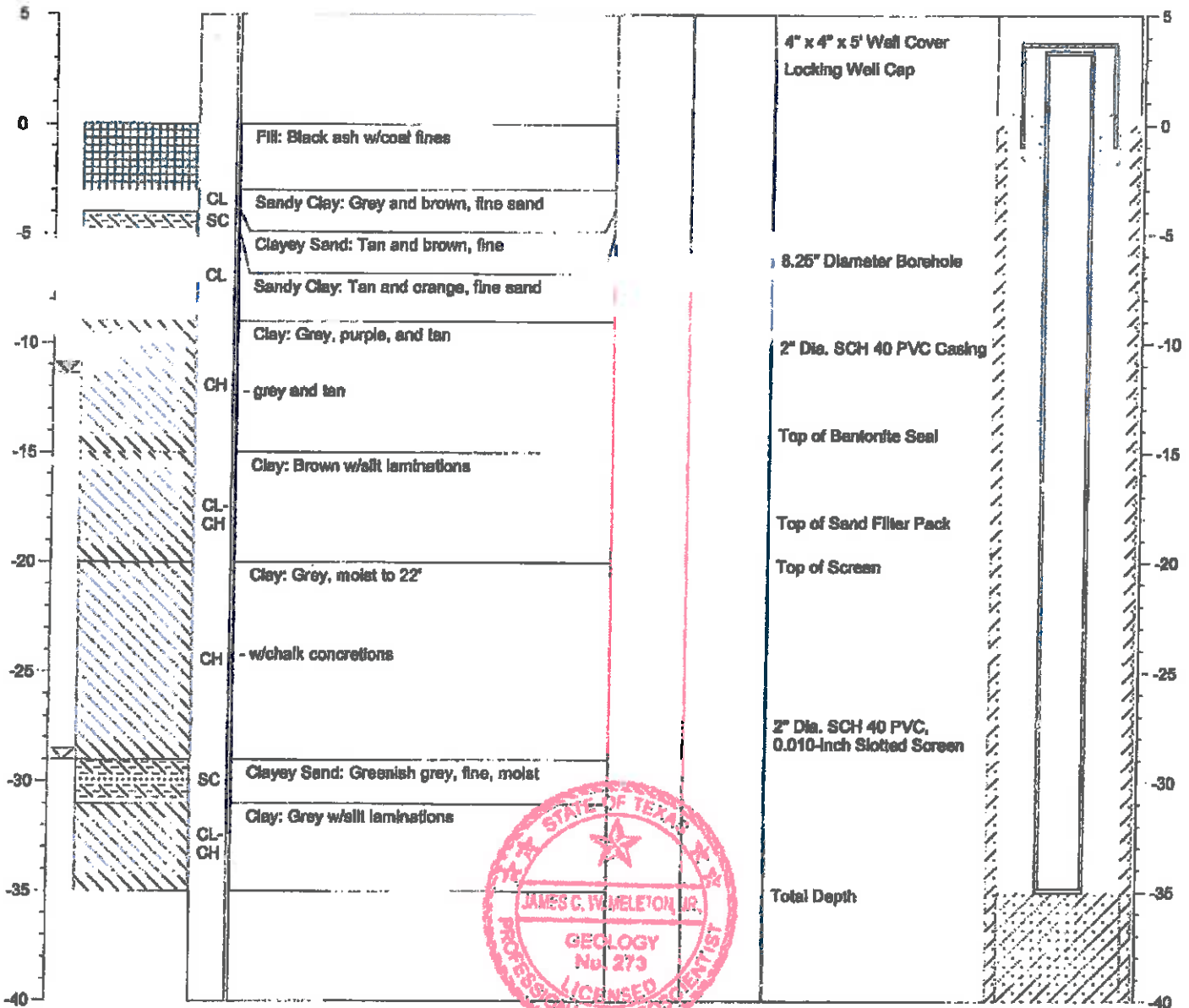
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.04995
 Longitude: 94.84196

⊗ Water level during drilling
 ⊗ Water level in completed well
 Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-10
 TOTAL DEPTH: 35'
 TOP OF CASING ELEV.: 343.01 ft. NGVD
 GROUND SURFACE ELEV.: 340.23 ft. NGVD

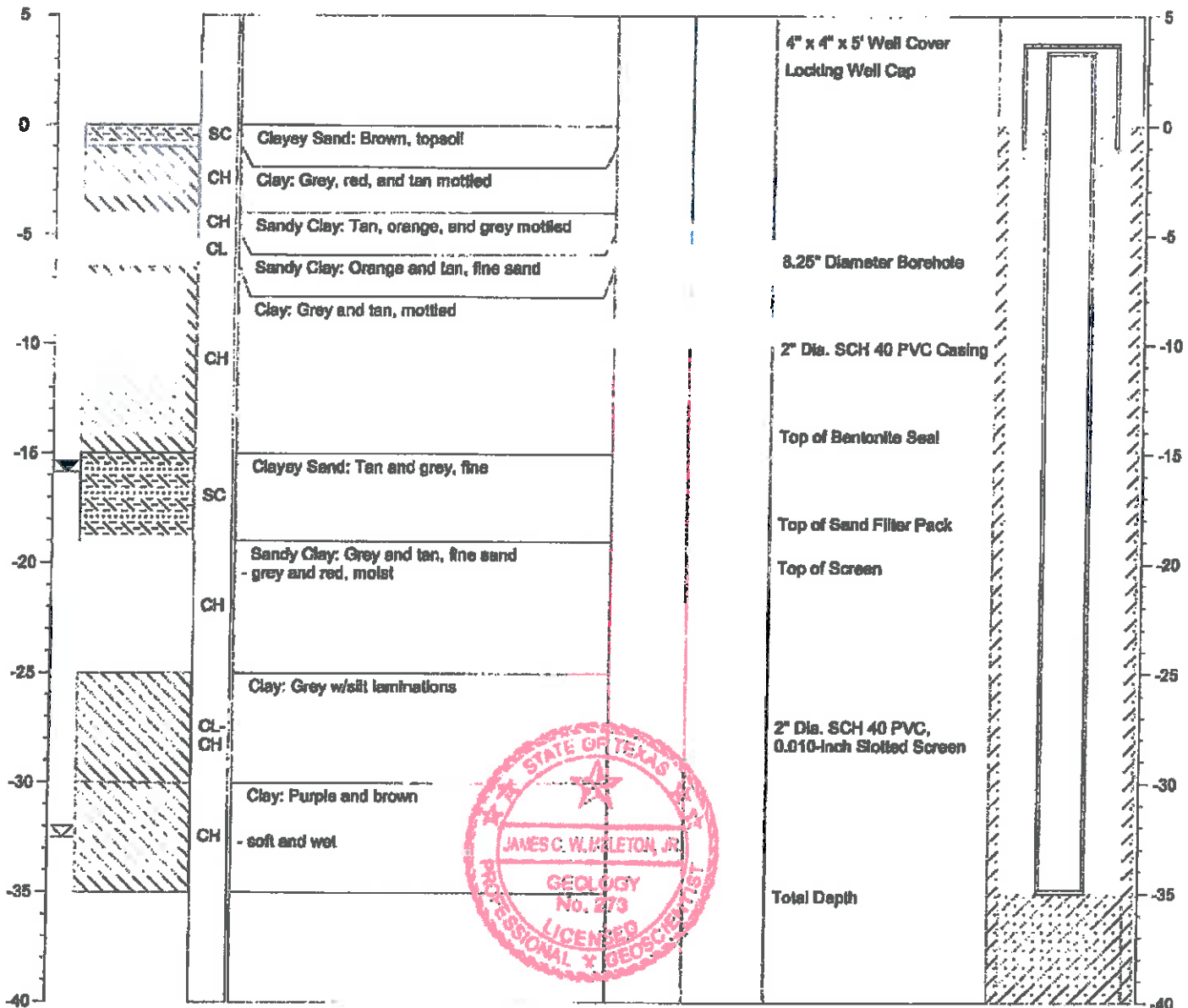
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04881
 Longitude: 94.84047

≡ Water level during drilling
 ≡ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-11
 TOTAL DEPTH: 20'
 TOP OF CASING ELEV.: 342.18 ft. NGVD
 GROUND SURFACE ELEV.: 339.61 ft. NGVD

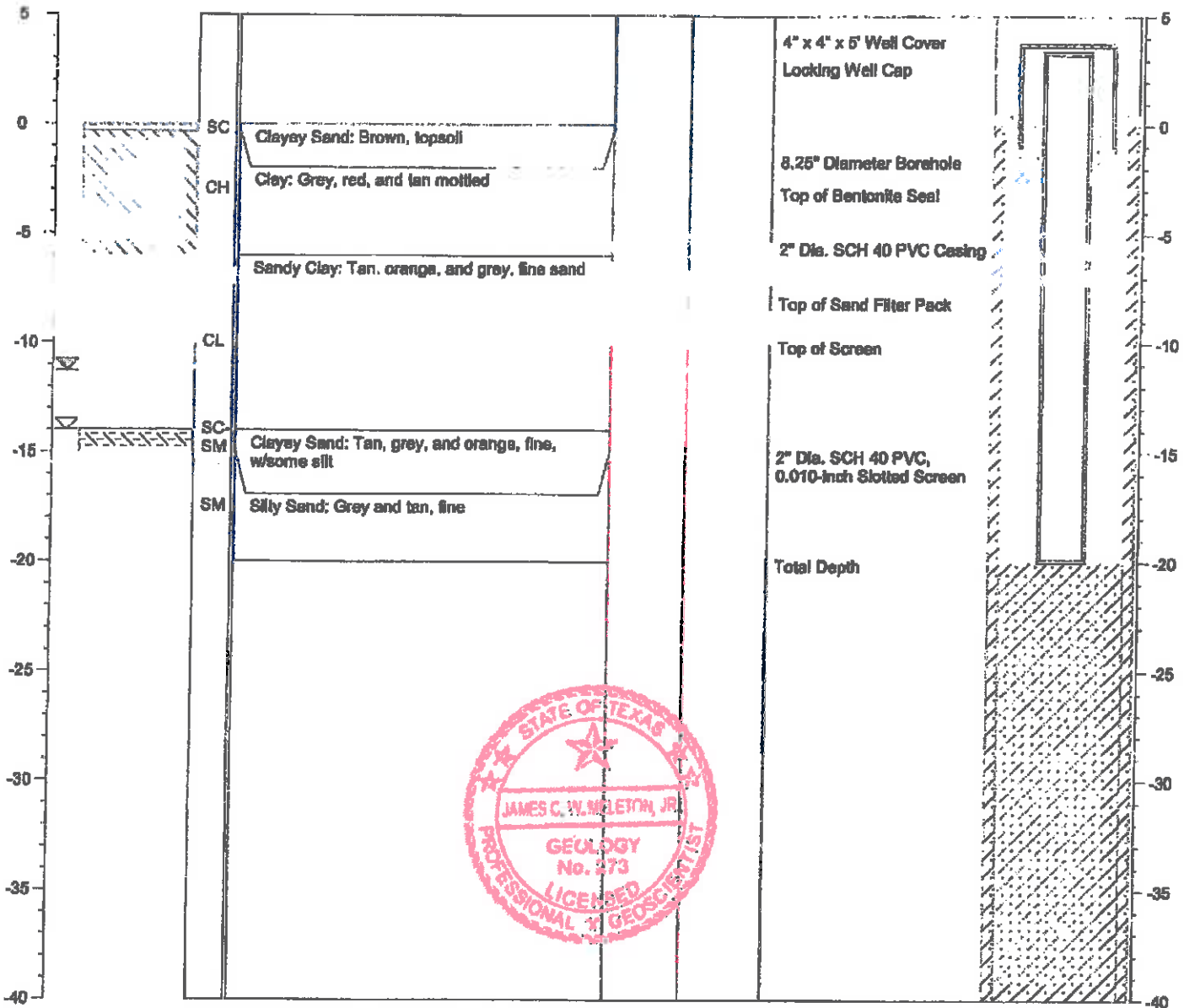
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04824
 Longitude: 94.84177

☒ Water level during drilling
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-12
 TOTAL DEPTH: 30'
 TOP OF CASING ELEV.: 369.33 ft. NGVD
 GROUND SURFACE ELEV.: 366.27 ft. NGVD

CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

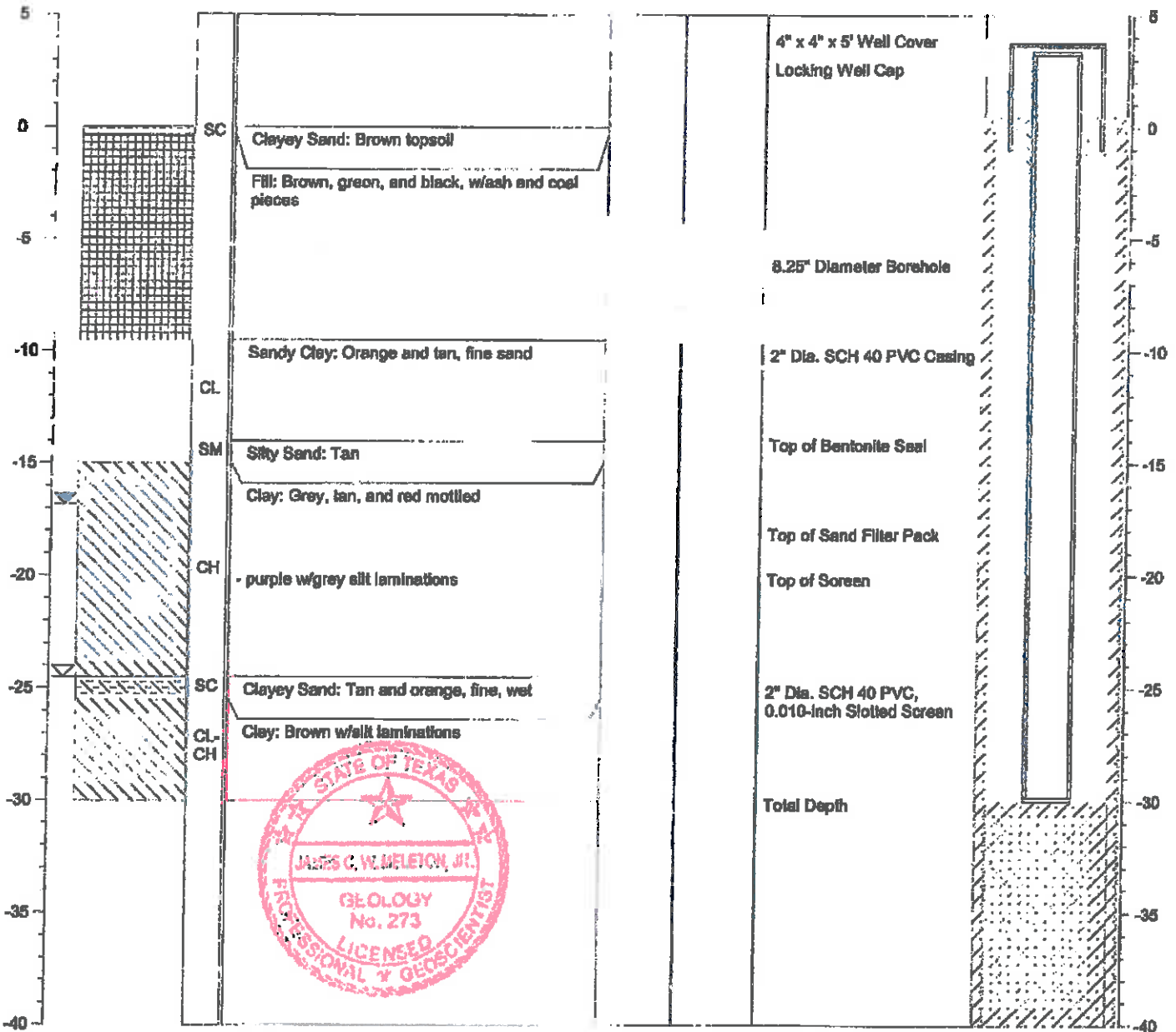
DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/24/09

NOTES: Latitude: 33.04901
 Longitude: 94.84977

≍ Water level during drilling
 ≍ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-13
 TOTAL DEPTH: 20'
 TOP OF CASING ELEV.: 347.00 ft. NGVD
 GROUND SURFACE ELEV.: 344.12 ft. NGVD

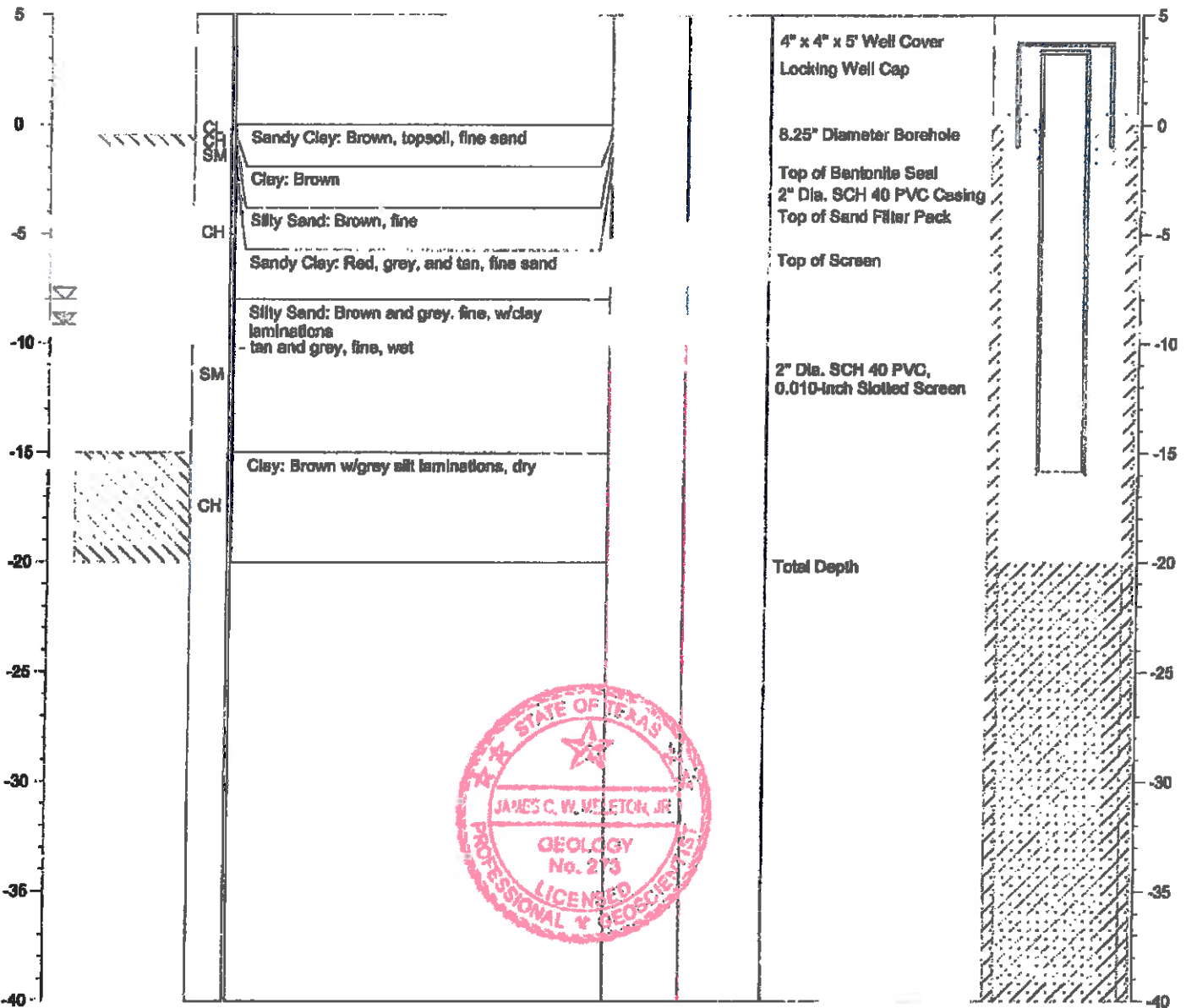
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04918
 Longitude: 94.84275

☒ Water level during drilling
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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SOIL BORING LOG

BORING/WELL NO.: AD-14
 TOTAL DEPTH: 18.5'
 TOP OF CASING ELEV.: 345.43 ft. NGVD
 GROUND SURFACE ELEV.: 342.32 ft. NGVD

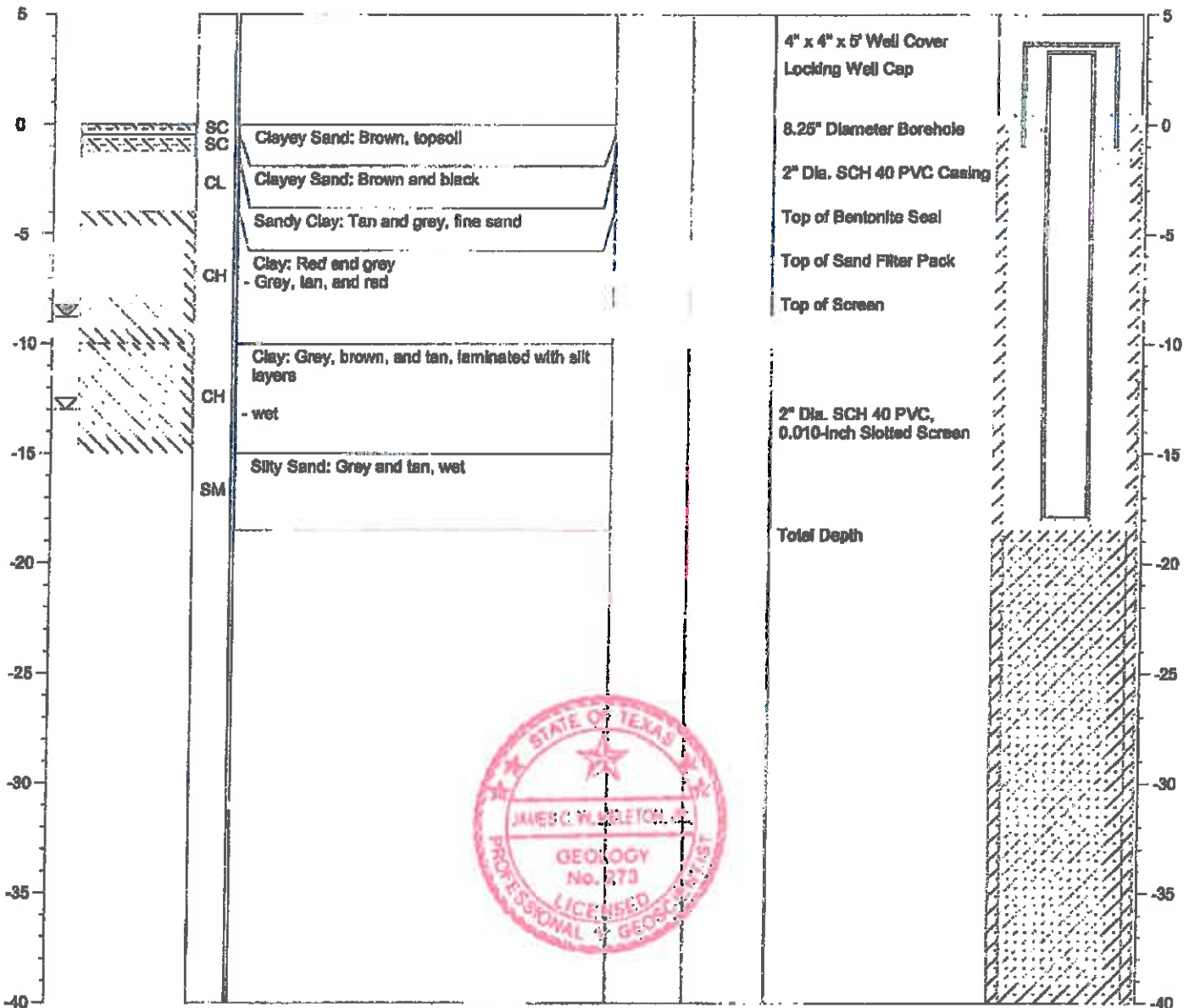
CLIENT: AEP
 PROJECT: Ash Disposal Area
 SITE LOCATION: Welsh Power Plant
 PROJECT NO.: S-08-0109
 LOGGED BY: James Meleton, Jr.

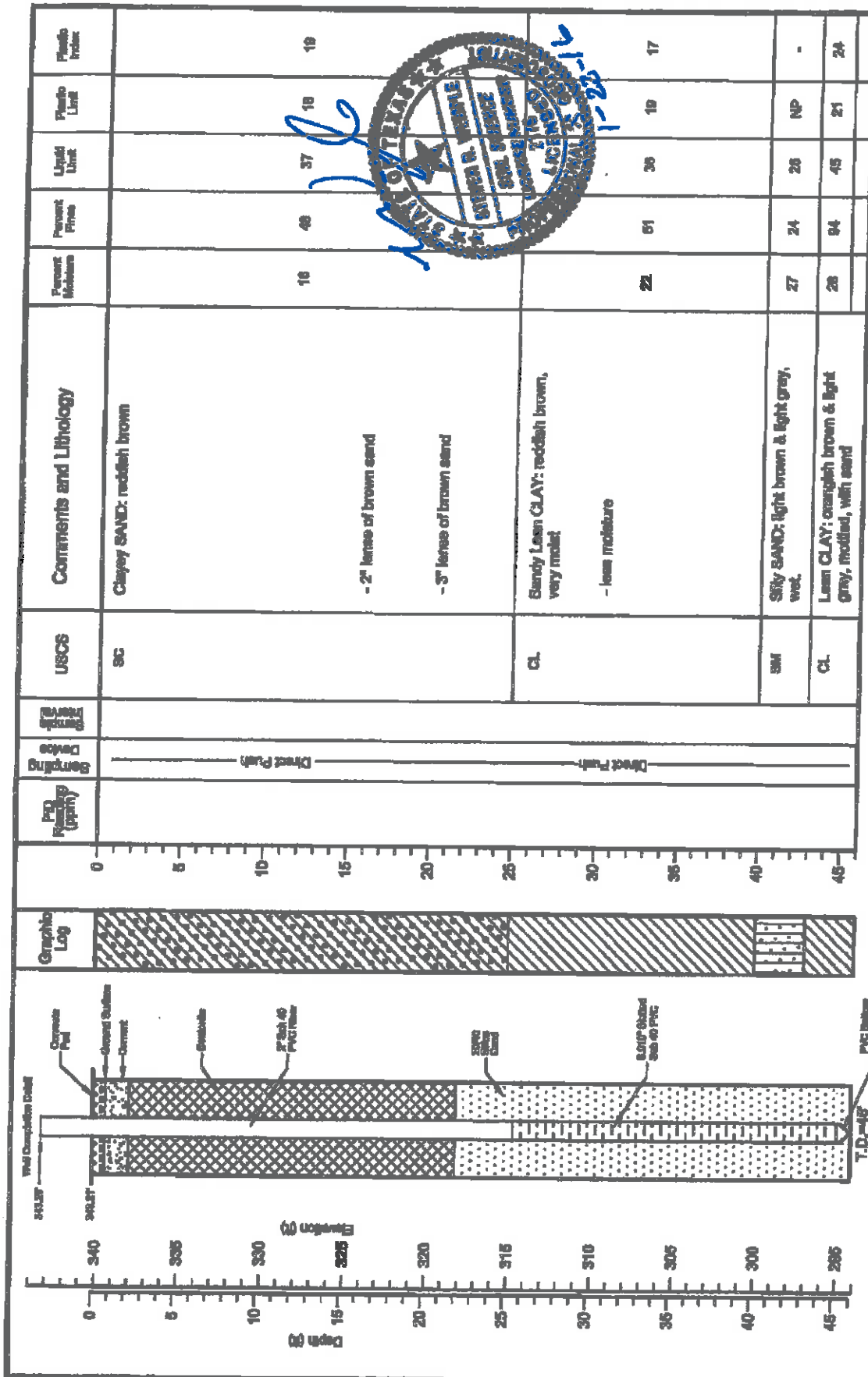
DRILLING CO.: WEST Drilling
 DRILLER: Tom McCullough
 METHOD OF DRILLING: Hollow-stem Auger
 SAMPLING METHODS: Split-spoon
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04715
 Longitude: 94.84256

☞ Water level during drilling
 ☞ Water level in completed well
 Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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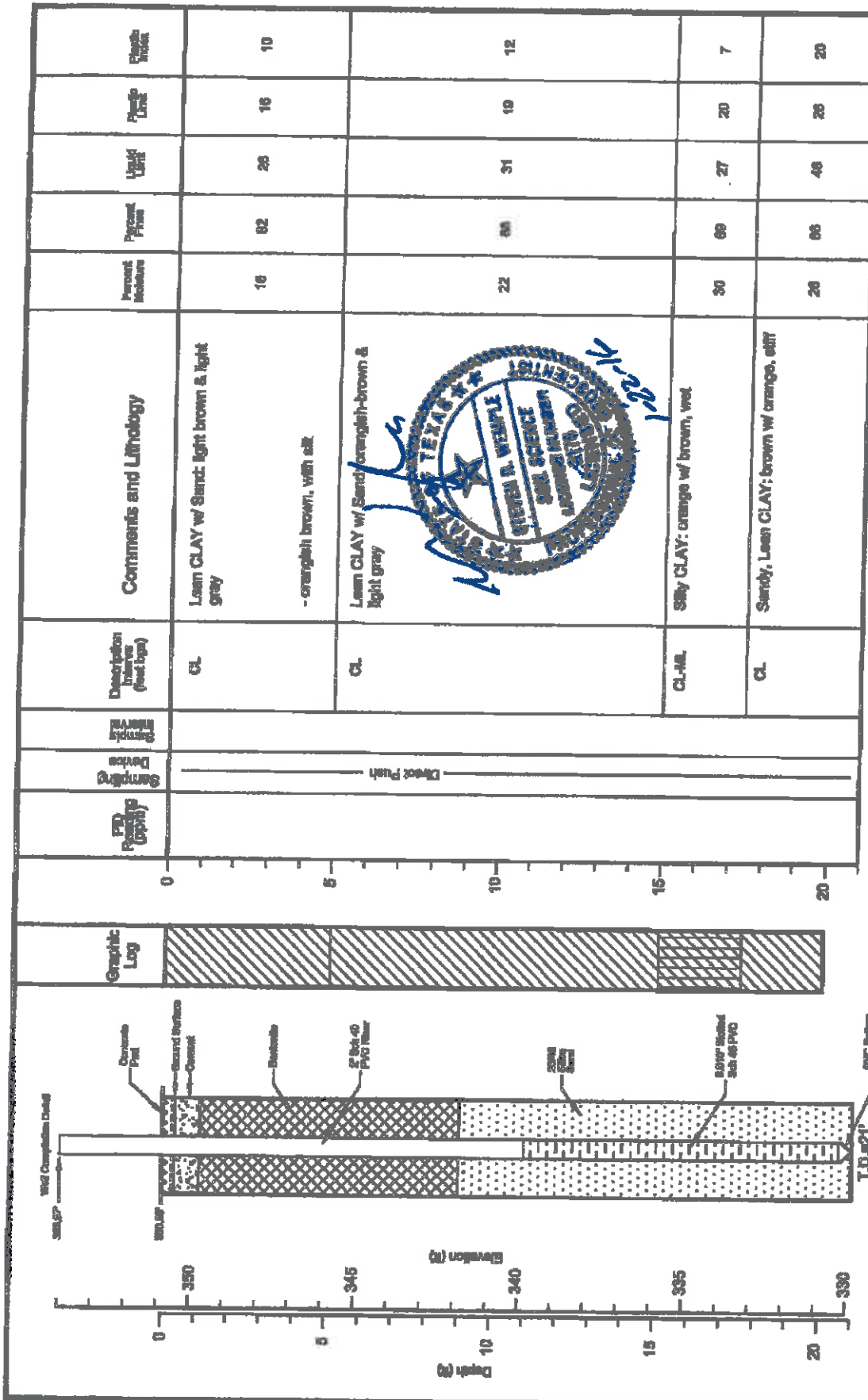
DATE: 12/12/15
Drilling Method: H.S.A.
Bit Diameter: 7.25"
Depth to Water: --

Logged by: Robert Williams, PE
Driller: Robert Williams
Data Completed: 12/12/15
Depth to Product: NA

Welch Power Station
Pittsburg, Texas
DRAWN BY: HRS
CHECKED BY: SRW

Log of Boring
AD-15
PROJ. NO.: --
SOLD AS SHOWN
P.L.S. PRINT AT Welch Power Plant Library

Depth (ft)	Elevation (ft)	USCS	Comments and Lithology	Percent Moisture	Percent Plasticity	Liquid Limit	Plastic Limit	Plastic Index
0	340	SC	Clayey SAND: reddish brown	16	46	37	18	19
2	338		- 2" lense of brown sand					
5	335		- 3" lense of brown sand					
25	315	CL	Sandy Lean CLAY: reddish brown, very moist	22	61	36	19	17
30	310		- less moisture					
42	286	SM	Silty SAND: light brown & light gray, wet.	27	24	26	NP	-
45	286	CL	Lean CLAY: orangeish brown & light gray, modified, with sand	28	94	45	21	24



Depth (ft)	Elevation (ft)	Percent Moisture	Moisture Incr.	Comments and Lithology	Description (soil type)	Sampling Device	PTD Penetration Depth	Graphic Log
0	350			Lean CLAY w/ Sand: light brown & light gray	CL			
16	345	82	16	- orangeish brown, with silt				
22	340	88	22	Lean CLAY w/ Sand: orangeish-brown & light gray	CL	Direct Push		
30	335	66	30	Silty CLAY: orange w/ brown, wet	CL-ML			
36	330	66	36	Sandy, Lean CLAY: brown w/ orange, stiff	CL			

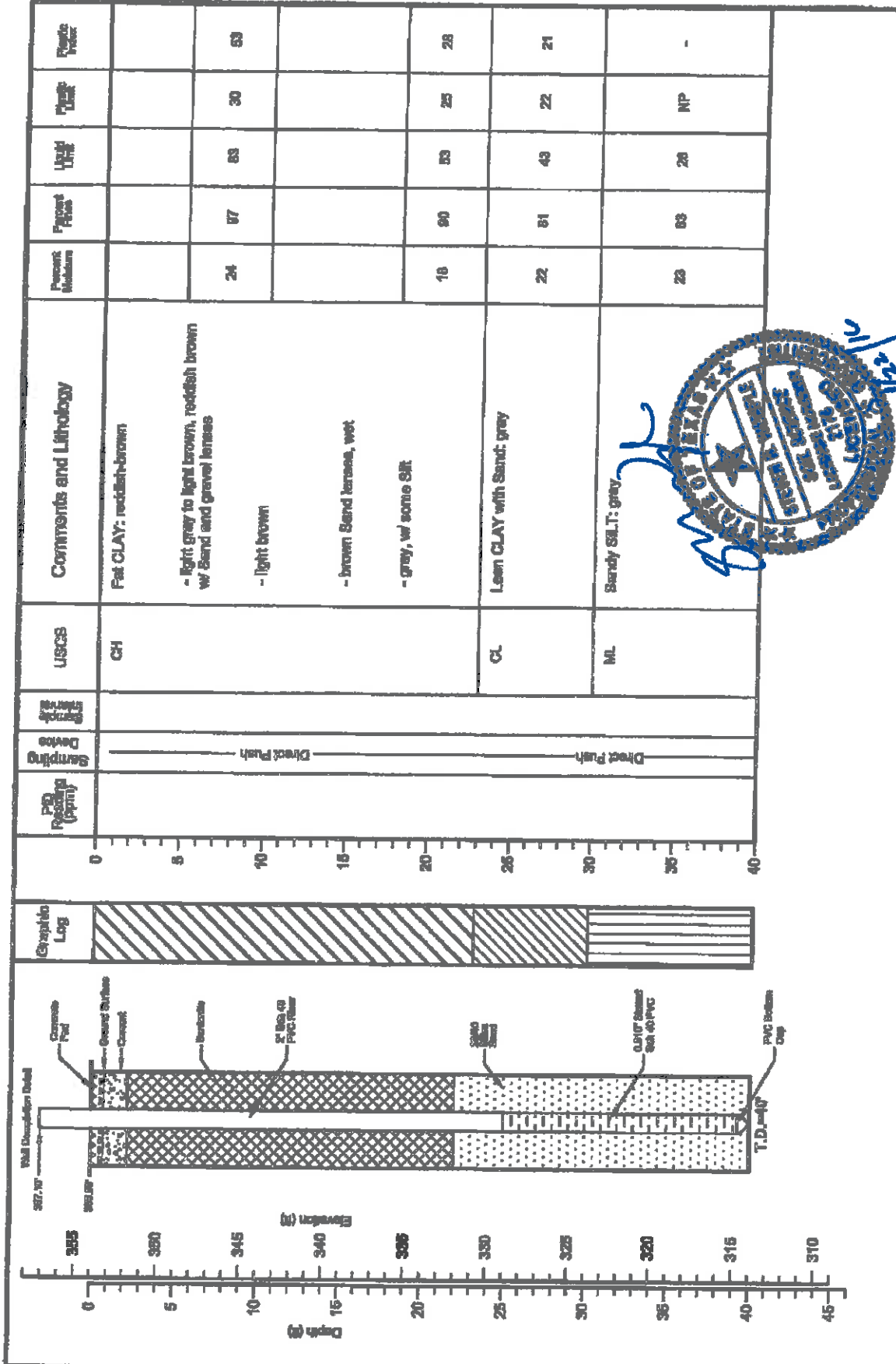
west
DRILLING
 environmental & geotechnical
 WEST Drilling, Inc.
 101 Industrial Drive
 Waco, Texas 76785

DATE: 12/10/15
 Drilling Method: H.S.A.
 Bit Diameter: 7.25"
 Depth to Water: --

Logged by: Robert Williams, PE
 Driller: Robert Williams
 Date Completed: 12/10/15
 Depth to Product: NA

Welsh Power Station
 Pittsburg, Texas
 DRAWN BY: HDS
 CHECKED BY: SHW

Log of Boring
 AD-16
 PRIMER NO. ---
 FILL HEAD OR BOLD POWER TEST LOGGING

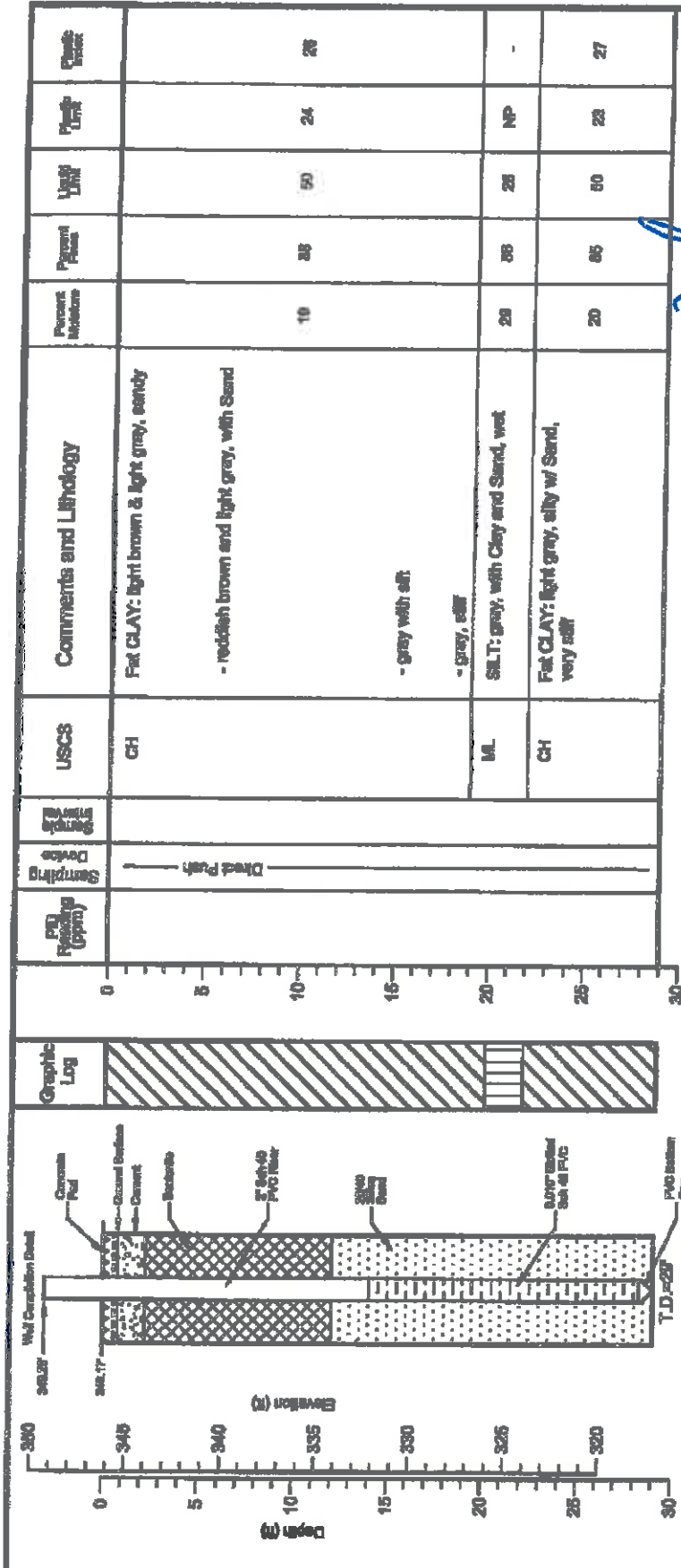


DATE: 12/10/16
 Drilling Method: H.S.A.
 Bit Diameter: 7.25"
 Depth to Water: -

Logged by: Robert Williams, PE
 Driller: Robert Williams
 Date Completed: 12/11/16
 Depth to Product: NA

Welsh Power Station
 Pflugburg, Texas
 DROWN BY: MDS
 CHECKED BY: SWW
 PROBE NO. ---
 SCLD AS SHOWN
 FILE NO: 45 Welsh Power Plant 12/10/16

Log of Boring
 AD-17



Log of Boring AD-18	
<p>WELSH POWER STATION PITTSBURG, TEXAS</p>	<p>DRIVEN BY: HDS CHECKED BY: SWP</p>
<p>Logged by: Robert Williams, PE Driller: Robert Williams</p>	<p>DATE: 12/11/15 Drilling Method: N.S.A. Bit Diameter: 7.25" Depth to Water: -</p>
<p>USCS: CH</p>	<p>DATE COMPLETED: 12/11/15 DEPTH TO PRODUCT: NA</p>
<p>Comments and Lithology: Fat CLAY: light brown & light gray, sandy - reddish brown and light gray, with sand - gray with silt - gray, silt S.L.T.: gray, with clay and sand, wet Fat CLAY: light gray, silty w/ sand, very silt</p>	<p>PERCENT MOISTURE: 10, 28, 26, 26, 20, 65</p>
<p>Sampling Points: 0 5 10 15 20 25 30</p>	<p>DEPTH (ft): 0, 5, 10, 15, 20, 25, 30</p>
<p>Graphic Log</p>	<p>Elevation (ft): 350, 345, 340, 335, 330, 325, 320</p>

west
DRILLING
 environmental & geotechnical
 WEST Drilling, Inc.
 101 Industrial Drive
 Woodhouse, Texas 76166

Project: AEP Walsh Power Plant
 Project Location: Cason, TX
 Project Number: TXL0064

Log of Boring GB-1
 Sheet 1 of 2

Date(s) Drilled July 23, 2009	Logged By Kush S. Chohan	Checked By
Drilling Method Hollow Stem Auger	Drill Bit Size/Type	Total Depth of Borehole 37 feet bgs
Drill Rig Type Mobil B61	Drilling Contractor Total Support Services	Approximate Surface Elevation 367 feet MSL
Groundwater Level and Date Measured	Sampling Method(s) SPT, Tube	Hammer Data 140 lb, 30 in drop, Auto-hammer
Borehole Backfill Bentonite Chips	Location On the Northern edge of proposed chemical pond along the screening berm.	

Printed with a trial version of Borings - visit www.geotechnical.com for purchase information. P:\Projects\AEP Walsh Plant\2009 Pond Design\Hydrogec Investigation\Boring Log\Boring GB 1\Boring GB 1 Log (USC AEP).log

Elevation, feet	Depth, feet	Sample Type	Sample Sampling Resistance, Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
367	0	ST		Other		Black COAL, a few fine roots and organics.						Shelby tube pulled black COAL.
	5	SS	10	SC		Reddish Brown fine SAND, little clay, trace silt, Dry. Natural Ground.						SPT 4, 5, 5, 5, 24" recovered
	8	SS	11	SM		Reddish brown fine SAND with silt, trace clay. Vertical sand seams in sample, Dry.						SPT 4, 5, 8, 7, 24" recovered
	11	SS	11	SM		Reddish brown fine SAND with silt, trace clay. Vertical sand seams in sample, Dry.						SPT 5, 5, 8, 8, 24" recovered.
357	10	ST		Other			23.5	22	48.9	3.4E-07		Shelby tube sample, 18" recovered.
	12	SS	12	DL		Reddish brown well graded fine SAND, trace silt and clay. Damp.						SPT 5, 6, 8, 8, 24" recovered
	13	SS	13	SC		Grayish red CLAY, little sand, horizontal sand seams, Dry.						
	14	SS	13	SC		Brownish red fine SAND, little clay, Damp.						SPT 7, 8, 7, 9, 24" recovered.
	15	SS	13	SC-CL		Brownish red fine SAND, little clay, Damp.						
	16	SS	16	SM		Fourish CLAY room, thin fine sand. Reddish gray CLAY, little sand, oxidized iron ore, Dry.						
	17	SS	16	SM		Brownish red fine SAND, trace clay, thin clay seams. Moist.	17.74	14	40.1			SPT 8, 9, 8, 8, 24" recovered.
	18	SS	17	Other			16.25	NP	25.9	3.8E-05		Shelby tube sample took like SC. 17" recovered.
	19	SS	17	Other		Iron oxidized material Brownish red fine SAND, little clay, Moist.						SPT 8, 8, 8, 11, 24 inches recovered.
	20	SS	15	DL		Dark gray CLAY, little fine sand, Wet.						SPT 5, 7, 8, 50/2, 24" recovered
	21	SS	15	SP		Dark gray-black cemented SAND, little clay, Wet. Driller comments that cemented sand terminates at 25.5 feet.						SPT 50/5"
342	25	SS	27	SC		Dark gray fine SAND, little clay, Moist. Soft sand with lenses of firm clay.						SPT 11, 13, 14, 16, 24" recovered.
	26	SS	45	CL		Dark gray CLAY, little sand, Dry.						SPT 11, 16, 30, 14, 24" recovered.
	27	SS	37	SC		Dark gray-black fine SAND, little clay, Wet. Encountered water but water rose to 18 feet after 15 min break.						SPT 11, 15, 22, 25, 24" recovered.

Figure

Project: AEP Welsh Power Plant
 Project Location: Cason, TX
 Project Number: TXL0064

Log of Boring GB-1
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Description	Resistance, Blow Count	Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
337	30	SS	37	Hard	CL	CL		Dark gray CLAY, little fine sand, occasional horizontal sand seams. Wet. (cont.)						SPT 11, 15, 22, 25, 24" recovered.
		SS	29	Soft	ML	ML		Dark gray-black fine SAND, with clay, frequent hard clay streaks (1-3"). Wet.	26.37	NP	57.5			SPT 8, 11, 15, 24, 24" recovered.
332	35	SS	34	Hard	CL	CL		Black CLAY, trace to little fine sand, trace silt. Dry						SPT 9, 10, 13, 23, 24" recovered.
								Bottom of Boring at 37 feet bgs						
327	40													
322	45													
317	50													
312	55													
307	60													
302	65													

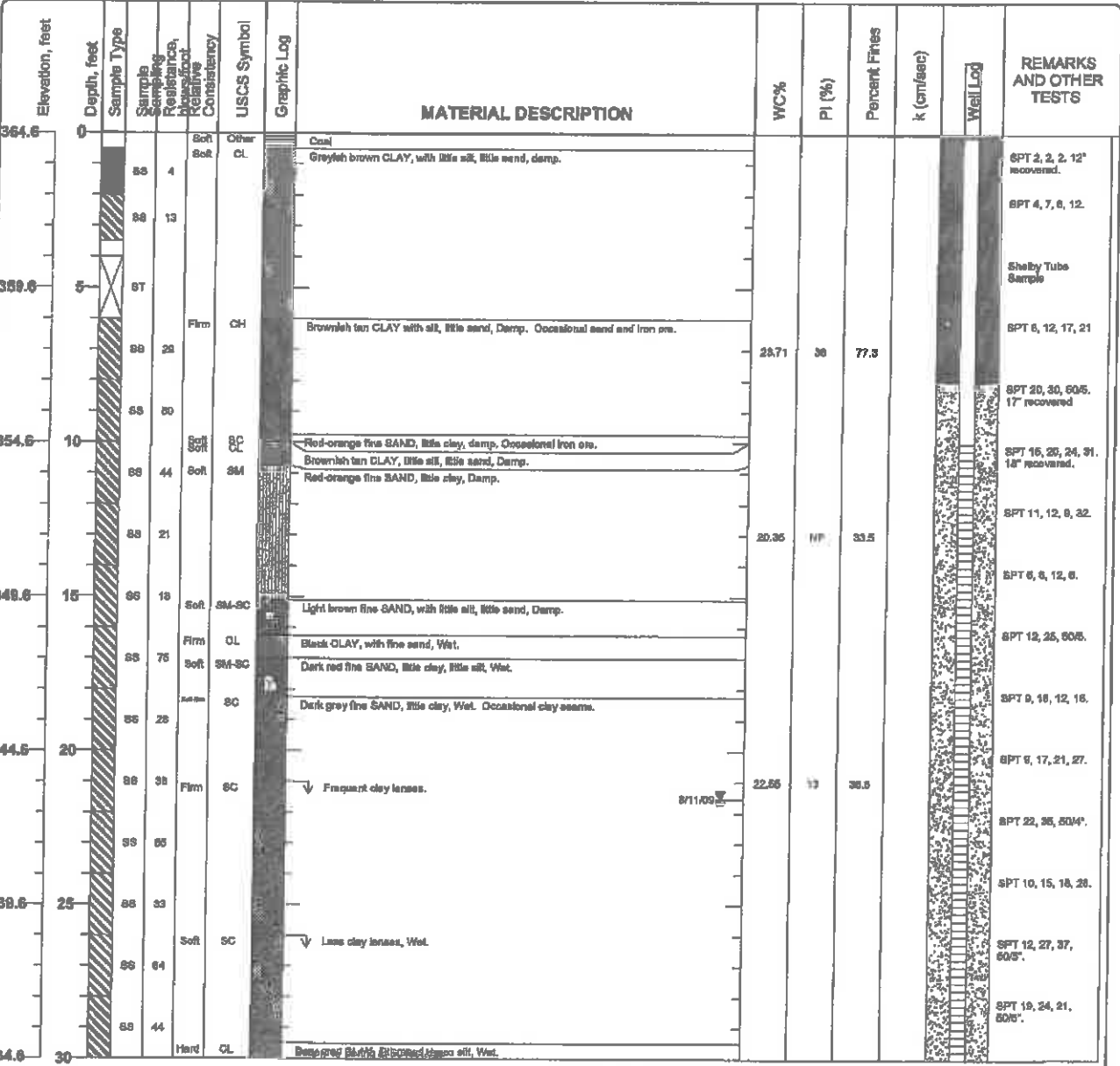
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Figure

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-02
 Sheet 1 of 1

Date(s) Drilled	August 14, 2009	Logged By	Kush S. Chohan	Checked By	
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type		Total Depth of Borehole	30 feet bgs
Drill Rig Type	Mobil B61	Drilling Contractor	Total Support Services	Approximate Surface Elevation	364.56 feet MSL
Groundwater Level and Date Measured	21.53 feet measured on 8/11/09	Sampling Method(s)	SPT, Tube	Hammer Data	140 lb, 30 in drop, rope & cathead
Borehole Backfill	Well Completion	Location	Western edge of proposed chemical pond near perimeter fence.		



Figure

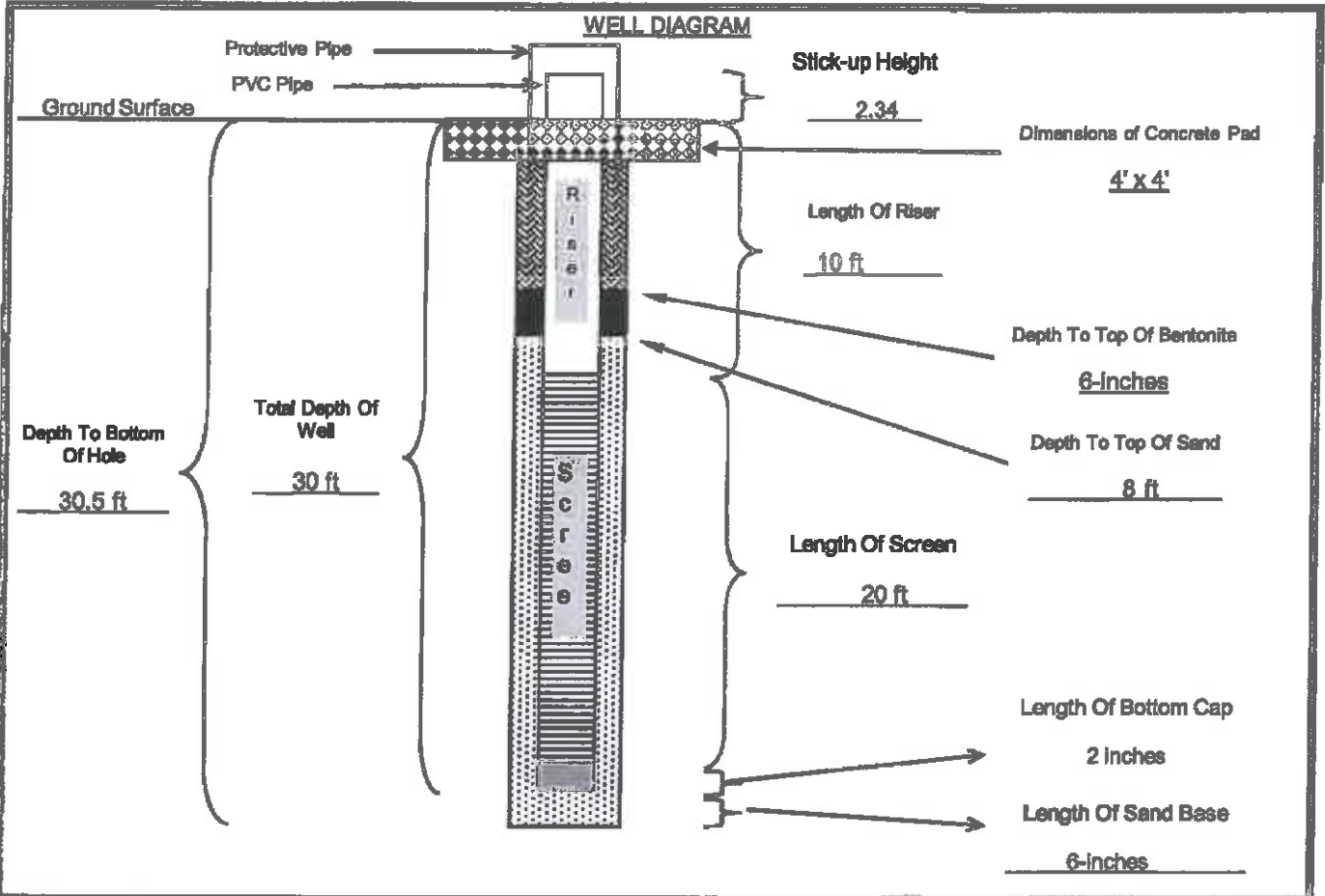
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WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Welsh Power Plant</u>	GB-02
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>8/7/2009</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>364.56</u> (ft. msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>354.56</u> (ft. msf)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>334.06</u> (ft. msf)	CEMENT TYPE: <u>Not used-sealed with bentonite chips</u>
NORTHING: <u>747.0223</u> EASTING: <u>-2442.886</u>	CEMENT MANUFACTURER:
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER:	SAND MANUFACTURER: <u>Uninum</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER:	AMOUNT BENTONITE USED: <u>4</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>10</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>20</u> (ft)	AMOUNT SAND USED: <u>13</u> bags lbs
BOREHOLE DIAMETER: <u>8</u> (in)	STATIC WATER: <u>21.53</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow stem</u> Size: _____ (in)	ENCOUNTERED WATER: _____ depth from ground



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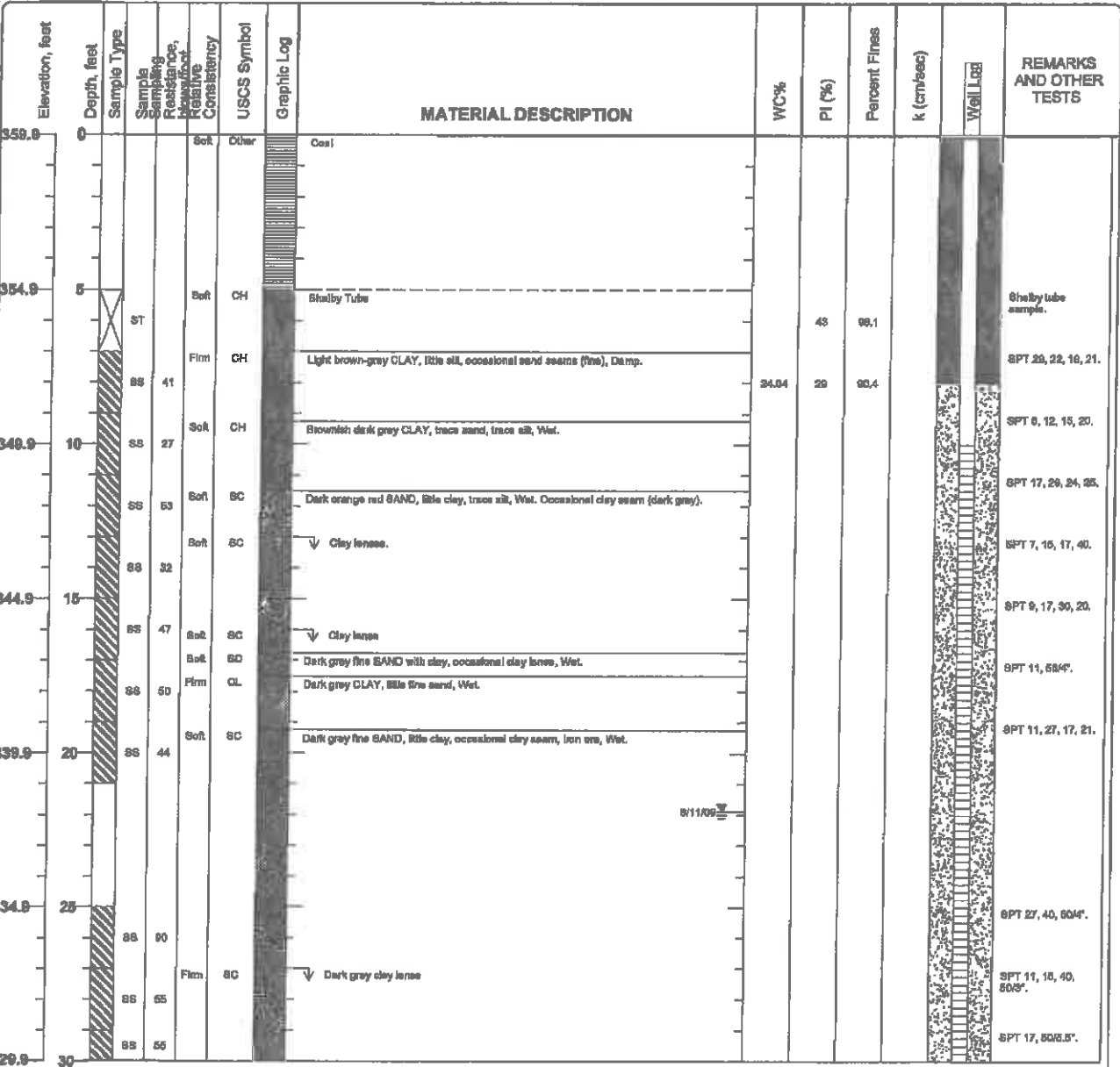
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>
	DATE: <u>August 7th, 2009</u>	CHECKED BY: _____ DATE: _____

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-03
 Sheet 1 of 2

Date(s) Drilled August 7, 2009	Logged By Kush S. Chohan	Checked By
Drilling Method Hollow Stem Auger	Drill Bit Size/Type	Total Depth of Borehole 31 feet bgs
Drill Rig Type Mobil B61	Drilling Contractor Total Support Services	Approximate Surface Elevation 359.91 feet MSL
Groundwater Level and Date Measured 21.89 feet measured on 8/11/09	Sampling Method(s) SPT, Tube	Hammer Data 140 lb, 30 in drop, rope & cathead
Borehole Backfill Well Completion	Location Southwest corner of proposed chemical pond near screening pile.	

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Figure

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-03
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Description	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
329.9	30	SS	SS	CL		Dark gray CLAY, trace silt, trace fine sand.						SPT 17, 606.6'
						Bottom of Boring at 31 feet bgs						
324.9	35											
319.9	40											
314.9	45											
309.9	50											
304.9	55											
299.9	60											
294.9	65											

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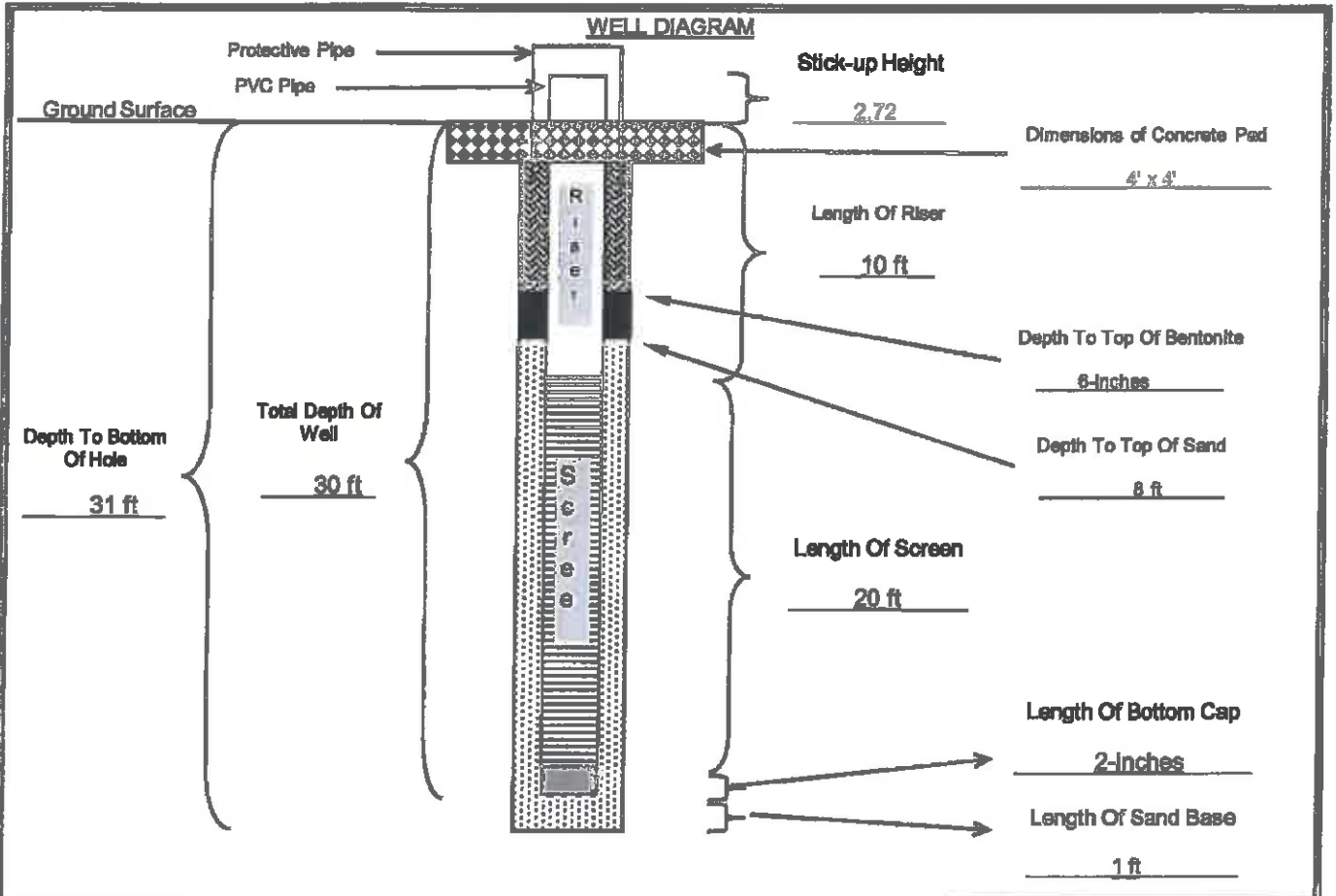
Figure

WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Welsh Power Plant</u>	GB-03
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>8/7/2009</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>359.57</u> (ft. msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>349.57</u> (ft. msl)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>328.57</u> (ft. msl)	CEMENT TYPE: <u>None used-sealed with bentonite chips</u>
NORTHING: <u>460.5803</u> EASTING: <u>-2507.6332</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER: _____	SAND MANUFACTURER: <u>Uninum</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER: _____	AMOUNT BENTONITE USED: <u>4</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>10</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>20</u> (ft)	AMOUNT SAND USED: <u>12</u> bags lbs
BOREHOLE DIAMETER: <u>8</u> (in)	STATIC WATER: <u>21.88</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow Stem</u> Size: <u>8</u> (in)	ENCOUNTERED WATER: _____ depth from ground

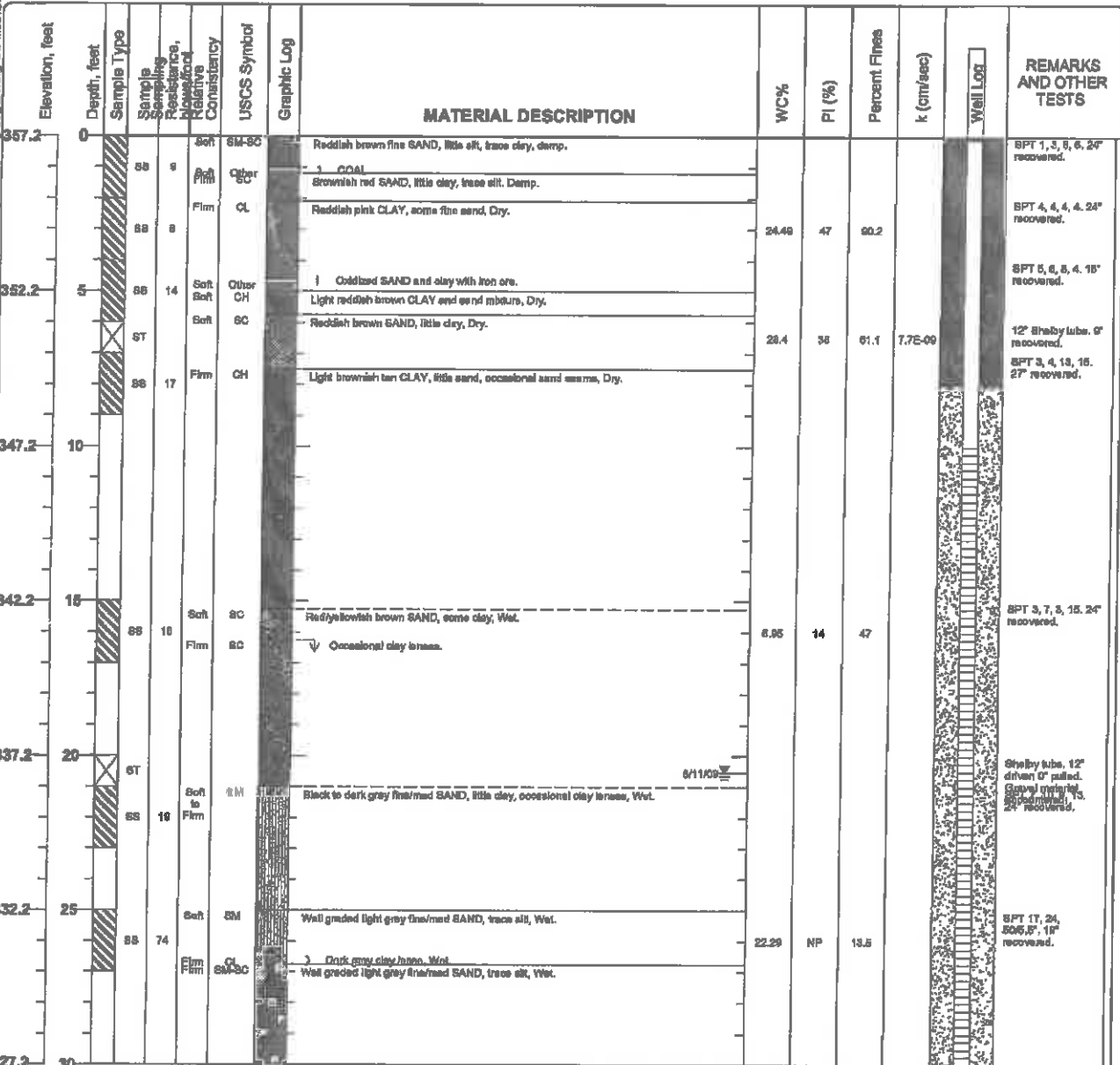


QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush S. Chohan</u>		
	DATE: <u>7-Aug-09</u>	CHECKED BY: _____	DATE: _____	

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-04
 Sheet 1 of 2

Date(s) Drilled	July 24, 2009	Logged By	Kush S. Chohan	Checked By	
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type		Total Depth of Borehole	34 feet bgs
Drill Rig Type	Mobil B61	Drilling Contractor	Total Support Services	Approximate Surface Elevation	357.22 feet MSL
Groundwater Level and Date Measured	20.54 feet measured on 8/11/09	Sampling Method(s)	SPT, Tube	Hammer Data	140 lb, 30 in drop, Auto-hammer
Borehole Backfill	Well Completion	Location	Southeast corner of proposed chemical evaporation pond. Located in a grassy field.		



Figure

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Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-04
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Description	Hardness	Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
327.2	30	ST		Hard		ML		Dark gray CLAY, little sand, Wet.						12" Shelby tube. Bent shaly tube.
		ST							21.3	NP	64.2	2.0E-06		12" Shelby tube.
		SS		Hard		CL		Dark gray CLAY, trace sand, Wet.	26.44	10	62.5			SPT 15, 18, 19, 25. 2" recovered.
								Bottom of Boring at 34 feet bgs						
322.2	35													
317.2	40													
312.2	45													
307.2	50													
302.2	55													
297.2	60													
292.2	65													

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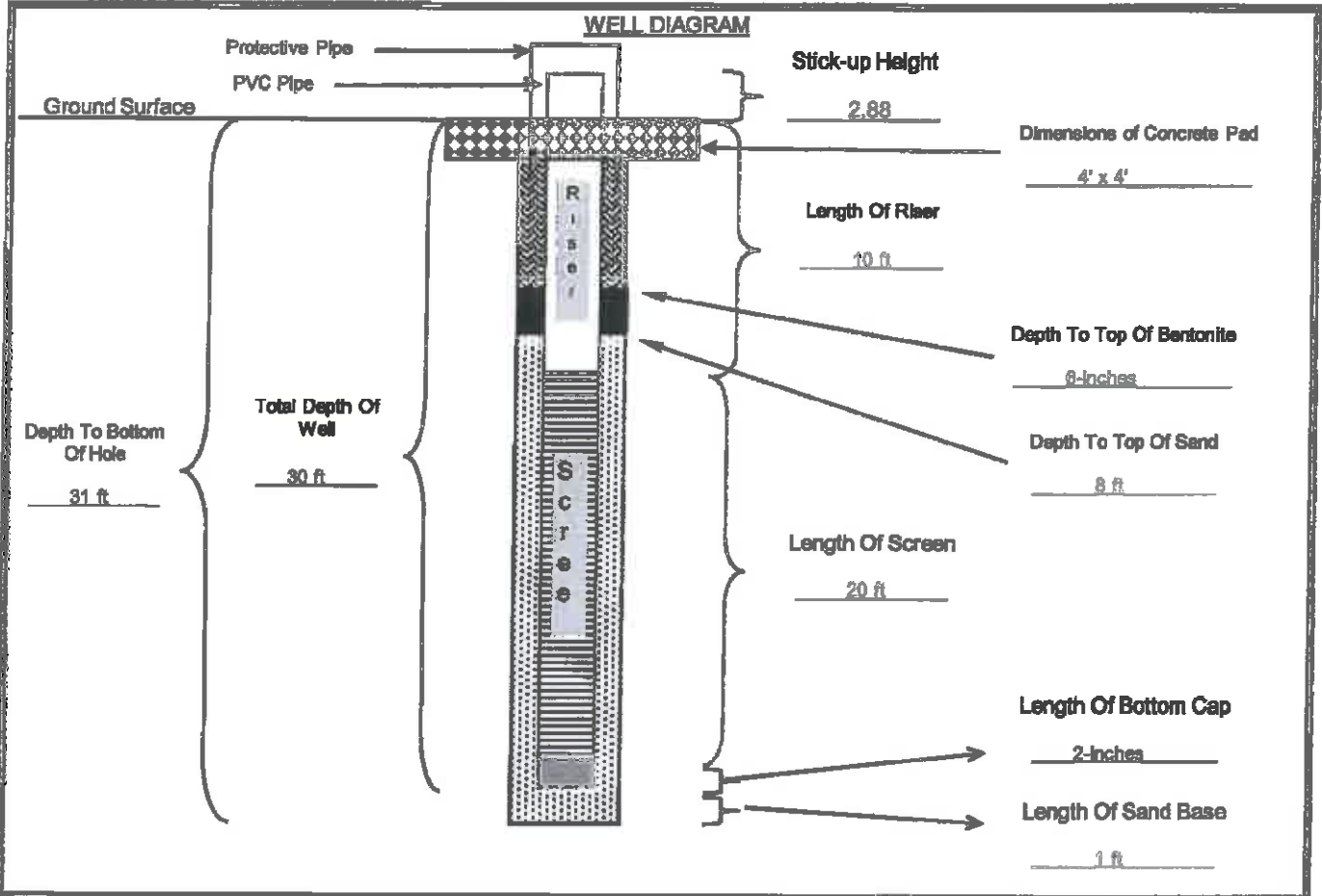
Figure

WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Walsh Power Plant</u>	GB-04
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>24-Jul-09</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>357.22</u> (ft, msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>347.22</u> (ft, msl)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>326.22</u> (ft, msl)	CEMENT TYPE: _____
NORTHING: <u>-384.9666</u> EASTING: <u>-2353.7375</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER: _____	SAND MANUFACTURER: <u>Unium</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER: _____	AMOUNT BENTONITE USED: <u>3</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>10</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>20</u> (ft)	AMOUNT SAND USED: <u>7</u> bags lbs
BOREHOLE DIAMETER: _____ <u>6.75</u> (in)	STATIC WATER: <u>20.54</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow Stem</u> Size: <u>6.75</u> (in)	ENCOUNTERED WATER: _____ depth from ground



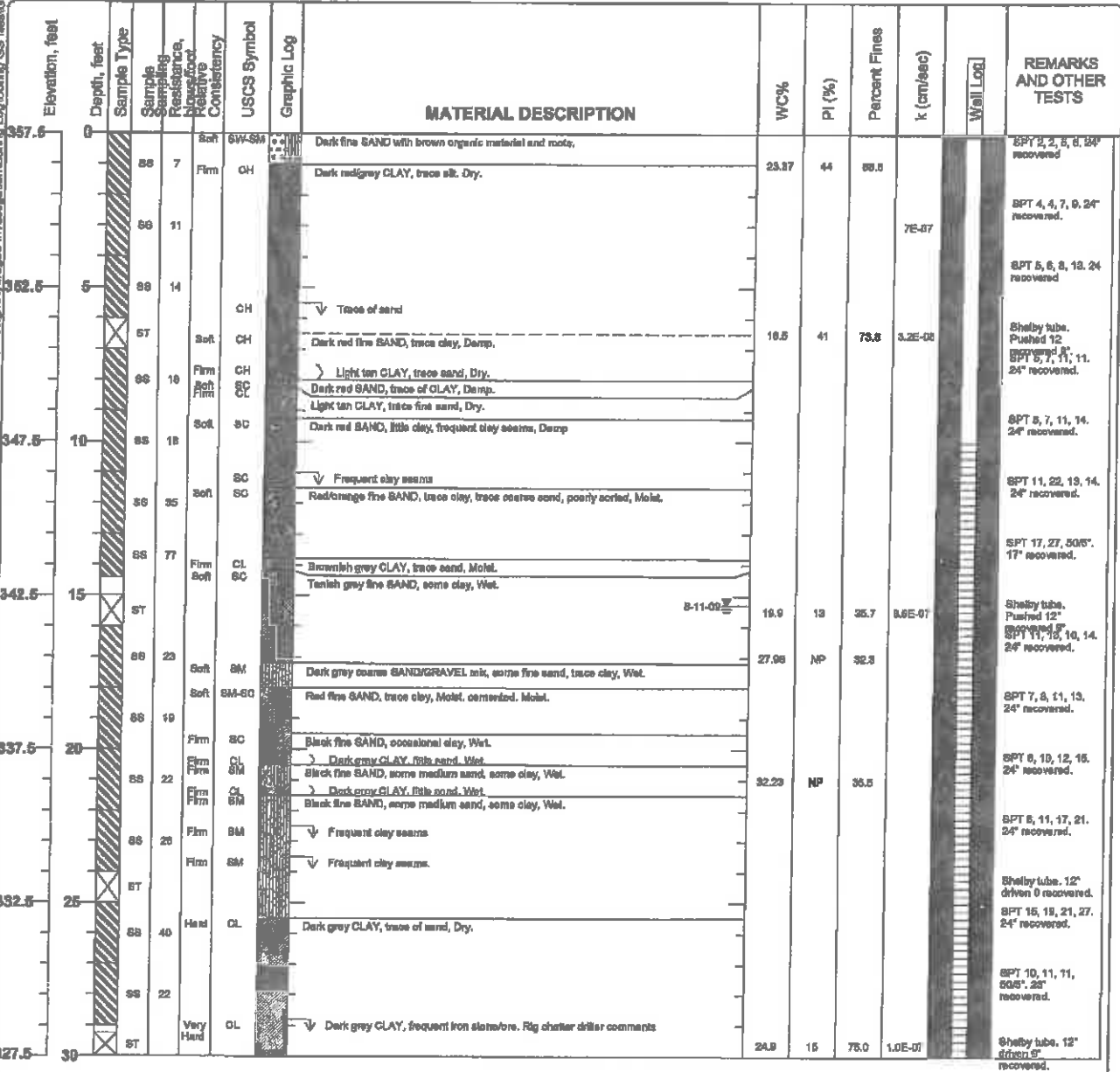
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush S. Chohan</u>		
	DATE: <u>24-Jul-09</u>	CHECKED BY: _____	DATE: _____	

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-05
 Sheet 1 of 2

Date(s) Drilled	July 24, 2009	Logged By	Kush S. Chohan	Checked By	
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type		Total Depth of Borehole	30.5 feet bgs
Drill Rig Type	Mobil B61	Drilling Contractor	Total Support Services	Approximate Surface Elevation	357.49 feet MSL
Groundwater Level and Date Measured	15.3 feet measured on 8-11-09	Sampling Method(s)	SPT, Tube	Hammer Data	140 lb, 30 in drop, Auto-hammer
Borehole Backfill	Well Completion	Location	Eastern edge of proposed chemical evaporation pond.		

Printed with a trial version of BorWinCS - visit www.geotechnical.com for purchase information: P:\Projects\AEP Welsh Plant\2009 Pond Design\Hydrogeo Investigation\Boring Log\Boring GB-05\BorWinCS\BorWinCS.dwg



Figure

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-05
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Soils Testing Relative Moisture Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
327.5	30	SI	Hard	CL		Dark grey CLAY, trace of sand, Dry, (cont.) Bottom of Boring at 30.5 feet bgs	24.0	15	75.0	1.0E-07		Shelby tube, 12" driven 9" recovered.
322.5	35											
317.5	40											
312.5	45											
307.5	50											
302.5	55											
297.5	60											
292.5	65											

Printed with a trial version of BorlogGS. Visit www.geobaseoftware.com for purchase information: P:\Projects\AEP Welsh Plant\2009 Pond Design\Hydrogeo Investigation\Boring Log\Boring_GS_files\GB-05_logs_BSSC_AEP.dwg

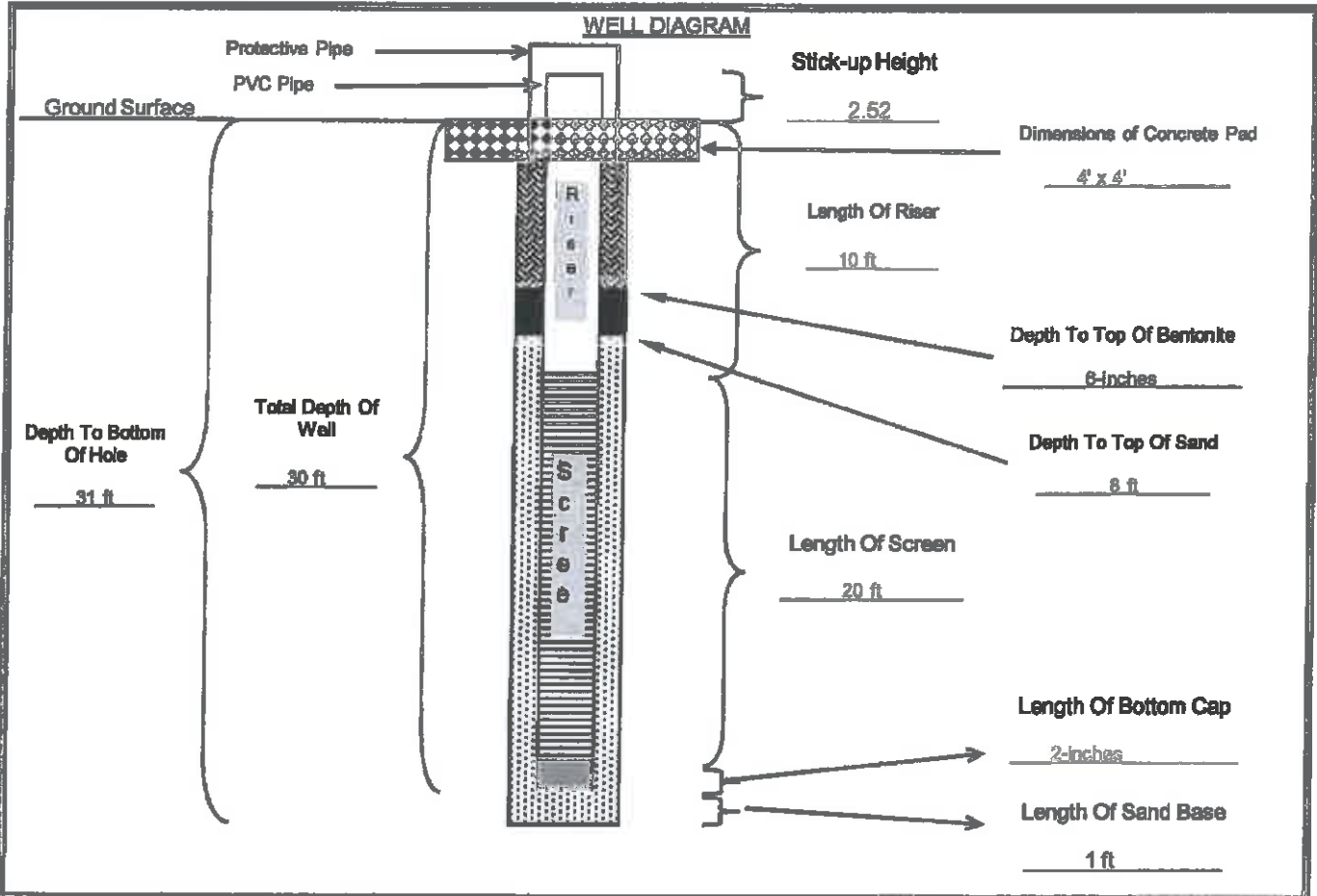
Figure

WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Welsh Power Plant</u>	GB-05
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>August 6 2009</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>357.49</u> (ft, msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>347.49</u> (ft, msl)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>326.49</u> (ft, msl)	CEMENT TYPE: _____
NORTHING: <u>529.1865</u> EASTING: <u>-2243.9873</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER: _____	SAND MANUFACTURER: <u>Uninum</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER: _____	AMOUNT BENTONITE USED: <u>3</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>10</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>20</u> (ft)	AMOUNT SAND USED: <u>7</u> bags lbs
BOREHOLE DIAMETER: <u>8</u> (in)	STATIC WATER: <u>17.33</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow Stem</u> Size: <u>8</u> (in)	ENCOUNTERED WATER: _____ depth from ground



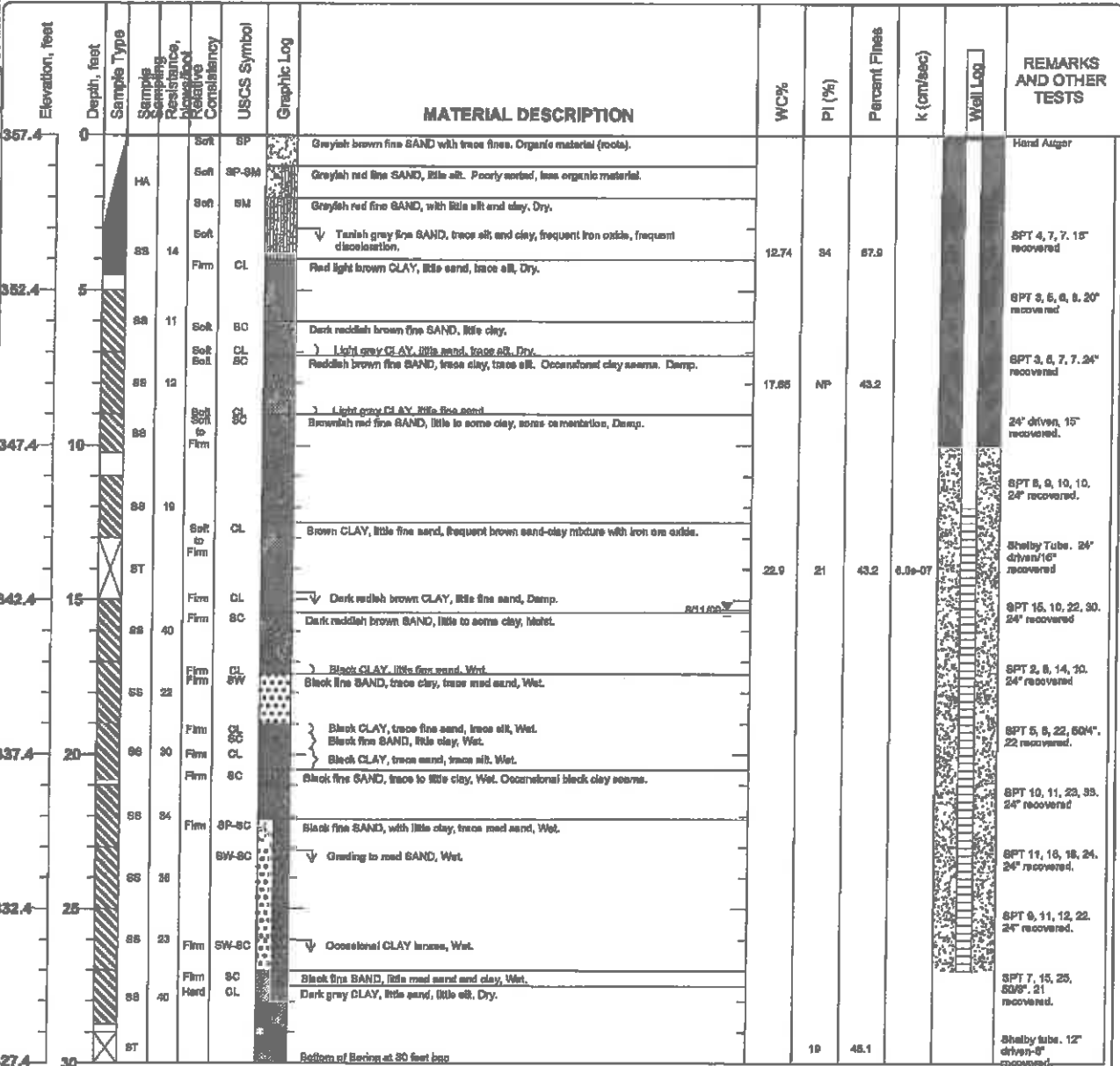
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>		
	DATE: <u>8-Aug-09</u>	CHECKED BY:	DATE:	

Project: AEP Welsh Power Plant
 Project Location: Cason, Texas
 Project Number: TXL0064

Log of Boring GB-06
 Sheet 1 of 1

Date(s) Drilled 7/23/2009	Logged By Kush S. Chohan	Checked By
Drilling Method Hollow Stem Auger	Drill Bit Size/Type	Total Depth of Borehole 30 feet bgs
Drill Rig Type Mobil B61	Drilling Contractor Total Support Services	Approximate Surface Elevation 357.41 feet MSL
Groundwater Level and Date Measured 15.3 feet measured on 8/11/09	Sampling Method(s) SPT, Tube, Other	Hammer Data 140 lb, 30 in drop, auto hammer
Borehole Backfill Well Completion	Location Northeast corner of proposed chemical pond in the middle of open grass field.	

Printed with a trial version of BorinGIS - visit www.gocadsoft.com for purchase information: P:\Project\AEP Welsh Plant\2008 Pond Design\Hydrogeob Investigation\Boring Log\Boring 06 final\GB-06 final\GB-06 final.dwg



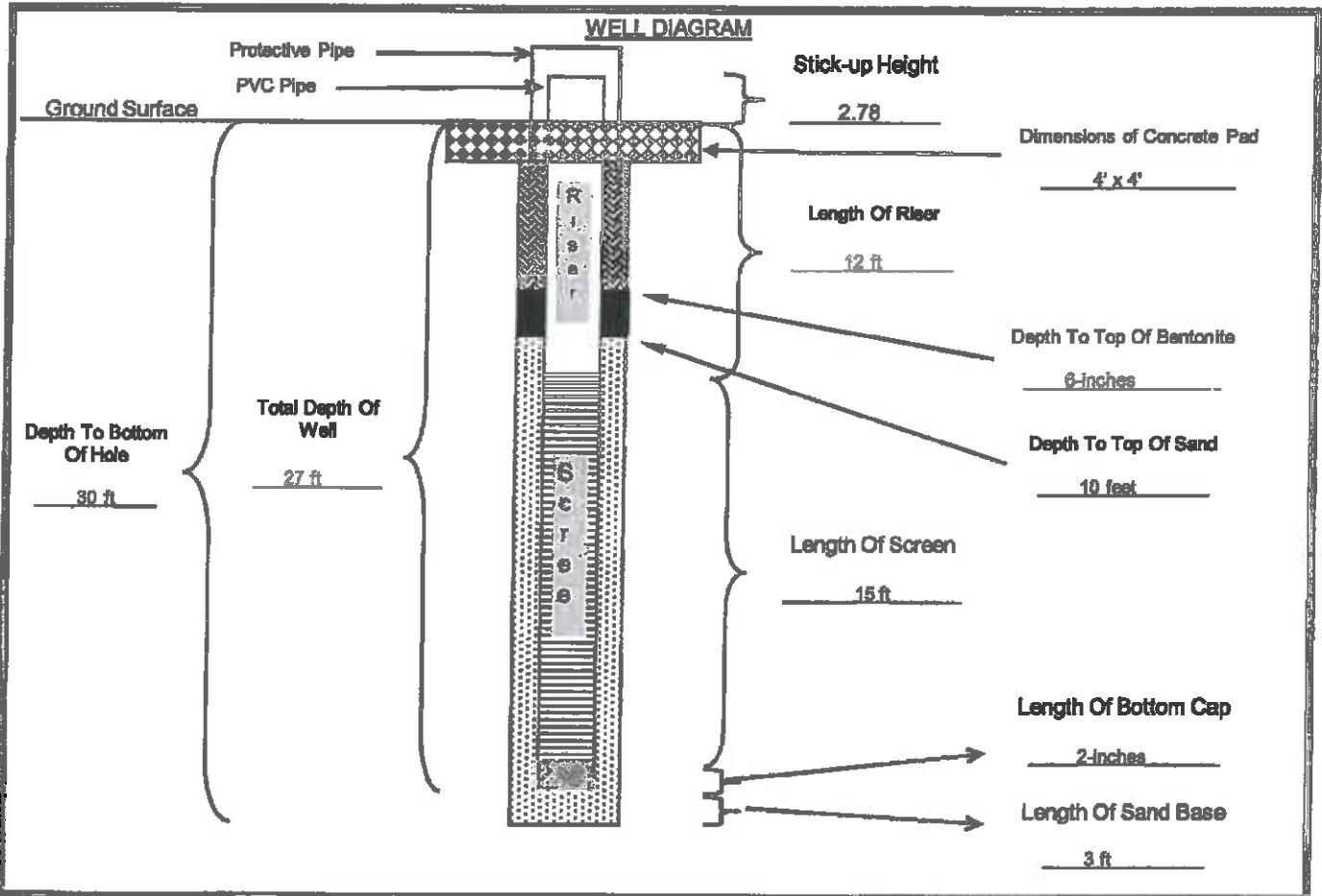
Figure

WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Welsh Power Plant</u>	GB-06
JOB NO.: <u>TXL0084</u>	
DATE/TIME: <u>23-Jul-09</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>357.41</u> (ft, msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>345.41</u> (ft, msl)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>327.41</u> (ft, msl)	CEMENT TYPE: _____
NORTHING: <u>740.4893</u> EASTING: <u>-2166.134</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER: _____	SAND MANUFACTURER: <u>Uninum</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER: _____	AMOUNT BENTONITE USED: <u>2.5</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>12</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>15</u> (ft)	AMOUNT SAND USED: <u>7</u> bags lbs
BOREHOLE DIAMETER: <u>6.75</u> (in)	STATIC WATER: <u>15.3</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow Stem</u> Size: <u>6.75</u> (in)	ENCOUNTERED WATER: _____ depth from ground



QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>		
	DATE: <u>23-Jul-09</u>	CHECKED BY: _____	DATE: _____	



SOIL BORING LOG

BORING/WELL NO.: GB-07/MW-7
TOTAL DEPTH: 34'
TOP OF CASING ELEV.: 362.75 ft. NGVD
GROUND SURFACE ELEV.: 360.20 ft. NGVD

CLIENT: AEP
PROJECT: Metal Cleaning Waste Pond
SITE LOCATION: Welsh Power Plant
PROJECT NO.: S-08-0120
LOGGED BY: James Meleton, Jr.

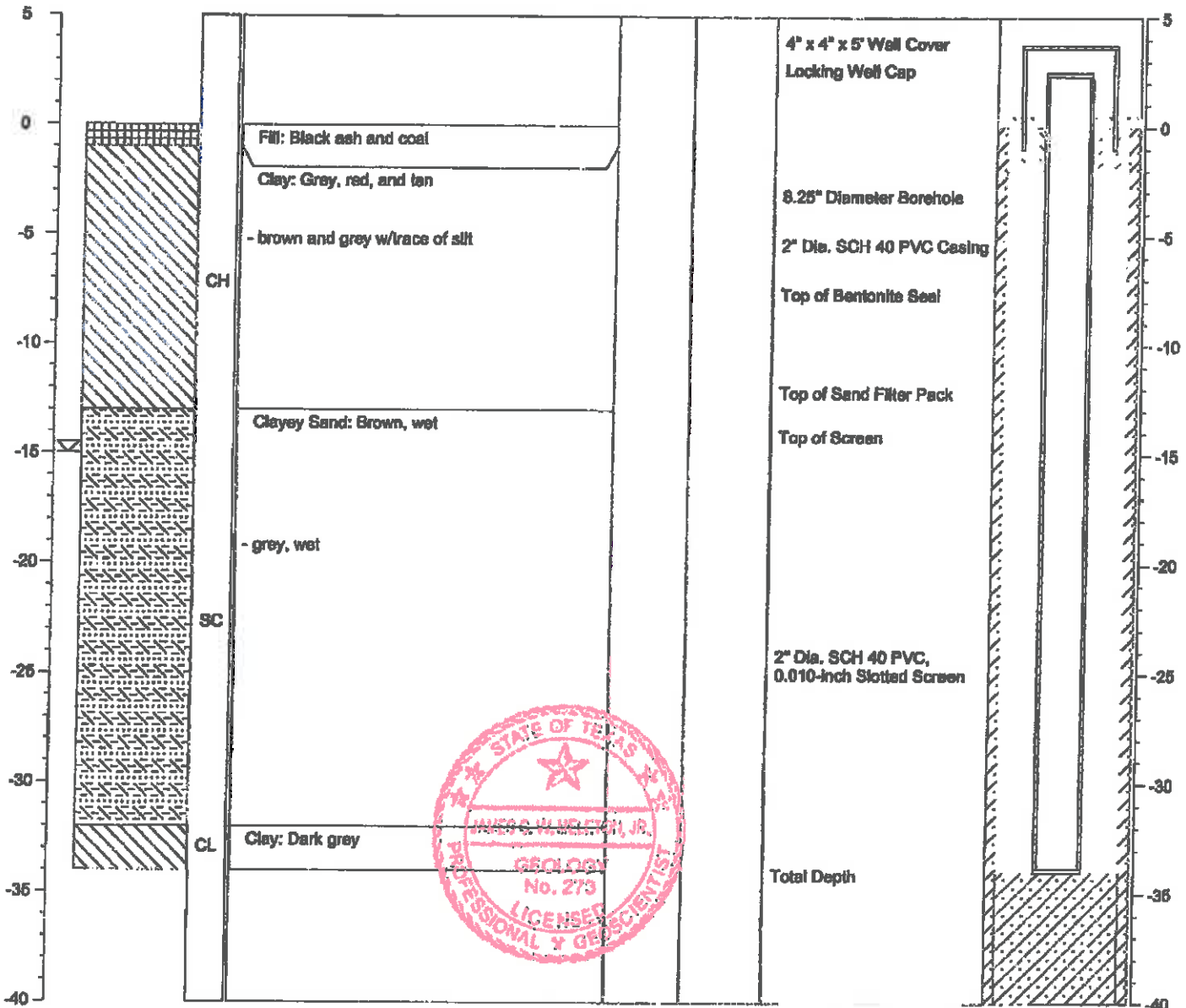
DRILLING CO.: WEST Drilling
DRILLER: Tom McCullough
METHOD OF DRILLING: Hollow-stem Auger
SAMPLING METHODS: Split-spoon
DATE DRILLED: 12/1/09

NOTES: Latitude: 33.05455
 Longitude: 94.84674

≍ Water level during drilling
 ≍ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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LOG OF BORING B-1

PROJECT: Walsh Power Plant
Pittsburgh, Texas
PROJECT NO.: G3242-09

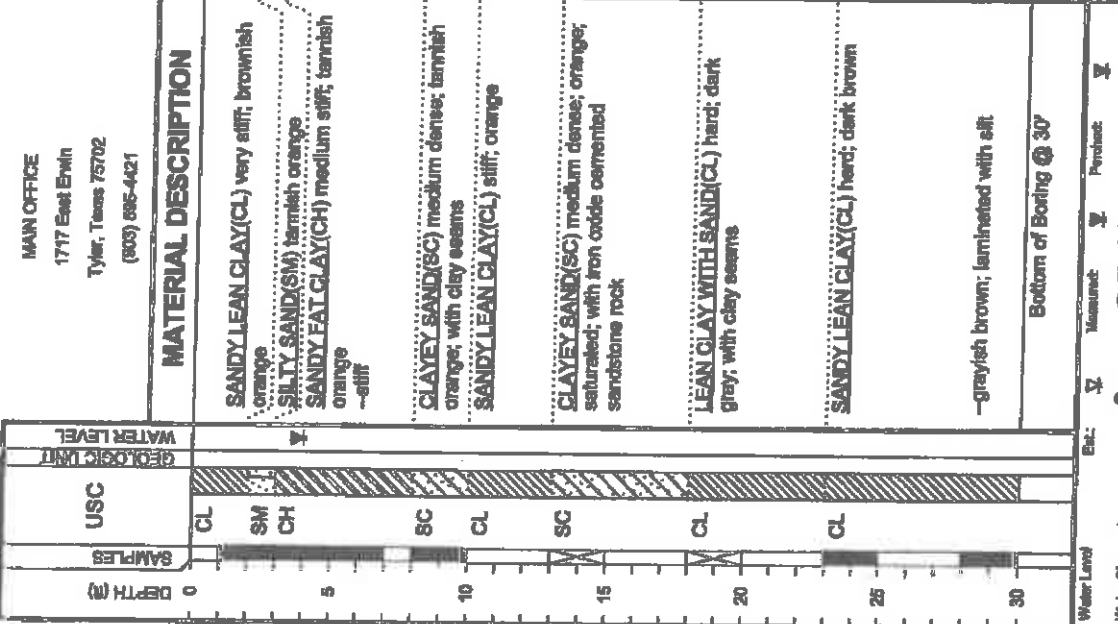
ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 835-4421

DATE: 10/27/09
SURFACE ELEVATION: 324.1

BORING TYPE: Flight Auger

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (psi)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Moisture Content and Atterberg Limits		OTHER TESTS PERFORMED (Page Ref. #)
									Moisture Content (%)	Plasticity Index (%)	
0									LL	PL	
5	CL			P=4.0 SF N=7					20	38	+40 Sieve=10% +4 Sieve=1%
10	SM			P=1.5					18	17	+40 Sieve=7% +4 Sieve=3%
15	CH			P=1.75					22	15	+40 Sieve=35% +4 Sieve=22%
20	SC			N=15					21	20	+40 Sieve=2% +4 Sieve=0%
25	CL			N=35					15	18	+40 Sieve=1% +4 Sieve=0%
30	CL			P=4.5+							



Key to Abbreviations:
N - SPT Data (Blow/P)
P - Pocket Penetrometer (psi)
T - Torvane (pcf)
L - Lab Vane Shear (psi)

Water Level: Bottom of Boring @ 30'
Water Observations: Seepage @ 5' while drilling. Water level @ 4' and open to 30' upon completion.

Notes: GPS Coordinates: N 33°03.080', W 94°50.417'

Piezo B-2

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(937) 685-4421

PROJECT: Welch Power Plant
Pittsburgh, Texas
PROJECT NO.: G3242-06

BORING TYPE: Flight Auger

DATE: 10/28/09
SURFACE ELEVATION: 339.7

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ksf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)
						1	2	3	4					PL	LI		PL	PL	PI	
0																				
3	CL			SANDY LEAN CLAY (CL) hard; red and tan -very stiff	P=4.5+									28	14	14	14	14	61	+40 Sieve=3% +4 Sieve=0%
5				-stiff	P=3.5									40	16	24	24	24	85	+40 Sieve=0% +4 Sieve=0%
10				-very stiff; reddish brown	N=14									30	14	16	16	16	58	+40 Sieve=0% +4 Sieve=0%
15	CL			SANDY LEAN CLAY (CL) hard; red and tan	P=4.5+									34	15	19	19	19	54	+40 Sieve=0% +4 Sieve=0%
20				-very stiff	P=3.5									37	16	21	21	21	47	+40 Sieve=5% +4 Sieve=3%
25					P=4.0															
30	SC			CLAYEY SAND (SC) medium dense; tan, red, and gray	P=4.5															

Water Level @ 19' and open to 24' upon completion.

Water Level

Water Observations: completion.

Key to Abbreviations:
N - SPT Data (Blow/Ft)
P - Pocket Penetrometer (ksf)
T - Torque (ksf)
L - Lab Vane Shear (ksf)

Notes:
GPS Coordinates: N 33°03.078', W 94°50.449'



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 Tyler, Texas 75702
 (803) 666-4421

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
------------	---------	-----	---------------	-------------

MATERIAL DESCRIPTION

-red and tan

SILTY CLAYEY SAND(SM-SC) red, tan, and gray; saturated

FAT CLAY(CH) hard; brown, tan, and gray; with ferric joints; with lignite and sand seams

SILTY SAND(SM) black and gray

Bottom of Boring @ 50'

Water Level
 Water Observations:
 completion.
 E.M.L. ▾ Measured: ▾ Perched: ▾
 Water level @ 15' and open to 24' upon

LOG OF BORING B-2

PROJECT: Welsh Power Plant
 Pittsburgh, Texas

PROJECT NO.: G3242-08

BORING TYPE: Flight Auger

DATE 10/28/09

SURFACE ELEVATION
 339.7

FIELD STRENGTH DATA	● BLOW COUNT 20 40 60 80 ▲ C _u (pcf) ▲ 4 1 2 3 4 ■ PRR (pcf) ■ 4.0 1.0 2.0 3.0 4.0 ◆ Torsions (pcf) ◆ 4.0 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (psi)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits				MOISTURE CONTENT (%)	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Moisture Content	Liquid Limit					
P-2.5													
SF													
P-4.5+													
SF													+40 Sieve=0% +4 Sieve=0%

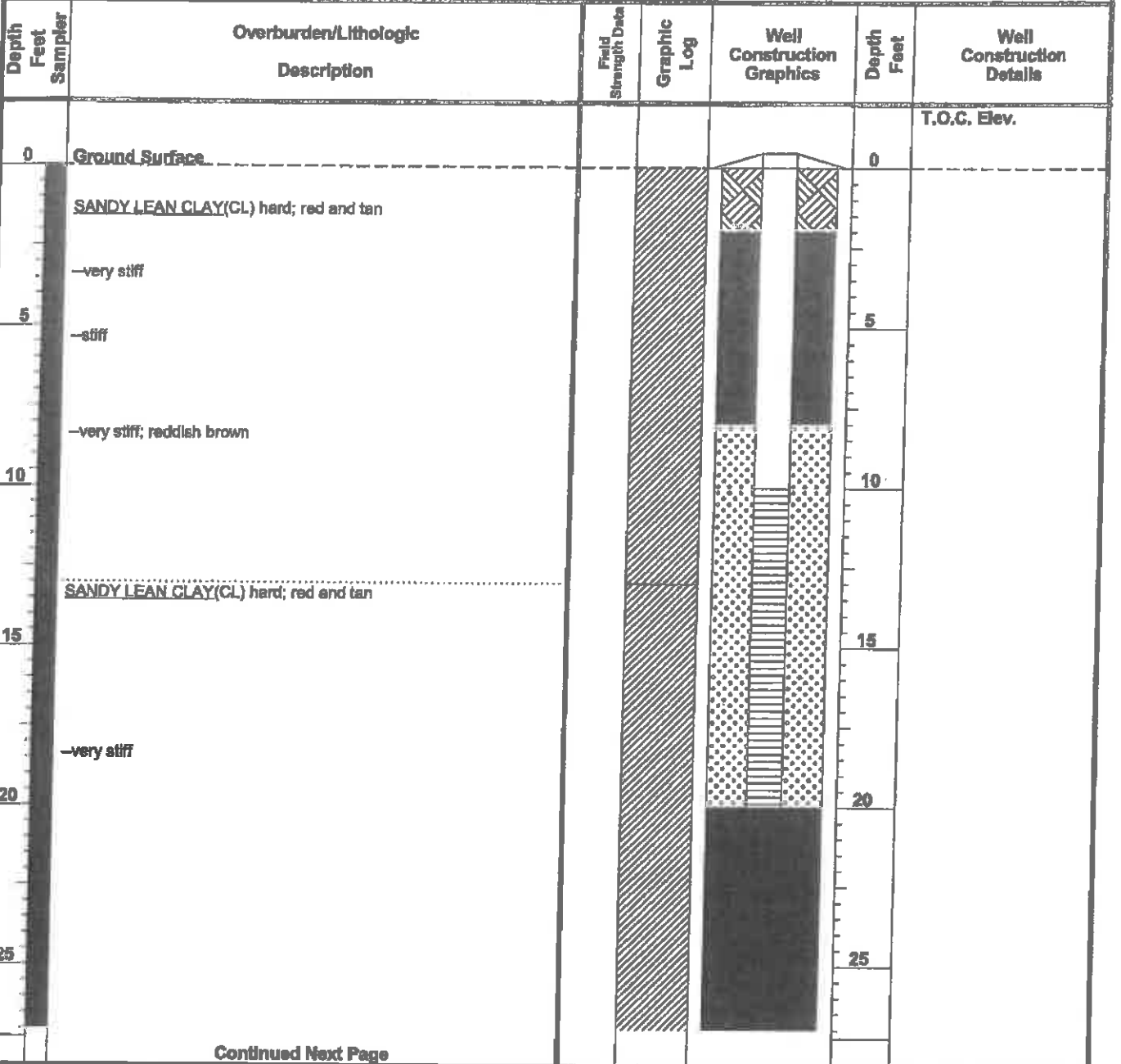
Key to Abbreviations:

- N - SPT Data (blow-ft)
- P - Pocket Penetrometer (pcf)
- T - Torsions (pcf)
- L - Lab Vane Shear (pcf)

Notes:
 GPS Coordinates: N 33°03.078', W 94°50.449'

Piezometer B-2

ENVIRONMENTAL LOG			Well No. B-2	
Client: Welsh Power Plant			Location Pittsburg, Texas	
Project No: G3242-095	Phase	Task	Surface Elev.	Page 1 of 2



Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>2-8' & 20-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>8-20'</u>
Drilling Started <u>10/28/09</u>	Well Casing <u>2.0" Dia. 0.0' to 10.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/28/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 10.0' to 20.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	
Type of Well _____	Slot Size <u>0.010"</u>	
	Grout Type <u>Bentonite</u>	



ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095

Phase




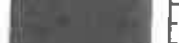






Task

Well No. B-2

Location Pittsburg, Texas

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	CLAYEY SAND(SC) medium dense; tan, red, and gray				30	
35	-red and tan				35	
40	SILTY CLAYEY SAND(SM-SC) red, tan, and gray; saturated				40	
45	FAT CLAY(CH) hard; brown, tan, and gray; with ferric joints; with lignite and sand seams				45	
50	SILTY SAND(SM) black and gray				50	
50	Bottom of Boring @ 50'					
55						
60						





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ENGINEERS &
CONSULTANTS**

MAIN OFFICE
1717 East Evelyn
Tyler, Texas 75702
(903) 593-4421

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-08

BORING TYPE: Flight Auger

LOG OF BORING B-3

DATE: 10/27/09

SURFACE ELEVATION
339.6

OTHER TESTS
(Page Ref. #)

MINUS #200 SIEVE (%)

ATTERBERG
LIMITS(%)

LIQUID LIMIT

PLASTIC LIMIT

PLASTICITY INDEX

+40 Sieve=3%,
+4 Sieve=0%

+40 Sieve=3%,
+4 Sieve=0%

+40 Sieve=10%,
+4 Sieve=1%

+40 Sieve=11%,
+4 Sieve=0%

+40 Sieve=1%,
+4 Sieve=0%

NATURAL MOISTURE CONTENT
AND
ATTERBERG LIMITS

PLASTIC LIMIT

LIQUID LIMIT

MOISTURE CONTENT (%)

COMPRESSION
STRENGTH (ks)

FAILURE STRAIN (%)

CONFINING
PRESSURE (psi)

FIELD
STRENGTH

N=11

P=1.0

P=3.5

P=3.75

P=2.5

P=4.5+

N=58

BLOW COUNT

20 40 60 80

1 2 3 4

PPR (pcf)

1.0 2.0 3.0 4.0

Torsion (pcf)

1.0 2.0 3.0 4.0

FIELD
STRENGTH

N=11

P=1.0

P=3.5

P=3.75

P=2.5

P=4.5+

N=58

CLAYEY SAND(SC) medium dense; gray
and red

FAT CLAY(CH) stiff, red and tan; with sand
seams

-very stiff

FAT CLAY WITH SAND(CH) very stiff;
brown; with ferric joints

-red and tan; layered; with ferric seams

FAT CLAY(CH) hard; gray; with sand seams

CLAYEY SAND(SC) very dense; gray; with
sand seams

USC

SC

CH

CH

CH

CH

SC

DEPTH (ft)

0

5

10

15

20

25

30

WATER LEVEL

EST: 339.6

339.6

339.6

339.6

339.6

339.6

339.6

Water Observations:

Seepage @ 13' while drilling. Water level

@ 19' and open to 24' upon completion.

Key to Abbreviations:

N - SPT Data (Blows/Ft)

P - Pocket Penetrometer (pcf)

T - Torsion (pcf)

L - L&D Vane Shear (pcf)

Note:

GPS Coordinates: N 33°02.996', W 94°50.514'



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CONSULTANTS**

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(800) 695-4421

MATERIAL DESCRIPTION

FAT CLAY(CH) hard; brown; layered and with sand seams

-gray and green

SANDY LEAN CLAY(CL) very stiff; gray and dark green; layered; with sand seams

FAT CLAY(CH) hard; gray and dark green; layered; with all seams

Bottom of Boring @ 50'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35		CH		
40				
45		CL		
50		CH		

LOG OF BORING B-3

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE: 10/27/09

SURFACE ELEVATION
339.6

FIELD STRENGTH DATA	BLOW COUNT 20 40 60 80 1 2 3 4 ▲ Cu (pcf) ▲ ■ PPR (pcf) ■ ◆ Torvane (pcf) ◆	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ksf)	FAILURE STRAIN (%)	CONFINING PRESSURE (pcf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (L) PLASTIC LIMIT (P) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Moisture Content	Liquid Limit				
P=4.5+	● 20 40 60 80 ▲ 1 2 3 4 ■ 1.0 2.0 3.0 4.0 ◆ 1.0 2.0 3.0 4.0					21	60	24	36	95	+40 Sieve=1% +4 Sieve=0%
P=4.5+											
P=3.5											
P=4.5+											

Key to Abbreviations:
N - SPT Data (Blow/ft)
P - Pocket Penetrometer (pcf)
T - Torvane (pcf)
L - Lab Vane Shear (ksf)

Notes:
GPS Coordinates: N 33°02.998', W 84°50.514'

Water Level: [] Measured [] Perched []
Water Observations: Seepage @ 13' while drilling. Water level @ 19' and open to 24' upon completion.

Pipe Bender B-4

ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 985-4421		LOG OF BORING B-4 PROJECT: Walsh Power Plant Pittsburgh, Texas PROJECT NO.: G3242-08 BORING TYPE: Flight Auger										DATE: 10/27/09 SURFACE ELEVATION: 340.5						
DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (psi)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)	
											Plastic Limit	Liquid Limit		LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		MINUS #200 SIEVE (%)
0																		
5		SM			N=18	20						14	24	15	9	59	+40 Sieve=1%, +4 Sieve=0%	
10		CL			SF	30						22	45	21	24	94	+40 Sieve=2%, +4 Sieve=0%	
15		SC			P=3.25	40						15	31	15	16	40	+40 Sieve=1%, +4 Sieve=0%	
20		CL			N=9	50						25	59	24	35	88	+40 Sieve=4%, +4 Sieve=0%	
25		CH			P=4.0	60												
30					P=2.75	70												

GPS Coordinates: N 33°03.011', W 94°50.462'

Key to Abbreviations:
 N - SPT Data (blows/ft)
 P - Proctor Parameters (pcf)
 T - Torrens (pcf)
 L - Lab Vane Shear (psi)

Water Level
 Water Observations: completion.
 Water level @ 18' and open to 45' upon completion.



ETTL
ENGINEERS &
CONSULTANTS

MAIN OFFICE
 1717 East Erwin
 Tyler, Texas 75702
 (936) 296-4421

MATERIAL DESCRIPTION

-hard; light gray; layered and with silt seams

LEAN CLAY(CI); hard; light gray; layered and with silt seams

-light gray

-layered and with sand seams; with lignite

Bottom of Boring @ 50'

DEPTH (')	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35				
40		CL		
45				
50				

Water Level
 Water Observations: completion.

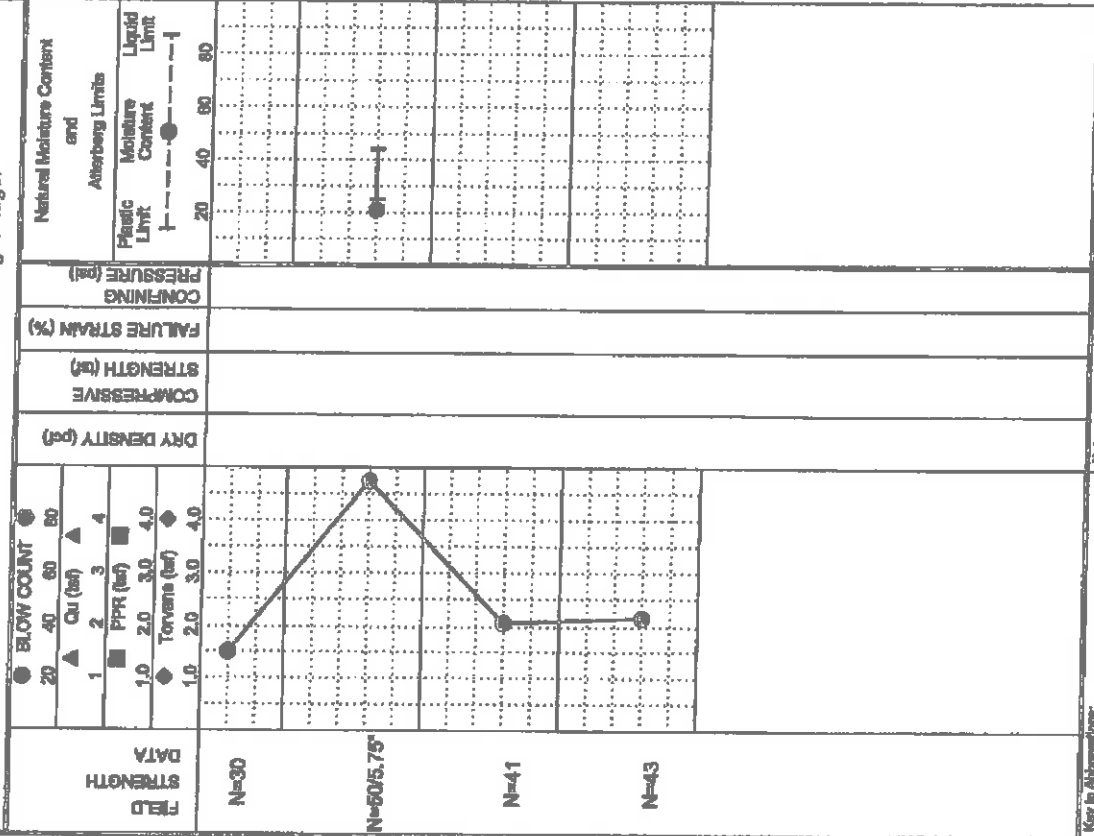
Ext: Measured: Predicted:
 Water level @ 18' and open to 48' upon completion.

Key to Abbreviations:
 N - SPT Data (Blows/Ft)
 P - Pocket Penetration (MP)
 T - Torrens (MP)
 L - Lab Vane Shear (MP)

LOG OF BORING B-4

PROJECT: Welsh Power Plant
 Pittsburg, Texas
 PROJECT NO.: G3242-09

BORING TYPE: Flight Auger






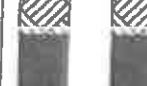






DATE	10/27/09	OTHER TESTS PERFORMED	(Page Ref. #)
SURFACE ELEVATION	340.6	MOISTURE CONTENT (%)	21
ATTERBERG LIMITS (%)		PLASTICITY INDEX	19
		LIQUID LIMIT	44
		PLASTIC LIMIT	25
		MINUS #200 SIEVE (%)	93
			+40 Sieve=1% +4 Sieve=0%

Notes:
 GPS Coordinates: N 33°03.011', W 94°50.462'

Pittsburger B-4

ENVIRONMENTAL LOG



Client: Walsh Power Plant Well No. B-4
 Project No: G3242-095 Phase Task Location Pittsburg, Texas
 Surface Elev. Page 1 of 2

Depth Feet	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
0	Ground Surface				0	T.O.C. Elev.
	SILTY SAND(SM) medium dense; tan; with gravel					
5	SANDY LEAN CLAY(CL) dark brown -tannish orange -hard; orangish tan				5	
10	-very stiff; white				10	
15	CLAYEY SAND(SC) medium dense; tan -orangish gray; with sand seams				15	
20	SANDY LEAN CLAY(CL) stiff; orangish tan				20	
25	FAT CLAY(CH) very stiff; orangish tan; with ferric seams				25	

Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>2-8' & 18-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>6-18'</u>
Drilling Started <u>10/27/09</u>	Well Casing <u>2.0" Dia. 0.0' to 8.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/27/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 8.0' to 18.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	
Type of Well _____	Slot Size <u>0.010"</u>	
	Grout Type <u>Bentonite</u>	



ENVIRONMENTAL LOG			Well No. B-4			
Client: Welsh Power Plant			Location Pittsburg, Texas			
Project No: G3242-095		Phase	Task	Surface Elev.		Page 2 of 2
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	-tannish brown; with iron ore seams				30	
35	-hard; light gray; layered and with silt seams				35	
40	<u>LEAN CLAY (CL)</u> hard; light gray; layered and with silt seams				40	
45	-light gray				45	
50	-layered and with sand seams; with lignite				50	
Bottom of Boring @ 50'						
55						
60						



P.C. Zone for B-5

ETTL
ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(936) 595-4421

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-08

LOG OF BORING B-5

BORING TYPE: Flight Auger

DATE

10/27/09

SURFACE ELEVATION
340.0

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT 20 40 60 80 ▲ Cu (bl) ▲ 1 2 3 4 ■ PPR (bl) ■ 1.0 2.0 3.0 4.0 ◆ Torrens (bl) ◆	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (psi)	FAILURE STRAIN (%)	CONFINING PRESSURE (pcf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)
									Plastic Limit	Liquid Limit		LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0															
1	CL	LEAN CLAY WITH SAND (CL) stiff, red and tan	P=2.0	■						22	47	19	28	81	+40 Sieve=8% +4 Sieve=3%
2	CL	LEAN CLAY (CL) hard; red and tan	P=4.5+	■											
3		-very stiff	P=4.0	■						21	46	18	26	94	+40 Sieve=3% +4 Sieve=0%
4	CH	FAT CLAY (CL) very stiff; brown and tan	P=3.0	■											
5	CH	FAT CLAY WITH SAND (CH) hard; red and tan	P=4.5+	■											
6															
7	CL	SANDY LEAN CLAY (CL) very stiff; red and gray; with sand seams	P=3.0	■						22	52	24	28	88	+40 Sieve=3% +4 Sieve=0%
8															
9	SC	CLAYEY SAND (SC) very loose; tan, red, and gray	P=0.5	■						19	33	17	16	44	+40 Sieve=1% +4 Sieve=0%
10															
11	CH	FAT CLAY WITH SAND (CH) stiff; red and gray	P=2.0	■						25	61	19	42	83	+40 Sieve=5% +4 Sieve=3%
12															

Water Level: Measured Perched

Water Observations: Seepage @ 35' while drilling. Water level @ 31' and open to 35' upon completion and after 30 minutes.

Water Level: Estimated Perched

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

Notes:
GPS Coordinates: N 33°02.964', W 94°50.428'



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Tyler, Texas 75702
(936) 685-4421

MATERIAL DESCRIPTION

SILTY CLAYEY SAND(SC) gray and red;
saturated

EAT CLAY(CH) hard; red and gray; with sand
seams

—gray, tan, and red; with sand seams

SILTY SAND(SM-SC) red and gray

Bottom of Boring @ 50'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35		SC		
40		CH		
45		SM		
50		SC		

LOG OF BORING B-5

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-08

BORING TYPE: Flight Auger

DATE

10/27/09

SURFACE ELEVATION

340.0

FIELD STRENGTH DATA	● BLOW COUNT 20 40 60 80	▲ Qu (ksf) ▲ 1 2 3 4	■ PPR (ksf) ■ 1.0 2.0 3.0 4.0	◆ Torque (ftk) ◆ 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ksf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)			ATTERBERG LIMITS(%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
										PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	PL	LL	PI		
SF										25	51	31	20	87	+40 Sieve=0% +4 Sieve=0%		
P=4.5+																	
P=4.5+																	
SF																	

Key to Abbreviations:

- N - SPT Data (Blows/Ft)
- P - Pocket Penetrometer (ksf)
- T - Torque (ftk)
- L - Lab Vane Shear (ksf)

Note:

GPS Coordinates: N 33°02.964', W 94°50.428'

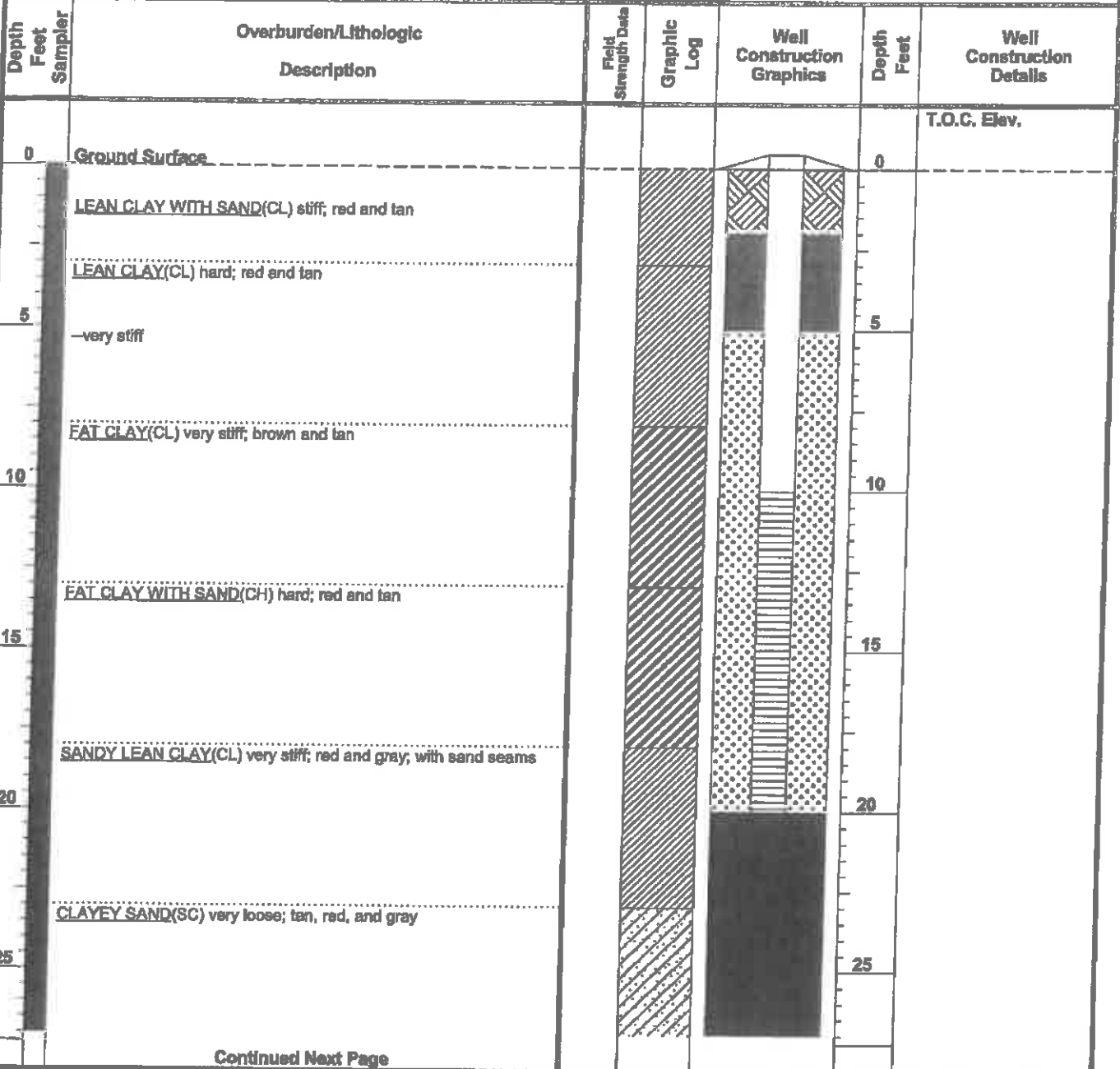
Water Level

Est: Measured: Predict:

Water Observations:
Seepage @ 35' while drilling. Water level @ 31' and open to 35' upon completion and after 30 minutes.

Appendix P-5

ENVIRONMENTAL LOG
 Client: Welsh Power Plant
 Project No: G3242-095 Phase Task
 Well No. B-5
 Location Pittsburg, Texas
 Surface Elev. Page 1 of 2



Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>2-5' & 20-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>5-20'</u>
Drilling Started <u>10/27/09</u>	Well Casing <u>2.0" Dia. 0.0' to 10.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/27/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 10.0' to 20.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	_____
Type of Well _____	Slot Size <u>0.010"</u>	_____
	Grout Type <u>Bentonite</u>	_____

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Well No. B-5

Location Pittsburg, Texas

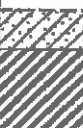



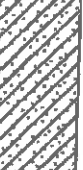


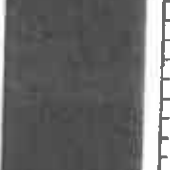


Project No: G3242-095

Phase

Task

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	FAT CLAY WITH SAND(CH) stiff; red and gray				30	
35	SILTY CLAYEY SAND(SC) gray and red; saturated				35	
40	FAT CLAY(CH) hard; red and gray; with sand seams				40	
45	-gray, tan, and red; with sand seams				45	
50	SILTY SAND(SM-SC) red and gray				50	
55	Bottom of Boring @ 50'					
60						



Pic 7 on the B-6

LOG OF BORING B-6

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MAIN OFFICE
 1717 East Erwin
 Tyler, Texas 75702
 (800) 895-4421

PROJECT: Welsh Power Plant
 Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION
 340.1

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	FIELD STRENGTH	SLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ksi)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits		ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
										Moisture Content (%)	Plastic Limit (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)		
0		USC														
0		CH	EAT CLAY(CH) very stiff, red and gray, with ferric seams	P=4.0	20						20	32	14	18	60	+40 Sieve=0%, +4 Sieve=0%
5		CL	SANDY LEAN CLAY(CL) hard; red and tan	P=4.5+	2						20	49	20	29	93	+40 Sieve=2%, +4 Sieve=0%
10			-very stiff, red, gray, and brown; with gravel -with sand seams	P=3.0	3						20	49	20	29	93	+40 Sieve=2%, +4 Sieve=0%
15				P=3.0	3						20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
20		SM	SILTY SAND(SM) gray; saturated	P=3.0	3						20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
25			-very dense; gray and red	P=4.0	3						20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
30				P=3.0	3						20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
30				N=505.25'							20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
30				SF							20	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%

Water Level: Measured; Perched; Seepage @ 17' while drilling. Water level @ 13' and open to 15' upon completion and after 30 minutes.

Key to Abbreviations:
 N - SPT Data (blows/ft)
 P - Pocket Penetrometer (pcf)
 T - Torvane (pcf)
 L - Lab Vane Shear (pcf)

GPS Coordinates: N 33°02.912', W 94°50.462'



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 1717 East Erwin
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LOG OF BORING B-6

PROJECT: Welsh Power Plant
 Pittsburg, Texas
PROJECT NO.: G3242-09

DATE: 10/27/09
SURFACE ELEVATION: 340.1

BORING TYPE: Flight Auger

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH	FIELD DATA						DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ksf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)	
					BLOW COUNT	Cu (pcf)	Cc	PPR (pcf)	Torsion (pcf)	Plastic Limit					Liquid Limit	LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX	MMUS #200 SIEVE (%)		
35	CH			P=4.5+	1	2.0	3.0	4.0	1.0	2.0	3.0	4.0				22	68	24	44	95	+40 Sieve=0% +4 Sieve=0%	
40				P=4.5+																		
45				P=4.5+																		
50	CL			P=4.5+																		

MATERIAL DESCRIPTION
 FAT CLAY (CH) hard; brown; with sand
 streaks
 -dark green
 LEAN CLAY (CL) hard; dark green; laminated with lignite
 Bottom of Boring @ 50'

Key to Abbreviations:
 N - SPT Data (blows/ft)
 P - Pocket Penetrometer (pcf)
 T - Torsion (pcf)
 L - Lab Vane Shear (pcf)

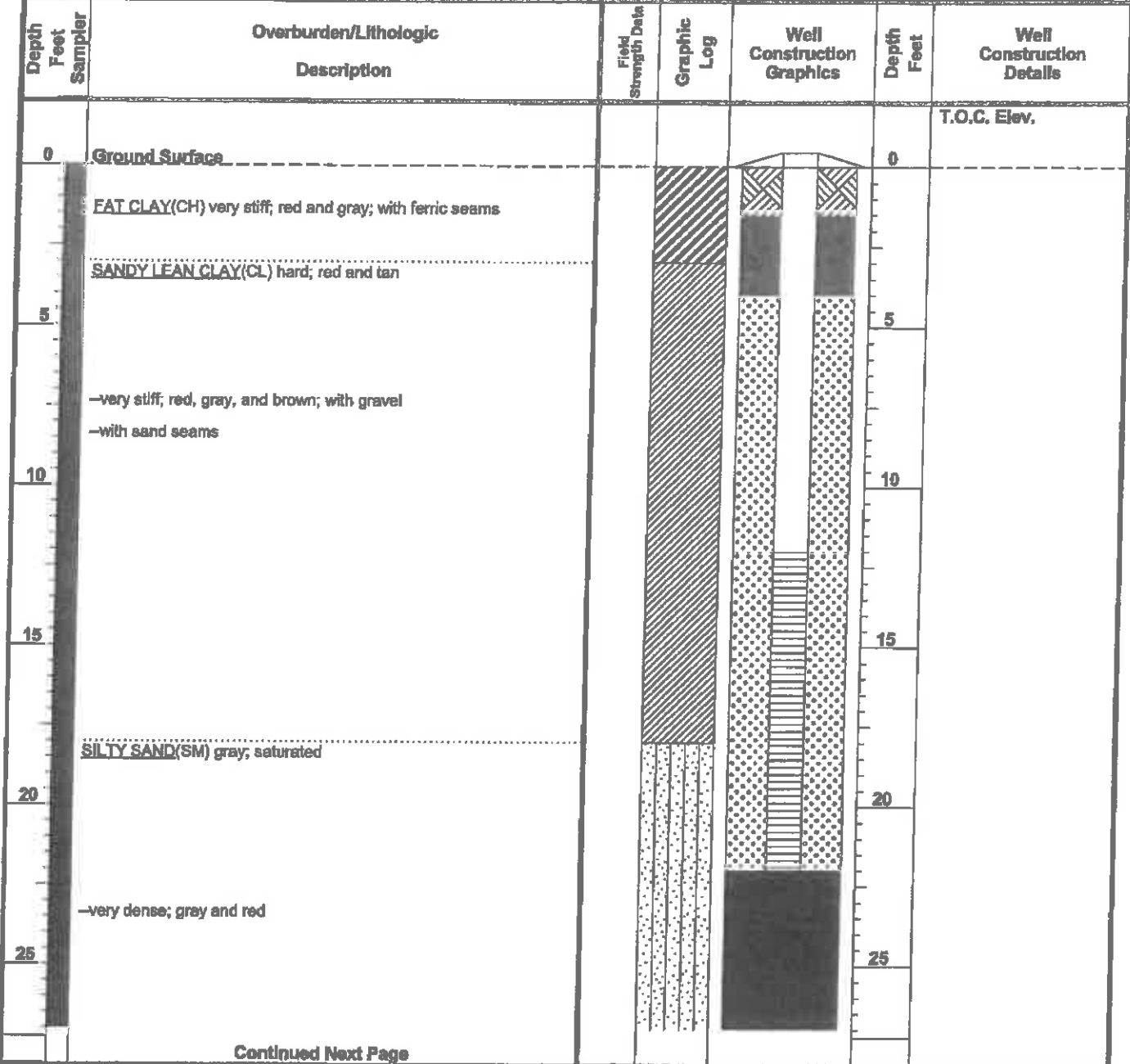
Notes:
 GPS Coordinates: N 33°02.912', W 94°50.462'

Water Level
 B.C. Measured: Perfect:
 Water Observations:
 Seepage @ 17' while drilling. Water level @ 13' and open to 15' upon completion and after 30 minutes.

Piezometer P-6

ENVIRONMENTAL LOG

Client: Welsh Power Plant Well No. B-6
 Project No: G3242-095 Location Pittsburg, Texas
 Phase Task Surface Elev. Page 1 of 2



Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>1.5-4' & 22-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>4-22'</u>
Drilling Started <u>10/28/09</u>	Well Casing <u>2.0" Dia. 0.0' to 12.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/28/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 12.0' to 22.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	
Type of Well _____	Slot Size <u>0.010"</u>	
	Grout Type <u>Bentonite</u>	

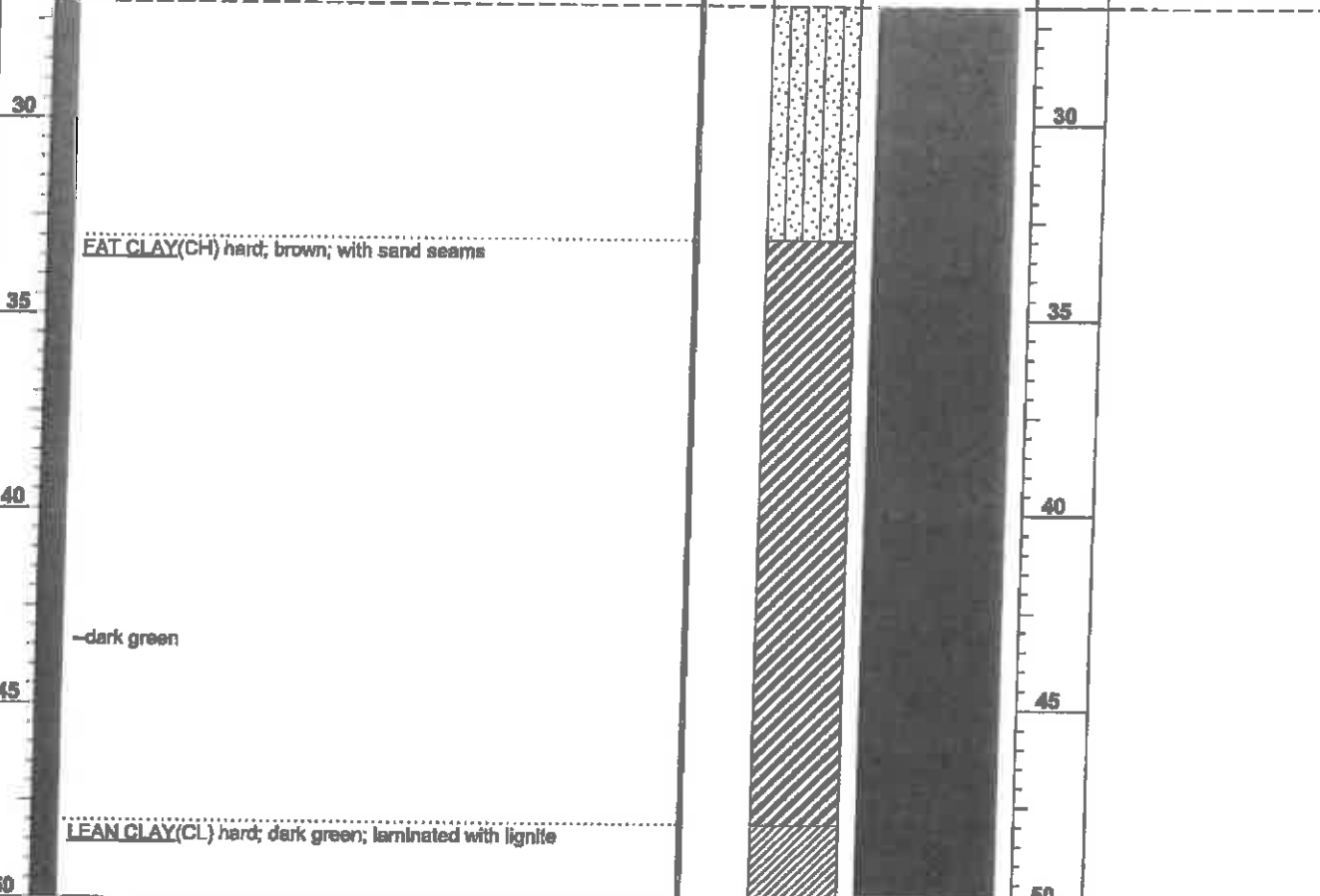


ENVIRONMENTAL LOG
 Client: Welsh Power Plant
 Project No: G3242-095

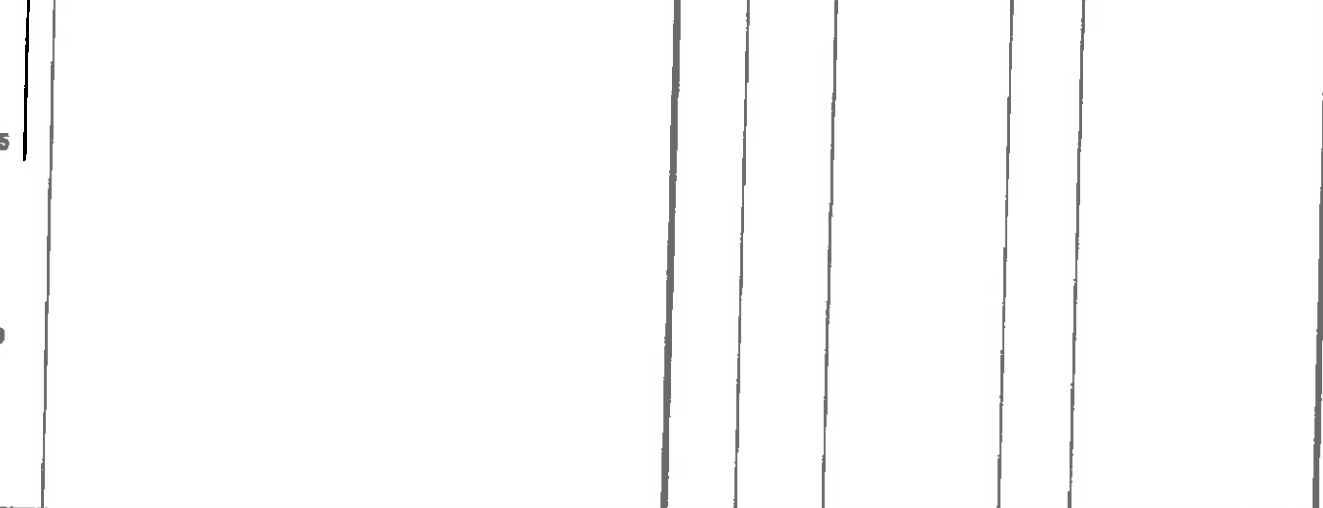
Well No. B-6
 Location Pittsburg, Texas
 Surface Elev. _____
 Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
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Continued from previous page



Bottom of Boring @ 50'



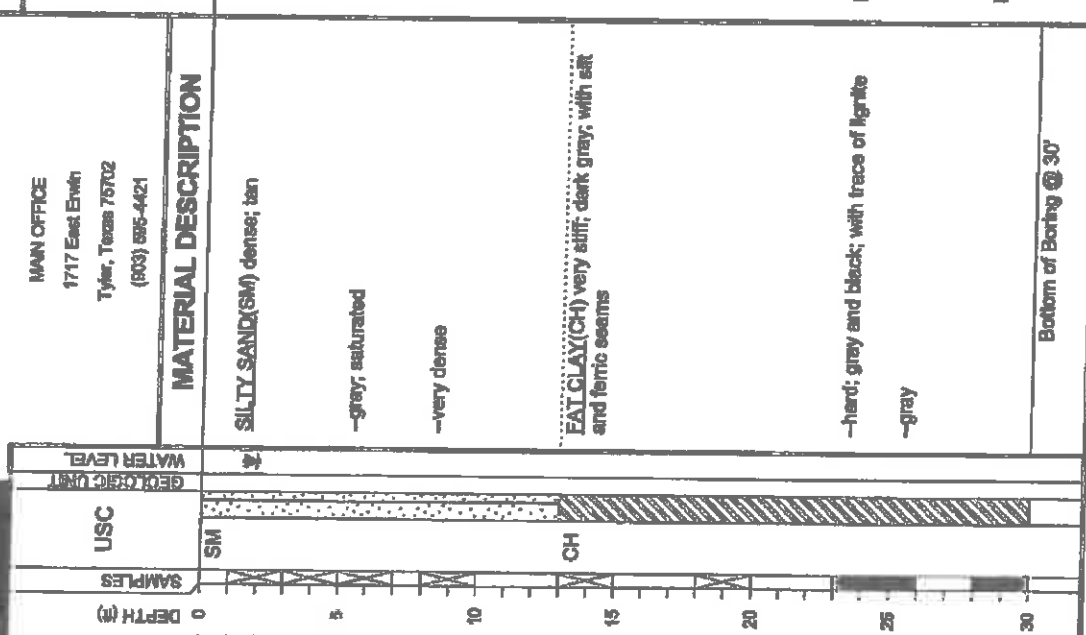
ETTL ENGINEERS & CONSULTANTS
 MAIN OFFICE
 1717 East Elwha
 Tyler, Texas 75702
 (903) 895-4421

PROJECT: Welsh Power Plant
 Pittsburgh, Texas
PROJECT NO.: G3242-08

LOG OF BORING B-7
DATE: 10/27/09
SURFACE ELEVATION: 340.4

BORING TYPE: Flight Auger

FIELD DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSION STRENGTH (ksf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)	
						PLASTIC LIMIT	LIQUID LIMIT		PL	PL	LI		
N=31	20	1.0				21	21	21				+40 Sieve=0%, +4 Sieve=0%	
N=38	20	1.0				23	23	23				+40 Sieve=0%, +4 Sieve=0%	
N=38	20	1.0				14	14	14	58	22	36	98	+40 Sieve=0%, +4 Sieve=0%
N=59	20	1.0											
N=26	20	1.0											
P=4.5+													
P=4.5+													



Water Level: Measured: Penetrated:
Water Observations: Seepage @ 4' while drilling. Water level @ 2' and open to 7 upon completion.
Bottom of Boring @ 30'

GPS Coordinates: N 33°02.898', W 94°50.519'

Landfill Boring B-2

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(900) 585-4421

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas
DRILL RIG: B-81 HDX
BORING TYPE: Rotary Wash/Fight Auger

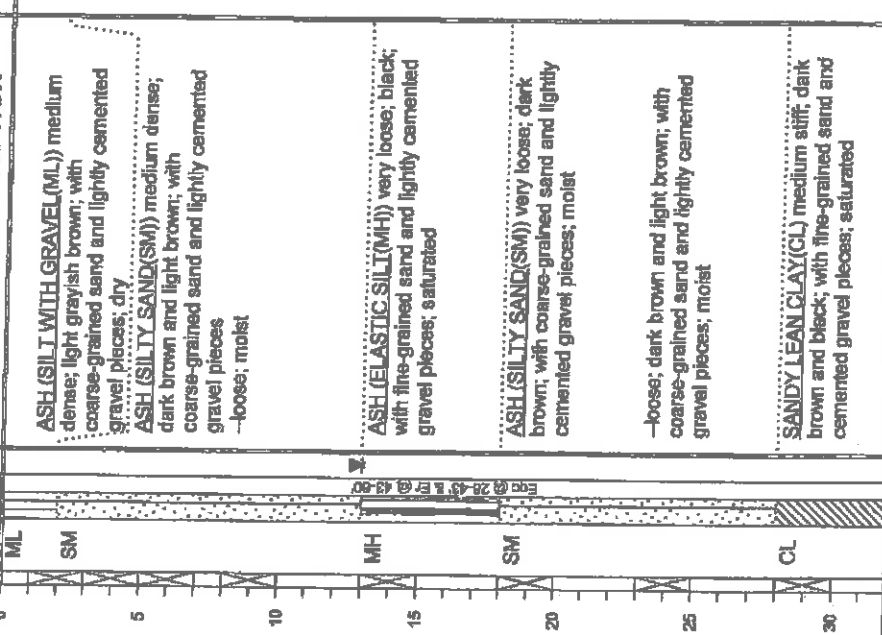
PROJECT NO.: G4207-146

LOG OF BORING B-2

DATE: 10/8/14

SURFACE ELEVATION: 373.8

USC
SAMPLER
DEPTH (ft)
WATER LEVEL
GEOLOGIC UNIT



MATERIAL DESCRIPTION

ASH (SILT WITH GRAVEL (ML)) medium dense; light grayish brown; with coarse-grained sand and lightly cemented gravel pieces; dry

ASH (SILTY SAND (SM)) medium dense; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces

-loose; moist

ASH (ELASTIC SILT (MH)) very loose; black; with fine-grained sand and lightly cemented gravel pieces; saturated

ASH (SILTY SAND (SM)) very loose; dark brown; with coarse-grained sand and lightly cemented gravel pieces; moist

-loose; dark brown and light brown; with coarse-grained sand and tightly cemented gravel pieces; moist

SANDY LEAN CLAY (CL) medium stiff; dark brown and black; with fine-grained sand and cemented gravel pieces; saturated

FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tn)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
N=13	1.0				Plastic Limit: 20, Liquid Limit: 40	46				58	+40 Sieves=27% +4 Sieves=18%
N=29	2.0				Plastic Limit: 20, Liquid Limit: 40	40				40	+40 Sieves=19% +4 Sieves=2%
N=18	3.0				Plastic Limit: 20, Liquid Limit: 40	200	134	92	42	100	+40 Sieves=0% +4 Sieves=0%
N=9	4.0				Plastic Limit: 20, Liquid Limit: 40						
N=0	4.0				Plastic Limit: 20, Liquid Limit: 40						
N=1	4.0				Plastic Limit: 20, Liquid Limit: 40						
N=7	4.0				Plastic Limit: 20, Liquid Limit: 40						
N=6	4.0				Plastic Limit: 20, Liquid Limit: 40	91				61	+40 Sieves=1% +4 Sieves=1%
N=6	4.0				Plastic Limit: 20, Liquid Limit: 40	18	30	15	15	83	+40 Sieves=1% +4 Sieves=0%

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

Note:

GPS Coordinates: N 33.04890°, W 94.84451°

Driller: Tommy Cook

Logger: B. Hobbs/O. Sanderson



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

LOG OF BORING B-2 (cont.)

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Casson, Texas
PROJECT NO.: G4207-146
BORING TYPE: Rotary Wash/Flight Auger

DATE: 10/8/14
SURFACE ELEVATION: 373.8

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH DATA	BLOW COUNT ● BLOW COUNT ▲ Qu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ ◆ 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		ATTERBERG LIMITS (%)		MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
										Moisture Content	Plastic Limit	Liquid Limit	LL		
35	SC			P=3.5 P=2.75	●	110	1.30	4.3	21	20	20	30	15	39	+40 Sieve=0% +4 Sieve=0%
40	SM			N=78	●					20	20	30	15	24	+40 Sieve=0% +4 Sieve=0%
45	CH			N=27	●					20	20	62	26	96	+40 Sieve=2% +4 Sieve=0%
50				P=4.0	■	98				20	20	62	26	24	
55															
60				N=37	●					20	20	62	26		
Bottom of Boring @ 60'															

Water Level: Measured: Perched:
Water Closest to: Water level @ 13'.
Notes: GRS Coordinates: N33.04880° W94.84451°
Logger: B. Hobbs/O. Sanderson
Coffer: Tommy Cook

Leadhill Boring B-10



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CONSULTANTS**

MAIN OFFICE
1717 East Ewin
Tyler, Texas 75702
(903) 585-4421

MATERIAL DESCRIPTION

ASH (CLAYEY SAND)(SC) loose; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces; moist

ASH (ELASTIC SILT)(MH) very loose; black; moist

-wet

ASH (SILTY SAND WITH GRAVEL)(SM) very dense; light brown and dark brown; with lightly cemented gravel pieces and coarse-grained sand; moist; cemented layer from 17.5' to 21'

-cemented layer from 23' to 27'

SANDY LEAN CLAY (CL) medium stiff; grayish brown and yellowish brown; saturated; mottled

LOG OF BORING B-10

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas
DRILL RIG: B-61 HDX
BORING TYPE: Rotary Wash/Flight Auger

PROJECT NO.: G4207-146

DATE

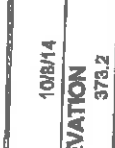
10/8/14
SURFACE ELEVATION
373.2

DEPTH (ft)	USC	SAMPLER	WATER LEVEL	GEOLOGIC UNIT	FIELD STRENGTH	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSION STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
													LL	PL	LI		
0	SC				N=7	1					20	24	31	18	12	41	+40 Sieve=21% +4 Sieve=11%
5					N=3	2					20						
10	MH				N=0	3					20						
15					N=50/1"	4					20						
20	SM				N=50/1"	5					20	56	23	14	9	14	+40 Sieve=71% +4 Sieve=28%
25					N=50/1"	6					20						
30	CL				N=4	7					20	19	23	14	9	57	+40 Sieve=1% +4 Sieve=0%

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

Notes:
Seepage @ 13' while drilling.

GIS Coordinates: N33.04895° W94.84390°
Driller: Tammy Cook
Logger: B. Hobbs/O. Sanderson



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 Tyler, Texas 75702
 (903) 595-4421

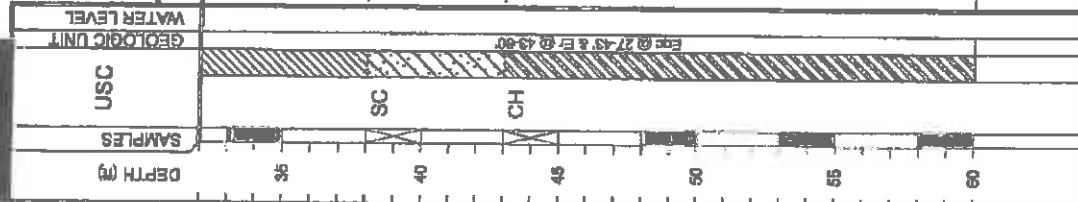
MATERIAL DESCRIPTION

CLAYEY SAND(SC) medium dense; reddish brown and grayish brown; moist; mottled

EAT CLAY(CH) very stiff; dark brown with light gray; with silt seams; moist

-hard

Bottom of Boring @ 60'



Water Level
 Water Observations: Seepage @ 15' white drilling.

Est.: Measured Punched
 Key to Abbreviations:
 N - 8FT Data (Blows/FT)
 P - Pocket Penetrometer (tsf)
 T - Torvane (tsf)
 L - Lab Vane Shear (tsf)

LOG OF BORING B-10 (cont.)

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
 Welsh Power Station - Cason, Texas
 PROJECT NO.: G4207-148
 BORING TYPE: Rotary Wash/Flight Auger

DATE: 10/8/14
 SURFACE ELEVATION: 378.2

FIELD DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTEMBERG LIMITS (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit			
P=1.25 P=1.0	1.0 2.0 3.0 4.0	107	2.10	6.1	21	20	25	22	TL 25 PL 17 LI 6	+40 Sieves=3% +4 Sieves=0%
N=23	1.0 2.0 3.0 4.0									+40 Sieves=7% +4 Sieves=0%
N=18	1.0 2.0 3.0 4.0									
P=4.5+	1.0 2.0 3.0 4.0									
P=4.5+	1.0 2.0 3.0 4.0									

Notes:

GIS Coordinates: N33.04895°, W84.84390°
 Driller: Tommy Cook
 Logger: B. Hobbs/O. Sanderson

Landfill Boring B-12

DATE: 10/15/14

SURFACE ELEVATION: 381.7

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Carson, Texas

PROJECT NO.: G4207-146

BORING TYPE: Flight Auger

OTHER TESTS PERFORMED (Page Ref. #)

LOG OF BORING B-12

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (psi)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
									Moisture Content	Atterberg Limits		LIQUID LIMIT	PLASTIC LIMIT	PL		
0																
3	CL	LEAN CLAY WITH SAND (CL) stiff, light gray and reddish brown; moist; mottled	P=3.75	20							16	33	19	14	58	+40 Sieve=1% +4 Sieve=0%
5	CL	SANDY LEAN CLAY (CL) stiff, light brown, light gray and reddish brown; moist; mottled	N=15	4												
11		-grayish brown and brown; moist	N=11	3												
17	CH	FAT CLAY WITH SAND (CH) stiff; light gray and reddish brown; moist; mottled; with ferric seams	P=3.75	3												
23	CL	LEAN CLAY (CL) stiff; light gray and brownish gray; moist; layered with silt	N=14	3												
27	ML	SILT WITH SAND (ML) very dense; light brown and yellowish brown; moist; with clay seams	N=53	3												
30		Bottom of Boring @ 30'														

Key to Abbreviations:
 N - SPT Data (Blows/Ft)
 P - Pocket Penetrometer (psi)
 T - Torque (ft-lb)
 L - Lab Vane Shear (psi)

Notes:
 Water level @ 27' and open upon completion.

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(803) 595-4421



GIS Coordinates: N33.04713° W94.84486°
 Driller: Lewis Drilling, Inc.
 Logger: O. Sanderson

Landfill Boring B-13

DATE: 10/15/14

SURFACE ELEVATION: 361.4

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas

PROJECT NO.: G-4207-146

BORING TYPE: Flight Auger

DRILL RIG:

OTHER TESTS PERFORMED (Page Ref. #)

LOG OF BORING B-13

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas

PROJECT NO.: G-4207-146

BORING TYPE: Flight Auger

DRILL RIG:

OTHER TESTS PERFORMED (Page Ref. #)

FIELD DATA	BLOW COUNT				Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
	1	2	3	4							
N=7	1.0	2.0	3.0	4.0	20	45	17	28	76	+40 Sieve=1% +4 Sieve=0%	
P=4.0	1.0	2.0	3.0	4.0							
N=11	1.0	2.0	3.0	4.0							
N=8	1.0	2.0	3.0	4.0						+40 Sieve=1% +4 Sieve=0%	
N=21	1.0	2.0	3.0	4.0							
N=50/5"	1.0	2.0	3.0	4.0						+40 Sieve=0% +4 Sieve=0%	

MATERIAL DESCRIPTION

LEAN CLAY WITH SAND(CL) medium stiff; reddish brown with light gray; moist

SANDY LEAN CLAY(CL) very stiff; light brown, gray and reddish brown; moist; mottled

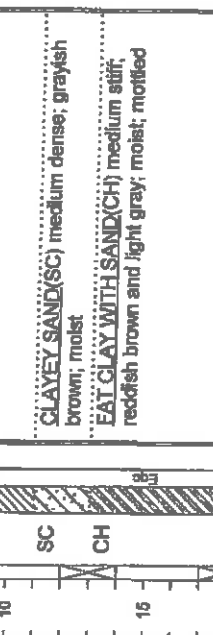
CLAYEY SAND(SC) medium dense; grayish brown; moist

FAT CLAY WITH SAND(CH) medium stiff; reddish brown and light gray; moist; mottled

LEAN CLAY(CL) very stiff; light gray and grayish brown; moist; layered with silt

SILT WITH SAND(ML) very dense; light gray and yellowish brown; wet; with clay seams

Bottom of Boring @ 30'



DRY DENSITY (pcf)

COMPRESSION STRENGTH (ksf)

FAILURE STRAIN (%)

CONFINING PRESSURE (psi)

ATTERBERG LIMITS (%)

LIQUID LIMIT

PLASTIC LIMIT

PLASTICITY INDEX

MOISTURE CONTENT (%)

MINUS #200 SIEVE (%)

OTHER TESTS PERFORMED (Page Ref. #)

DATE: 10/15/14

SURFACE ELEVATION: 361.4

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas

PROJECT NO.: G-4207-146

BORING TYPE: Flight Auger

DRILL RIG:

OTHER TESTS PERFORMED (Page Ref. #)



MAIN OFFICE
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Tyler, Texas 75702
(903) 885-4421

USC

DEPTH (ft)

0 5 10 15 20 25 30

CL

CL

SC

CH

CL

ML

Water Level

Water Observations: Water level @ 25' and open upon completion.

Est: Measured Perched

Key to Abbreviations:

N - SPT Data (Blows/ft)

P - Pocket Penetrometer (tsf)

T - Torvane (pcf)

L - Lab Vane Shear (tsf)

Notes:

GPS Coordinates: N 33.047160° W 94.84384°

Driller: Lewis Drilling, Inc.

Logger: O. Sanderson

Landfill Boring B-14

DATE		SURFACE ELEVATION		OTHER TESTS PERFORMED	
10/14/14		347.2		PERFORMED	
PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest. Welch Power Station - Cason, Texas DRILL RIG: BORING TYPE: Flight Auger		ATTERBERG LIMITS (%) LIQUID LIMIT (LL) PLASTIC LIMIT (PL) PLASTICITY INDEX (PI)		MINUS #200 SIEVE (%) +40 Sieve=1% +4 Sieve=1%	
PROJECT NO.: G4207-148		MOISTURE CONTENT (%)		+40 Sieve=1% +4 Sieve=0%	
FIELD STRENGTH DATA N=9 N=11 P=4.0 N=34 N=27 N=26		DRY DENSITY (pcf) COMPRESSIVE STRENGTH (tsf) FAILURE STRAIN (%) CONFINING PRESSURE (psf)		MOISTURE CONTENT (%) 28 40 16 24 67 10	
BLOW COUNT 20 40 60 80 1 2 3 4 PPR (tsf) 1.0 2.0 3.0 4.0 Torvane (tsf) 1.0 2.0 3.0 4.0		Natural Moisture Content and Atterberg Limits Plastic Limit Moisture Content Liquid Limit		ATTERBERG PLASTICITY INDEX (%) 108 17 17 NP 26 40 16 24 67 10	
MATERIAL DESCRIPTION SANDY LEAN CLAY (CL) medium stiff; yellowish brown with reddish brown; dry; with clay seams SANDY SILT (ML) medium dense; grayish brown; moist; with clay seams SANDY LEAN CLAY (CL) very stiff; light gray and gray; moist -light gray and grayish brown; moist; layered with silt POORLY GRADED SAND WITH SILT (SP-SM) medium dense; yellowish brown; light gray and reddish brown; wet LEAN CLAY (CL) very stiff; dark brown; moist; with silt partings Bottom of Boring @ 30'		Natural Moisture Content and Atterberg Limits Plastic Limit Moisture Content Liquid Limit		ATTERBERG PLASTICITY INDEX (%) 108 17 17 NP 26 40 16 24 67 10	
USC CL ML CL SP SM CL		WATER LEVEL 17'		WATER LEVEL 17'	
EITL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (936) 585-4421		Key to Abbreviations: N - SPT Data (Blows/Ft) P - Pocket Penetrometer (tsf) T - Torvane (tsf) L - Lab Vane Shear (tsf)		Notes: Water level @ 17' and cased to 23' upon completion.	
GEORGIC UNIT WATER LEVEL		GEORGIC UNIT WATER LEVEL		GEORGIC UNIT WATER LEVEL	
DEPTH (ft)		DEPTH (ft)		DEPTH (ft)	
0 5 10 15 20 25 30		0 5 10 15 20 25 30		0 5 10 15 20 25 30	
EITL		GCS Coordinates: N33.04774°, W94.84290°		Driver: Lewis Drilling, Inc. O. Sanderson	

Landfill Boring B-15

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 565-4421

LOG OF BORING B-15

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Carson, Texas
PROJECT NO.: G-207-146
BORING TYPE: Flight Auger

DATE

10/14/14
SURFACE ELEVATION
346.2

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH	TEST DATA				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psf)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)			
					BLOW COUNT	Qr (tsf)	PPR (tsf)	Torvane (tsf)					LIQUID LIMIT	PLASTIC LIMIT		PLASTICITY INDEX	MINUS #200 SIEVE (%)					
0		CH		N=10																		
5				P=3.75											24	59	21	38	85	+40 Sieve=0% +4 Sieve=0%		
10				N=59																+40 Sieve=0% +4 Sieve=0%		
15				N=21											7						+40 Sieve=0% +4 Sieve=0%	
20				N=58																		+40 Sieve=0% +4 Sieve=0%
25				P=4.5											25	45	22	23	92			+40 Sieve=0% +4 Sieve=0%
30																						

MATERIAL DESCRIPTION

FAT CLAY (CH) stiff; reddish brown and light gray; moist; mottled

very stiff; light gray, grayish brown and reddish brown; moist; layered

SILTY SAND (SM) very dense; light brown; dry

medium dense; wet

very dense

LEAN CLAY (CL) hard; dark brown; moist; with silt partings

Bottom of Boring @ 30'

Water Level: Measured; Perched; Water level @ 17' and caved to 19' 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: N33.04857°, W94.84288°
Driller: Lewis Drilling, Inc.
Logger: O. Sanderson



Appendix B

Photographic Log



PHOTOGRAPHIC LOG

Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
1

Date:
8/20/2015

Direction Photo Taken:
North

Description:
Staging area west of landfill.

P8200493



PHOTOGRAPHIC LOG

Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
2

Date:
8/20/2015

Direction Photo Taken:
South Southeast

Description:
Potential wetland on the top (west) end of the Primary Ash Pond.

P8200495



Project Name:

AEP – J. ROBERT WELSH POWER PLANT

Location:

PITTSBURG, TITUS COUNTY, TEXAS

Project No.

OK001625.0001

Photo No.
3
Date:

8/20/2015

Direction Photo Taken:

West Northwest

Description:

Ditch between road and railway west of landfill, this ditch would be non-jurisdictional.

P8200497


Project Name:

AEP – J. ROBERT WELSH POWER PLANT

Location:

PITTSBURG, TITUS COUNTY, TEXAS

Project No.

OK001625.0001

Photo No.
4
Date:

8/20/2015

Direction Photo Taken:

Northeast

Description:

Ground Water Monitoring Well AD-12 near northwest end of landfill.

P8200501



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
5

Date:
8/20/2015

Direction Photo Taken:
East Northeast

Description:
View of plant from top of landfill. Primary ash pond is within the wooded area on left.

P8200506



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
6

Date:
8/20/2015

Direction Photo Taken:
East Northeast

Description:
Drainage canal that drains from primary ash pond to clear water pond.

P8200510



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
7

Date:
8/20/2015

Direction Photo Taken:
West Northwest

Description:
Vegetated strip between landfill and road. This would be isolated due to lack of connectivity.

P8200521



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
8

Date:
8/20/2015

Direction Photo Taken:
North

Description:
Dike between landfill and primary ash pond. Facility in the background.

P8200522



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
9

Date:
8/20/2015

Direction Photo Taken:
West

Description:
Vegetated strip between landfill and road. This area would be isolated due to lack of connectivity.

P8200527



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
10

Date:
8/20/2015

Direction Photo Taken:
North Northeast

Description:
Road east of landfill running toward facility and clear water pond.

P8200530



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
11

Date:
8/20/2015

Direction Photo Taken:
South

Description:
Top of landfill.

P8200534



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
12

Date:
8/20/2015

Direction Photo Taken:
Southeast

Description:
View of lined bottom ash storage pond.

P8200538



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
13

Date:
8/20/2015

Direction Photo Taken:
Southeast

Description:
Lined bottom ash storage pond.

P8200545



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
14

Date:
8/20/2015

Direction Photo Taken:
South

Description:
Southside of lined bottom ash storage pond.

P8200547



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
15

Date:
8/20/2015

Direction Photo Taken:
West

Description:
East side of lined bottom ash storage pond.

P8200560



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
16

Date:
8/20/2015

Direction Photo Taken:
North

Description:
Upland with pine and ground water monitoring well AD-2 south of lined bottom ash storage pond.

P8200563



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
17

Date:
8/20/2015

Direction Photo Taken:

Description:

Outflow of water from plant into the northeast portion of the Primary Ash Pond.

P8200577



Project Name:
AEP – J. ROBERT WELSH POWER PLANT

Location:
PITTSBURG, TITUS COUNTY, TEXAS

Project No.
OK001625.0001

Photo No.
18

Date:
8/20/2015

Direction Photo Taken:

South Southwest

Description:

Northeast portion of primary ash pond, view facing south-southwest.

P8200578

