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Bottom Ash Storage Pond - CCR Groundwater Monitoring Well Network Evaluation

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

May 16, 2017

ARCADIS

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1187County Road 4865
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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 Bottom Ash Storage Pond (CCR Unit) at the AEP Generating Plant (Plant) located at 1187 County Road 4865 in Pittsburg, Titus County, Texas (**Figure 1**). The CCR requirements include an evaluation of the adequacy of the groundwater monitoring well network to characterize groundwater quality up and down gradient of the CCR unit.

Three regulated CCR units associated with the Plant were identified for review, which include the primary 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 Bottom Ash Storage Pond (Site).

This evaluation included a review of AEP-provided data associated with previously completed subsurface investigation activities in the vicinity of the Bottom Ash Storage 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 J. Robert Welsh Generating Plant (Welsh Plant) Bottom Ash Storage Pond.

2.1 Facility Location Description

The AEP Welsh Plant is located in southern Titus County, approximately 8 miles northeast of Pittsburg, Texas, and approximately two miles northwest of Cason, Texas. The Bottom Ash Storage Pond CCR unit is located at the south end of the Plant and approximately 1,000 feet west of the Welsh Reservoir (**Figures 1** and **2**).

2.2 Description of Bottom Ash Storage Pond CCR Unit

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

2.2.1 Embankment Configuration

The Bottom Ash Storage Pond was placed into operation in 2000, and is located in a topographically high area of the Plant. The Bottom Ash Storage Pond embankments are approximately 20 feet in height and are constructed of compacted clay on a 3:1 slope (3 feet horizontal, 1 foot vertical). The elevation at the base of the embankment is approximately 340 feet amsl, and the elevation at the top of the embankment around the perimeter of the Bottom Ash Storage Pond is approximately 360 feet amsl (Southwestern Electric Power Company, 2000).

2.2.2 Area/Volume

The Bottom Ash Storage Pond is 22 acres in size. Per the *Hydraulic Analysis of Welsh Power Plant Ash Ponds Report,* dated December 2010 (Freese and Nichols, 2010), the principal spillway for the Bottom Ash Storage Pond is located near the southeast corner of the pond and consists primarily of an 18 inch drain at elevation 350.5 feet amsl and also of a 40-foot-long broad-crested weir with a crest elevation of 355 feet amsl. The emergency spillway is an 8-foot-wide weir with a rock rip-rap discharge chute located along the southern embankment at an elevation of 358 feet amsl. The storage capacity of the Bottom Ash Storage Pond at elevation 358 feet amsl is 86.50 acre-ft (Freese and Nichols, 2010).

2.2.3 Construction and Operational History

The AEP J. Robert Welsh Plant began operations in approximately 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 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 ash pond (**Figure 2**).

The Bottom Ash Storage Pond 60-mil HDPE liner is located at the base of the Bottom Ash Storage Pond at an elevation of 340 feet amsl. The liner also extends along the base of the Bottom Ash Storage Pond sidewalls and is keyed into the top of the Bottom Ash Storage Pond earthen embankment at an elevation of 360 feet amsl (Southwestern Electric Power Company, 2000).

The southeast corner of the Bottom Ash Storage Pond contains an approximate ¼-acre clear water pond with a base elevation of 347 feet amsl (**Figure 3**). The clear water pond receives clear water primarily through an 18 inch drain and then through an overflow structure from the main part of the Bottom Ash Storage Pond through the 40-foot-long broad-crested weir discussed above in Section 2.2.2. Water in the ¼-acre clear water pond at the southeast corner of the Bottom Ash Storage Pond discharges through a 30-inch-diameter pipe into the primary ash pond system.

2.2.4 Surface Water Control

Surface water flow within the Bottom Ash Storage Pond is primarily controlled by an 18 inch drain and then by a weir located on the southeast side of the pond below the embankments. The pond elevation is maintained so that surface water flows through the drain pipe at invert elevation 350.5 amsl or weir which has a crest elevation of 355 feet amsl. Clear water flows through the weir into the ¼-acre clear water pond at the southeast corner of the Bottom Ash Storage Pond, then discharges through a 30-inch-diameter pipe into the primary ash pond (**Figure 3**).

The emergency spillway for the Bottom Ash Storage Pond is located along the southern embankment, and is 8 feet wide with a crest elevation of 358 feet amsl. The perimeter embankments of the Bottom Ash Storage Pond are located at an elevation of 360 feet amsl. Therefore the perimeter embankments have approximately five feet of

freeboard above the clear water discharge weir, and approximately two 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 ash pond area, and geotechnical soil testing to characterize the area encompassed by the primary ash pond.

In 2000, Maxim Technologies prepared a report entitled "*Subsurface Exploration for Ash Storage Area, Phase II, Welsh Power Plant, Cason, Texas*". This report evaluated the geotechnical properties of the soils below the Bottom Ash Storage Pond.

In 2000, an HDPE liner installation report was prepared by Alliance Incorporated. This report provided details regarding installation of the 60-mil HDPE liner on the bottom of the Bottom Ash Storage Pond.

In 2001, five monitoring wells (AD-1 through AD-5) were installed in the area of the primary 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 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, 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 ash pond, clear water pond, and Bottom Ash Storage Pond 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). In April 2017, ARCADIS installed monitoring well AD-16R as a replacement for monitoring well AD-16, which was nearly dry following drilling. 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 Bottom Ash Storage 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 normal January temperature is 45°Fahrenheit (F), and the normal 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 underling the Welsh Reservoir to the east of the Bottom Ash Storage 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 ETTL report entitled "*Geotechnical Investigation, Welsh Power Station, Existing Ash Storage Ponds Embankment Investigation, Pittsburg, Texas*" (ETTL, 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 Bottom Ash Storage Pond normal operating level is near the clear water overflow weir which has a crest elevation of 355 feet amsl. **Figure 9** is a potentiometric surface map based on March 2016 water level data for the uppermost aquifer 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 Bottom Ash Storage Pond is east-southeasterly 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 (sidegradient) of the primary 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 Bottom Ash Storage Pond is a very fine to fine grained silty sand and sandy silt stratum with an average thickness of approximately 12 feet that is located between an elevation of approximately 320 and 332 feet amsl (**Appendix A**). The base of the Bottom Ash Storage Pond is at an elevation of 340 feet feet amsl. Therefore the separation distance between the uppermost aquifer and the base of the Bottom Ash Storage Pond is approximately 8 feet. This separation distance is further illustrated on cross section C-C' (**Figure 6)** and cross section D-D' (**Figure 7**).

3.1.2 Overall Flow Conditions

Groundwater is recharged from regional precipitation infiltration. The uppermost aquifer (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 12 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 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

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 Bottom Ash Storage Pond is the very fine to fine grained silty sand and sandy silt stratum that is located between an elevation of approximately 320 and 332 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-1 through AD-4, AD-4a, AD-4b, and AD-4c were previously installed at the Site to monitor the uppermost aquifer (very fine to fine grained silty sand and sandy silt stratum) associated with the Bottom Ash Storage Pond. As discussed above in Section 3.1.1, the aquifer below the Bottom Ash Storage Pond is approximately 12 feet thick and is located between an elevation of approximately 320 and 332 feet amsl.

3.3.2 Gaps in Monitoring Network

As shown on Geologic Cross Sections A-A' (**Figure 4**) and C-C' (**Figure 6**), existing monitoring wells AD-5 and AD-1 are screened at the top of the uppermost aquifer up gradient (northwest) of the Bottom Ash Storage Pond, and existing monitoring wells AD-4a, AD-4b, and AD4c are screened in the uppermost aquifer down gradient (east) of the Bottom Ash Storage Pond. Existing monitoring wells AD-1 and AD-5 will be utilized as the up gradient monitoring wells for the Bottom Ash Storage Pond. Monitoring wells AD-17 and AD-18, installed northwest (up gradient) of the Bottom Ash Storage Pond during December 2015, will also be utilized as up gradient monitoring wells for the Bottom Ash Storage Pond.

Existing monitoring well AD-3, located east of the Bottom Ash Storage Pond, will be utilized as a down gradient monitoring well for the Bottom Ash Storage Pond. Existing monitoring wells AD-4, AD-4a, AD-4b, and AD-4c are located in close proximity to each other, and as shown on **Figure 9**, monitoring well AD-4c is the furthest down gradient of these four monitoring wells. Therefore monitoring well AD-4c will be utilized as a down gradient monitoring well for the Bottom Ash Storage Pond.

As shown on **Figure 9**, existing monitoring well AD-14 is located east of the northeast corner of the Bottom Ash Storage Pond. However, due to the close proximity of the landfill CCR unit directly north of the Bottom Ash Storage Pond, groundwater at monitoring well AD-14 could be affected by the landfill. Therefore monitoring well AD-14 will not be utilized as part of the groundwater monitoring system for the Bottom Ash Storage Pond. This data gap was addressed by installation of new monitoring well AD-16 during December 2015 east (down gradient) of the Bottom Ash Storage Pond as shown on **Figure 9** and **Figure 10**. However, monitoring well AD-16 was nearly dry following drilling. Therefore monitoring well AD-16 was replaced with monitoring well AD-16R during April 2017. With the addition of monitoring wells AD-16R, AD-17, and AD-18, there are no gaps remaining in the groundwater monitoring network for the Bottom Ash Storage Pond.

4. Recommended Monitoring Network and PE Certification

The recommended existing groundwater monitoring well network is intended to meet specifications stated in 40 CFR 257.91. Recommended wells are further discussed with respect to location to the Bottom Ash Storage 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 Bottom Ash Storage Pond.

4.1 Recommended Monitoring Well Network Distribution

Four up gradient well locations (existing monitoring wells AD-1, AD-5, AD-17, and AD-18) and three down gradient well locations (existing monitoring wells AD-3, AD-4c, and AD-16R) are recommended to establish a groundwater quality monitoring well network for the Bottom Ash Storage Pond. In addition, existing monitoring wells AD-2, AD-4, AD-4a, AD-4b, and AD-16 may be utilized as piezometers to obtain additional groundwater flow direction and gradient data for the Bottom Ash Storage Pond.

4.1.1 Location

The recommended monitoring well network for groundwater quality of the uppermost aquifer at the Bottom Ash Storage 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 320 and 332 feet amsl as shown on Geologic Cross Sections C-C' (**Figure 6**) and D-D' (**Figure 7**). 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 Bottom Ash Storage Pond was addressed by installation of monitoring wells AD-16R, AD-17, and AD-18. Monitoring wells AD-16R, AD-17, 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

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

Kenneth J Brandner
Signature

69586	Texas	5-16-17
Registration No.	Registration State	Date

5. References

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Tables

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Table 1
Water Level Data
AEP J. Robert Welsh Power Plant - CCR Storage Areas
Pittsburg, Titus County, Texas

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-16R	33° 02' 49"	94° 50' 29"	350.55	27.0	4/12/17	PVC	2	10	341	27	324	12.0	338.55	27.0	323.55
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
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

General Notes:
Elevation in feet above mean sea level.

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

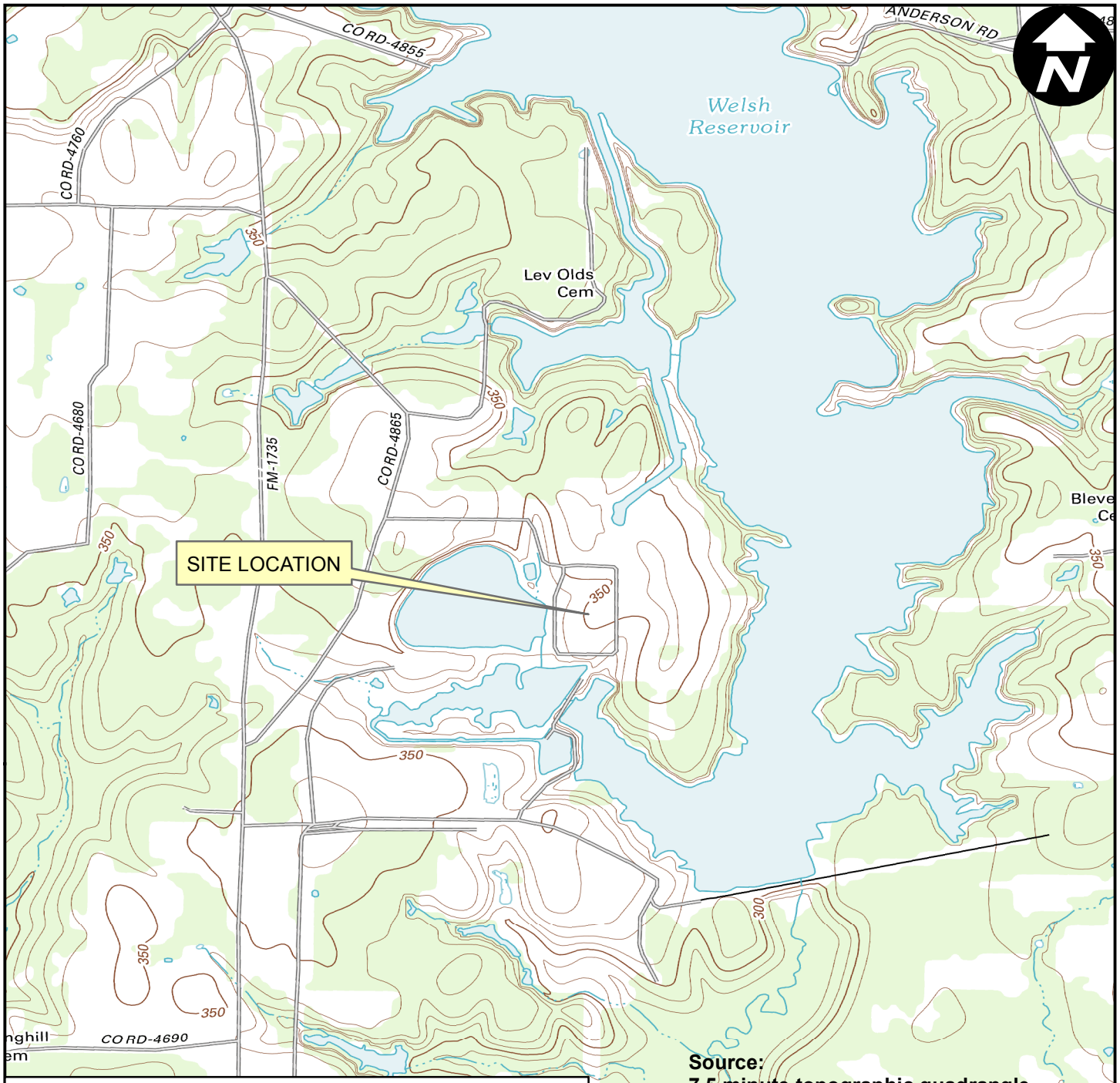
Table 3
Proposed Well Network
AEP J. Robert Welsh Power Plant - Bottom Ash Storage Pond
Pittsburg, Titus County, Texas

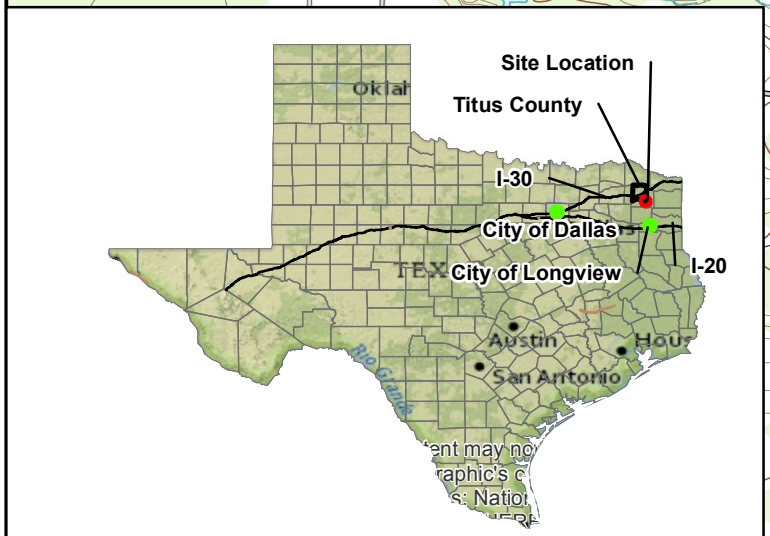
Well ID	Exisiting/ Proposed	Hydrostratigraphic Unit Target	Location Description		Screen Top Elevation (ft amsl)	Screen Bottom Elevation (ft amsl)	Screen Length (ft)	Comments
Upgradient								
AD-1	Existing	Uppermost Water-Bearing Unit	West of Bottom Ash Storage Pond	Upgradient	340.6	330.6	10	Existing well installed in 2001; well will be utilitzed to establish backgroud water quality
AD-5	Existing	Uppermost Water-Bearing Unit	NW of Bottom Ash Storage Pond	Upgradient	329.0	319.0	10	Existing well installed in 2001; well will be utilitzed to establish backgroud water quality
AD-17	Existing	Uppermost Water-Bearing Unit	NW of Bottom Ash Storage Pond	Upgradient	330.0	315.0	15	New monitoring well installed during December 2015 in uppermost shallow aquifer northwest of Bottom Ash Storage Pond - upgradient; well will be utilized to establish background water quality
AD-18	Existing	Uppermost Water-Bearing Unit	NW of Bottom Ash Storage Pond	Upgradient	332.2	317.2	15	New monitoring well installed during December 2015 in uppermost shallow aquifer northwest of Bottom Ash Storage Pond - upgradient; well will be utilized to establish background water quality
Downgradient								
AD-3	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	324.1	314.1	10	Existing well installed in 2001; uppermost shallow aquifer adjacent to the bottom ash storage pond - downgradient
AD-4c	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	324.2	314.2	10	Existing well installed in 2009; uppermost shallow aquifer adjacent to the bottom ash storage pond - downgradient
AD-16R	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	338.6	323.6	15	New monitoring well installed during April 2017 in uppermost shallow aquifer adjacent to the bottom ash storage pond - downgradient
Piezometers								
AD-2	Existing	Uppermost Water-Bearing Unit	South of Bottom Ash Storage Pond	Side gradient	329.2	319.2	10	Existing well installed in 2001; and utilitzed to obtain water level data for uppermost water-bearing unit
AD-4	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	321.6	311.6	10	Existing well installed in 2001; and utilitzed to obtain water level data for uppermost water-bearing unit
AD-4a	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	320.2	310.2	10	Existing well installed in 2009; and utilitzed to obtain water level data for uppermost water-bearing unit
AD-4b	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	324.6	314.6	10	Existing well installed in 2009; and utilitzed to obtain water level data for uppermost water-bearing unit
AD-16	Existing	Uppermost Water-Bearing Unit	East of Bottom Ash Storage Pond	Down gradient	339.9	329.9	10	New piezometer installed during December 2015 in uppermost shallow aquifer adjacent to the bottom ash storage pond - downgradient

Acronyms and Abbreviations:
U=Upgradient
D=Downgradient
ft = feet
amsl = above mean sea level

ARCADIS

Figures





Source:
7.5 minute topographic quadrangle
Cason, Texas, 2013

0 2,000 4,000

SCALE IN FEET

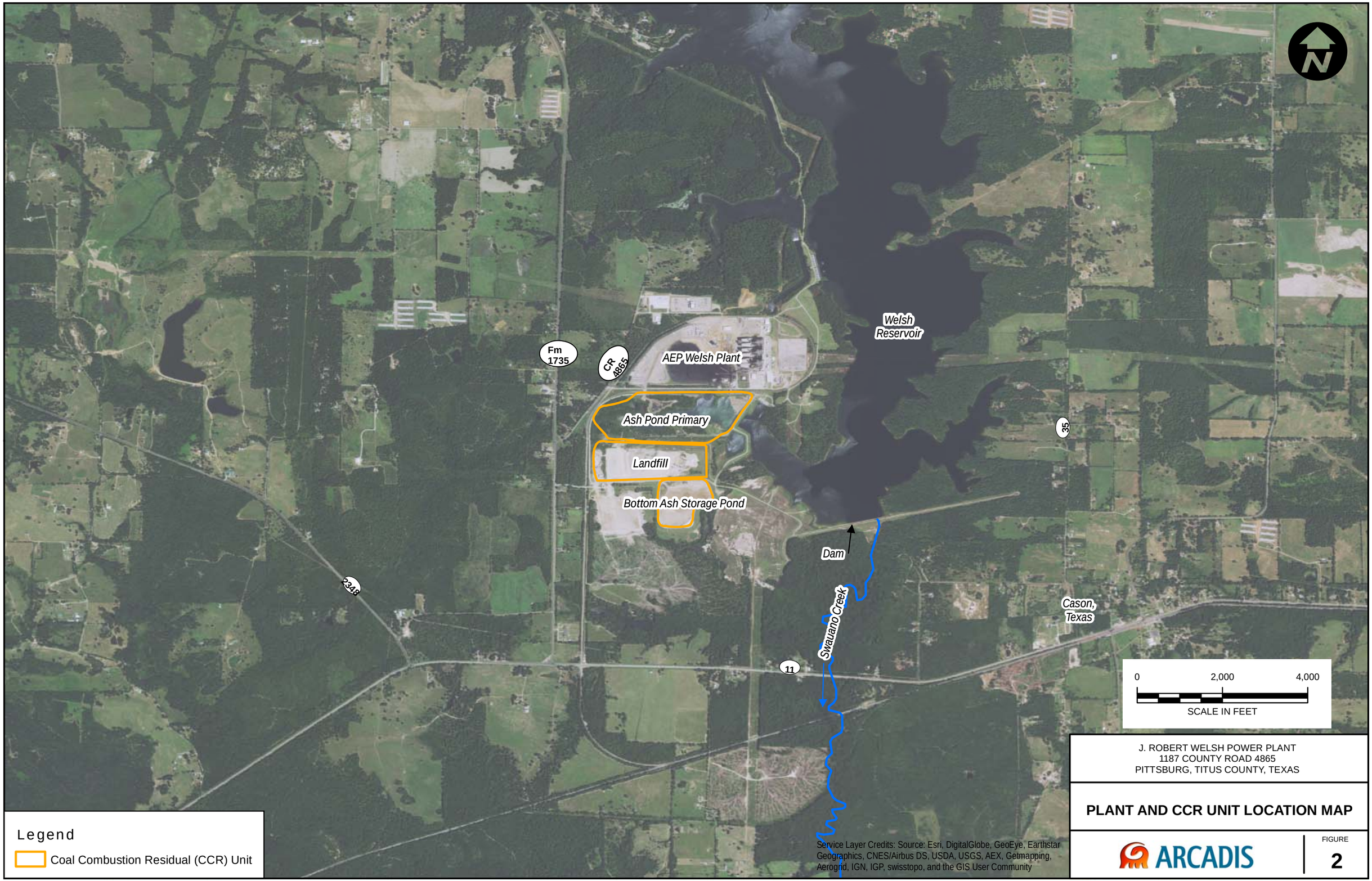
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

SITE LOCATION MAP

ARCADIS

FIGURE
1

Document Path: Z:\GISPROJECTS_ENV\AEP\Welsh Plant\MXD\Landfill report\fig 1 - site map.mxd



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PITTSBURG, TITUS COUNTY, TEXAS

PLANT AND CCR UNIT LOCATION MAP

ARCADIS

FIGURE
2

Document Path: Z:\GISPROJECTS_ENV\AEP\Welsh Plant\MXD\Landfill report\fig 2 - CCR location.mxd

GB2
GB6
GB7
GB5
GB4
MW9
MW10
D
AD5
AD7
E
AD6
AD8
A'
B1
AD-15
B2
A
AD-18
Ash Pond Primary
Weir Box
B4
AD9
B3
Drainage Canal
Clear Water Pond
B5
Welsh Reservoir
B
AD-17
AD12
B2
B10
AD13
AD10
B'
B15
B6
AD11
B7
Landfill
TPDES Outfall
B14
B12
B13
AD14
AD-16
AD-16R
AD1
C
Bottom Ash Storage Pond
AD4a
AD4b
C'
AD4c
AD4
1/4-acre Clear Water Pond
Weir Box
AD3
AD2
D'
E'

0 450 900
SCALE IN FEET

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

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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

SITE LAYOUT AND WELL LOCATIONS

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FIGURE
3

Document Path: Z:\GISPROJECTS_ENV\AEP\Welsh Plant\MXD\Landfill report\fig 3 - site layout.mxd

WEST
A

EAST
A'

ASH POND PRIMARY

AD-18

AD-5

AD-6

AD-7

AD-8

FILL (ASH)

SILTY CLAY AND SANDY CLAY,
BROWN TO GRAY.

SAND, SANDY SILT AND CLAYEY SAND,
GRAY TO BROWN,
FINE TO MEDIUM GRAINED.

CLAY

SILTY CLAY, GRAY TO BLACK.

ELEVATION (FEET MSL)

360'
350'
340'
330'
320'
310'
300'

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PROFESSIONAL GEOSCIENTIST

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0 300'
HORIZONTAL SCALE

NOTE: BASE OF ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

LEGEND

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

J. ROBERT WELSH POWER PLANT
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PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
A - A'

ARCADIS

FIGURE
4

WEST

B

EAST

B'

ELEVATION (FEET MSL)

380'
370'
360'
350'
340'
330'
320'
310'
300'

LANDFILL

B-2 B-10

AD-12

AD-17

AD-13

AD-10

FILL
(W/ASH-COAL PIECES)

SILTY SAND, DRY

CLAY AND SANDY CLAY, GRAY TO TAN.

5'

CLAYEY/SILTY SAND AND SANDY SILT,
BROWN TO GRAY, FINE GRAINED.

SILTY AND SANDY CLAY, GRAY TO BROWN.

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0 300'
HORIZONTAL SCALE

NOTE: BASE OF LANDFILL ELEVATION TAKEN FROM "WELSH POWER PLANT- UNIT 1 FLY ASH STORAGE AREA PHASE I" DRAWING ID WEPX-88, DATED 12/3/76.

LEGEND

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

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

CROSS SECTION
B - B'

ARCADIS

FIGURE
5

WEST

C

EAST

C'

BOTTOM ASH STORAGE

PERIMETER ROAD (EL. 360')

PERIMETER ROAD (EL. 360')

B-12

B-13

AD-1

AD-4A

AD-4B

AD-4C

CLAYEY SAND, DRY

SILTY CLAY AND SANDY CLAY, BROWN TO GRAY.

BOTTOM ASH STORAGE 60-ML. HDPE LINER (PROJECTED)

SANDY SILT AND SILTY SAND, VERY FINE TO FINE GRAINED, GRAY TO TAN.

SANDY CLAY

370'
360'
350'
340'
330'
320'
310'

ELEVATION (FEET MSL)

ELEVATION (FEET MSL)

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0 200'
HORIZONTAL SCALE

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

LEGEND

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

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

CROSS SECTION C - C'

ARCADIS

FIGURE 6

NORTH

D

ASH POND PRIMARY

LANDFILL

BOTTOM ASH STORAGE

SOUTH

D'

ELEVATION (FEET MSL)

380'
370'
360'
350'
340'
330'
320'
310'
300'

AD-7

AD-2

B-10

B-13

PERIMETER ROAD (EL. 360')

PERIMETER ROAD (EL. 360')

FILL WITH (ASH-COAL PIECES)

FILL WITH (ASH-COAL PIECES)

CLAYEY SAND, DRY

60-MIL HDPE LINER (PROJECTED)

CLAY AND SANDY CLAY, GRAY TO TAN.

SAND AND CLAYEY SAND, GRAY TO BROWN.

SILTY CLAY, GRAY TO BROWN.

CLAY AND SANDY CLAY

FILL WITH (ASH-COAL PIECES)

SAND

CLAY

SILTY CLAY

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LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (3/4/16)

BASE OF CCR UNIT

NOTE: BASE OF ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

0 300'
HORIZONTAL SCALE

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

CROSS SECTION D - D'

ARCADIS

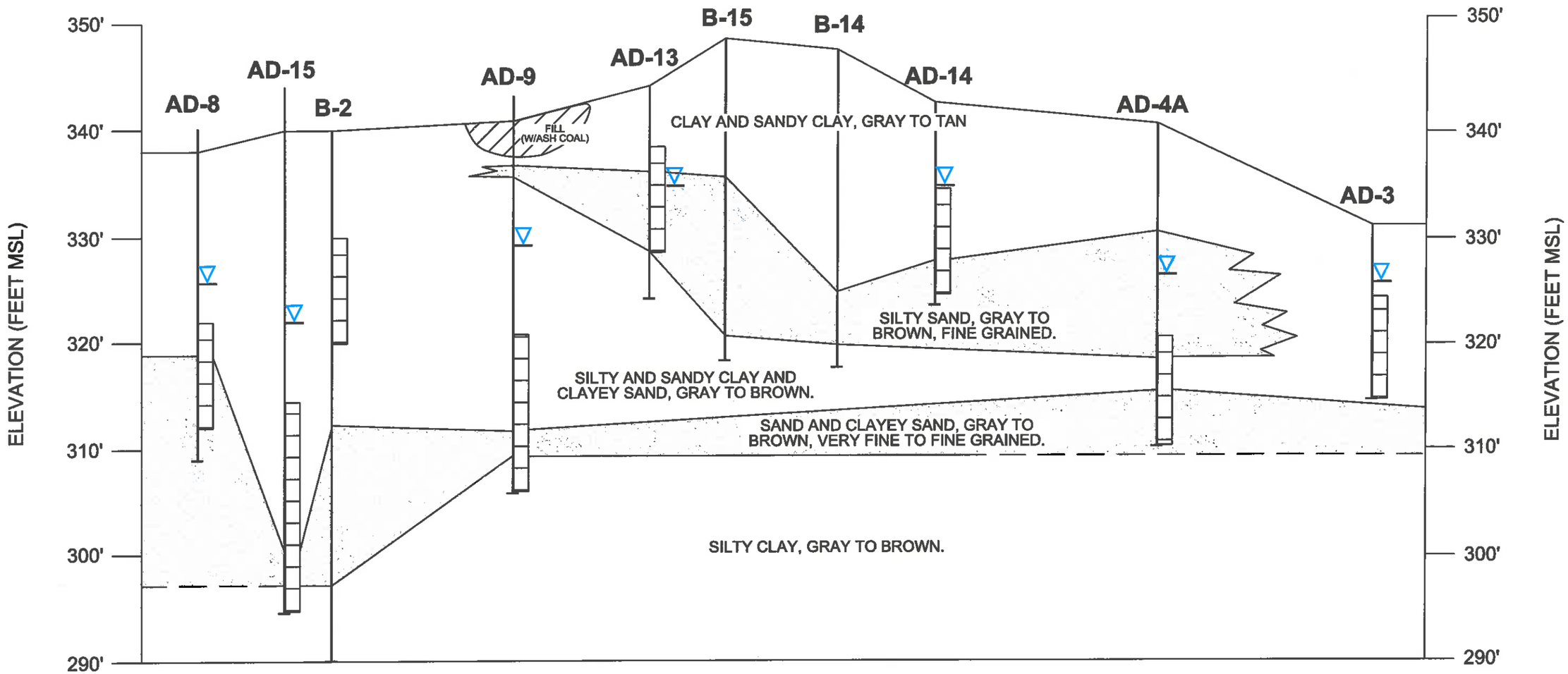
FIGURE 7

NORTH

E

SOUTH

E'



0 300'
HORIZONTAL SCALE

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LEGEND

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

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

CROSS SECTION
E - E'

ARCADIS

FIGURE
8

GB2
GB6
GB7
GB5
GB4
MW9
MW10
330
325
AD5
338.04
AD7
333.61
AD6
334.00
AD8
325.70
AD-15
322.14
B1
AD-18
343.66
Ash Pond Primary
B2
AD9
329.74
B4
B3
AD-17
334.64
AD13
334.76
Clear Water Pond
B5
Welsh Reservoir
AD10
323.55
B2
B10
B15
AD12
350.39
B6
AD11
328.13
Landfill
B7
B14
AD14
334.83
AD-16
337.09
B12
B13
340
350
AD1
342.83
Bottom Ash Storage Pond
AD4a
327.12
AD4b
326.67
AD4
326.90
AD4c
326.19
AD3
325.12
AD2
332.32
330
340
350
325

0 450 900
SCALE IN FEET

Legend

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

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

WELL ELEVATIONS AND POTENTIOMETRIC MAP MARCH 4, 2016

ARCADIS

FIGURE 9

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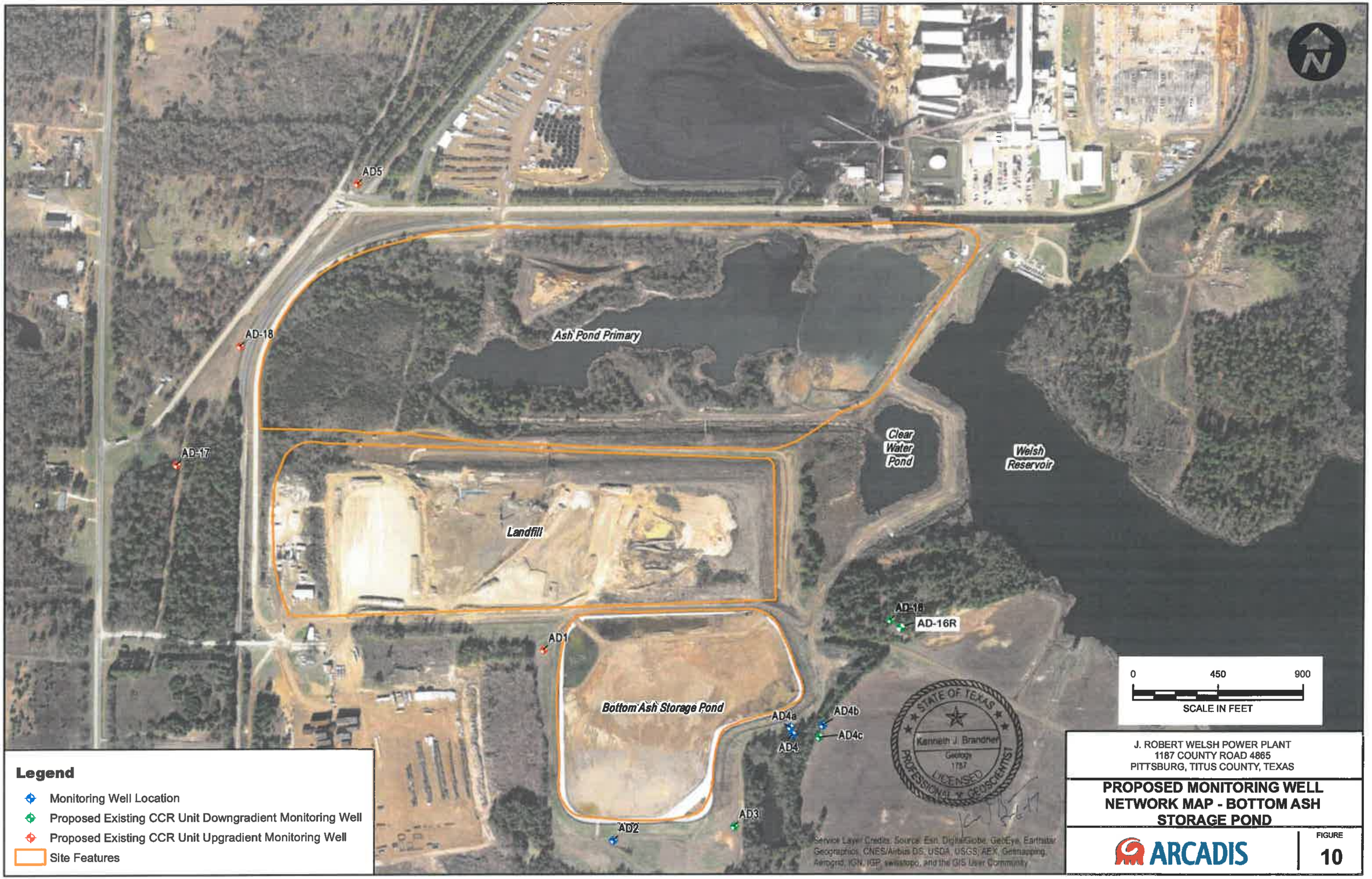

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J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

PROPOSED MONITORING WELL NETWORK MAP - BOTTOM ASH STORAGE POND

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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
512-239-0530

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

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

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

4) PROPOSED USE (Check): [X] 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) GPS 33°02' 48" N 94°50' 47" W

6) WELL LOG:
Date Drilling: Started 1-11 19 2001 Completed 1-11 19 2001

DIAMETER OF HOLE

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

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

From (ft.)	To (ft.)	Description and color of formation material
0	25	gray silty clay with some hard red streaks

AP-1

(Use reverse side if necessary)

8) Borehole Completion (Check): [ ] Open Hole [ ] Straight Wall [ ] Underreamed [X] Gravel Packed [ ] Other
If Gravel Packed give interval ... from 1.3 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.) From	Setting (ft.) To	Gage Casting Screen
2	N	riser	+2	15	Sch 40
2	N	#10 slot screen	15	25	Sch 40

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 13 ft. to 0 ft. No. of sacks used 6-50#
ft. to ft. No. of sacks used
Method used bentonite
Cemented by
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

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

11) WATER LEVEL:
Static level 12' 8" ft. below land surface Date 1-11-01
Artesian flow gpm. Date

12) PACKERS: NA Type Depth

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

14) WELL TESTS: NA
Type test: [ ] Pump [ ] Bailer [ ] Jetted [ ] Estimated
Yield: gpm with ft. drawdown after hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
[ ] Yes [X] 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 (Street or RFD) (City) (State) (Zip)

(Signed) Dilbert M. Kelly (Licensed Well Driller) (Signed) (Registered Driller Trainee)

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

TNRCC-0199 (Rev. 11-01-94)

Send one (1) copy each to: TNRCC, DRILLER, WELL OWNER

AD-2

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
512-239-0530

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

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

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

4) PROPOSED USE (Check): [X] 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) GPS
33°02'37"N
94°50'44"W

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 [X] 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
		AP-2

(Use reverse side if necessary)

8) Borehole Completion (Check): [ ] Open Hole [ ] Straight Wall [ ] Underreamed [X] 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.) From	Setting (ft.) To	Gage Casing Screen
2	N	riser	+2	15	Sch 40
2	N	#10 slot screen	15	25	Sch 40

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 12 ft. to +2 ft. No. of sacks used 5-50#
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

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

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

12) PACKERS: NA Type Depth

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

14) WELL TESTS: NA
Type test: [ ] Pump [ ] Bailer [ ] Jetted [ ] Estimated
Yield: gpm with ft. drawdown after hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
[ ] Yes [X] 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 (Street or RFD) (City) (State) (Zip)

(Signed) (Licensed Well Driller) (Signed) (Registered Driller Trainee)

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

TNRCC-0199 (Rev. 11-01-94)

Send one (1) copy each to: TNRCC, DRILLER, WELL OWNER

AD-3

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
512-239-0538

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

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

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

4) PROPOSED USE (Check): [X] 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) GPS
33°02'38"N
94°50'37"W
N

6) WELL LOG:
Date Drilling: Started 4/26 19 2001 Completed 4/26 19 2001

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 1/4	Surface	17

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

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

AP-3

(Use reverse side if necessary)

8) Borehole Completion (Check): [ ] Open Hole [ ] Straight Wall [ ] Underreamed [X] Gravel Packed [ ] Other
If Gravel Packed give interval ... from 5 ft. to 17 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	Setting (ft.) To	Gage Casting Screen
2	N	riser	+2	7	Sch 40
2	N	#10 slot screen	7	17	Sch 40

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 2 ft. to 5 ft. No. of sacks used 2 1/2 - 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

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

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

14) WELL TESTS: NA
Type test: [ ] Pump [ ] Bailer [ ] 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 [X] 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 (Street or RFD) (City) (State) (Zip)

(Signed) (Licensed Well Driller) (Signed) (Registered Driller Trainee)

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

TNRCC-0199 (Rev. 11-01-94)

Send one (1) copy each to: TNRCC, DRILLER, WELL OWNER

AD-4

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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
512-239-0530

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

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

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

4) PROPOSED USE (Check): [X] 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) GPS
33° 02' 43" N
94° 50' 33" 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	30

7) DRILLING METHOD (Check): [ ] Driven [ ] Air Rotary [ ] Mud Rotary [X] 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
5 -	30	gray silty clay with red streaks
		AP-4

(Use reverse side if necessary)

8) Borehole Completion (Check): [ ] Open Hole [ ] Straight Wall [ ] Underreamed [X] Gravel Packed [ ] Other
If Gravel Packed give interval ... from 16 ft. to 30 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	Setting (ft.) To	Gage Casting Screen
2	N	riser	+2	19	Sch 40
2	N	#10 slot screen	19	29	Sch 40

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

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

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

12) PACKERS: NA Type Depth

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

14) WELL TESTS: NA
Type test: [ ] Pump [ ] Bailer [ ] Jetted [ ] Estimated
Yield: gpm with ft. drawdown after hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
[ ] Yes [X] 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 (Street or RFD) (City) (State) (Zip)

(Signed) (Licensed Well Driller) (Signed) (Registered Driller Trainee)

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

TNRCC-0199 (Rev. 11-01-94)

Send one (1) copy each to: TNRCC, DRILLER, WELL OWNER

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ENVIRONMENTAL SERVICES OF SHREVEPORT, INC.

SOIL BORING LOG

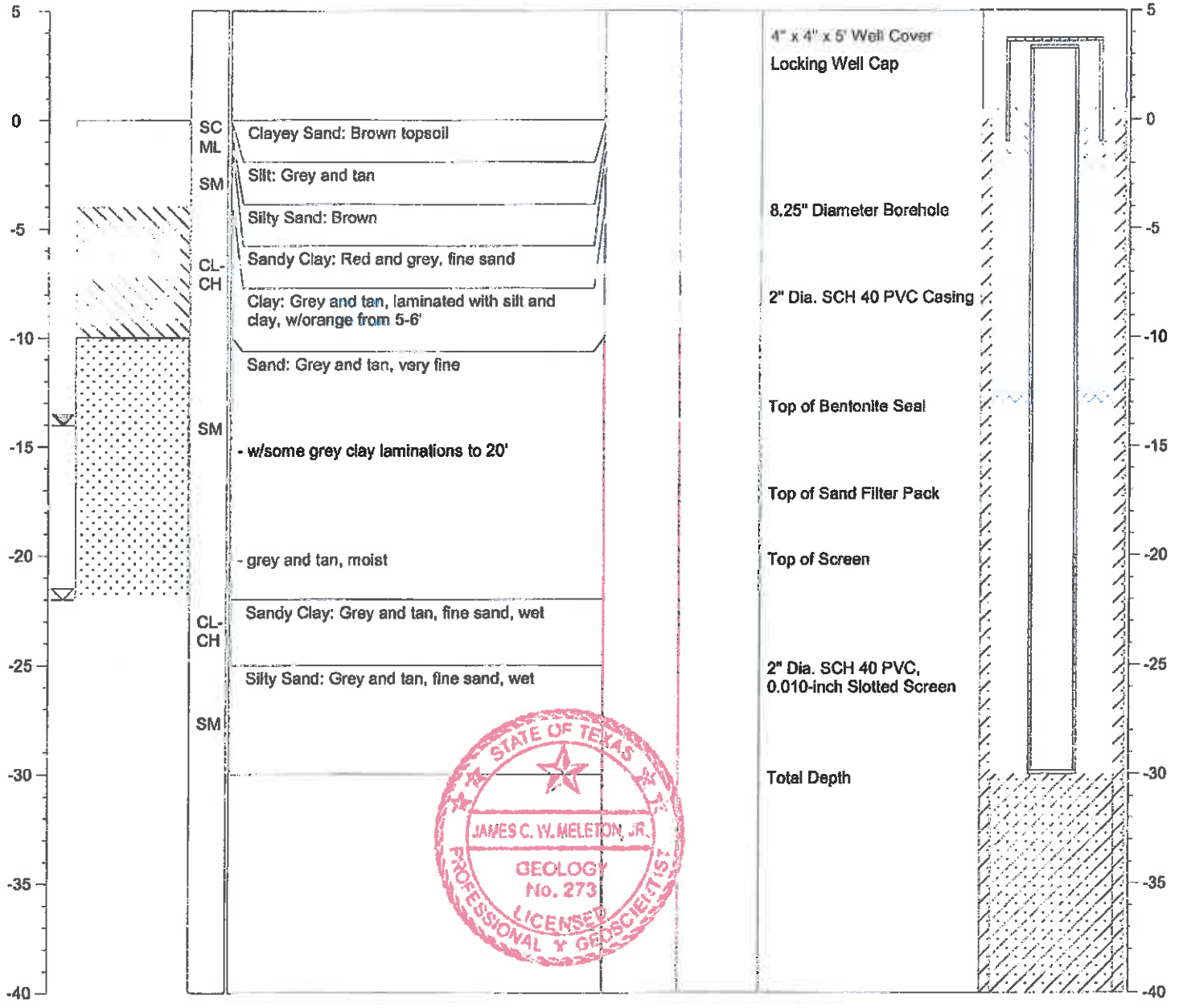
BORING/WELL NO.:	**AD-4A**
TOTAL DEPTH:	**30'**
TOP OF CASING ELEV.:	**342.85 ft. NGVD**
GROUND SURFACE ELEV.:	**340.19 ft. NGVD**

CLIENT:	**AEP**	DRILLING CO.:	**WEST Drilling**
PROJECT:	**Ash Disposal Area**	DRILLER:	**Tom McCullough**
SITE LOCATION:	**Welsh Power Plant**	METHOD OF DRILLING:	**Hollow-stem Auger**
PROJECT NO.:	**S-08-0109**	SAMPLING METHODS:	**Split-spoon**
LOGGED BY:	**James Meleton, Jr.**	DATE DRILLED:	**9/22/09**

NOTES: **Latitude: 33.04527**
Longitude: 94.84258

▽ 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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ENVIRONMENTAL SERVICES OF SHREVEPORT, INC.

SOIL BORING LOG

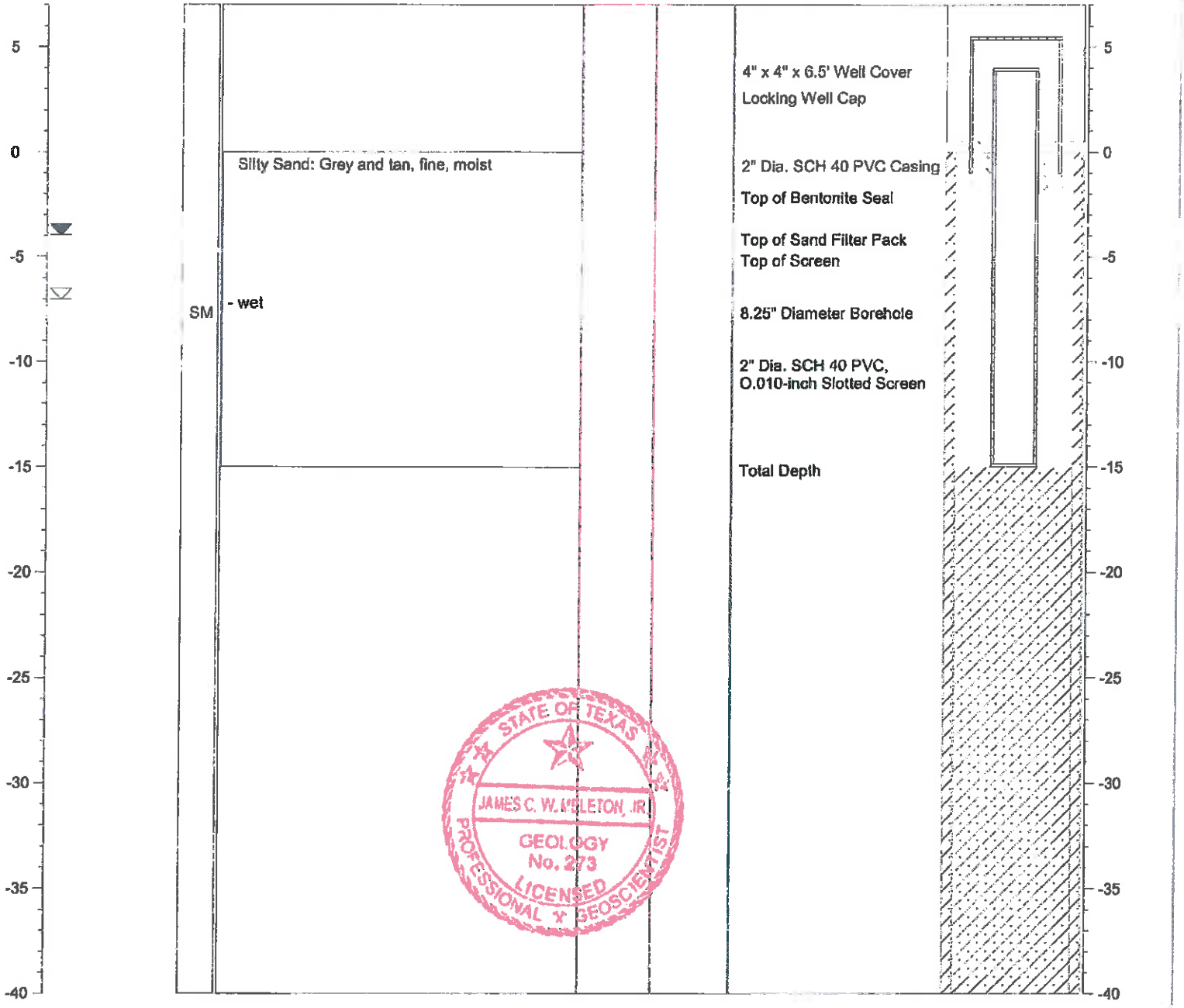
BORING/WELL NO.:	**AD-4B**
TOTAL DEPTH:	**15'**
TOP OF CASING ELEV.:	**333.23 ft. NGVD**
GROUND SURFACE ELEV.:	**329.55 ft. NGVD**

CLIENT:	**AEP**	DRILLING CO.:	**WEST Drilling**
PROJECT:	**Ash Disposal Area**	DRILLER:	**Tom McCullough**
SITE LOCATION:	**Welsh Power Plant**	METHOD OF DRILLING:	**Hollow-stem Auger**
PROJECT NO.:	**S-08-0109**	SAMPLING METHODS:	**Split-spoon**
LOGGED BY:	**James Meleton, Jr.**	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
0			Silty Sand: Grey and tan, fine, moist			4" x 4" x 6.5' Well Cover Locking Well Cap 2" Dia. SCH 40 PVC Casing Top of Bentonite Seal Top of Sand Filter Pack Top of Screen	
-5		SM	- wet			8.25" Diameter Borehole	
-10						2" Dia. SCH 40 PVC, O.010-inch Slotted Screen	
-15						Total Depth	



STATE OF TEXAS
JAMES C. W. MELETON, JR.
GEOLOGY
No. 273
LICENSED
PROFESSIONAL GEOSCIENTIST

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ENVIRONMENTAL SERVICES OF SHREVEPORT, INC.

SOIL BORING LOG

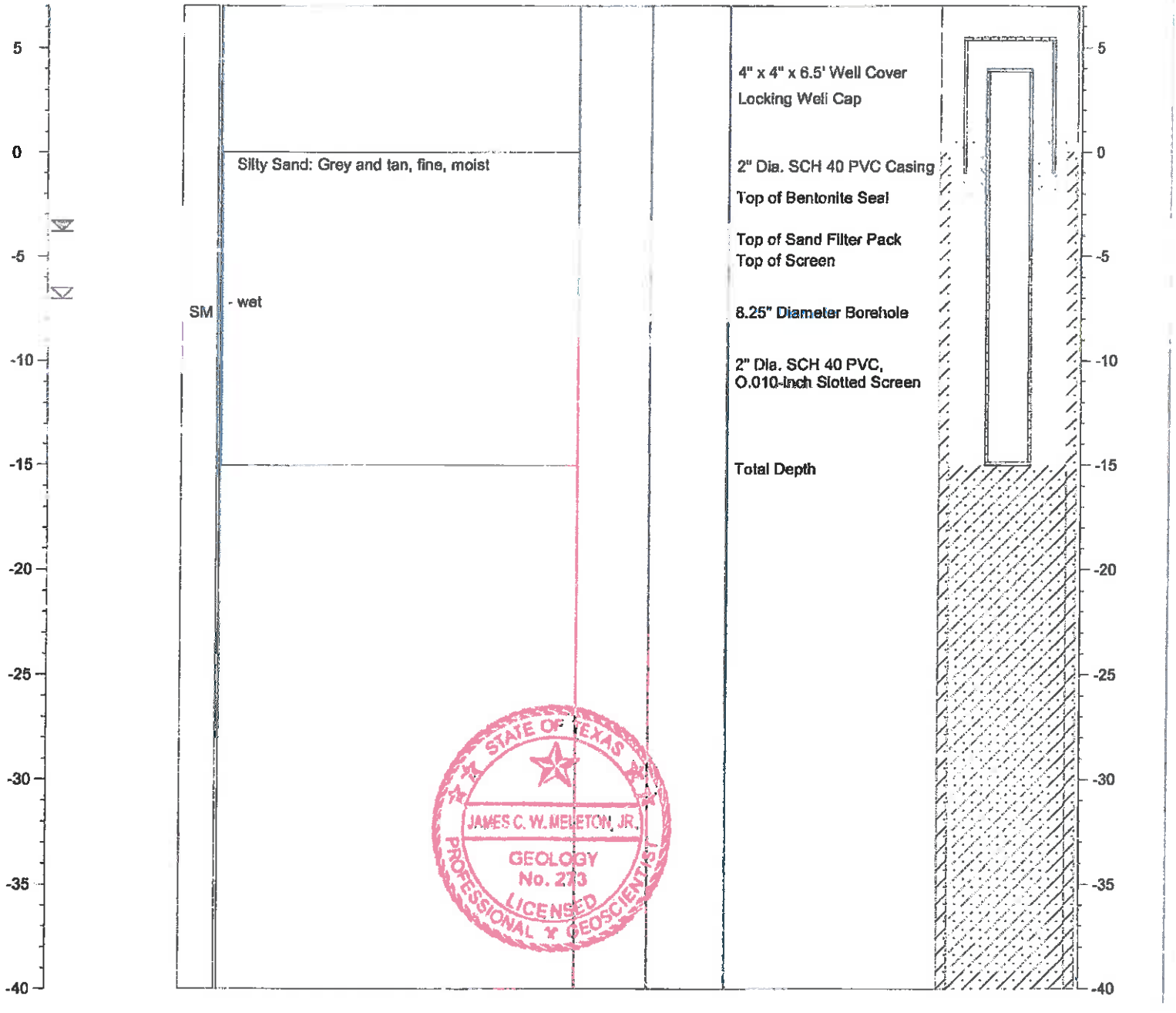
BORING/WELL NO.:	AD-4C
TOTAL DEPTH:	15'
TOP OF CASING ELEV.:	333.28 ft. NGVD
GROUND SURFACE ELEV.:	329.15 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	DATE DRILLED:	9/23/09

NOTES: **Latitude: 33.04507**
Longitude: 94.84244

⧖ Water level during drilling
⧖ Water level in completed well

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



STATE OF TEXAS
JAMES C. W. MELETON, JR.
GEOLOGY
No. 273
LICENSED
PROFESSIONAL GEOSCIENTIST

AD-5

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
512-239-0530

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

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

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

4) PROPOSED USE (Check): [X] 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 N

6) WELL LOG:
Date Drilling: Started 1-11 19 2001 Completed 1-11 19 2001

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8¼	Surface	30

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

From (ft.)	To (ft.)	Description and color of formation material
0	10	red & gray clay with orange streaks
10	20	gray/black clay with tan clay
20	25	stiff clay with lignite streak
25	30	fine gray sand

AP-5

(Use reverse side if necessary)

8) Borehole Completion (Check): [ ] Open Hole [ ] Straight Wall [ ] Underreamed [X] Gravel Packed [ ] Other
If Gravel Packed give interval ... from 16 ft. to 30 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	Setting (ft.) To	Gage Casting Screen
2	N	riser	+2	20	Sch 40
2	N	#10 slot screen	20	30	Sch 40

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 bentonite
Cemented by _____
Distance to septic system field lines or other concentrated contamination _____ ft.
Method of verification of above distance _____

10) SURFACE COMPLETION
[X] Specified Surface Slab Installed [Rule 338.44(2)(A)]
[X] Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
[ ] Pitless 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 [ ] Bailer [ ] Jetted [ ] Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
[ ] Yes [X] 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 _____ (Street or RFD) (City) (State) (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

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

TNRCC-0199 (Rev. 11-01-94)

Send one (1) copy each to: TNRCC, DRILLER, WELL OWNER

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ENVIRONMENTAL SERVICES OF SHREVEPORT, INC.

SOIL BORING LOG

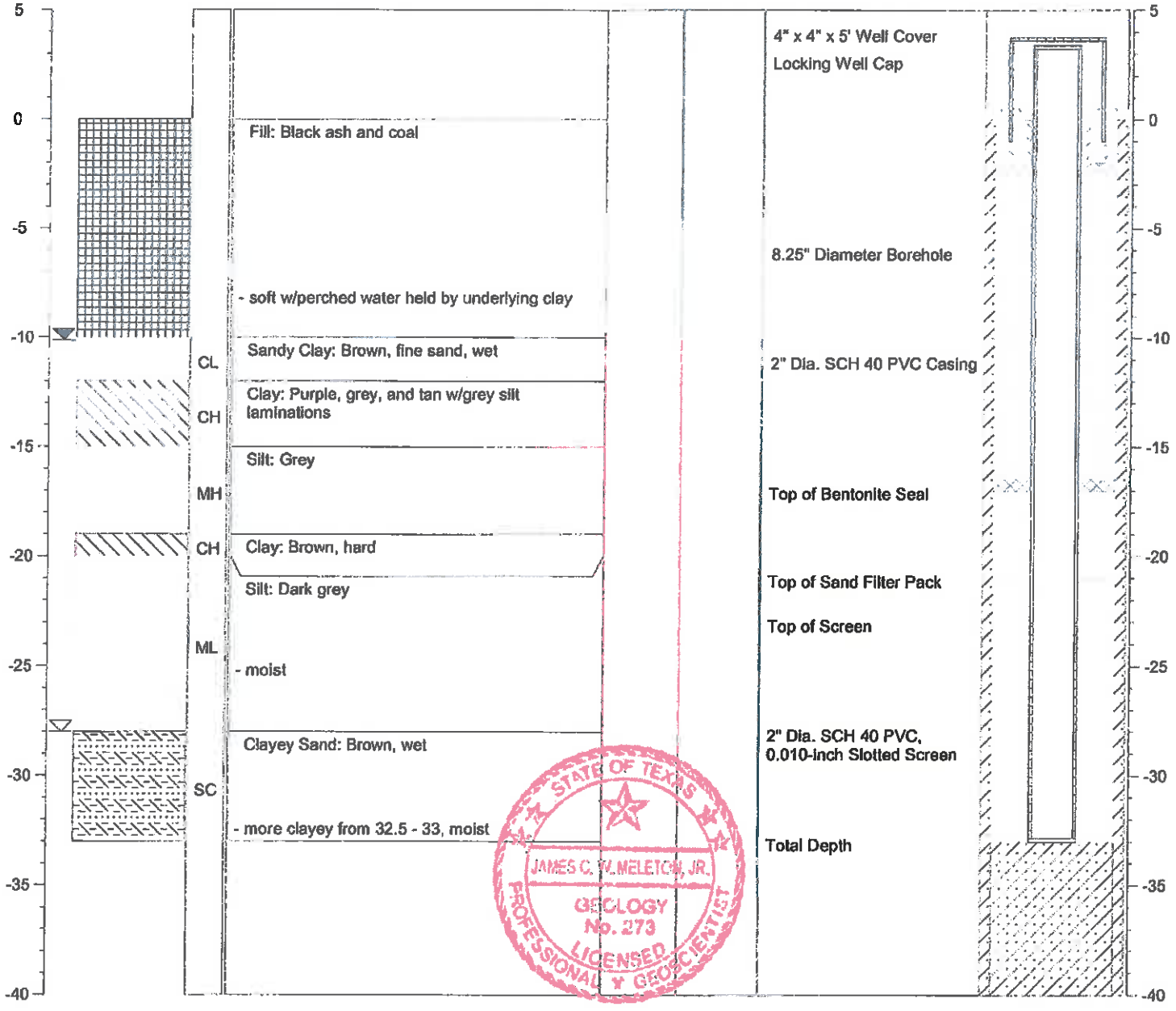
BORING/WELL NO.:	AD-6
TOTAL DEPTH:	33'
TOP OF CASING ELEV.:	346.33 ft. NGVD
GROUND SURFACE ELEV.:	343.31 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	DATE DRILLED:	9/23/09

NOTES: **Latitude: 33.05235**
Longitude: 94.84757

▽ 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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ENVIRONMENTAL SERVICES OF SHREVEPORT, INC

SOIL BORING LOG

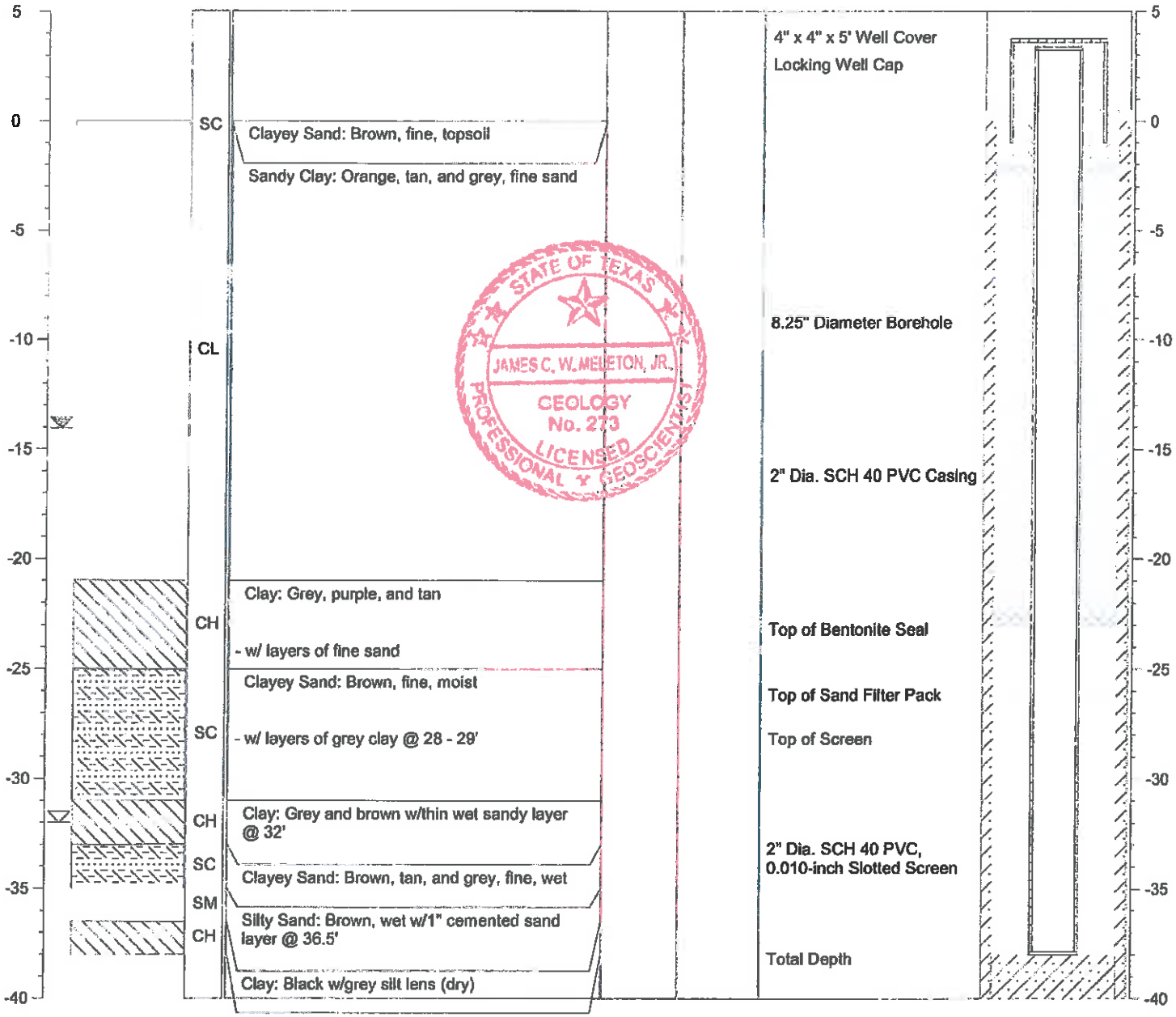
BORING/WELL NO.:	AD-7
TOTAL DEPTH:	38'
TOP OF CASING ELEV.:	350.82 ft. NGVD
GROUND SURFACE ELEV.:	347.86 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	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

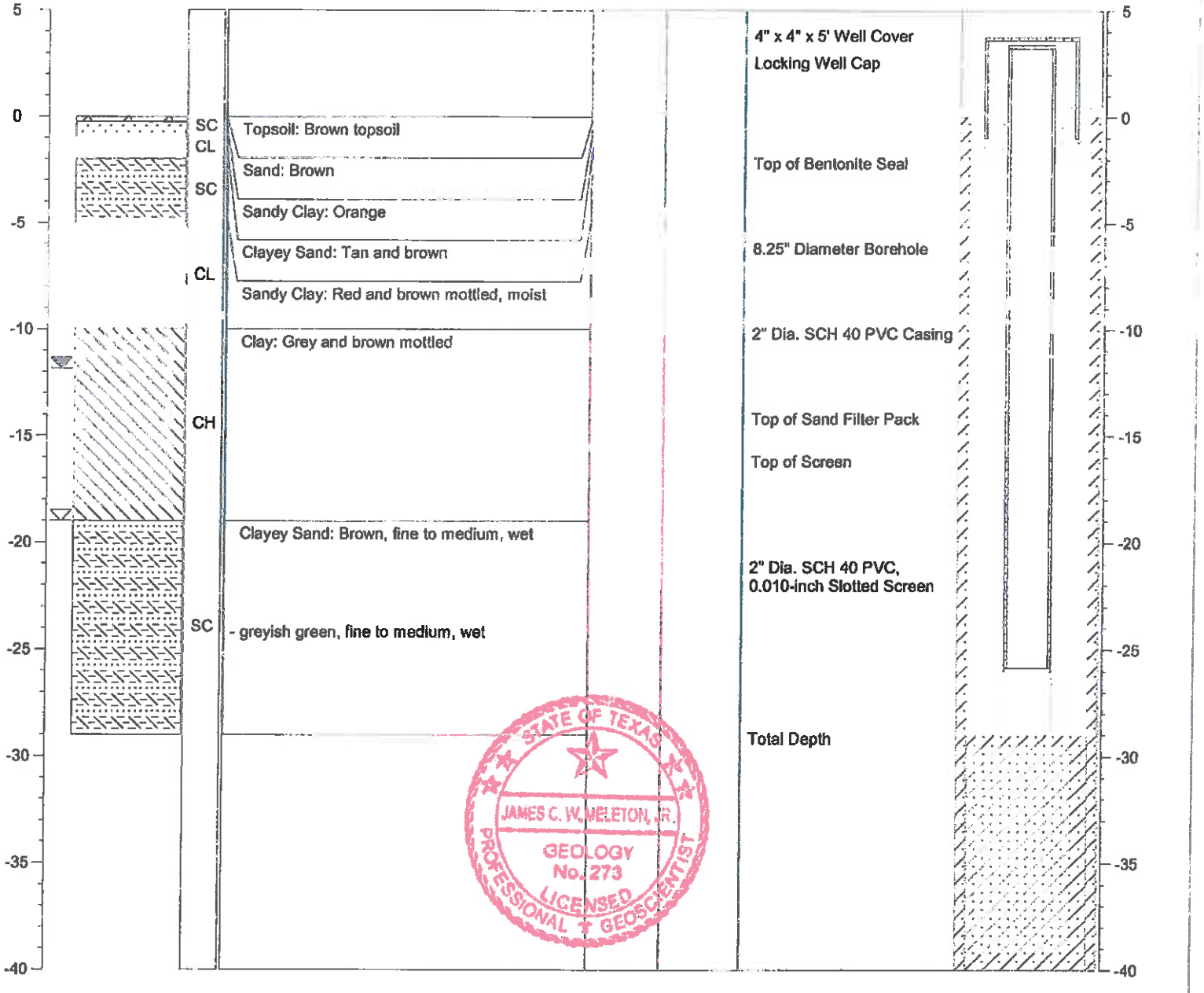
BORING/WELL NO.:	AD-8
TOTAL DEPTH:	29'
TOP OF CASING ELEV.:	340.01 ft. NGVD
GROUND SURFACE ELEV.:	337.53 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	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	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	DATE DRILLED:	9/21/09

NOTES: **Latitude: 33.04995**
Longitude: 94.84196

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
5			Fill: Black ash w/coal fines			4" x 4" x 5' Well Cover Locking Well Cap	
0		CL	Sandy Clay: Grey and brown, fine sand				
-5		SC	Clayey Sand: Tan and brown, fine			8.25" Diameter Borehole	
		CL	Sandy Clay: Tan and orange, fine sand				
-10			Clay: Grey, purple, and tan			2" Dia. SCH 40 PVC Casing	
		CH	- grey and tan			Top of Bentonite Seal	
-15			Clay: Brown w/silt laminations				
		CL-CH				Top of Sand Filter Pack	
-20			Clay: Grey, moist to 22'			Top of Screen	
		CH	- w/chalk concretions				
-25							
						2" Dia. SCH 40 PVC, 0.010-inch Slotted Screen	
-30		SC	Clayey Sand: Greenish grey, fine, moist				
		CL-CH	Clay: Grey w/silt laminations				
-35						Total Depth	
-40							

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SOIL BORING LOG

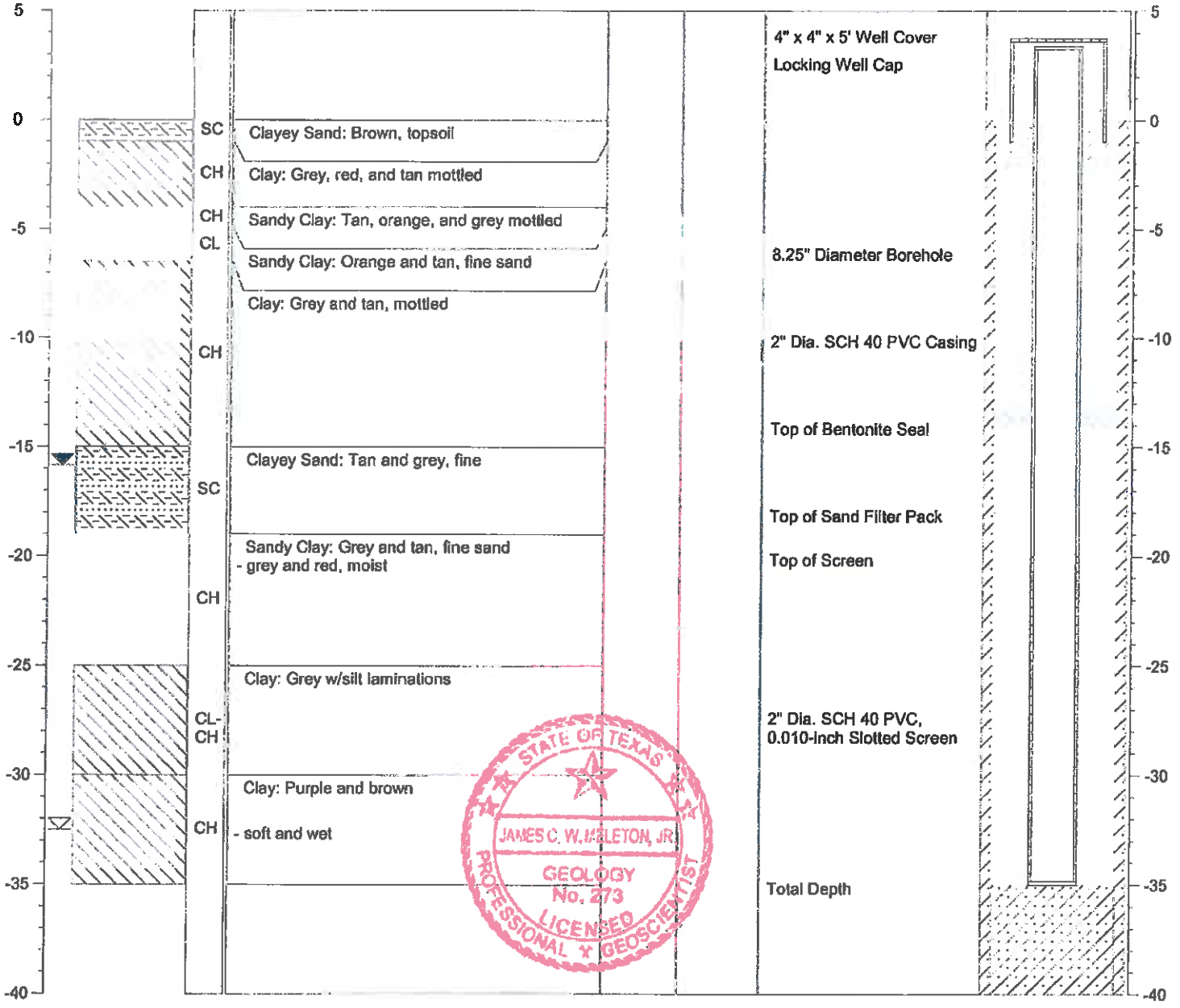
BORING/WELL NO.:	AD-10
TOTAL DEPTH:	35'
TOP OF CASING ELEV.:	343.01 ft. NGVD
GROUND SURFACE ELEV.:	340.23 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	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

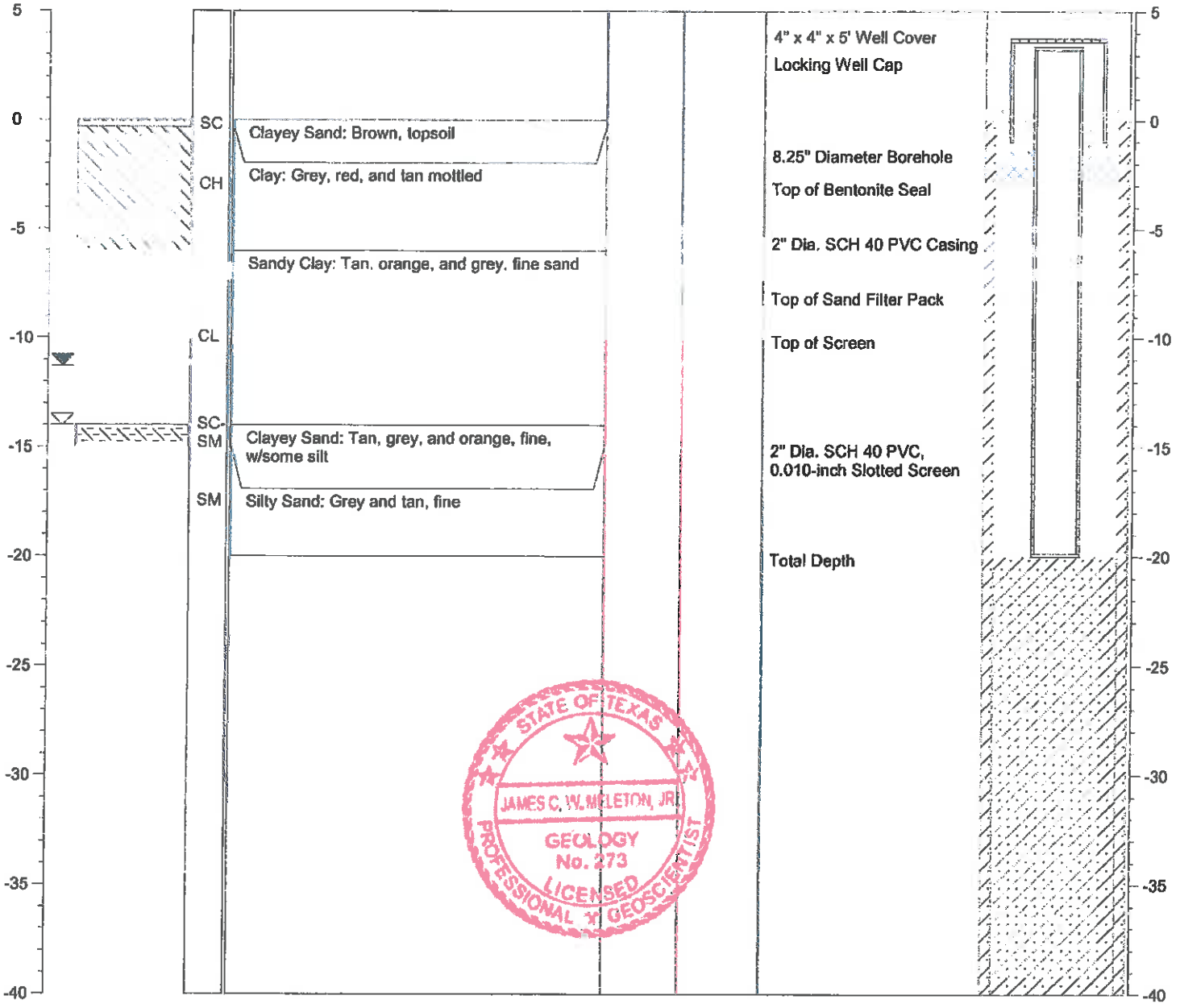
BORING/WELL NO.:	**AD-11**
TOTAL DEPTH:	**20'**
TOP OF CASING ELEV.:	**342.18 ft. NGVD**
GROUND SURFACE ELEV.:	**339.61 ft. NGVD**

CLIENT:	**AEP**	DRILLING CO.:	**WEST Drilling**
PROJECT:	**Ash Disposal Area**	DRILLER:	**Tom McCullough**
SITE LOCATION:	**Welsh Power Plant**	METHOD OF DRILLING:	**Hollow-stem Auger**
PROJECT NO.:	**S-08-0109**	SAMPLING METHODS:	**Split-spoon**
LOGGED BY:	**James Meleton, Jr.**	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

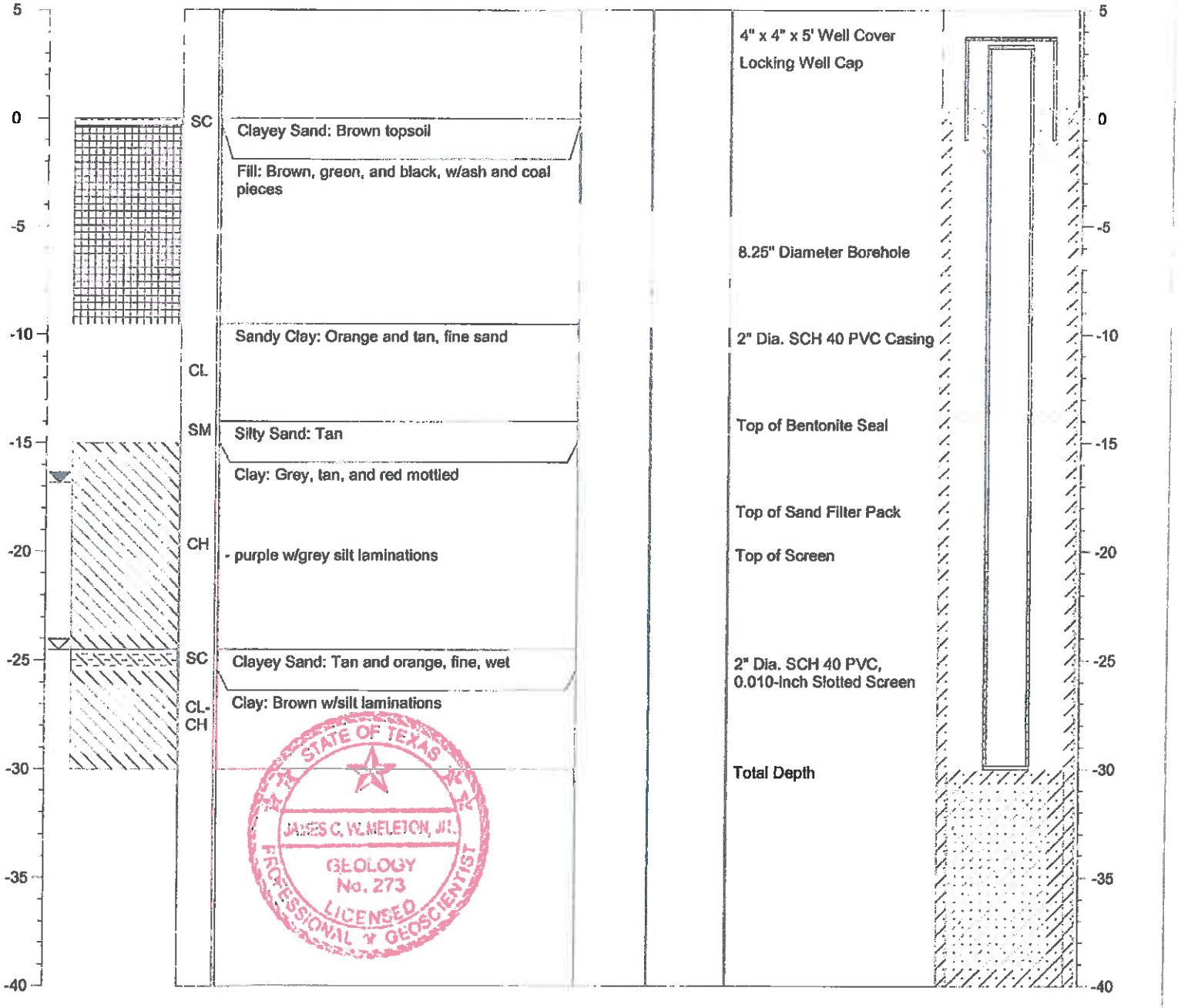
BORING/WELL NO.:	AD-12
TOTAL DEPTH:	30'
TOP OF CASING ELEV.:	369.33 ft. NGVD
GROUND SURFACE ELEV.:	366.27 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Ash Disposal Area	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0109	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	DATE DRILLED:	9/24/09

NOTES: **Latitude: 33.04901**
Longitude: 94.84977

▽ 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

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ENVIRONMENTAL SERVICES OF SHREVEPORT INC

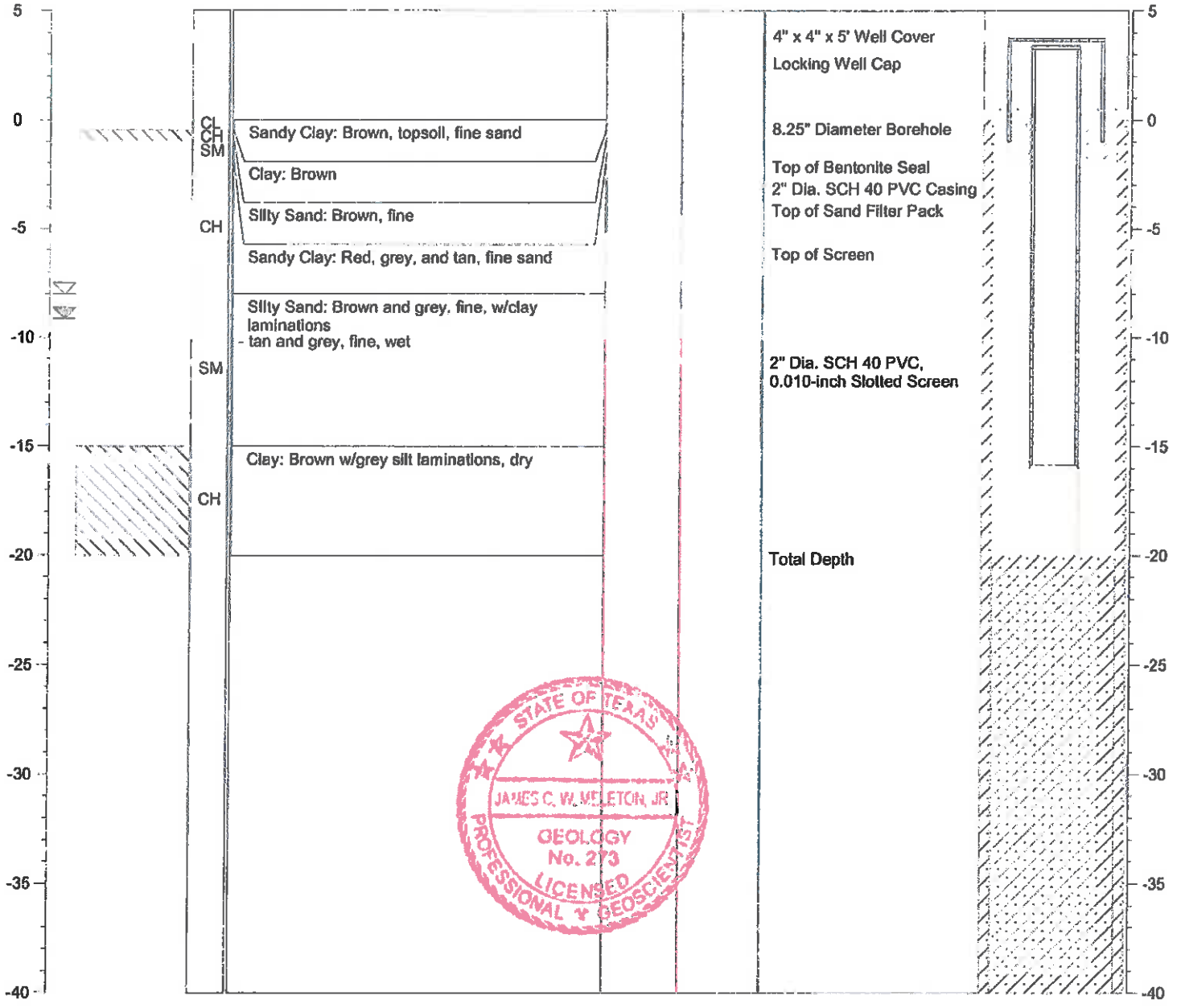
BORING/WELL NO.:	**AD-13**
TOTAL DEPTH:	**20'**
TOP OF CASING ELEV.:	**347.00 ft. NGVD**
GROUND SURFACE ELEV.:	**344.12 ft. NGVD**

CLIENT:	**AEP**	DRILLING CO.:	**WEST Drilling**
PROJECT:	**Ash Disposal Area**	DRILLER:	**Tom McCullough**
SITE LOCATION:	**Welsh Power Plant**	METHOD OF DRILLING:	**Hollow-stem Auger**
PROJECT NO.:	**S-08-0109**	SAMPLING METHODS:	**Split-spoon**
LOGGED BY:	**James Meleton, Jr.**	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

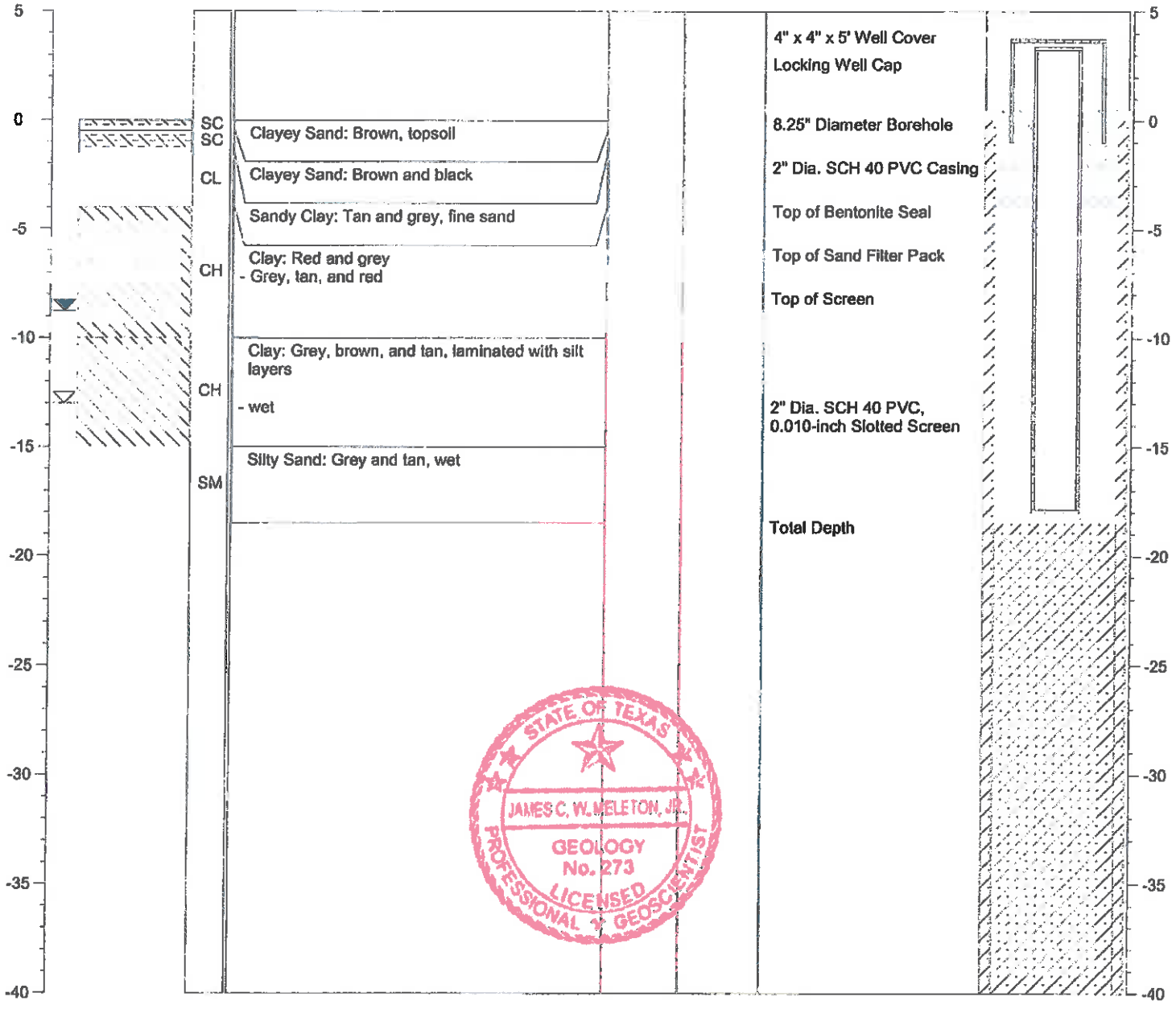
BORING/WELL NO.:	**AD-14**
TOTAL DEPTH:	**18.5'**
TOP OF CASING ELEV.:	**345.43 ft. NGVD**
GROUND SURFACE ELEV.:	**342.32 ft. NGVD**

CLIENT:	**AEP**	DRILLING CO.:	**WEST Drilling**
PROJECT:	**Ash Disposal Area**	DRILLER:	**Tom McCullough**
SITE LOCATION:	**Welsh Power Plant**	METHOD OF DRILLING:	**Hollow-stem Auger**
PROJECT NO.:	**S-08-0109**	SAMPLING METHODS:	**Split-spoon**
LOGGED BY:	**James Meleton, Jr.**	DATE DRILLED:	**9/22/09**

NOTES: **Latitude: 33.04715**
Longitude: 94.84256

▽ 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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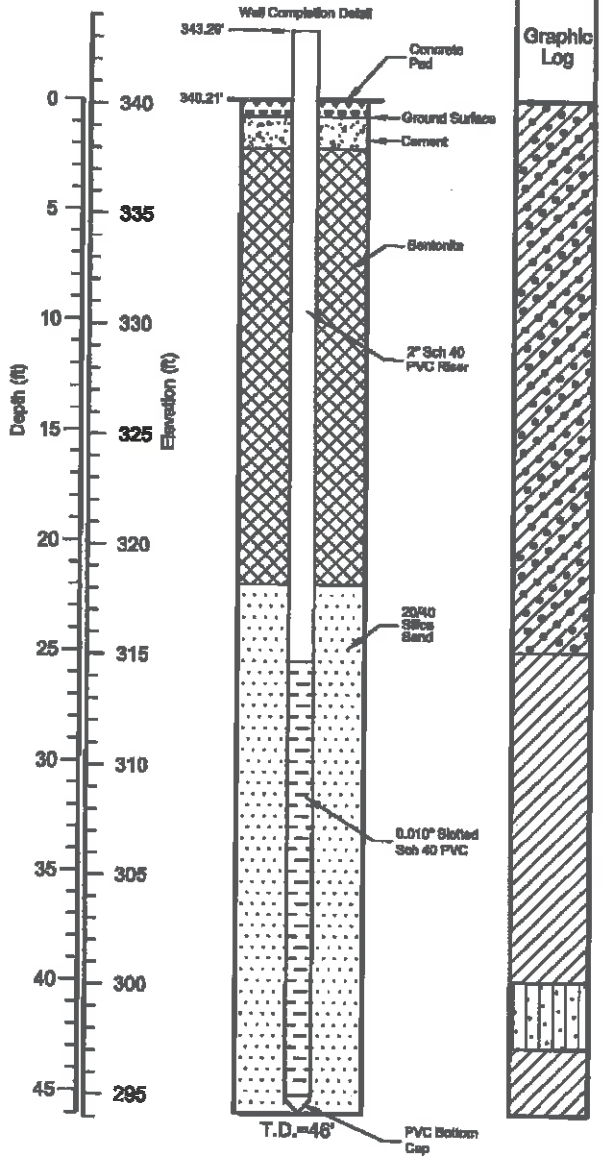

Graphic Log	PID Reading (ppm)	Sampling Device	Sample Interval	USCS	Comments and Lithology	Percent Moisture	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index
		Direct Push		SC	Clayey SAND: reddish brown	16	48	37	18	19
					- 2" lense of brown sand					
					- 3" lense of brown sand					
				CL	Sandy Lean CLAY: reddish brown, very moist	22	51	36	19	17
					- less moisture					
				SM	Silty SAND: light brown & light gray, wet.	27	24	26	NP	-
				CL	Lean CLAY: orangish brown & light gray, mottled, with sand	28	94	45	21	24

STATE OF TEXAS
STEVEN R. WEMPLE
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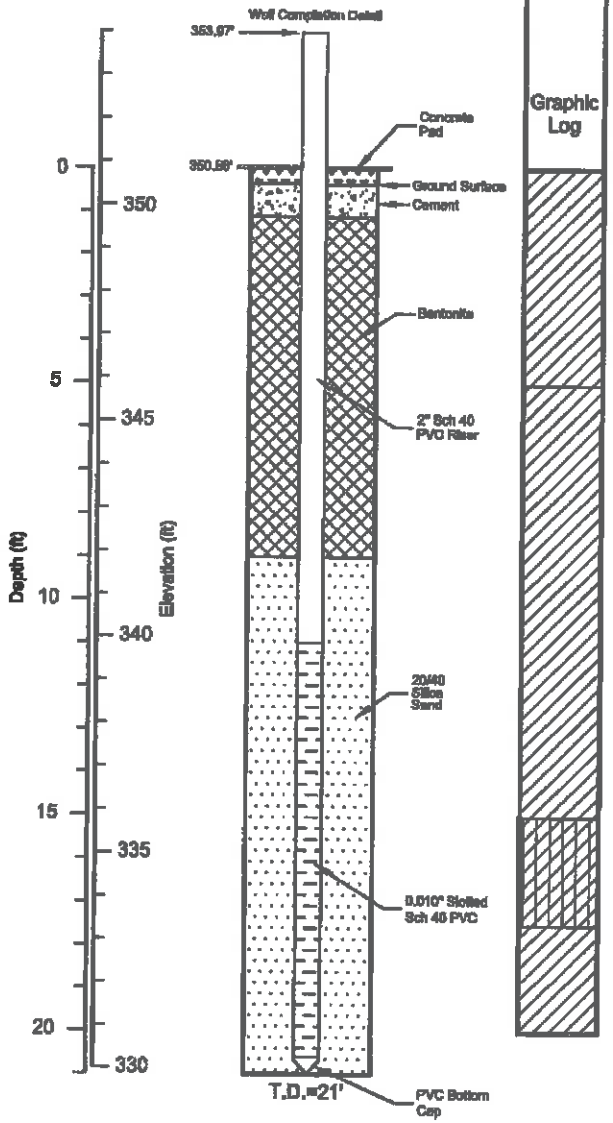
west DRILLING
enviornmental & geotechnical

WEST Drilling, Inc.
101 Industrial Drive
Waxahatchie, Texas 75165

DATE: 12/12/15	Logged by: Robert Williams, PE	Welsh Power Station Pittsburg, Texas	Log of Boring AD-15		
Drilling Method: H.S.A.	Driller: Robert Williams				
Bit Diameter: 7.25"	Date Completed: 12/12/15	DRAWN BY: HDS	PROJECT NO.: —	SCALE: AS SHOWN	
Depth to Water: —	Depth to Product: NA	CHECKED BY: SRW	FILE NAME: JR Welsh Power Plant LOGS.dwg		



Graphic Log	PID Reading (ppm)	Sampling Device	Sample Interval	Description Interva (feet bgs)	Comments and Lithology	Percent Moisture	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index
		Direct Push		CL	Lean CLAY w/ Sand: light brown & light gray	16	82	26	16	10
					- orangish brown, with silt					
				CL	Lean CLAY w/ Sand: orangish-brown & light gray	22	88	31	19	12
				CL-ML	Silty CLAY: orange w/ brown, wet	30	69	27	20	7
				CL	Sandy, Lean CLAY: brown w/ orange, stiff	26	66	46	26	20

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1-22-16

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enviornmental & geotechnical

WEST Drilling, Inc.
101 Industrial Drive
Waxahachie, Texas 75165

DATE: 12/10/15	Logged by: Robert Williams, PE	Welsh Power Station Pittsburg, Texas	Log of Boring AD-16
Drilling Method: H.S.A.	Driller: Robert Williams		
Bit Diameter: 7.25"	Date Completed: 12/10/15	DRAWN BY: HDS	PROJECT NO.: — / SCALE: AS SHOWN
Depth to Water: —	Depth to Product: NA	CHECKED BY: SRW	FILE NAME: JR Welsh Power Plant LOGS.dwg

WELL LOG

DEPTH	SAMPLE ANALYZED	TYPE	ORGANIC VAPOR (ppm)	SAMPLE DESCRIPTION
0				(0-15') SILTY CLAY (CL), BROWN TO ORANGE-BROWN, STIFF, DRY.
5		SS		
10		SS		
15		SS		
20		SS		(15-18') SILTY CLAY AND SANDY CLAY, ORANGE-BROWN TO LIGHT GRAY, MOIST.
25		SS		(18-27') SILTY CLAY AND SANDY CLAY, DARK BROWN TO GRAY, MOIST TO WET.
30		SS		
35		SS		
40		SS		
45		SS		TOTAL DEPTH = 27' BGS

SYMBOL

COMPLETION

AD-16R
WELL

AEP
CLIENT

BOTTOM ASH STORAGE POND
PROJECT

WELSH POWER PLANT
LOCATION

4/12/17
DATE

HSA
DRILLING METHOD

2" PVC, 2' AGL-12' BGL
CASING

2" PVC, 12'-27' BGS
SCREEN

0-2' BGS
CEMENT

2-10' BGS
BENTONITE

10-27' BGS
SAND PACK

350.55' / 353.49'
GROUND ELEV. / TOP OF CASING ELEV.

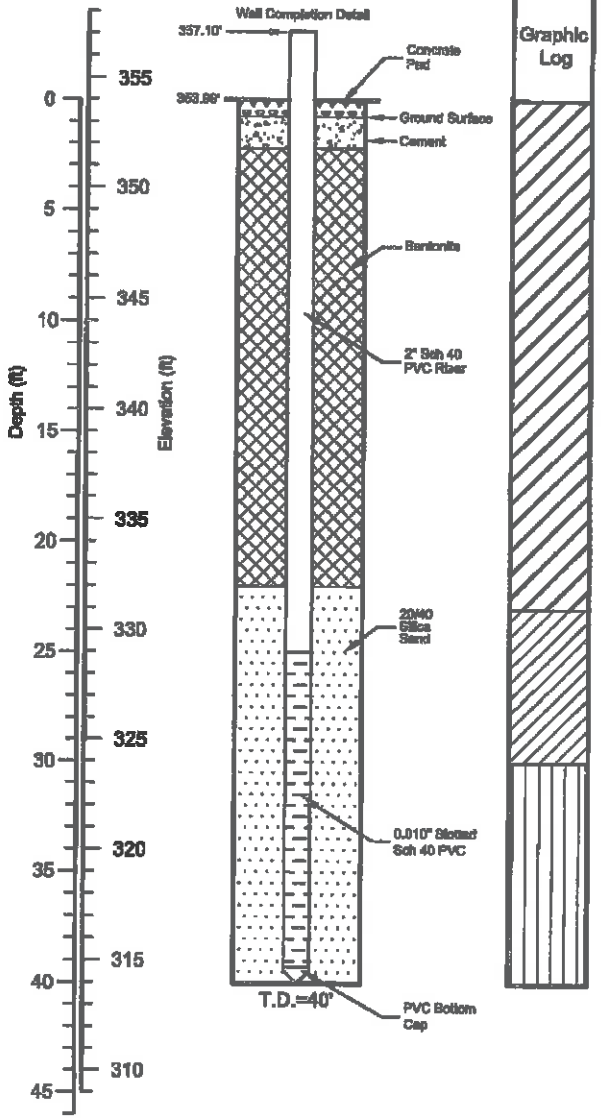
CT - CUTTINGS
SB - SPLIT BARREL(5')
SS - SPLIT SPOON(2')

HC LEVEL
WATER LEVEL

SAND
SILT
CLAY
FILL/CONCRETE
BENTONITE
GRAVEL

START: FINISH:

ARCADIS Design & Consultancy for natural and built assets
711 N. CARANCAHUA, #1080
CORPUS CHRISTI, TEXAS 78401
TEL: (361) 883-1353 FAX: (361) 883-7565



PID Reading (ppm)	Sampling Device	Sample Interval	USCS	Comments and Lithology	Percent Moisture	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index
	Direct Push		CH	Fat CLAY: reddish-brown					
				- light gray to light brown, reddish brown w/ Sand and gravel lenses	24	97	83	30	53
				- light brown					
				- brown Sand lenses, wet					
				- gray, w/ some Silt	18	90	53	25	28
			CL	Lean CLAY with Sand: gray	22	81	43	22	21
	Direct Push		ML	Sandy SILT: gray	23	63	26	NP	-

STATE OF TEXAS
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1/22/16

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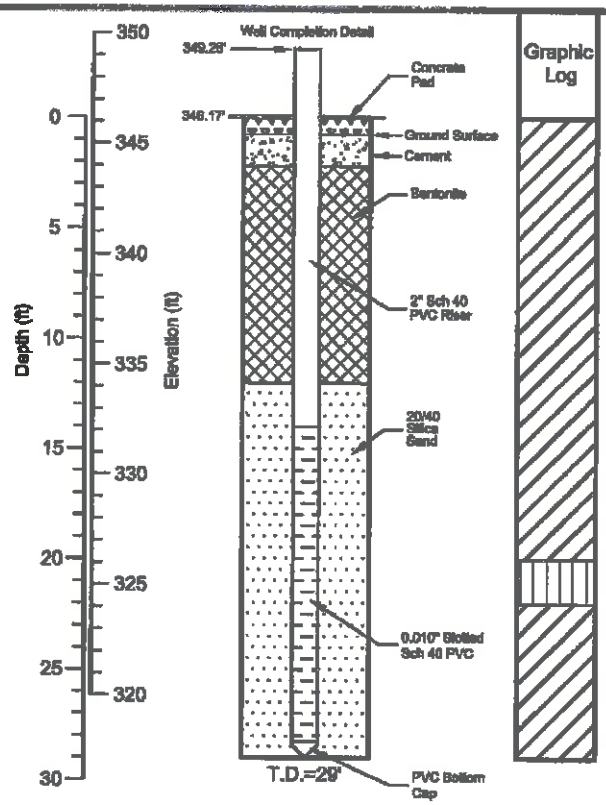
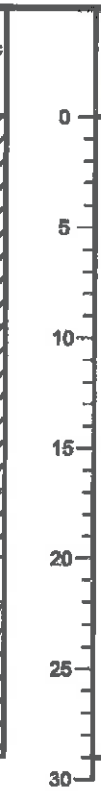
environmental & geotechnical

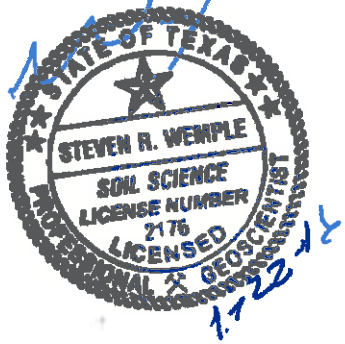
WEST Drilling, Inc.
101 Industrial Drive
Waxahatchie, Texas 75165

DATE: 12/10/15	Logged by: Robert Williams, PE	Welsh Power Station Pittsburg, Texas	Log of Boring AD-17		
Drilling Method: H.S.A.	Driller: Robert Williams				
Bit Diameter: 7.25"	Date Completed: 12/11/15	DRAWN BY: HDS	PROJECT NO.: —	SCALE: AS SHOWN	
Depth to Water: —	Depth to Product: NA	CHECKED BY: SRW	FILE NAME: JR Welsh Power Plant LOGS.dwg		





PID Reading (ppm)	Sampling Device	Sample Interval	USCS	Comments and Lithology	Percent Moisture	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index
	Direct Push		CH	Fat CLAY: light brown & light gray, sandy - reddish brown and light gray, with Sand - gray with silt - gray, stiff	19	88	50	24	26
			ML	SILT: gray, with Clay and Sand, wet	29	86	28	NP	-
			CH	Fat CLAY: light gray, silty w/ Sand, very stiff	20	85	50	23	27



west DRILLING environmental & geotechnical WEST Drilling, Inc. 101 Industrial Drive Waxahachie, Texas 75165	DATE: 12/11/15	Logged by: Robert Williams, PE	Welsh Power Station Pittsburg, Texas	Log of Boring AD-18	
	Drilling Method: H.S.A.	Driller: Robert Williams			
	Bit Diameter: 7.25"	Date Completed: 12/11/15	DRAWN BY: HDS	PROJECT NO.: —	SCALE: AS SHOWN
	Depth to Water: —	Depth to Product: NA	CHECKED BY: SRW	FILE NAME: JR Welsh Power Plant LOGS.dwg	

Project: AEP Welsh 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.**	

Elevation, feet	Depth, feet	Sample Type	Sample Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
367	0				Other		Black COAL, a few fine roots and organics.						
		ST											Shelby tube pulled black COAL
		SS	10										SPT 4, 5, 5, 5. 24" recovered
362	5			Soft to Firm	SC		Reddish Brown fine SAND, little clay, trace silt, Dry. Natural Ground.						
		SS	11										SPT 4, 5, 6, 7. 24" recovered
				Soft	SM		Reddish brown fine SAND with silt, trace clay. Vertical sand seams in sample, Dry.						
		SS	11										SPT 3, 5, 6, 8. 24" recovered.
357	10	ST						23.6		48.9	5.4E-07		Shelby tube sample, 18" recovered.
				Soft	SC		Reddish brown well graded fine SAND, trace silt and clay. Damp.						
		SS	12	Firm	CL		Greyish red CLAY, little sand, horizontal sand seams, Dry.						SPT 5, 6, 8, 9. 24" recovered
				Soft	SC		Brownish red fine SAND, little clay, Damp.						
		SS	13	Firm	SC-CL		) Four-inch CLAY seam, little fine sand.						SPT 7, 6, 7, 9. 24" recovered.
				Firm	CL		Reddish grey CLAY, little sand, oxidized iron ore. Dry						
352	15			Soft	SM		Brownish red fine SAND, trace clay, thin clay seams. Moist.						
		SS	18					17.74	14	40.1			SPT 8, 9, 9, 9. 24" recovered.
		ST						16.25	NP	28.9	3.6E-05		Shelby tube samples look like SC. 17" recovered.
													SPT 9, 8, 9, 11. 24 inches recovered.
347	20	SS	17	Soft	Other		) Iron oxidized material						
				Soft	SC		Brownish red fine SAND, little clay. Moist.						
		SS	15										SPT 5, 7, 8, 50/2. 21" recovered
		SS	50	Soft	CL		Dark grey CLAY, little fine sand, Wet.						
				Very Hard	SP		Dark grey-black cemented SAND, little clay. Wet. Driller comments that cemented sand terminates at 25.5 feet.						SPT 50/3".
342	25												
		SS	27	Soft to Firm	SC		Dark grey fine SAND, little clay. Moist. Soft sand with lenses of firm clay.						SPT 11, 13, 14, 16. 24" recovered.
				Hard	CL		Dark grey CLAY, little sand, Dry.						
		SS	46	Soft	SC		Dark grey-black fine SAND, little clay, Wet. Encountered water but water rose to 19 feet after 15 min break.						SPT 11, 16, 30, 14. 24" recovered.
337	30	SS	37	Hard	CL								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 Number	Sampling Resistance, Blows/foot	Relative 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		Dark grey CLAY, little fine sand, occansional horizontal sand seams. Wet. (cont.)						SPT 11, 15, 22, 25. 24" recovered.
					Soft	ML		Dark grey-black fine SAND, with clay, frequent hard clay lenses (1-3"), Wet.						
			SS	29					28.37	NP	57.5			SPT 6, 11, 18, 24. 24 recovered.
332	35				Hard	CL		Black CLAY, trace to little fine sand, trace silt. Dry						SPT 9, 16, 18, 23. 24" recovered.
			SS	34										
								Bottom of Boring at 37 feet bgs						
327	40													
322	45													
317	50													
312	55													
307	60													
302	65													

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.**	

Elevation, feet	Depth, feet	Sample Type	Sample Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
364.6	0			Soft	Other		Coal						
		SS	4	Soft	CL		Greyish brown CLAY, with little silt, little sand, damp.						SPT 2, 2, 2. 12" recovered.
		SS	13										SPT 4, 7, 6, 12.
359.6	5	ST											Shelby Tube Sample
				Firm	CH		Brownish tan CLAY with silt, little sand, Damp. Occasional sand and iron ore.						SPT 8, 12, 17, 21
		SS	29					23.71	38	77.3			
		SS	80										SPT 20, 30, 50/5. 17" recovered
354.6	10			Soft	SC		Red-orange fine SAND, little clay, damp. Occasional iron ore.						
		SS	44	Soft	CL SM		Brownish tan CLAY, little silt, little sand, Damp. Red-orange fine SAND, little clay, Damp.						SPT 15, 20, 24, 31. 18" recovered.
		SS	21					20.35	NP	33.5			SPT 11, 12, 9, 32.
349.6	15	SS	18	Soft	SM-SC		Light brown fine SAND, with little silt, little sand, Damp.						SPT 6, 6, 12, 6.
				Firm	CL		Black CLAY, with fine sand, Wet.						SPT 12, 25, 50/5.
		SS	75	Soft	SM-SC		Dark red fine SAND, little clay, little silt, Wet.						
					SC		Dark grey fine SAND, little clay, Wet. Occasional clay seams.						SPT 9, 16, 12, 15.
		SS	28										
344.6	20	SS	38	Firm	SC		Frequent clay lenses. 8/11/09	22.55	13	36.6			SPT 9, 17, 21, 27.
		SS	85										SPT 22, 35, 50/4".
339.6	25	SS	33										SPT 10, 15, 18, 26.
				Soft	SC		Less clay lenses, Wet.						
		SS	64										SPT 12, 27, 37, 50/5".
		SS	44										SPT 19, 24, 21, 50/5".
334.6	30			Hard	CL		Bentonite Grout Seal and Native silt, Wet.						

Figure

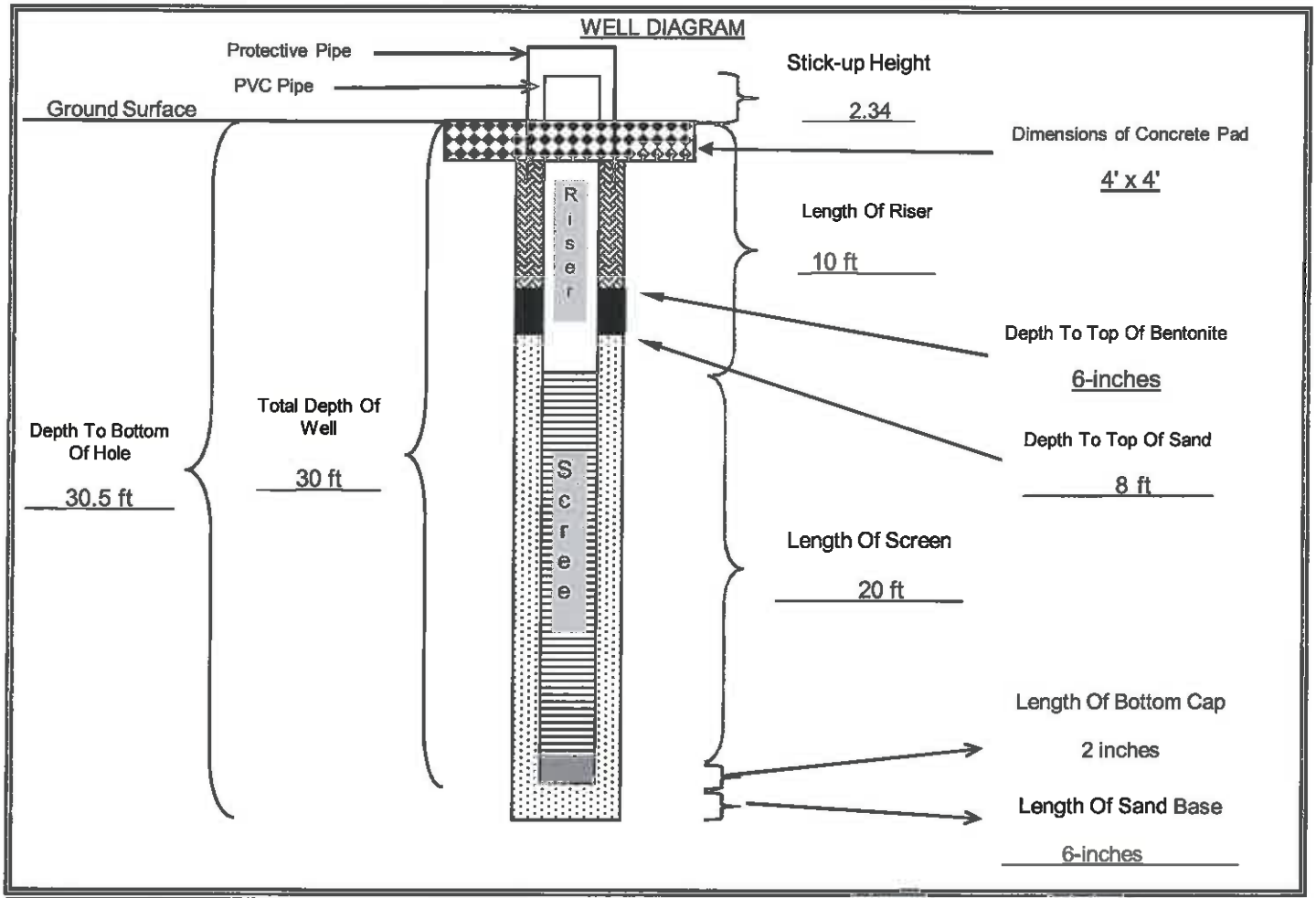
WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)

Geosyntec consultants

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

GROUND SURFACE ELEVATION:	364.56 (ft, msl)	BENTONITE TYPE:	Western Bentonite
TOP OF SCREEN ELEVATION:	354.56 (ft, msl)	MANUFACTURER:	PDS
BOTTOM OF WELL ELEVATION:	334.06 (ft, msl)	CEMENT TYPE:	Not used-sealed with bentonite chips
NORTHING: 747.0223 EASTING:	-2442.888	CEMENT MANUFACTURER:	
SCREEN MATERIAL:	PVC	SAND PACK TYPE AND SIZE:	Silica 20/40
SCREEN MANUFACTURER:		SAND MANUFACTURER:	Uninum
RISER MATERIAL:	PVC	DRILLING CONTRACTOR:	Total Support Services
RISER MANUFACTURER:		AMOUNT BENTONITE USED:	4 bags lbs
RISER DIAMETER: 2 (in) Length:	10 (ft)	AMOUNT CEMENT USED:	bags lbs
SCREEN DIAMETER: 2 (in) Length:	20 (ft)	AMOUNT SAND USED:	13 bags lbs
BOREHOLE DIAMETER:	8 (in)	STATIC WATER:	21.53 depth from TOC
DRILLING TECHNIQUE: Hollow stem Size:	(in)	ENCOUNTERED WATER:	depth from ground

WELL DIAGRAM



Cement/Bentonite Grout | Sand Pack | Neat Concrete | Bentonite | Bottom Cap

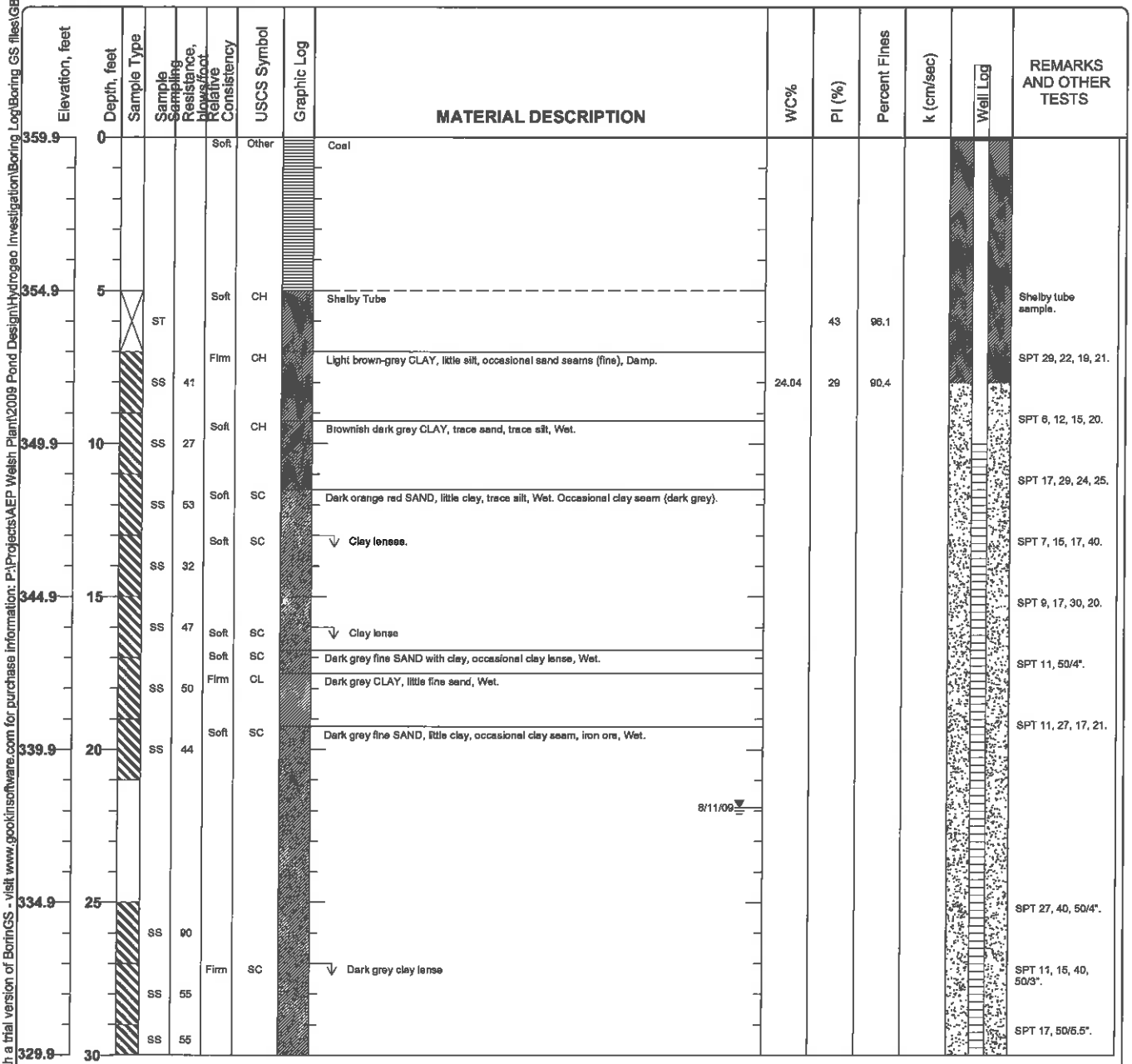
QA/QC	INSTALLED BY:	Total Support Services	OBSERVED BY:	Kush Chohan	
	DATE:	August 7th, 2009	CHECKED BY:		DATE:

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.**	



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 Sampling Resistance, blows/foot Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
329.9	30	SS	65 Hard	CL		Dark gray CLAY, trace silt, trace fine sand.						SPT 17, 50/5.5".
						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											

Figure

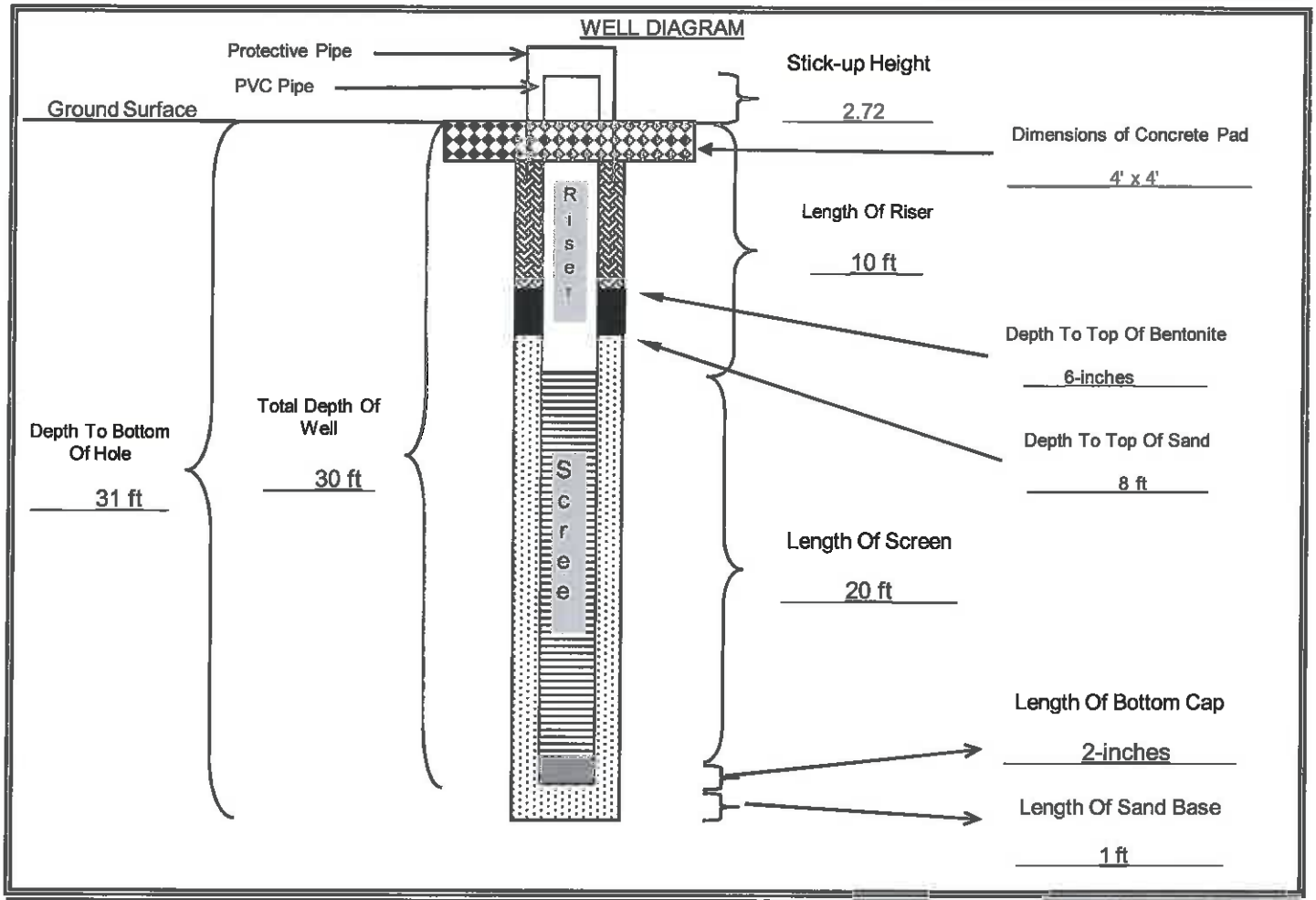
WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)

Geosyntec consultants

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

GROUND SURFACE ELEVATION:	359.57 (ft, msl)	BENTONITE TYPE:	Western Bentonite
TOP OF SCREEN ELEVATION:	349.57 (ft, msl)	MANUFACTURER:	PDS
BOTTOM OF WELL ELEVATION:	328.57 (ft, msl)	CEMENT TYPE:	None used-sealed with bentonite chips
NORTHING: 460.5803	EASTING: -2507.6332	CEMENT MANUFACTURER:	
SCREEN MATERIAL:	PVC	SAND PACK TYPE AND SIZE:	Silica 20/40
SCREEN MANUFACTURER:		SAND MANUFACTURER:	Uninum
RISER MATERIAL:	PVC	DRILLING CONTRACTOR:	Total Support Services
RISER MANUFACTURER:		AMOUNT BENTONITE USED:	4 bags lbs
RISER DIAMETER: 2 (in)	Length: 10 (ft)	AMOUNT CEMENT USED:	bags lbs
SCREEN DIAMETER: 2 (in)	Length: 20 (ft)	AMOUNT SAND USED:	12 bags lbs
BOREHOLE DIAMETER:	8 (in)	STATIC WATER:	21.89 depth from TOC
DRILLING TECHNIQUE: Hollow Stem	Size: 8 (in)	ENCOUNTERED WATER:	depth from ground

WELL DIAGRAM



Cement/Bentonite Grout | Sand Pack | Neat Concrete | Bentonite | Bottom Cap

QA/QC	INSTALLED BY:	Total Support Services	OBSERVED BY:	Kush S. Chohan	
	DATE:	7-Aug-09	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.**	

Elevation, feet	Depth, feet	Sample Type	Sample Sampling Resistance, blows/foot Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
357.2	0	SS	9 Soft	SM-SC		Reddish brown fine SAND, little silt, trace clay, damp.						SPT 1, 3, 6, 6. 24" recovered.
			Soft	Other		1 COAL						
			Firm	SC		Brownish red SAND, little clay, trace silt. Damp.						
			Firm	CL		Reddish pink CLAY, some fine sand, Dry.						SPT 4, 4, 4, 4. 24" recovered.
		SS	8				24.49	47	90.2			
												SPT 5, 6, 8, 4. 18" recovered.
352.2	5	SS	14 Soft	Other		1 Oxidized SAND and clay with iron ore.						
			Soft	CH		Light reddish brown CLAY and sand mixture, Dry.						
			Soft	SC		Reddish brown SAND, little clay, Dry.						
		ST					28.4	38	61.1	7.7E-09		12" Shelby tube. 9" recovered.
												SPT 3, 4, 13, 15. 27" recovered.
		SS	17 Firm	CH		Light brownish tan CLAY, little sand, occasional sand seams, Dry.						
347.2	10											
342.2	15		Soft	SC		Red/yellowish brown SAND, some clay, Wet.						SPT 3, 7, 3, 15. 24" recovered.
		SS	10 Firm	SC		Occasional clay lenses.	6.95	14	47			
337.2	20	ST				8/11/09						Shelby tube. 12" driven 0" pulled. Gravel material encountered.
			Soft to Firm	SM		Black to dark grey fine/med SAND, little clay, occasional clay lenses, Wet.						SPT 7, 10, 8, 13. 24" recovered.
		SS	19									
332.2	25		Soft	SM		Well graded light grey fine/med SAND, trace silt, Wet.						SPT 17, 24, 50/5.5". 19" recovered.
		SS	74				22.29	NP	13.5			
			Firm	CL		Dark grey clay lense, Wet.						
			Firm	SM-SC		Well graded light grey fine/med SAND, trace silt, Wet.						
327.2	30											

Figure

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 Sampling Resistance, Blows/foot Relative 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 grey CLAY, little sand, Wet.						12" Shelby tube. Bent shelby tube.
		ST					21.3	NP	84.2	2.0E-08		12" Shelby tube.
		SS	38 Hard	CL		Dark grey CLAY, trace sand, Wet.	25.44	18	92.5			SPT 15, 19, 19, 25. 24" 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											

Figure

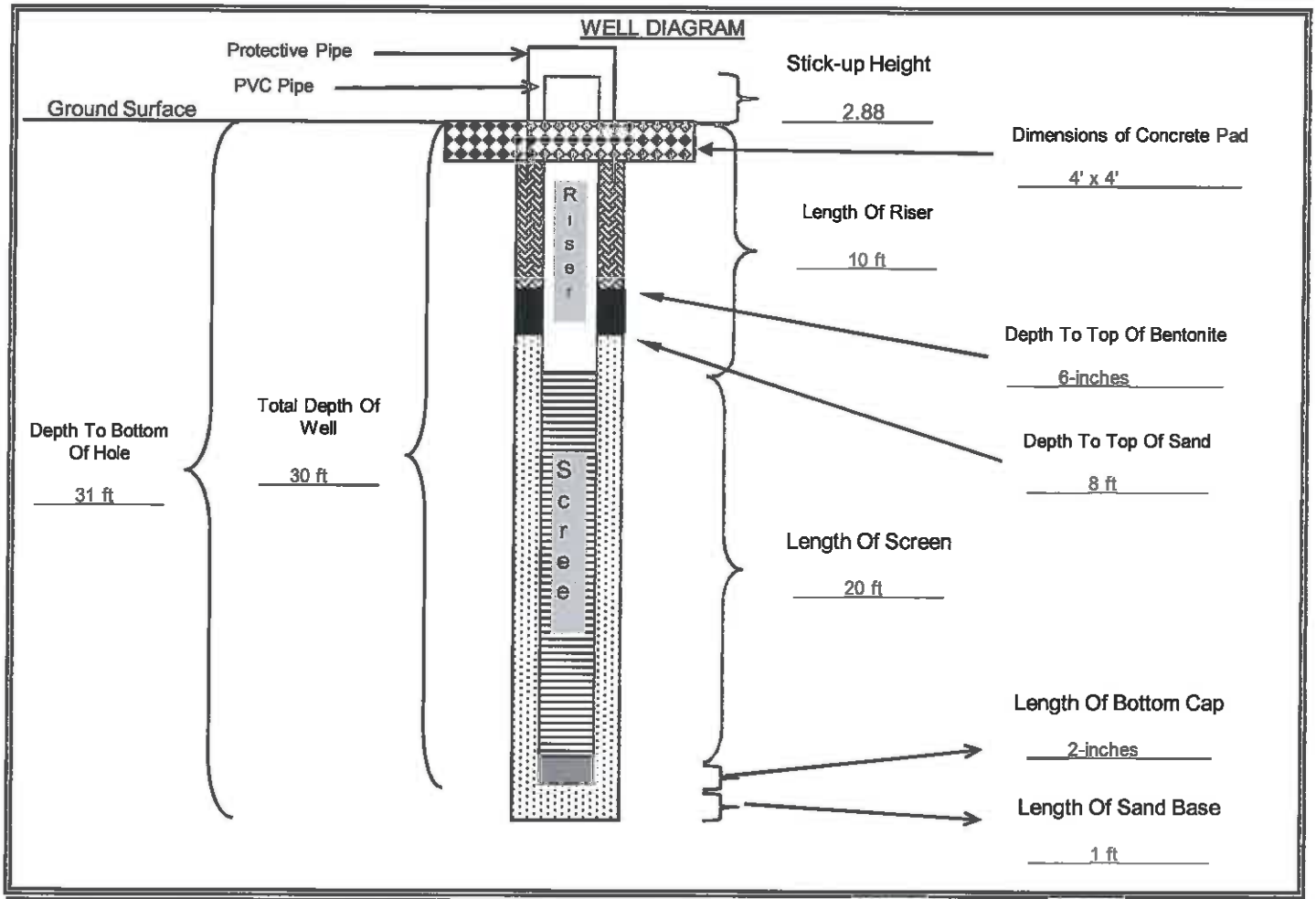
WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)

Geosyntec consultants

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

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

WELL DIAGRAM



Cement/Bentonite Grout | Sand Pack | Neat Concrete | Bentonite | Bottom Cap

QA/QC	INSTALLED BY:	Total Support Services	OBSERVED BY:	Kush S. Chohan	
	DATE:	24-Jul-09	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.**	

Elevation, feet	Depth, feet	Sample Type	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
357.5	0			Soft	SW-SM		Dark fine SAND with brown organic material and roots.						
		SS	7	Firm	CH		Dark red/grey CLAY, trace silt. Dry.	23.37	44	68.6			SPT 2, 2, 5, 5. 24" recovered
		SS	11								7E-07		SPT 4, 4, 7, 9. 24" recovered.
352.5	5	SS	14										SPT 5, 6, 8, 13. 24 recovered
					CH		Trace of sand						
		ST		Soft	CH		Dark red fine SAND, trace clay, Damp.	16.5	41	73.8	3.2E-08		Shelby tube. Pushed 12 recovered 8".
				Firm	CH		Light tan CLAY, trace sand, Dry.						
		SS	18	Soft	SC		Dark red SAND, trace of CLAY, Damp.						SPT 5, 7, 11, 11. 24" recovered.
				Firm	CL		Light tan CLAY, trace fine sand, Dry.						
				Soft	SC		Dark red SAND, little clay, frequent clay seams, Damp						
347.5	10	SS	18										SPT 6, 7, 11, 14. 24" recovered.
					SC		Frequent clay seams						
		SS	35	Soft	SC		Red/orange fine SAND, trace clay, trace coarse sand, poorly sorted, Moist.						SPT 11, 22, 13, 14. 24" recovered.
		SS	77										SPT 17, 27, 50/5". 17" recovered.
				Firm	CL		Brownish grey CLAY, trace sand, Moist.						
342.5	15			Soft	SC		Tanish grey fine SAND, some clay, Wet.						
		ST					8-11-09	19.9	13	35.7	8.6E-07		Shelby tube. Pushed 12" recovered 9".
		SS	23					27.98	NP	32.3			SPT 11, 13, 10, 14. 24" recovered.
				Soft	SM		Dark grey coarse SAND/GRAVEL mix, some fine sand, trace clay, Wet.						
				Soft	SM-SC		Red fine SAND, trace clay, Moist. cemented. Moist.						SPT 7, 8, 11, 13. 24" recovered.
		SS	19										
337.5	20			Firm	SC		Black fine SAND, occasional clay, Wet.						
				Firm	CL		Dark grey CLAY, little sand, Wet.						
		SS	22	Firm	SM		Black fine SAND, some medium sand, some clay, Wet.	32.23	NP	36.5			SPT 8, 10, 12, 15. 24" recovered.
				Firm	CL		Dark grey CLAY, little sand, Wet.						
				Firm	SM		Black fine SAND, some medium sand, some clay, Wet.						
		SS	28	Firm	SM		Frequent clay seams						SPT 6, 11, 17, 21. 24" recovered.
				Firm	SM		Frequent clay seams.						
		ST											Shelby tube. 12" driven 0 recovered.
332.5	25												SPT 15, 19, 21, 27. 24" recovered.
		SS	40	Hard	CL		Dark grey CLAY, trace of sand, Dry.						
		SS	22										SPT 10, 11, 11, 50/5". 23" recovered.
				Very Hard	CL		Dark grey CLAY, frequent iron stone/ore. Rig chatter driller comments						
327.5	30	ST						24.9	15	75.0	1.0E-07		Shelby tube. 12" driven 9" recovered.

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 Sampling Resistance, Blows/foot Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
327.5	30	ST	Hard	CL		Dark grey CLAY, trace of sand, Dry. (cont.)	24.9	15	75.0	1.0E-07		Shelby tube. 12" driven 9" recovered.
						Bottom of Boring at 30.5 feet bgs						
322.5	35											
317.5	40											
312.5	45											
307.5	50											
302.5	55											
297.5	60											
292.5	65											

Figure

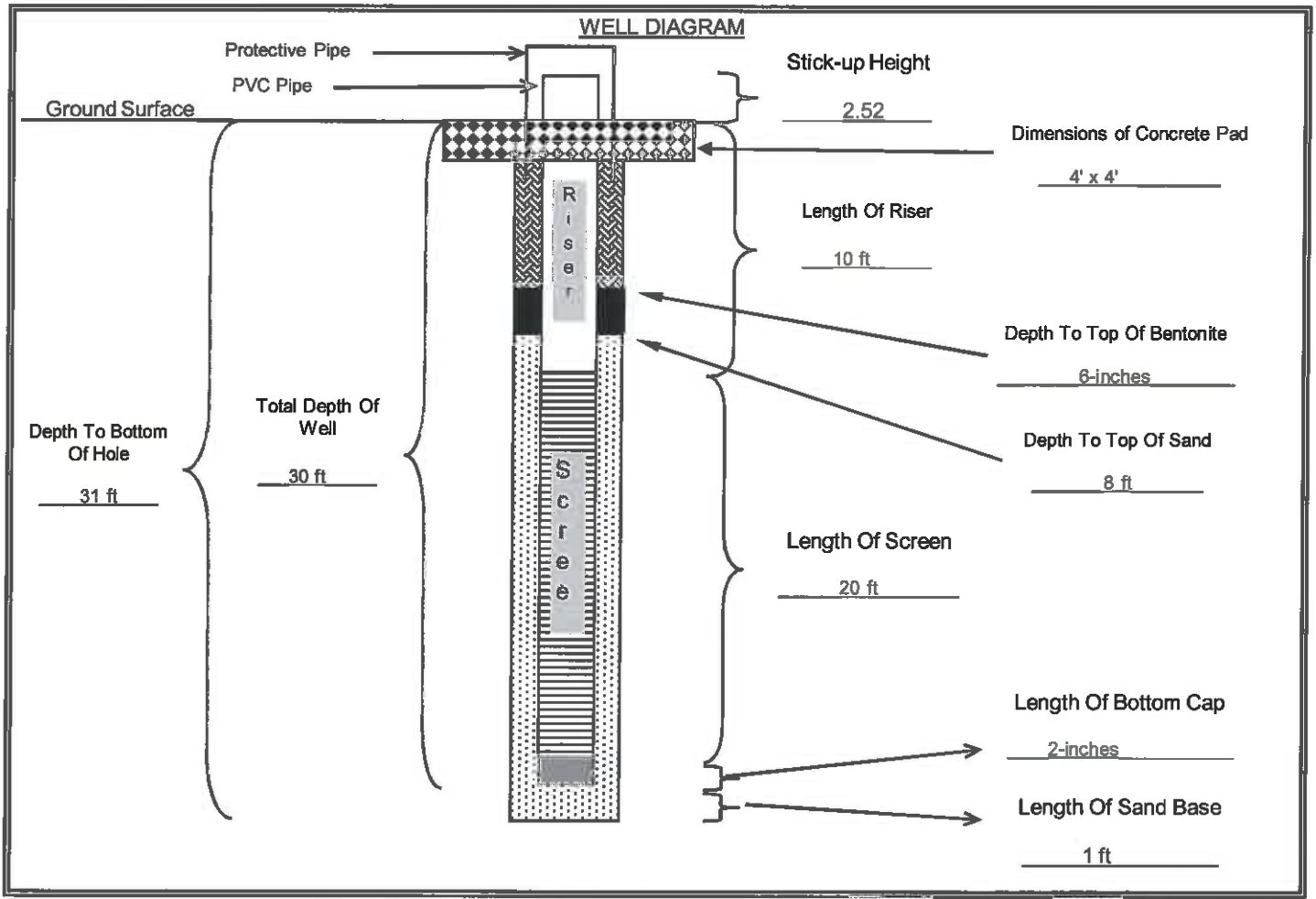
WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)

Geosyntec consultants

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

GROUND SURFACE ELEVATION:	357.49 (ft, msl)	BENTONITE TYPE:	Western Bentonite
TOP OF SCREEN ELEVATION:	347.49 (ft, msl)	MANUFACTURER:	PDS
BOTTOM OF WELL ELEVATION:	326.49 (ft, msl)	CEMENT TYPE:	
NORTHING: 529.1865	EASTING: -2243.9973	CEMENT MANUFACTURER:	
SCREEN MATERIAL:	PVC	SAND PACK TYPE AND SIZE:	Silica 20/40
SCREEN MANUFACTURER:		SAND MANUFACTURER:	Uninum
RISER MATERIAL:	PVC	DRILLING CONTRACTOR:	Total Support Services
RISER MANUFACTURER:		AMOUNT BENTONITE USED:	3 bags lbs
RISER DIAMETER:	2 (in) Length: 10 (ft)	AMOUNT CEMENT USED:	bags lbs
SCREEN DIAMETER:	2 (in) Length: 20 (ft)	AMOUNT SAND USED:	7 bags lbs
BOREHOLE DIAMETER:	8 (in)	STATIC WATER:	17.33 depth from TOC
DRILLING TECHNIQUE:	Hollow Stem Size: 8 (in)	ENCOUNTERED WATER:	depth from ground

WELL DIAGRAM



Cement/Bentonite Grout | Sand Pack | Neat Concrete | Bentonite | Bottom Cap

QA/QC	INSTALLED BY:	Total Support Services	OBSERVED BY:	Kush Chohan	
	DATE:	6-Aug-09	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.**	

Elevation, feet	Depth, feet	Sample Type	Sample Sampling Resistance, blows/foot Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
357.4	0			Soft	SP	Greyish brown fine SAND with trace fines. Organic material (roots).						Hand Auger
		HA		Soft	SP-SM	Greyish red fine SAND, little silt. Poorly sorted, less organic material.						
				Soft	SM	Greyish red fine SAND, with little silt and clay. Dry.						
				Soft		Tanish grey fine SAND, trace silt and clay, frequent iron oxide, frequent discoloration.						
		SS	14	Firm	CL	Red light brown CLAY, little sand, trace silt, Dry.	12.74	34	67.9			SPT 4, 7, 7. 18" recovered
352.4	5											
		SS	11	Soft	SC	Dark reddish brown fine SAND, little clay.						SPT 3, 5, 6, 8. 20" recovered
				Soft	CL	Light grey CLAY, little sand, trace silt. Dry.						
				Soft	SC	Reddish brown fine SAND, trace clay, trace silt. Occansional clay seams. Damp.						
		SS	12				17.65	NP	43.2			SPT 3, 5, 7, 7. 24" recovered
				Soft	CL	Light grey CLAY, little fine sand						
		SS		Soft to Firm	SC	Brownish red fine SAND, little to some clay, some cementation, Damp.						24" driven, 15" recovered.
347.4	10											
		SS	19									SPT 8, 9, 10, 10. 24" recovered.
				Soft to Firm	CL	Brown CLAY, little fine sand, frequent brown sand-clay mixture with iron ore oxide.						
		ST					22.9	21	43.2	6.0e-07		Shelby Tube. 24" driven/16" recovered
342.4	15			Firm	CL	Dark redish brown CLAY, little fine sand, Damp.						
				Firm	SC	8/11/09 Dark reddish brown SAND, little to some clay, Moist.						SPT 15, 10, 22, 30. 24" recovered
		SS	40	Firm	CL	Black CLAY, little fine sand, Wet.						
				Firm	SW	Black fine SAND, trace clay, trace med sand, Wet.						SPT 2, 8, 14, 10. 24" recovered
		SS	22									
				Firm	CL SC	Black CLAY, trace fine sand, trace silt, Wet. Black fine SAND, little clay, Wet.						SPT 5, 8, 22, 50/4". 22 recovered.
337.4	20	SS	30	Firm	CL	Black CLAY, trace sand, trace silt. Wet.						
				Firm	SC	Black fine SAND, trace to little clay, Wet. Occansional black clay seams.						SPT 10, 11, 23, 33. 24" recovered
		SS	34	Firm	SP-SC	Black fine SAND, with little clay, trace med sand, Wet.						
					SW-SC	Grading to med SAND, Wet.						SPT 11, 16, 16, 24. 24" recovered.
		SS	36									
332.4	25											SPT 9, 11, 12, 22. 24" recovered.
		SS	23	Firm	SW-SC	Occasional CLAY lenses, Wet.						
				Firm	SC	Black fine SAND, little med sand and clay, Wet.						
		SS	40	Hard	CL	Dark grey CLAY, little sand, little silt, Dry.						SPT 7, 15, 25, 50/3". 21 recovered.
		ST						19	45.1			Shelby tube. 12" driven-8" recovered.
327.4	30					Bottom of Boring at 30 feet bgs						

Figure

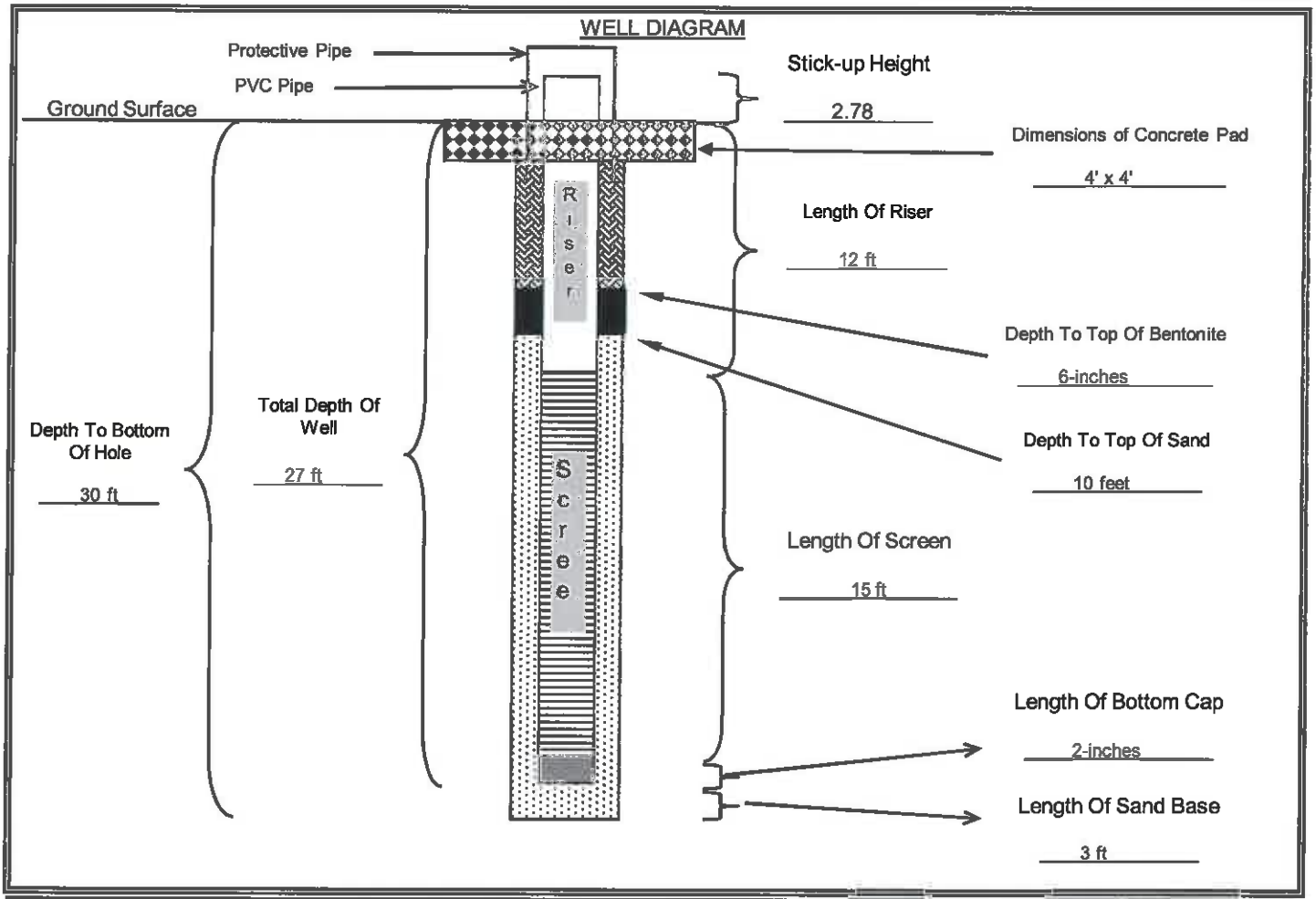
WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)

Geosyntec consultants

JOB NAME:	AEP Welsh Power Plant		GB-06
JOB NO.:	TXL0064		
DATE/TIME:	23-Jul-09	WELL NO.:	
WELL LOCATION:		FIELD REP:	Kush Chohan

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

WELL DIAGRAM



Cement/Bentonite Grout | Sand Pack | Neat Concrete | Bentonite | Bottom Cap

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

SOIL BORING LOG

E·A·G·L·E
ENVIRONMENTAL SERVICES OF SHREVEPORT, INC.

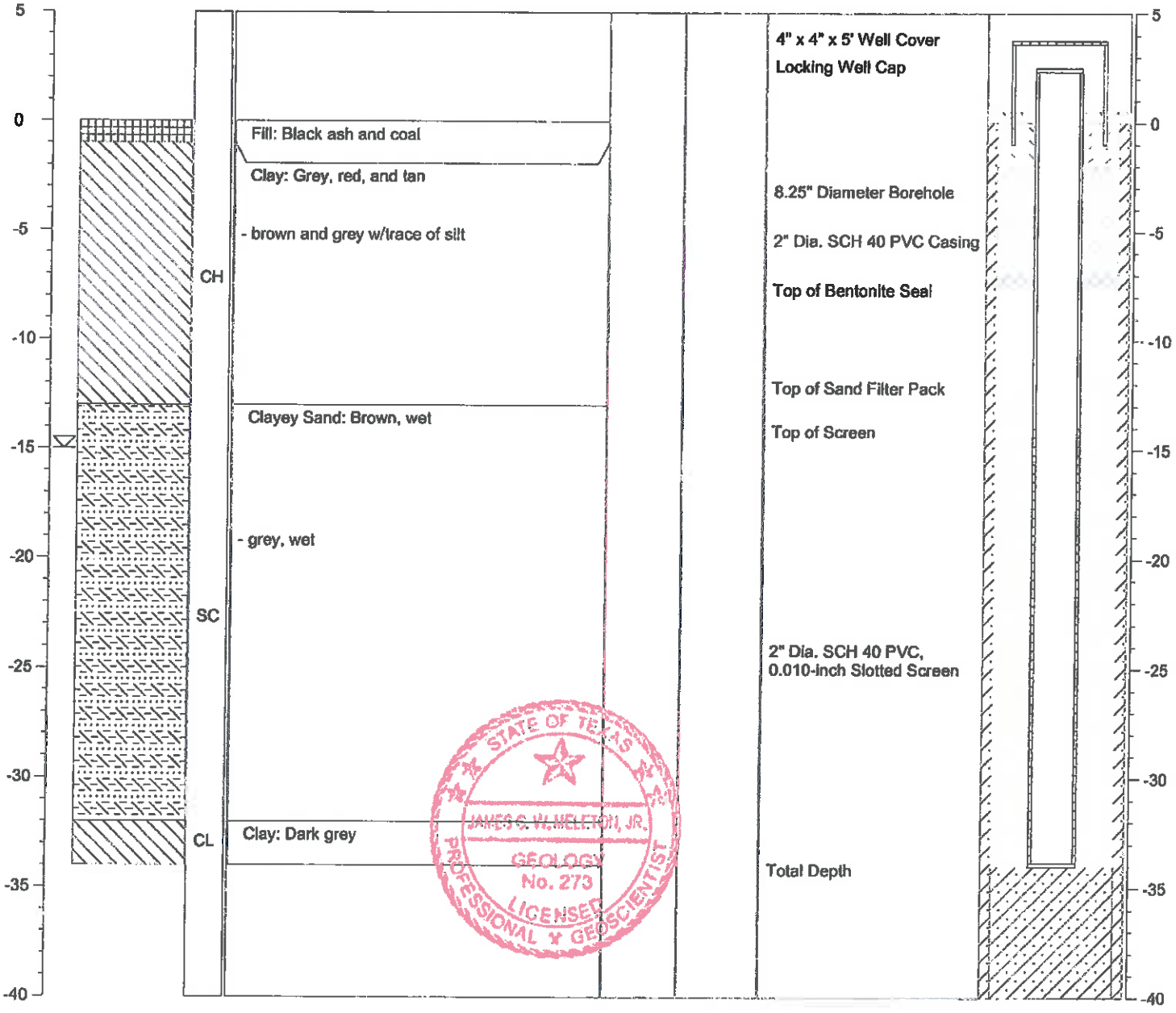
BORING/WELL NO.:	GB-07/MW-7
TOTAL DEPTH:	34'
TOP OF CASING ELEV.:	362.75 ft. NGVD
GROUND SURFACE ELEV.:	360.20 ft. NGVD

CLIENT:	AEP	DRILLING CO.:	WEST Drilling
PROJECT:	Metal Cleaning Waste Pond	DRILLER:	Tom McCullough
SITE LOCATION:	Welsh Power Plant	METHOD OF DRILLING:	Hollow-stem Auger
PROJECT NO.:	S-08-0120	SAMPLING METHODS:	Split-spoon
LOGGED BY:	James Meleton, Jr.	DATE DRILLED:	12/1/09

NOTES: **Latitude: 33.05455**
Longitude: 94.84674

▽ Water level during drilling
▼ Water level in completed well

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



LOG OF BORING B-1

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 324.1

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			SANDY LEAN CLAY(CL) very stiff; brownish orange	P=4.0										
		SM			SILTY SAND(SM) tannish orange	SF										
		CH			SANDY FAT CLAY(CH) medium stiff; tannish orange	N=7					20	54	16	38	63	+40Sieve=10%, +4 Sieve=1%
5					–stiff	P=1.5										
		SC			CLAYEY SAND(SC) medium dense; tannish orange; with clay seams	P=1.75					19	34	17	17	32	+40 Sieve=7%, +4 Sieve=3%
10		CL			SANDY LEAN CLAY(CL) stiff; orange											
		SC			CLAYEY SAND(SC) medium dense; orange; saturated; with iron oxide cemented sandstone rock	N=15					22	24	15	9	19	+40Sieve=35%, +4 Sieve=22%
15																
		CL			LEAN CLAY WITH SAND(CL) hard; dark gray; with clay seams	N=35					21	41	21	20	75	+40 Sieve=2%, +4 Sieve=0%
20																
		CL			SANDY LEAN CLAY(CL) hard; dark brown	P=4.5+					15	33	17	16	52	+40 Sieve=1%, +4 Sieve=0%
25					–grayish brown; laminated with silt	P=4.5+										
30					Bottom of Boring @ 30'											

BLOW COUNT 20 40 60 80
Qu (tsf) 1 2 3 4
PPR (tsf) 1.0 2.0 3.0 4.0
Torvane (tsf) 1.0 2.0 3.0 4.0

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

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

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

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

Notes:
GPS Coordinates: N 33°03.090', W 94°50.417'

Piezometer B-2

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09 **BORING TYPE:** Flight Auger

DATE 10/28/09

SURFACE ELEVATION 339.7

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			SANDY LEAN CLAY(CL) hard; red and tan	P=4.5+					13	28	14	14	61	+40 Sieve=3%, +4 Sieve=0%
					--very stiff	P=3.5										
5					--stiff	N=14					14	40	16	24	65	+40 Sieve=0%, +4 Sieve=0%
					--very stiff; reddish brown	P=2.75					13	30	14	16	58	+40 Sieve=0%, +4 Sieve=0%
10																
		CL			SANDY LEAN CLAY(CL) hard; red and tan	P=4.5+										
15																
					--very stiff	P=3.5					14	34	15	19	54	+40 Sieve=0%, +4 Sieve=0%
20																
						P=4.0										
25																
		SC			CLAYEY SAND(SC) medium dense; tan, red, and gray	P=4.5					15	37	16	21	47	+40 Sieve=5%, +4 Sieve=3%
30																

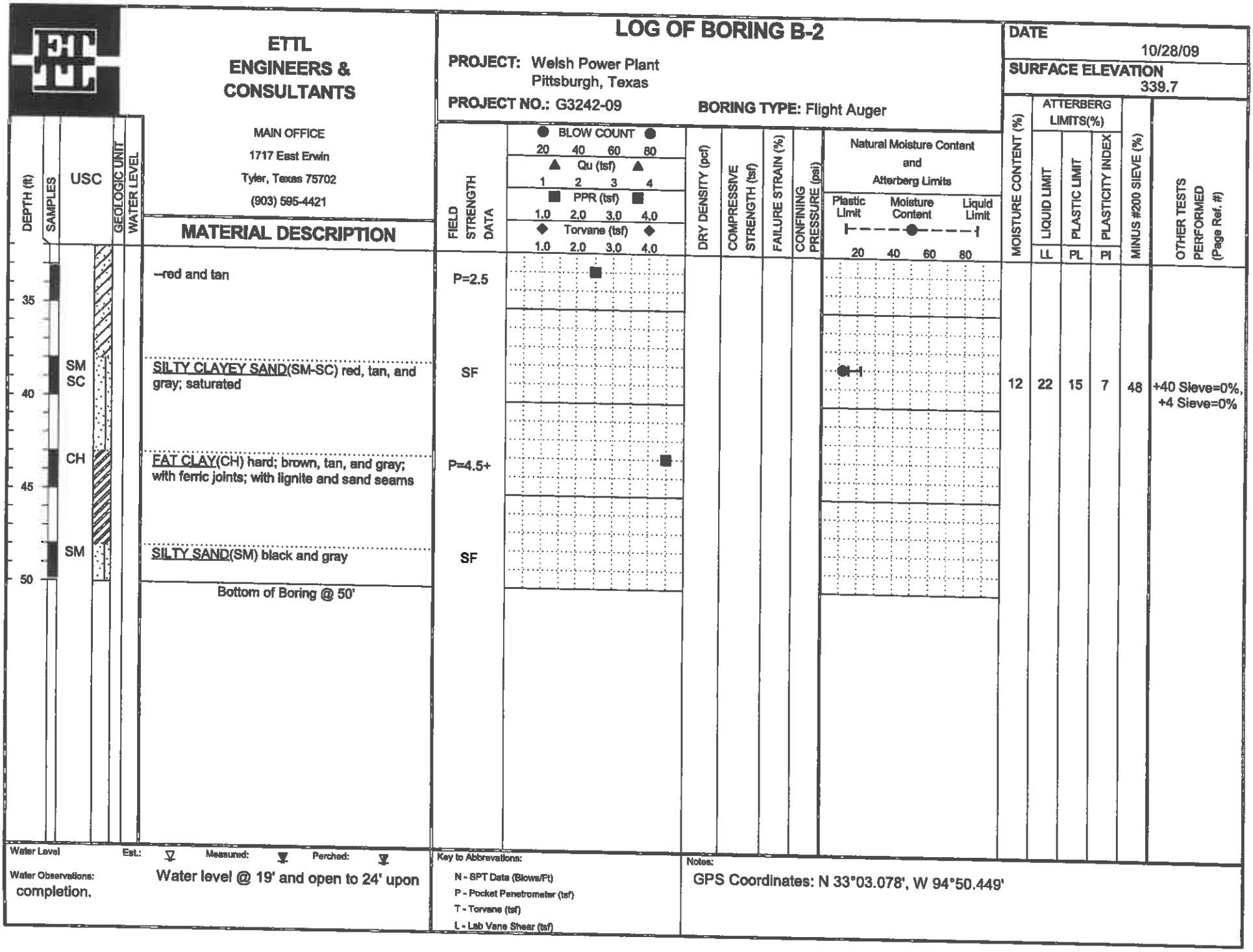
Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

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

Water Observations: completion. Water level @ 19' and open to 24' upon

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

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



ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING B-2

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/28/09

SURFACE ELEVATION 339.7

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35					--red and tan	P=2.5										
40		SM SC			SILTY CLAYEY SAND(SM-SC) red, tan, and gray; saturated	SF					12	22	15	7	48	+40 Sieve=0%, +4 Sieve=0%
45		CH			FAT CLAY(CH) hard; brown, tan, and gray; with ferric joints; with lignite and sand seams	P=4.5+										
50		SM			SILTY SAND(SM) black and gray	SF										
					Bottom of Boring @ 50'											

BLOW COUNT: 20 40 60 80
Qu (tsf): 1 2 3 4
PPR (tsf): 1.0 2.0 3.0 4.0
Torvane (tsf): 1.0 2.0 3.0 4.0

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

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

Water Observations:
Water level @ 19' and open to 24' upon completion.

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

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

Piezometer B-2

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-2

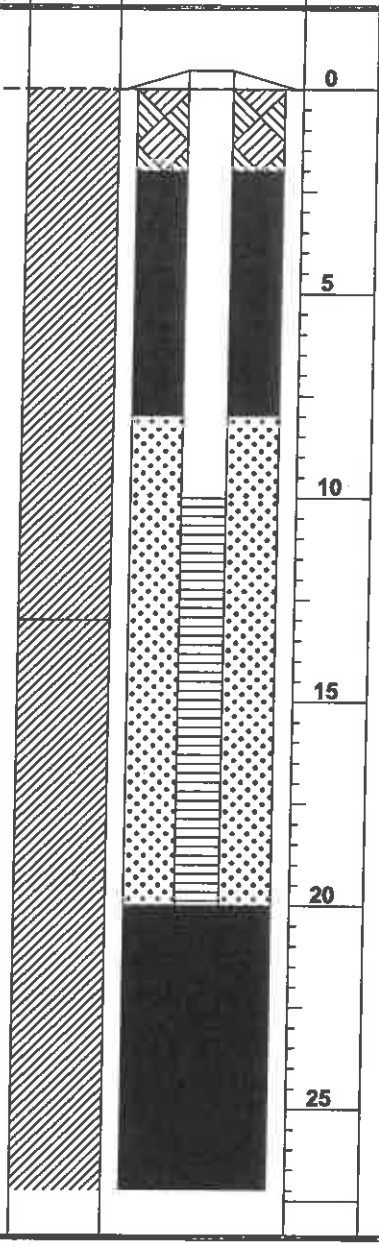
Location Pittsburg, Texas

Surface Elev.

Depth Feet Sampler	Overburden/Lithologic Description
0	**Ground Surface**
	SANDY LEAN CLAY(CL) hard; red and tan
	--very stiff
5	--stiff
	--very stiff; reddish brown
10	
	SANDY LEAN CLAY(CL) hard; red and tan
15	
	--very stiff
20	
25	

Continued Next Page

Field Strength Data | Graphic Log | Well Construction Graphics | Depth Feet | Well Construction Details



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

ETTL Engineers & Consultants Inc.

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-2

Location Pittsburg, Texas

Surface Elev.

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	
	Bottom of Boring @ 50'					
55						
60						

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

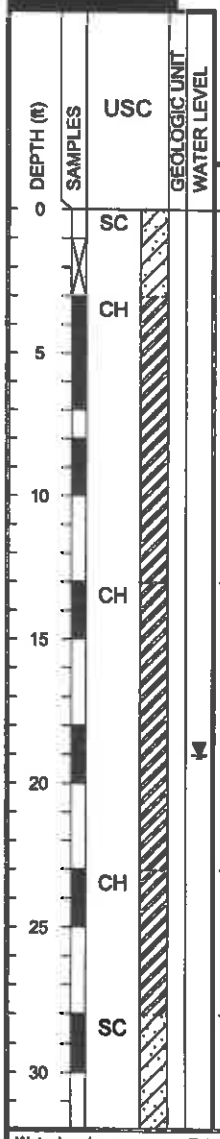
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09 **BORING TYPE:** Flight Auger

DATE 10/27/09

SURFACE ELEVATION 339.6



MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CLAYEY SAND(SC) medium dense; gray and red	N=11										
FAT CLAY(CH) stiff; red and tan; with sand seams	P=1.0					23	52	18	34	87	+40 Sieve=3%, +4 Sieve=0%
–very stiff	P=3.5					21	51	19	32	86	+40 Sieve=3%, +4 Sieve=0%
FAT CLAY WITH SAND(CH) very stiff; brown; with ferric joints	P=3.75					21	54	20	34	85	+40Sieve=10%, +4 Sieve=1%
–red and tan; layered; with ferric seams	P=2.5					23	61	24	37	81	+40Sieve=11%, +4 Sieve=0%
FAT CLAY(CH) hard; gray; with sand seams	P=4.5+										
CLAYEY SAND(SC) very dense; gray; with sand seams	N=56					22	42	22	20	35	+40 Sieve=1%, +4 Sieve=0%

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

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

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

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 (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 33°02.998', W 94°50.514'

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09 **BORING TYPE:** Flight Auger

DATE 10/27/09

SURFACE ELEVATION 339.6

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35		CH			FAT CLAY(CH) hard; brown; layered and with sand seams	P=4.5+					21	60	24	36	95	+40 Sieve=1%, +4 Sieve=0%
40					--gray and green	P=4.5+										
45		CL			SANDY LEAN CLAY(CL) very stiff; gray and dark green; layered; with sand seams	P=3.5										
50		CH			FAT CLAY(CH) hard; gray and dark green; layered; with silt seams	P=4.5+										
					Bottom of Boring @ 50'											

BLOW COUNT: 20 40 60 80
Qu (tsf): 1 2 3 4
PPR (tsf): 1.0 2.0 3.0 4.0
Torvane (tsf): 1.0 2.0 3.0 4.0

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

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

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 (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 33°02.998', W 94°50.514'

Piezometer B-4

ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING B-4

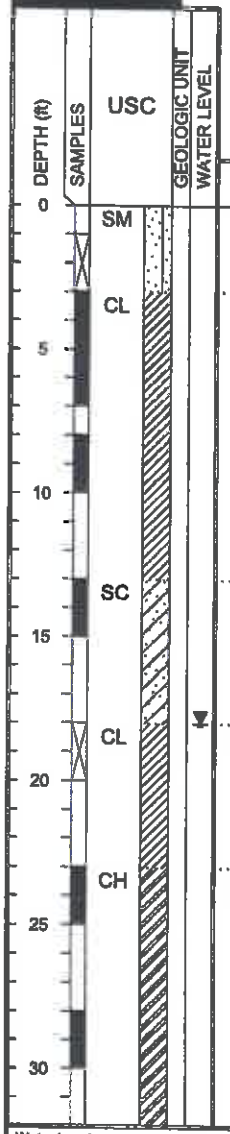
PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 340.6



MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
SILTY SAND(SM) medium dense; tan; with gravel	N=19										
SANDY LEAN CLAY(CL) dark brown	SF										
--tannish orange											
--hard; orangish tan	P=4.5					14	24	15	9	59	+40 Sieve=1%, +4 Sieve=0%
	P=3.25										
--very stiff; white						22	45	21	24	94	+40 Sieve=2%, +4 Sieve=0%
CLAYEY SAND(SC) medium dense; tan	P=3.25										
--orangish gray; with sand seams						15	31	15	16	40	+40 Sieve=1%, +4 Sieve=0%
SANDY LEAN CLAY(CL) stiff; orangish tan	N=9										
FAT CLAY(CH) very stiff; orangish tan; with ferric seams	P=4.0					25	59	24	35	88	+40 Sieve=4%, +4 Sieve=0%
--tannish brown; with iron ore seams	P=2.75										

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

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

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

Water Observations: Water level @ 18' and open to 48' upon completion.

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

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

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09 **BORING TYPE:** Flight Auger

DATE 10/27/09

SURFACE ELEVATION 340.6

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35					–hard; light gray; layered and with silt seams	N=30										
40		CL			LEAN CLAY(CL) hard; light gray; layered and with silt seams	N=50/5.75"					21	44	25	19	93	+40 Sieve=1%, +4 Sieve=0%
45					–light gray	N=41										
50					–layered and with sand seams; with lignite	N=43										
					Bottom of Boring @ 50'											

BLOW COUNT: 20 40 60 80
Qu (tsf): 1 2 3 4
PPR (tsf): 1.0 2.0 3.0 4.0
Torvane (tsf): 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

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

Water Observations: Water level @ 18' and open to 48' upon completion.

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

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

Piezometer B-4

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-4

Location Pittsburg, Texas

Surface Elev.

Depth Feet	Sampler	Overburden/Lithologic Description
0		Ground Surface
		SILTY SAND(SM) medium dense; tan; with gravel
		SANDY LEAN CLAY(CL) dark brown
5		–tannish orange
		–hard; orangish tan
10		–very stiff; white
		CLAYEY SAND(SC) medium dense; tan
15		–orangish gray; with sand seams
		SANDY LEAN CLAY(CL) stiff; orangish tan
20		
		FAT CLAY(CH) very stiff; orangish tan; with ferric seams
25		

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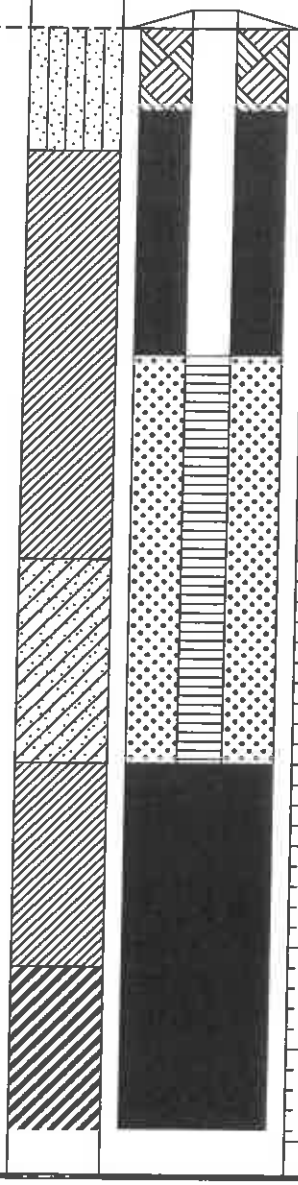


Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
			0	T.O.C. Elev.
			5	
			10	
			15	
			20	
			25	

Driller Doug Hinds

Logged By James Griffith

Drilling Started 10/27/09

Drilling Completed 10/27/09

Construction Completed

Development Completed

Type of Well

Drilling Method Soild Stem Auger

Borehole Diameter 6.5"

Well Casing 2.0" **Dia.** 0.0' **to** 8.0'

Casing Type PVC

Well Screen 2.0" **Dia.** 8.0' **to** 18.0'

Screen Type Slotted

Slot Size 0.010"

Grout Type Bentonite

Bentonite Seal 2-8' & 18-50'

Filter Pack Qty. 6-18'

Filter Pack Type 20/40 Sand

Static Water Level

Notes:

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-4

Location Pittsburg, Texas

Surface Elev.

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
	Continued from previous page					
	--tannish brown; with iron ore seams					
30					30	
	--hard; light gray; layered and with silt seams					
35					35	
	LEAN CLAY(CL) hard; light gray; layered and with silt seams					
40					40	
	--light gray					
45					45	
	--layered and with sand seams; with lignite					
50					50	
	Bottom of Boring @ 50'					
55						
60						

Piezometer B-5

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING B-5

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 340.0

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			LEAN CLAY WITH SAND(CL) stiff; red and tan	P=2.0					22	47	19	28	81	+40 Sieve=8%, +4 Sieve=3%
		CL			LEAN CLAY(CL) hard; red and tan	P=4.5+										
5					–very stiff	P=4.0					21	46	18	28	94	+40 Sieve=3%, +4 Sieve=0%
		CH			FAT CLAY(CL) very stiff; brown and tan	P=3.0										
10																
		CH			FAT CLAY WITH SAND(CH) hard; red and tan	P=4.5+					22	52	24	28	88	+40 Sieve=3%, +4 Sieve=0%
15																
		CL			SANDY LEAN CLAY(CL) very stiff; red and gray; with sand seams	P=3.0										
20																
		SC			CLAYEY SAND(SC) very loose; tan, red, and gray	P=0.5					19	33	17	16	44	+40 Sieve=1%, +4 Sieve=0%
25																
		CH			FAT CLAY WITH SAND(CH) stiff; red and gray	P=2.0					25	61	19	42	83	+40 Sieve=5%, +4 Sieve=3%
30																

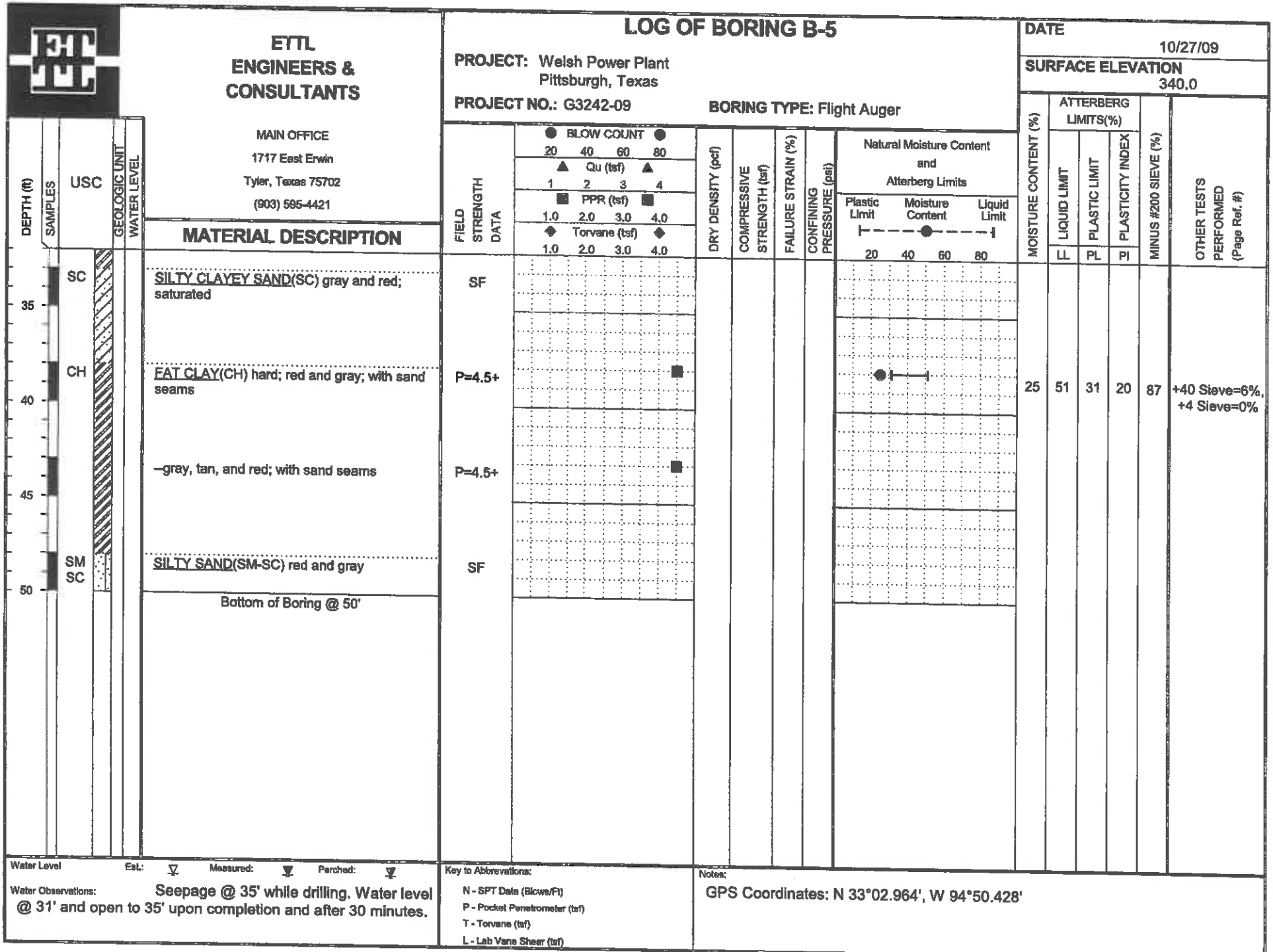
Natural Moisture Content and Atterberg Limits: Plastic Limit – Moisture Content – Liquid Limit (20 40 60 80)

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

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

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

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



ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING B-5

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 340.0

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35		SC			SILTY CLAYEY SAND(SC) gray and red; saturated	SF										
40		CH			FAT CLAY(CH) hard; red and gray; with sand seams	P=4.5+					25	51	31	20	87	+40 Sieve=6%, +4 Sieve=0%
45					–gray, tan, and red; with sand seams	P=4.5+										
50		SM SC			SILTY SAND(SM-SC) red and gray	SF										
					Bottom of Boring @ 50'											

BLOW COUNT 20 40 60 80
Qu (tsf) 1 2 3 4
PPR (tsf) 1.0 2.0 3.0 4.0
Torvane (tsf) 1.0 2.0 3.0 4.0

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

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

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

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

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

Rezoned B-5

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-5

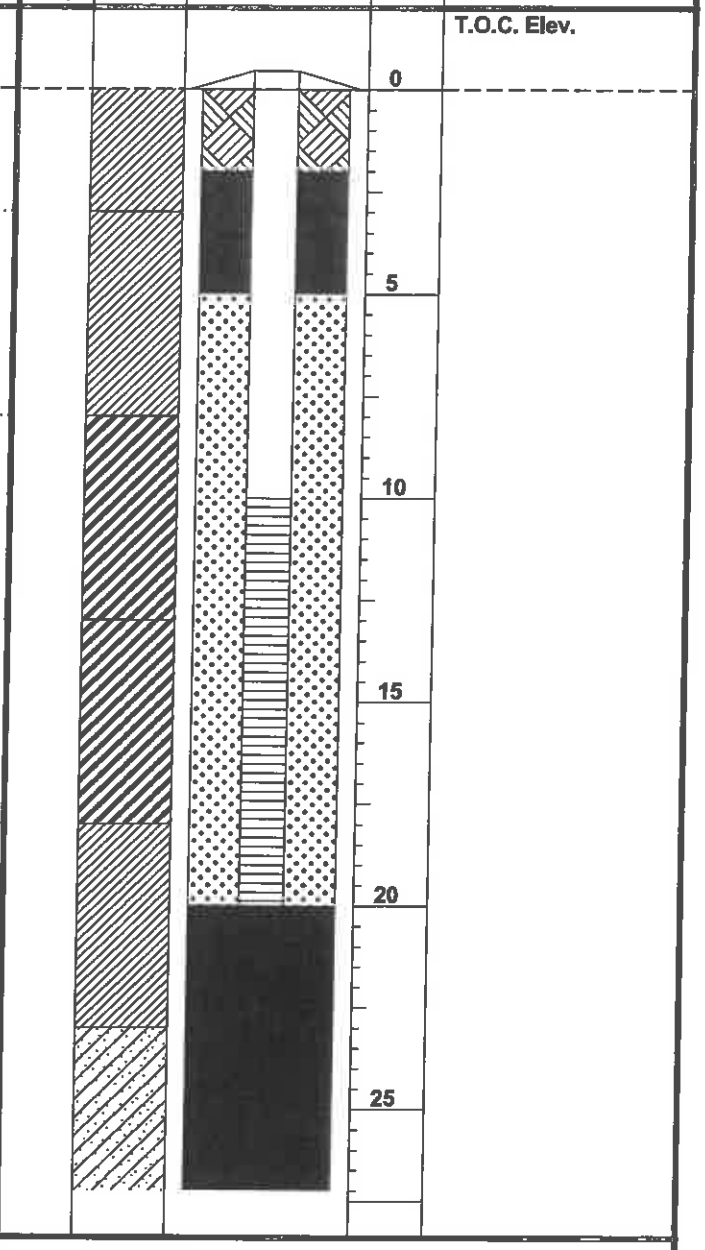
Location Pittsburg, Texas

Surface Elev.

Depth Feet Sampler	Overburden/Lithologic Description
0	**Ground Surface**
	LEAN CLAY WITH SAND(CL) stiff; red and tan
	LEAN CLAY(CL) hard; red and tan
5	--very stiff
	FAT CLAY(CL) very stiff; brown and tan
10	
	FAT CLAY WITH SAND(CH) hard; red and tan
15	
	SANDY LEAN CLAY(CL) very stiff; red and gray; with sand seams
20	
	CLAYEY SAND(SC) very loose; tan, red, and gray
25	

Continued Next Page

Field Strength Data | Graphic Log | Well Construction Graphics | Depth Feet | Well Construction Details



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

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-5

Location Pittsburg, Texas

Surface Elev.

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	
	Bottom of Boring @ 50'					
55						
60						

Piezometer B-6

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

LOG OF BORING B-6

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	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CH			FAT CLAY(CH) very stiff; red and gray; with ferric seams	P=4.0										
		CL			SANDY LEAN CLAY(CL) hard; red and tan	P=4.5+					12	32	14	18	60	+40 Sieve=0%, +4 Sieve=0%
5						P=3.0					21	49	20	29	93	+40 Sieve=2%, +4 Sieve=0%
					–very stiff; red, gray, and brown; with gravel –with sand seams	P=3.0										
10																
						P=4.0					14	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
15																
		SM			SILTY SAND(SM) gray; saturated	P=3.0										
20																
					–very dense; gray and red	N=50/5.25"					20				18	+40 Sieve=0%, +4 Sieve=0%
25																
						SF										
30																

BLOW COUNT 20 40 60 80
Qu (tsf) 1 2 3 4
PPR (tsf) 1.0 2.0 3.0 4.0
Torvane (tsf) 1.0 2.0 3.0 4.0

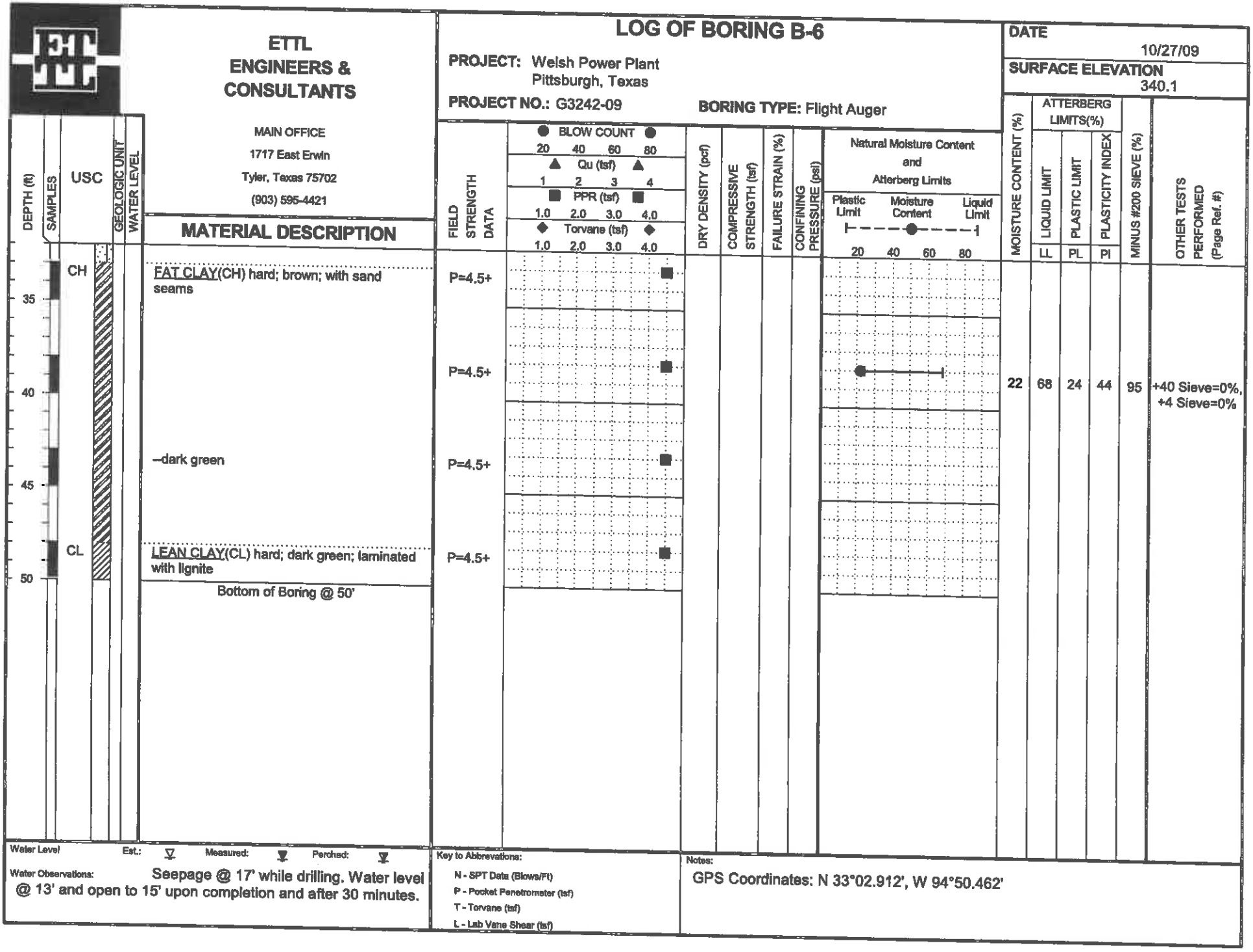
Natural Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
20 40 60 80

Water Level Est.: Measured: Perched:

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

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

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



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-6

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	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35		CH			FAT CLAY(CH) hard; brown; with sand seams	P=4.5+					22	68	24	44	95	+40 Sieve=0%, +4 Sieve=0%
40						P=4.5+										
45					–dark green	P=4.5+										
50		CL			LEAN CLAY(CL) hard; dark green; laminated with lignite	P=4.5+										
					Bottom of Boring @ 50'											

BLOW COUNT (20 40 60 80)
Qu (tsf) (1 2 3 4)
PPR (tsf) (1.0 2.0 3.0 4.0)
Torvane (tsf) (1.0 2.0 3.0 4.0)

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

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

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

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

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

Piezometer B-6

ENVIRONMENTAL LOG

Client: Welsh Power Plant

Project No: G3242-095 **Phase** **Task**

Well No. B-6

Location Pittsburg, Texas

Surface Elev.

Depth Feet	Sampler	Overburden/Lithologic Description
0		**Ground Surface**
		FAT CLAY(CH) very stiff; red and gray; with ferric seams
		SANDY LEAN CLAY(CL) hard; red and tan
5		
		–very stiff; red, gray, and brown; with gravel
		–with sand seams
10		
15		
		SILTY SAND(SM) gray; saturated
20		
		–very dense; gray and red
25		

Field Strength Data | Graphic Log | Well Construction Graphics | Depth Feet | Well Construction Details

T.O.C. Elev.

Continued Next Page

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

ENVIRONMENTAL LOG

Client: Welsh Power Plant

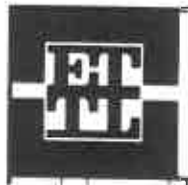
Project No: G3242-095 **Phase** **Task**

Well No. B-6

Location Pittsburg, Texas

Surface Elev.

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(CH) hard; brown; with sand seams				30	
35					35	
40	–dark green				40	
45					45	
50	LEAN CLAY(CL) hard; dark green; laminated with lignite				50	
	Bottom of Boring @ 50'					
55						
60						



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

LOG OF BORING B-7

PROJECT: Welsh Power Plant
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 340.4

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SM			SILTY SAND(SM) dense; tan	N=31					21				21	+40 Sieve=0%, +4 Sieve=0%
						N=36										
5					--gray; saturated	N=38					23				15	+40 Sieve=0%, +4 Sieve=0%
					--very dense	N=59										
10																
		CH			FAT CLAY(CH) very stiff; dark gray; with silt and ferric seams	N=26					14	58	22	36	98	+40 Sieve=0%, +4 Sieve=0%
15																
20																
					--hard; gray and black; with trace of lignite	P=4.5+										
25					--gray											
						P=4.5+										
30					Bottom of Boring @ 30'											

FIELD STRENGTH DATA: BLOW COUNT ● (20 40 60 80); Qu (tsf) ▲ (1 2 3 4); PPR (tsf) ■ (1.0 2.0 3.0 4.0); Torvane (tsf) ◆ (1.0 2.0 3.0 4.0)

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

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

Water Observations: Seepage @ 4' while drilling. Water level @ 2' and open to 7' upon completion.

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

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

Landfill Boring B-2

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas
DRILL RIG: B-61 HDX
PROJECT NO.: G4207-146
BORING TYPE: Rotary Wash/Flight Auger

DATE 10/8/14
SURFACE ELEVATION 373.8

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		ML	ASH (SILT WITH GRAVEL(ML)) medium dense; light grayish brown; with coarse-grained sand and lightly cemented gravel pieces; dry	N=13					46				59	+40 Sieve=27% +4 Sieve=16%
5		SM	ASH (SILTY SAND(SM)) medium dense; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces --loose; moist	N=29 N=18 N=9					40				40	+40 Sieve=19% +4 Sieve=2%
10														
15		MH	ASH (ELASTIC SILT(MH)) very loose; black; with fine-grained sand and lightly cemented gravel pieces; saturated	N=0					200	134	92	42	100	+40 Sieve=0% +4 Sieve=0%
20		SM	ASH (SILTY SAND(SM)) very loose; dark brown; with coarse-grained sand and lightly cemented gravel pieces; moist	N=1										
25			--loose; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces; moist	N=7					91				61	+40 Sieve=11% +4 Sieve=1%
30		CL	SANDY LEAN CLAY(CL) medium stiff; dark brown and black; with fine-grained sand and cemented gravel pieces; saturated	N=6					18	30	15	15	63	+40 Sieve=1% +4 Sieve=0%

GEOLOGIC UNIT: Eqc @ 28-43' & Er @ 43-60'
WATER LEVEL

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

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

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

Water Observations: Water level @ 13'.

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

Notes:

GPS Coordinates: N33.04890°, W94.84451°
Driller: Tommy Cook
Logger: B.Hobbs/O.Sanderson

LOG OF BORING B-2 (cont.)

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

PROJECT NO.: G4207-146

DRILL RIG: B-61 HDX

BORING TYPE: Rotary Wash/Flight Auger

DATE 10/8/14

SURFACE ELEVATION 373.8

ETTL ENGINEERS & CONSULTANTS

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

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35		SC			CLAYEY SAND(SC) dense; light brown, light gray and reddish brown; moist; with fine-grained sand; mottled	P=3.5 P=2.75	110	1.39	4.3	21	18 16	30	15	15	39	+40 Sieve=0% +4 Sieve=0%
40		SM			SILTY SAND(SM) very dense; light brown, yellowish brown and light gray; moist; mottled; with fine-grained sand	N=78					21				24	+40 Sieve=0% +4 Sieve=0%
45		CH	Eqc @ 28-43' & Er @ 43-60'		FAT CLAY(CH) very stiff; dark brown and light brown; moist; with sand seams; laminated	N=27					25	62	26	36	96	+40 Sieve=2% +4 Sieve=0%
50					--dark brown with light gray; moist; with silt seams	P=4.0	98				24					
55																
60					--hard; dark brown; moist	N=37										
					Bottom of Boring @ 60'											

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

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

Water Level Est.: Measured: Perched:

Water Observations: Water level @ 13'.

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

Notes:

GPS Coordinates: N33.04890°, W94.84451°

Driller: Tommy Cook

Logger: B.Hobbs/O.Sanderson

Landfill Boring B-10

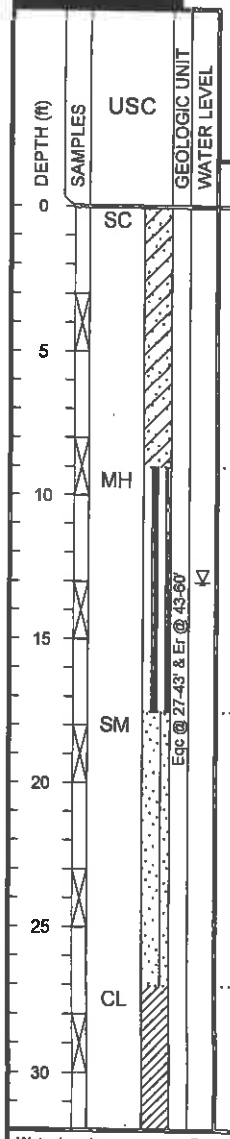
ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING B-10

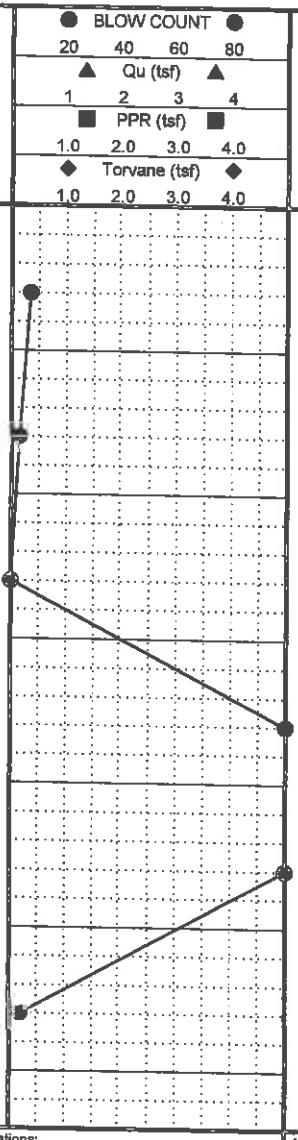
PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.
Welsh Power Station - Cason, Texas
PROJECT NO.: G4207-146
DRILL RIG: B-61 HDX
BORING TYPE: Rotary Wash/Flight Auger

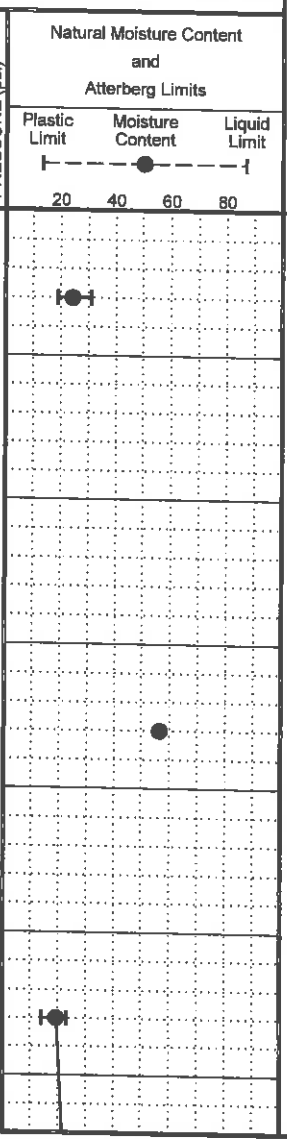
DATE 10/8/14
SURFACE ELEVATION 373.2



MATERIAL DESCRIPTION

Depth (ft)	USC	Material Description	Field Strength Data
0	SC	ASH (CLAYEY SAND(SC)) loose; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces; moist	N=7
5			
10	MH	ASH (ELASTIC SILT(MH)) very loose; black; moist	N=3
15		--wet	N=0
20	SM	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'	N=50/1"
25		--cemented layer from 23' to 27'	N=50/4"
30	CL	SANDY LEAN CLAY(CL) medium stiff; grayish brown and yellowish brown; saturated; mottled	N=4





Moisture Content (%)	Atterberg Limits (%) LL	PL	PI	Minus #200 Sieve (%)	Other Tests Performed (Page Ref. #)
24	31	19	12	41	+40 Sieve=21% +4 Sieve=11%
56				14	+40 Sieve=71% +4 Sieve=28%
19	23	14	9	57	+40 Sieve=1% +4 Sieve=0%

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

Water Observations: Seepage @ 13' while drilling.

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

Notes:

GPS Coordinates: N33.04895°, W94.84390°
Driller: Tommy Cook
Logger: B.Hobbs/O.Sanderson

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.: G4207-146

DRILL RIG: B-61 HDX

BORING TYPE: Rotary Wash/Flight Auger

DATE 10/8/14

SURFACE ELEVATION 373.2

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Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
35						P=1.25 P=1.0	107	2.10	6.1	21	22					
40		SC			CLAYEY SAND(SC) medium dense; reddish brown and grayish brown; moist; mottled	N=23					22	25	17	8	27	+40 Sieve=3% +4 Sieve=0%
45		CH	Eqc @ 27-43' & Er @ 43-60'		FAT CLAY(CH) very stiff; dark brown with light gray; with silt seams; moist	N=18					25	64	24	40	90	+40 Sieve=7% +4 Sieve=0%
50					--hard	P=4.5+										
55						P=4.5+										
60					Bottom of Boring @ 60'											

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

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

Water Observations: Seepage @ 13' while drilling.

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

Notes:

GPS Coordinates: N33.04895°, W94.84390°

Driller: Tommy Cook

Logger: B.Hobbs/O.Sanderson

Landfill Boring B-12

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

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

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

DATE 10/15/14
SURFACE ELEVATION 361.7

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			LEAN CLAY WITH SAND(CL) stiff; light gray and reddish brown; moist; mottled	P=3.75										
5		CL			SANDY LEAN CLAY(CL) stiff; light brown, light gray and reddish brown; moist; mottled	N=15					16	33	19	14	58	+40 Sieve=1% +4 Sieve=0%
10					--grayish brown and brown; moist	N=11										
15		CH	Etc		FAT CLAY WITH SAND(CH) stiff; light gray and reddish brown; moist; mottled; with ferric seams	P=3.75										
20		CL			LEAN CLAY(CL) stiff; light gray and brownish gray; moist; layered with silt	N=14					24	39	19	20	93	+40 Sieve=1% +4 Sieve=0%
25		ML			SILT WITH SAND(ML) very dense; light brown and yellowish brown; moist; with clay seams	N=53										
30					Bottom of Boring @ 30'											

BLOW COUNT (20 40 60 80)
Qu (tsf) (1 2 3 4)
PPR (tsf) (1.0 2.0 3.0 4.0)
Torvane (tsf) (1.0 2.0 3.0 4.0)

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

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

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

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

Notes:

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

Land fill Boring B-13

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

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

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

DATE 10/15/14
SURFACE ELEVATION 361.4

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			LEAN CLAY WITH SAND(CL) medium stiff; reddish brown with light gray; moist	N=7					20	45	17	28	76	+40 Sieve=1% +4 Sieve=0%
5		CL			SANDY LEAN CLAY(CL) very stiff; light brown, gray and reddish brown; moist; mottled	P=4.0										
10		SC			CLAYEY SAND(SC) medium dense; grayish brown; moist	N=11										
		CH			FAT CLAY WITH SAND(CH) medium stiff; reddish brown and light gray; moist; mottled											
15			Egc			N=8					22	54	20	34	79	+40 Sieve=1% +4 Sieve=0%
20		CL			LEAN CLAY(CL) very stiff; light gray and grayish brown; moist; layered with silt	N=21										
25		ML		▽	SILT WITH SAND(ML) very dense; light gray and yellowish brown; wet; with clay seams	N=50/5"					24				80	+40 Sieve=0% +4 Sieve=0%
30					Bottom of Boring @ 30'											

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

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

Water Observations: Water level @ 28' and open upon completion.

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

Notes:

GPS Coordinates: N33.047160°, W94.84384°
Driller: Lewis Drilling, Inc.
Logger: O.Sanderson

Landfill Boring B-14

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING B-14

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

PROJECT NO.: G4207-146

DRILL RIG:

BORING TYPE: Flight Auger

DATE 10/14/14

SURFACE ELEVATION 347.2

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	ATTERBERG LIMITS(%) PLASTIC LIMIT (PL)	ATTERBERG LIMITS(%) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			SANDY LEAN CLAY(CL) medium stiff; yellowish brown with reddish brown; dry; with clay seams	N=9										
5																
10		ML			SANDY SILT(ML) medium dense; grayish brown; moist; with clay seams	N=11					108	17	17	NP	68	+40 Sieve=1% +4 Sieve=1%
15		CL	Eqc @ 0-28' & Er @ 28-30'		SANDY LEAN CLAY(CL) very stiff; light gray and gray; moist	P=4.0										
20					–light gray and grayish brown; moist; layered with silt	N=34					26	40	16	24	67	+40 Sieve=1% +4 Sieve=0%
25		SP SM			POORLY GRADED SAND WITH SILT(SP-SM) medium dense; yellowish brown, light gray and reddish brown; wet	N=27					25				10	+40 Sieve=0% +4 Sieve=0%
30		CL			LEAN CLAY(CL) very stiff; dark brown; moist; with silt partings	N=26										
					Bottom of Boring @ 30'											

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

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

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

Water Observations: Water level @ 17' and caved to 23' 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: N33.04774°, W94.84290°

Driller: Lewis Drilling, Inc.

Logger: O.Sanderson

Landfill Boring B-15

ETTL
ENGINEERS &
CONSULTANTS

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

LOG OF BORING B-15

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

PROJECT NO.: G4207-146

DRILL RIG:

BORING TYPE: Flight Auger

DATE 10/14/14

SURFACE ELEVATION 348.2

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CH	FAT CLAY(CH) stiff; reddish brown and light gray; moist; mottled	N=10						
5									
10		--very stiff; light gray, grayish brown and reddish brown; moist; layered	P=3.75	24	59	21	38	85	+40 Sieve=0% +4 Sieve=0%
15	SM	SILTY SAND(SM) very dense; light brown; dry	N=59	7				12	+40 Sieve=0% +4 Sieve=0%
20		--medium dense; wet	N=21						
25		--very dense	N=56						
30	CL	LEAN CLAY(CL) hard; dark brown; moist; with silt partings	P=4.5	25	45	22	23	92	+40 Sieve=0% +4 Sieve=0%
		Bottom of Boring @ 30'							

Esc @ 0-28' & Er @ 28-30'

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

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

Water Observations: 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°, W94.84286°

Driller: Lewis Drilling, Inc.

Logger: O.Sanderson

ARCADIS

Appendix B

Photographic Log

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
1	8/20/2015

Direction Photo Taken:

North

Description:
Staging area west of landfill.

P8200493

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
2	8/20/2015

Direction Photo Taken:

South Southeast

Description:

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

P8200495

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
3	8/20/2015

Direction Photo Taken:

West Northwest

Description:

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

P8200497

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
4	8/20/2015

Direction Photo Taken:

Northeast

Description:

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

P8200501

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
5	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

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
6	8/20/2015

Direction Photo Taken:

East Northeast

Description:

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

P8200510

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
7	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

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
8	8/20/2015

Direction Photo Taken:

North

Description:

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

P8200522

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
9	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

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
10	8/20/2015

Direction Photo Taken:

North Northeast

Description:

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

P8200530

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
11	8/20/2015

Direction Photo Taken:

South

Description:

Top of landfill.

P8200534

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
12	8/20/2015

Direction Photo Taken:

Southeast

Description:

View of lined bottom ash storage pond.

P8200538

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
13	8/20/2015

Direction Photo Taken:

Southeast

Description:

Lined bottom ash storage pond.

P8200545

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
14	8/20/2015

Direction Photo Taken:

South

Description:

Southside of lined bottom ash storage pond.

P8200547

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
15	8/20/2015

Direction Photo Taken:

West

Description:

East side of lined bottom ash storage pond.

P8200560

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
16	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

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
17	8/20/2015

Direction Photo Taken:

Description:

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

P8200577

ARCADIS

PHOTOGRAPHIC LOG

Project Name:	Location:	Project No.
AEP – J. ROBERT WELSH POWER PLANT	PITTSBURG, TITUS COUNTY, TEXAS	OK001625.0001

Photo No.	Date:
18	8/20/2015

Direction Photo Taken:

South Southwest

Description:

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

P8200578