

**American Electric Power Service  
Corporation**

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

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

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CCR Groundwater Monitoring  
Well Network Evaluation**

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Pittsburg, Texas

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AEP

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**Acronyms and Abbreviation**

AEP	American Electric Power Service Cooperation
amsl	above mean sea level
ARCADIS	ARCADIS U.S., Inc.
BAP	bottom ash pond
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
FAP	fly ash pond
FGD	flue gas desulfurization
ft	feet
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 bottom ash pond, landfill, and Bottom Ash Storage Pond (**Figure 2**). This report summarizes the evaluation of the groundwater monitoring well network in the uppermost aquifer at the 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 publicly-available geologic and hydrogeologic data. This 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 the southern portion 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 bottom ash pond and in the adjacent landfill that was constructed in the late 1970's. In 2000, the 22-acre Bottom Ash Storage Pond was installed south of the landfill. The Bottom Ash Storage Pond was constructed with a 60-mil high-density polyethylene (HDPE) liner, and receives bottom ash and economizer ash dredged and sluiced from the primary bottom ash pond (**Figure 2**).

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 bottom 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 bottom 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 bottom ash pond area, and geotechnical soil testing to characterize the area encompassed by the primary bottom 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 bottom ash pond and Bottom Ash Storage Pond to obtain hydrologic data for the uppermost water-bearing unit. Twelve additional monitoring wells (AD-4a, AD-4b, AD-4c, AD-6 through AD-14) were installed in the area of the primary bottom ash pond, Bottom Ash Storage Pond, and landfill by Eagle Environmental Services in 2009 to obtain more detailed hydrologic data for the uppermost water-bearing unit.

In 2010, Freese and Nichols performed a *Hydraulic Analysis of the Welsh Power Plant Ash Ponds* (Freese and Nichols, 2010). The report concluded the spillways for the primary bottom ash pond, clear water pond, and 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 E TTL report entitled “*Geotechnical Investigation, Welsh Power Station, Existing Ash Storage Ponds Embankment Investigation, Pittsburg, Texas*” (E TTL, 2010).

#### 2.4.3 Surface Water and Surface Water Groundwater Interactions

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

The 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** and **Figure 10** are potentiometric surface maps for the uppermost aquifer at the Site based on March 2016 and February 2017 water level data, respectively. Water level elevations in the Site monitoring wells are summarized on **Table 1**. As shown on **Figures 9** and **10**, shallow groundwater flow direction in the 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 bottom ash pond, and was installed for Southwestern Electric Company in 1974 with screens from 515 to 535 feet below ground surface, and plugged at a later date.

### **3. Groundwater Monitoring Well Network Evaluation**

The existing monitoring well network present at the Site was evaluated to determine if any of the wells were viable for continued use as part of the groundwater monitoring well network or also retained as part of a larger groundwater hydraulic monitoring well network. The hydrogeologic conditions were also evaluated to determine if the uppermost aquifer unit has an effective well network. The evaluation was completed in accordance with 40 CFR 257.91 to have an established monitoring well network that effectively monitors the uppermost aquifer upgradient and down gradient of the Site. The upgradient 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 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 2017. The most recent comprehensive groundwater data set from February 2017 is depicted on **Figure 10**. 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 AD-4c 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 upgradient monitoring wells for the Bottom Ash Storage Pond. Monitoring well AD-17, installed northwest (upgradient) of the Bottom Ash Storage Pond during December 2015, will also be utilized as an upgradient monitoring well 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 **Figures 9** and **10**, 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 and AD-17, 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 (upgradient 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**

Three upgradient well locations (existing monitoring wells AD-1, AD-5, and AD-17) 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 11**.

###### **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 and AD-17. Monitoring wells AD-16R and AD-17 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**.



**Bottom Ash Storage  
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1187 County Road 4865  
Titus County, Pittsburg, Texas

**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

Registration No.

Texas

Registration State

11-29-2022

Date



## 5. References

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**Tables**

**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	5/26/2016	7/27/2016	10/19/2016	12/12/2016	1/17/2017	2/23/2017	
									Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl
<b>Monitoring Wells</b>																													
AD-1 <sup>(a)</sup>	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	344.89	342.89	341.23	340.58	341.18	339.74	
AD-2 <sup>(c)</sup>	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 <sup>(c)</sup>	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	324.59	323.70	323.47	323.78	325.04	324.92	
AD-4 <sup>(c)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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	325.89	324.01	323.76	325.07	326.39	324.89	
AD-5 <sup>(c)</sup>	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	337.62	337.24	337.74	337.01	338.34	336.17	
AD-6 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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	325.68	325.05	325.29	325.92	326.76	324.27	
AD-9 <sup>(a)</sup>	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	329.28	329.53	328.92	329.31	330.50	328.05	
AD-10 <sup>(a)</sup>	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 <sup>(a)</sup>	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	328.39	328.14	327.87	328.20	328.90	328.25	
AD-12 <sup>(a)</sup>	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 <sup>(a)</sup>	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	334.54	332.93	332.39	332.84	334.54	331.83	
AD-14 <sup>(a)</sup>	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	334.51	331.71	330.94	330.79	332.63	330.87	
AD-15 <sup>(d)</sup>	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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-16 <sup>(d)</sup>	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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-16R <sup>(e)</sup>	33° 02' 49"	94° 50' 28.9"	350.55	353.49	27.0	4/12/17	Sch. 40 PVC	2	12.0	338.55	27.0	323.55	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-17 <sup>(d)</sup>	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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-18 <sup>(d)</sup>	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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
<b>Piezometers</b>																													
B-2 <sup>(b)</sup>	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	NM	NM	NM	NM	NM	NM	
B-4 <sup>(b)</sup>	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	NM	NM	NM	NM	NM	NM	
B-5 <sup>(b)</sup>	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	NM	NM	NM	NM	NM	NM	
B-6 <sup>(b)</sup>	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	NM	NM	NM	NM	NM	

NM - Not measured.  
(a) Source: Eagle Environmental Services Well Logs (2009).  
(b) Source: EITL 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.  
(e) Monitoring well installed by ARCADIS on April 12, 2017 as a replacement for monitoring well AD-16.  
Groundwater Elevation Source: AEP, Shallow Groundwater Data Summary through February 2017.

**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
<b>Monitoring Wells</b>															
AD-1 <sup>(c)</sup>	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 <sup>(c)</sup>	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 <sup>(c)</sup>	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 <sup>(c)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(c)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(a)</sup>	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 <sup>(d)</sup>	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 <sup>(d)</sup>	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 <sup>(d)</sup>	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
<b>Piezometers</b>															
B-2 <sup>(b)</sup>	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 <sup>(b)</sup>	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 <sup>(b)</sup>	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 <sup>(b)</sup>	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 <sup>(d)</sup>	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: E TTL Engineers & Consultants Inc. (June 21, 2010).  
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).  
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.

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

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

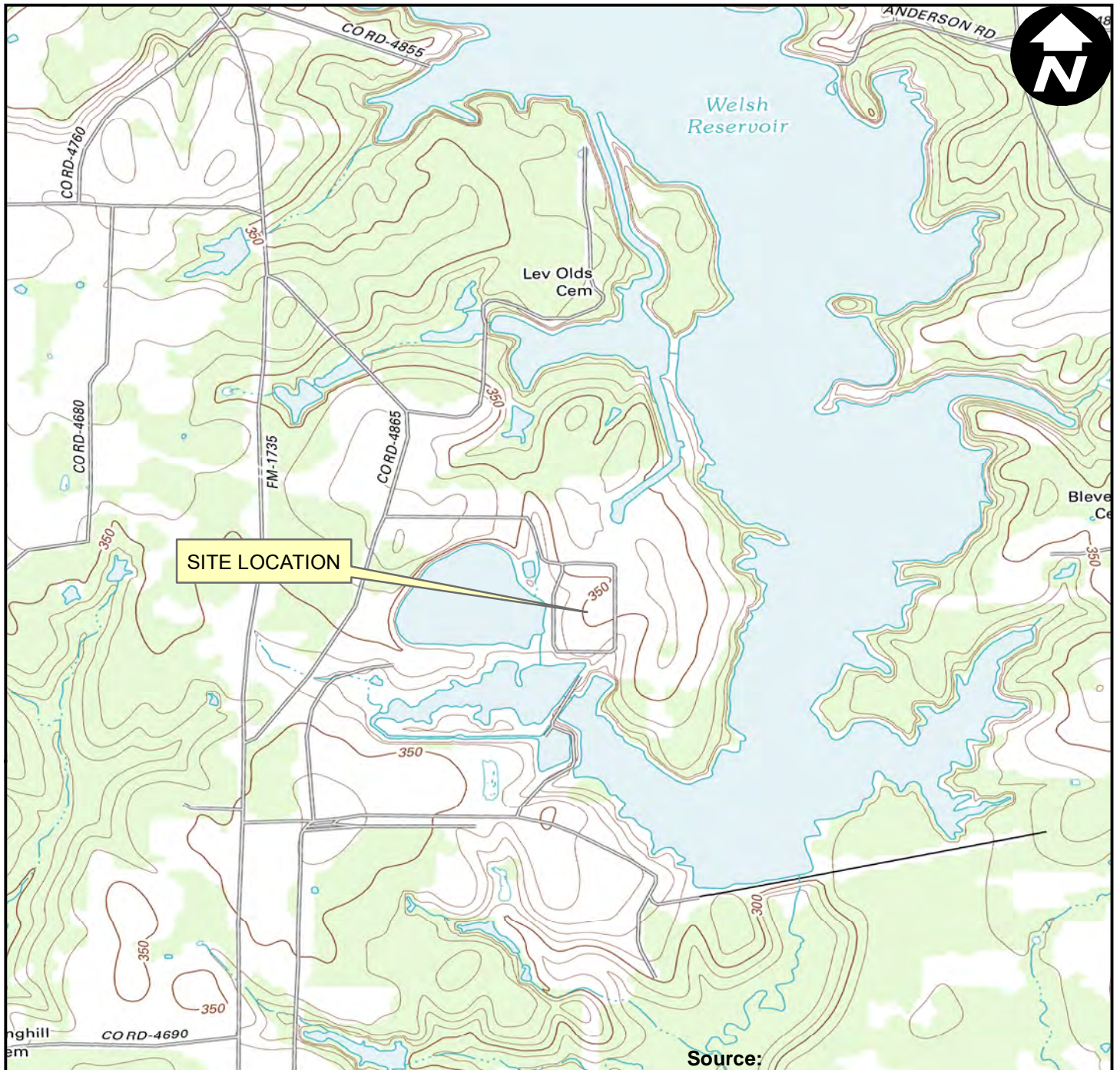
Well ID	Existing/ Proposed	Hydrostratigraphic Unit Target	Location Description		Screen Top Elevation (ft amsl)	Screen Bottom Elevation (ft amsl)	Screen Length (ft)	Comments
<b>Upgradient</b>								
AD-1	Existing	Uppermost Water-Bearing Unit	West of Bottom Ash Storage Pond	Upgradient	340.6	330.6	10	Existing well installed in 2001; well will be utilized to establish background 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 utilized to establish background 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
<b>Downgradient</b>								
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
<b>Piezometers</b>								
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 utilized 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 utilized 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 utilized 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 utilized 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:**

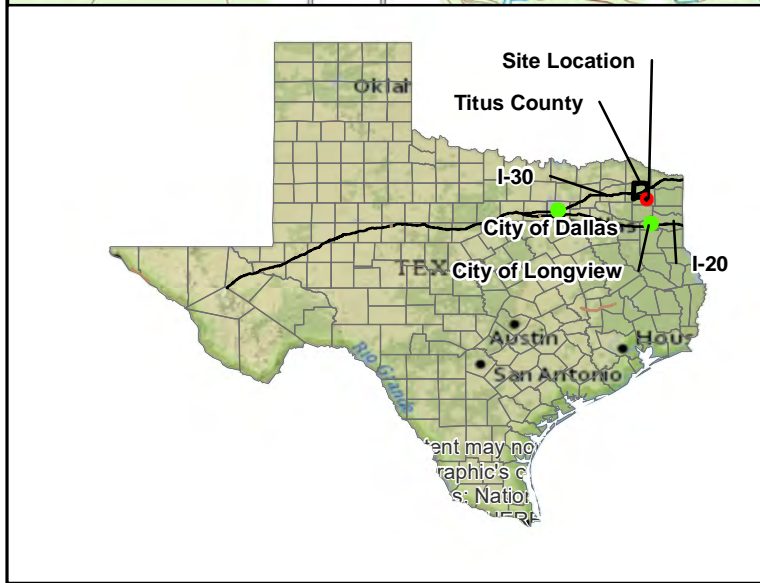
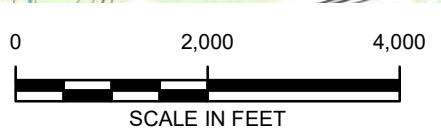
U=Upgradient  
D=Downgradient  
ft = feet  
amsl = above mean sea level



**Figures**



Source:  
7.5 minute topographic quadrangle  
Cason, Texas, 2013



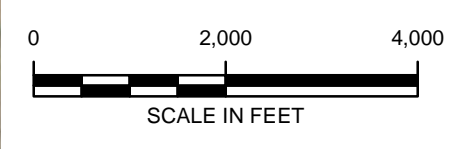
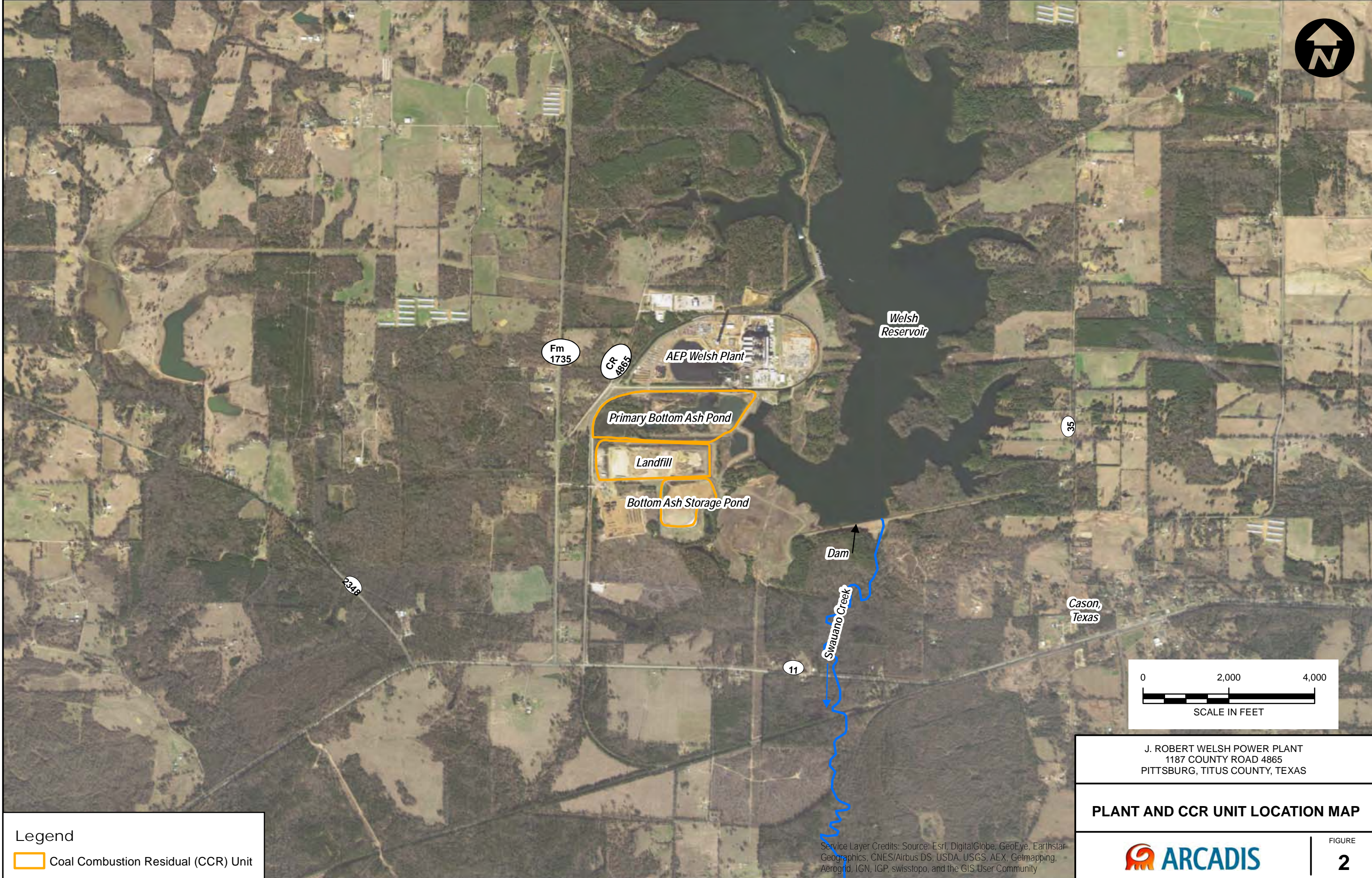
J. ROBERT WELSH POWER PLANT  
1187 COUNTY ROAD 4865  
PITTSBURG, TITUS COUNTY, TEXAS

**SITE LOCATION MAP**



FIGURE  
**1**






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

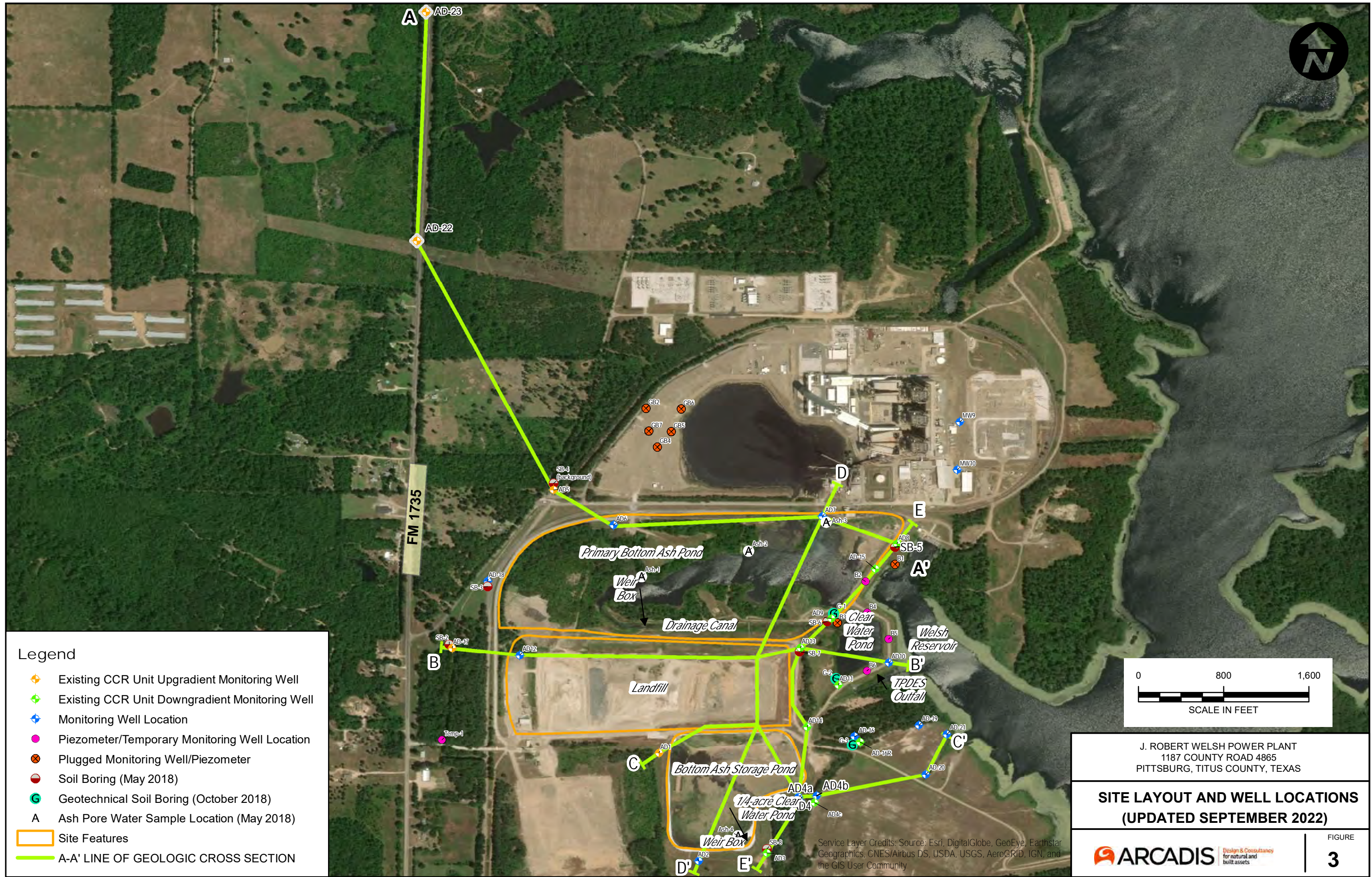
**PLANT AND CCR UNIT LOCATION MAP**

**Legend**

 Coal Combustion Residual (CCR) Unit

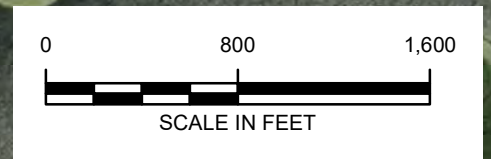
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community





**Legend**

- Existing CCR Unit Upgradient Monitoring Well
- Existing CCR Unit Downgradient Monitoring Well
- Monitoring Well Location
- Piezometer/Temporary Monitoring Well Location
- Plugged Monitoring Well/Piezometer
- Soil Boring (May 2018)
- Geotechnical Soil Boring (October 2018)
- A Ash Pore Water Sample Location (May 2018)
- Site Features
- A-A' LINE OF GEOLOGIC CROSS SECTION



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

**SITE LAYOUT AND WELL LOCATIONS  
 (UPDATED SEPTEMBER 2022)**

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

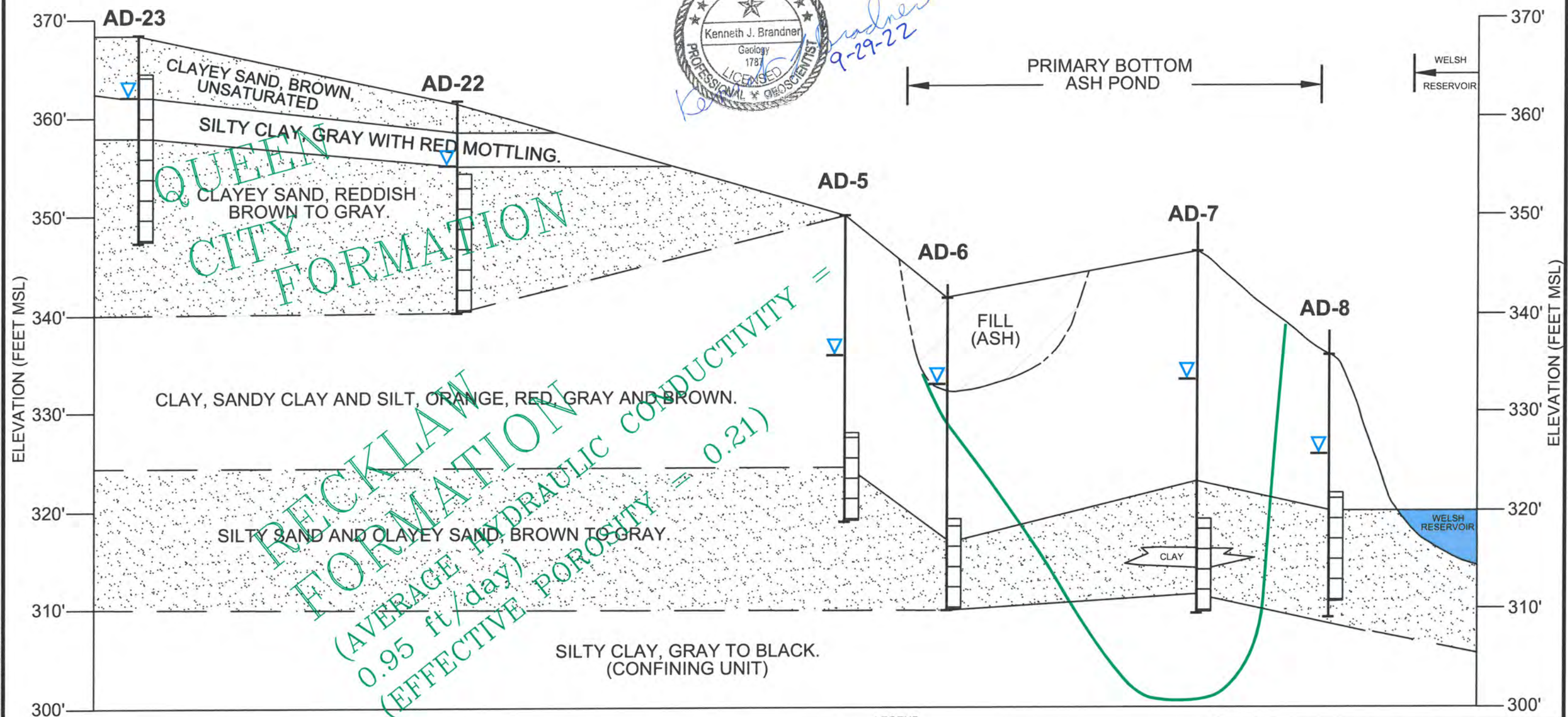
Design & Consultancy for natural and built assets

FIGURE  
**3**

CITY: DIV/GROUP: DB: LD: AM: PD: TM: TR: LYRON\* OFF=REF-  
 C:\Users\smith\OneDrive - Arcadis\OneDrive - Arcadis\Documents\AUS-REF-J-ROBERT WELSH POWER PLANT-PITTSBURG Texas\2022\01-10-Progress\01-DWG\Figure 4 Cross Section A-A.dwg LAYOUT: A-A SAVED: 9/28/2022 11:15 AM ACADVER: 24.26 (LMS TECH) PAGES: 1 OF 1  
 PLOTSTYLE/TABLE: ACAD.CTB PLOTTED: 9/28/2022 11:47 AM BY: SMITH, BOB

WEST  
A

EAST  
A'



QUEEN CITY FORMATION

RECKLAW FORMATION  
 (AVERAGE HYDRAULIC CONDUCTIVITY = 0.95 ft/day)  
 (EFFECTIVE POROSITY = 0.21)

- NOTES:
1. 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).
  2. HYDRAULIC CONDUCTIVITY CALCULATED BASED ON ON-SITE AQUIFER TEST OF MONITORING WELL AD-6 ON 9-17-21; AND SLUG TESTING OF MONITORING WELLS AD-6, AD-9, AD-13, AD-17, AND AD-19 DURING OCTOBER 2018.
  3. EFFECTIVE POROSITY ESTIMATED AT 0.21 BASED ON SITE LITHOLOGY. SITE SPECIFIC YIELD FOR FINE SAND, REFERENCE: C. W. FETTER, "APPLIED HYDROGEOLOGY", UNIVERSITY OF WISCONSIN - OSHKOSH, 1980.

- LEGEND
- ☐ MONITORING WELL SCREENED INTERVAL
  - ▽ WATER LEVEL IN EVALUATION (6/19/19)
  - PROJECTED BASE OF PRIMARY BOTTOM ASH POND (SEE NOTE)

0 600'  
HORIZONTAL SCALE

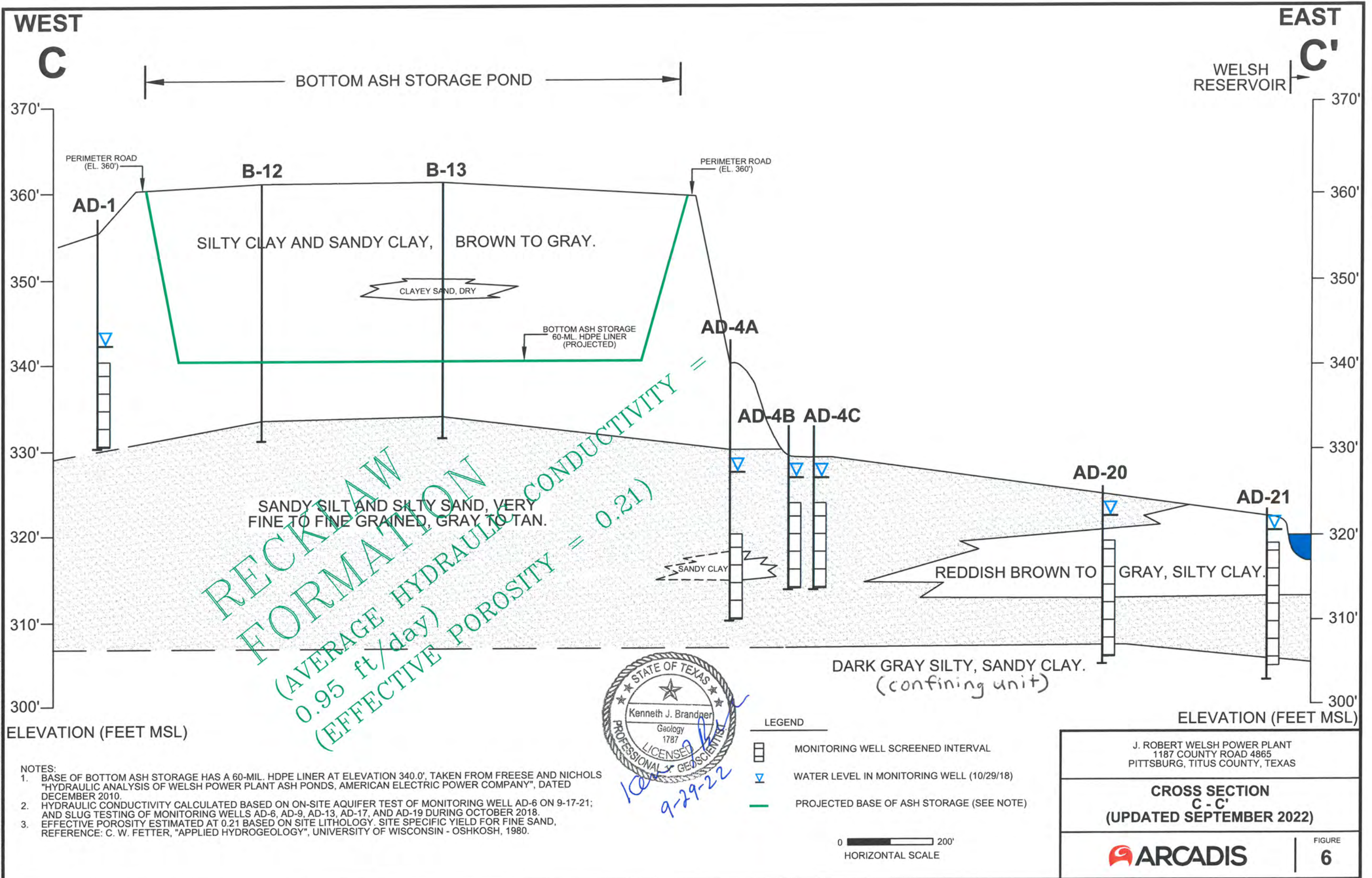
J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION  
 A - A'  
 (UPDATED SEPTEMBER 2022)**

**ARCADIS** | FIGURE 4



CITY: DIVISION: AM: PD: TR: LYNON-OFF-REF- ROBERT WELSH POWER PLANT-PITTSBURG Texas/202201-Progress/01-DWG/figure 6 Cross Section C-C.dwg LAYOUT: C-C. SAVED: 9/28/2022 11:33 AM ACADVER: 24.25 (LMS TECH) PAGES: 6  
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- NOTES:
1. BASE OF BOTTOM ASH STORAGE HAS A 60-MIL. 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.
  2. HYDRAULIC CONDUCTIVITY CALCULATED BASED ON ON-SITE AQUIFER TEST OF MONITORING WELL AD-6 ON 9-17-21; AND SLUG TESTING OF MONITORING WELLS AD-6, AD-9, AD-13, AD-17, AND AD-19 DURING OCTOBER 2018.
  3. EFFECTIVE POROSITY ESTIMATED AT 0.21 BASED ON SITE LITHOLOGY, SITE SPECIFIC YIELD FOR FINE SAND, REFERENCE: C. W. FETTER, "APPLIED HYDROGEOLOGY", UNIVERSITY OF WISCONSIN - OSKOSH, 1980.



- LEGEND
- MONITORING WELL SCREENED INTERVAL
  - WATER LEVEL IN MONITORING WELL (10/29/18)
  - PROJECTED BASE OF ASH STORAGE (SEE NOTE)



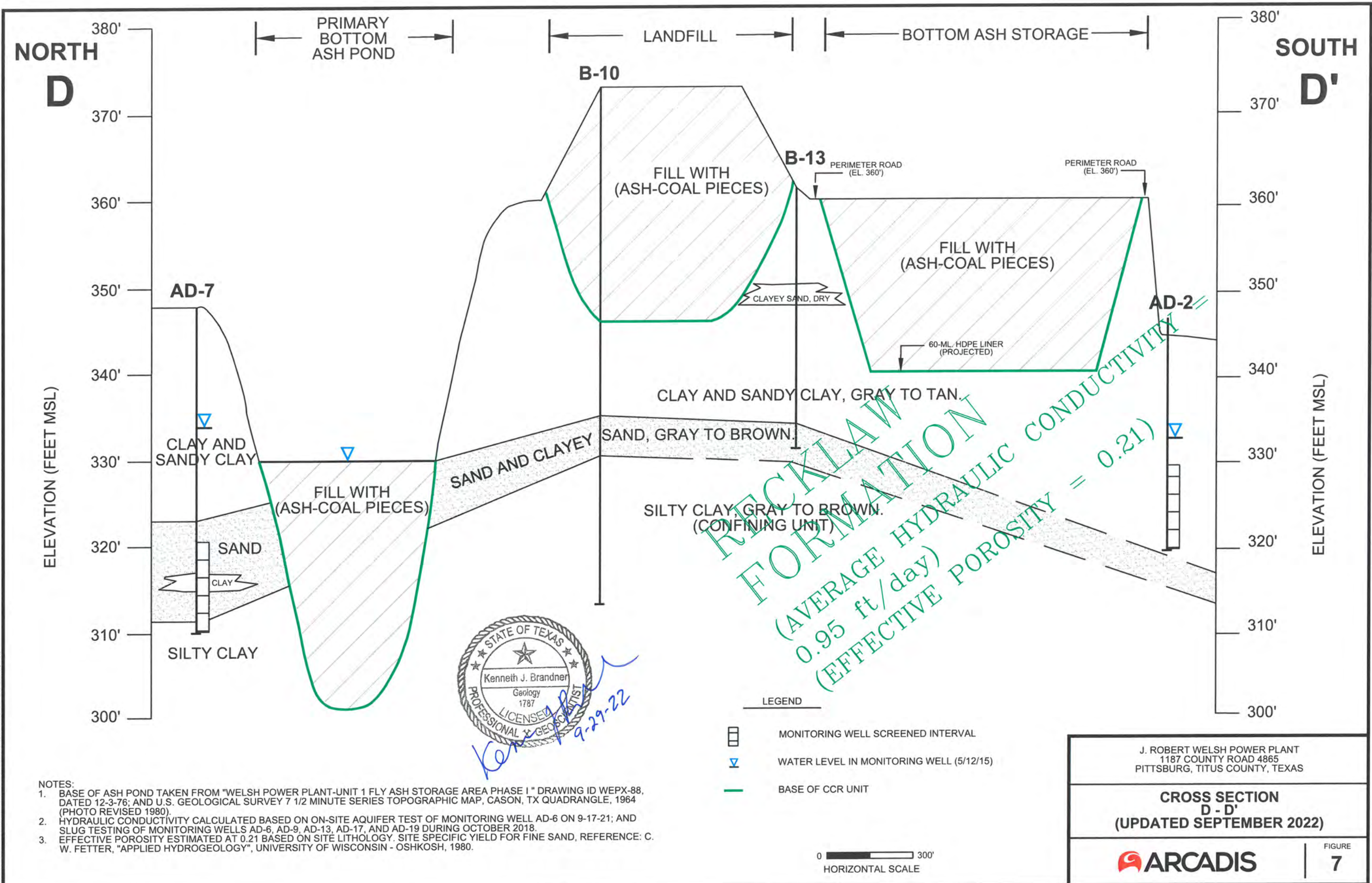
J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION  
 C - C'  
 (UPDATED SEPTEMBER 2022)**

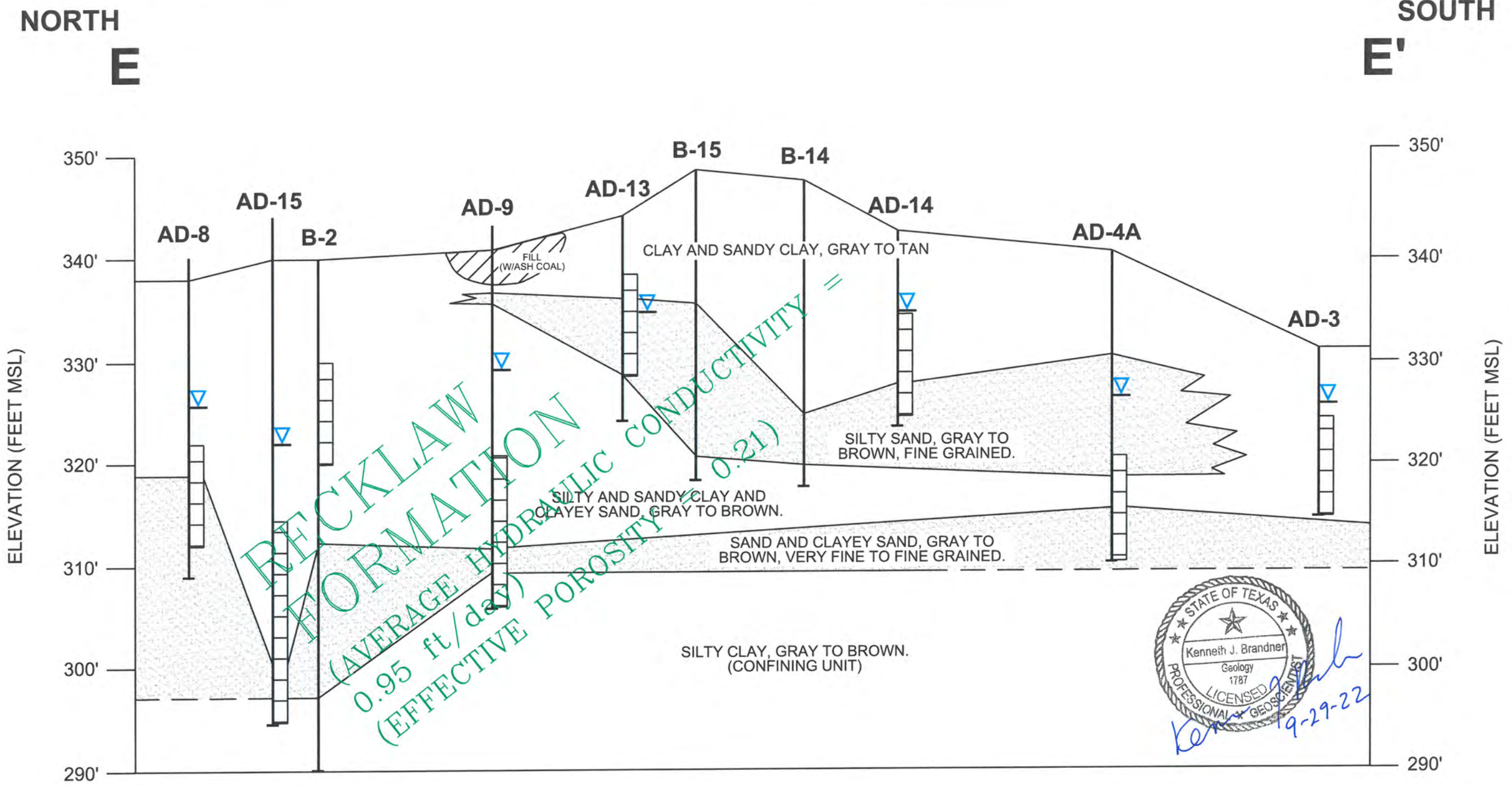
**ARCADIS**

FIGURE  
**6**

CITY: DIV/GRP: DB: LD: AM: PD: TM: TR: LYRON\*-OFF-REF-  
 C:\Users\mehin\OneDrive - Arcadis\GIS\BIM\60 - OneDrive Sync Location\AUS-AEP-J. ROBERT WELSH POWER PLANT-PITTSBURG Texas\202201-1-In Progress\01-DWG\Figure 7 Cross Section D-D.dwg LAYOUT: D-D SAVED: 9/28/2022 11:41 AM ACADVER: 24.2S (LMS TECH) PAGES: 1/1  
 PLOTSTYLE: ACAD.ctb PLOTTED: 9/28/2022 11:50 AM BY: SMITH, BOB



CITY: DIV/GROUP: DB: LD: AM: PD: TM: TR: LVR:ONE"OFF="REF" C:\Users\brmih\OneDrive - ARCADIS\BIM\360 - OneDrive Sync Location\AUS-AEP-J. ROBERT WELSH POWER PLANT-PITTSBURG Texas\2022\01-in Progress\01-DWG\Figure 8 Cross Section E-E.dwg LAYOUT: E-E SAVED: 9/27/2022 10:43 AM ACADVER: 24.2S (LMS TECH) PAGESETUP: PLOTSTYLETABLE: ACAD.CTB PLOTTED: 9/28/2022 11:46 AM BY: SMITH, BOB



- NOTES:
1. 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).
  2. HYDRAULIC CONDUCTIVITY CALCULATED BASED ON ON-SITE AQUIFER TEST OF MONITORING WELL AD-6 ON 9-17-21; AND SLUG TESTING OF MONITORING WELLS AD-6, AD-9, AD-13, AD-17, AND AD-19 DURING OCTOBER 2018.
  3. EFFECTIVE POROSITY ESTIMATED AT 0.21 BASED ON SITE LITHOLOGY. SITE SPECIFIC YIELD FOR FINE SAND, REFERENCE: C. W. FETTER, "APPLIED HYDROGEOLOGY", UNIVERSITY OF WISCONSIN - OSHKOSH, 1980.

- LEGEND
- ☐ MONITORING WELL SCREENED INTERVAL
  - ▽ WATER LEVEL IN MONITORING WELL (3/4/16)

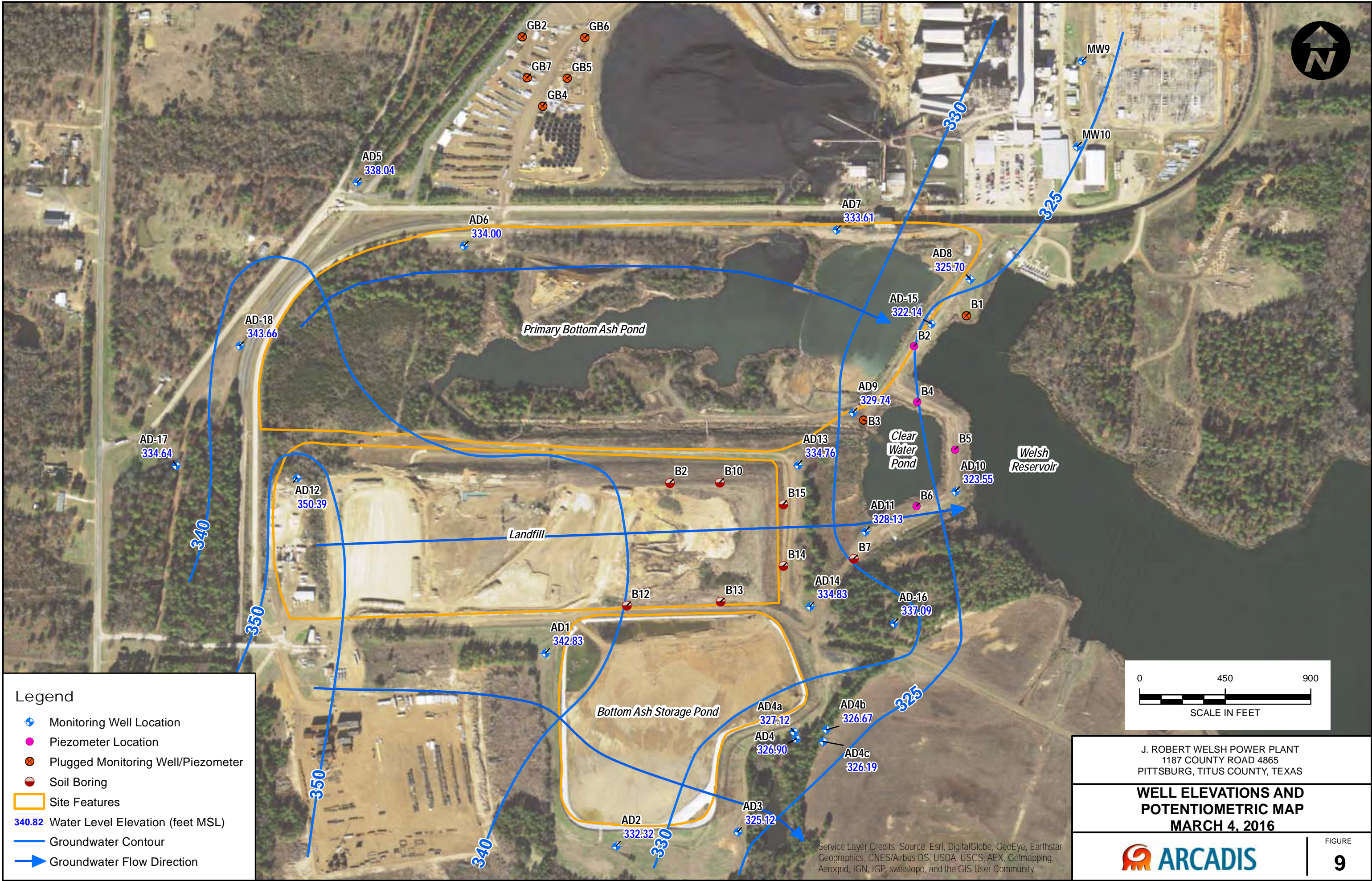


J. ROBERT WELSH POWER PLANT  
1187 COUNTY ROAD 4865  
PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION  
E - E'  
(UPDATED SEPTEMBER 2022)**

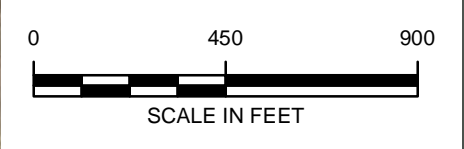
**ARCADIS**

FIGURE  
**8**



**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



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

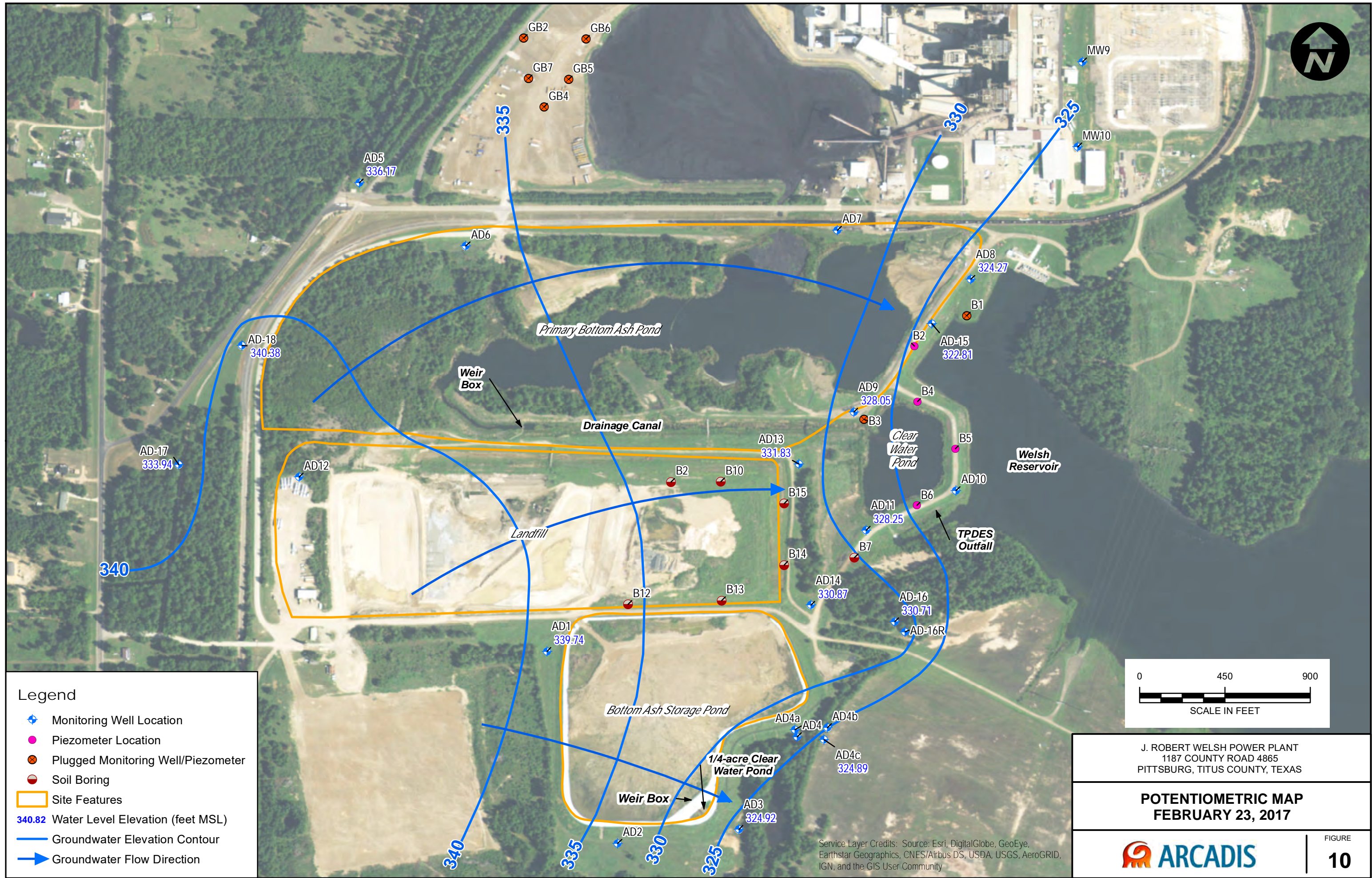
**WELL ELEVATIONS AND  
 POTENTIOMETRIC MAP  
 MARCH 4, 2016**

**ARCADIS**

FIGURE  
**9**

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





**Legend**

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

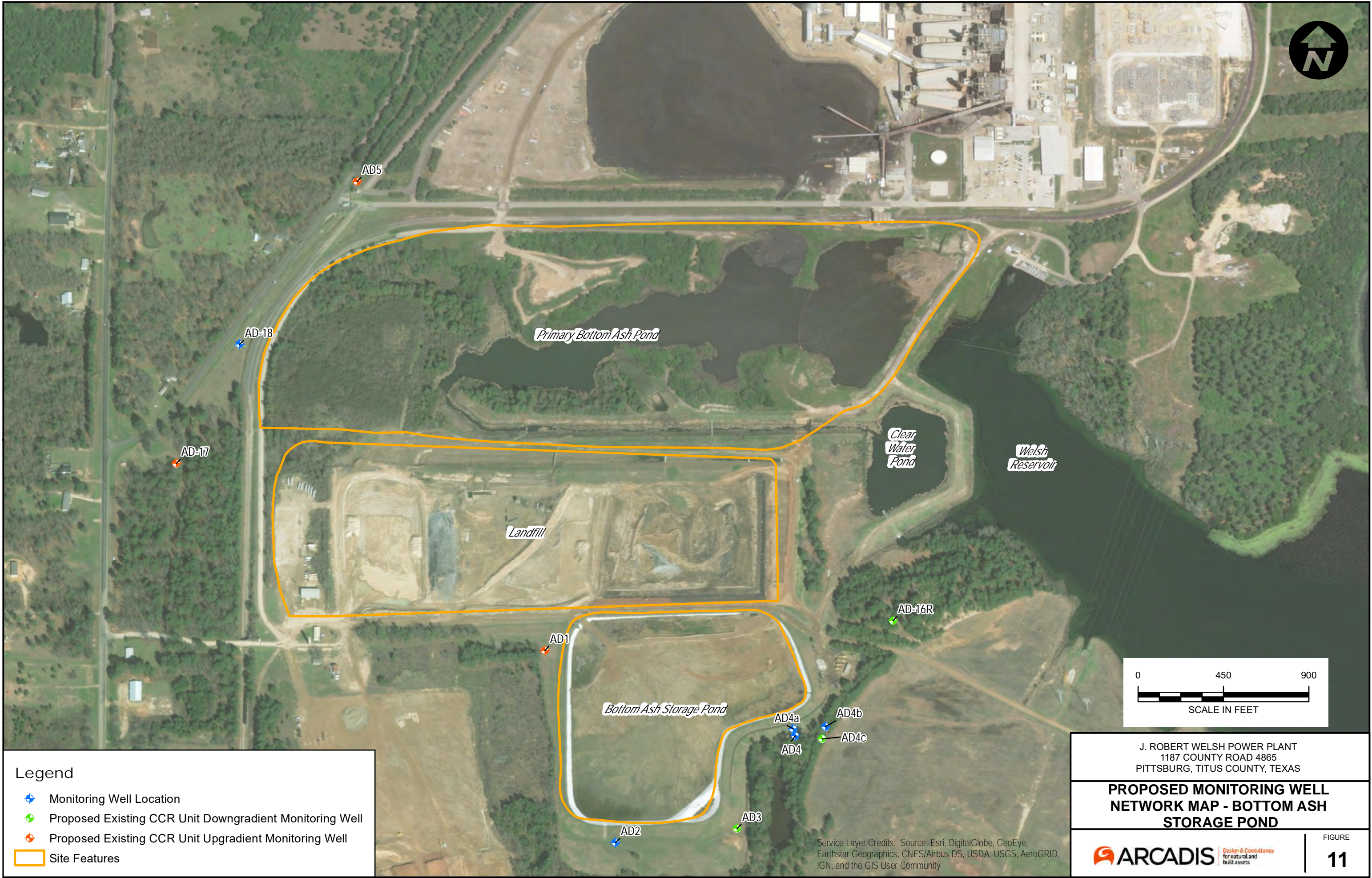
J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**POTENTIOMETRIC MAP  
 FEBRUARY 23, 2017**





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

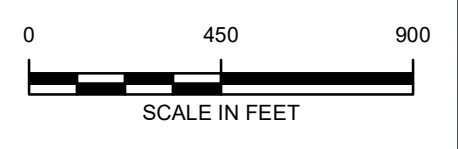
**ARCADIS**

FIGURE  
**10**



**Legend**

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



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

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


 Design & Consultancy for natural and built assets

FIGURE **11**

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



## **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.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

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

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

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

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

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

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

6) DRILLING METHOD (Check):  Driven  
 Air Rotary     Mud Rotary     Bored  
 Air Hammer     Cable Tool     Jetted  
 Other \_\_\_\_\_

7) Borehole Completion (Check):  Open Hole     Straight Wall  
 Underreamed     Gravel Packed     Other \_\_\_\_\_  
 If Gravel Packed give interval ... from 13 ft. to 25 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
<u>2</u>	<u>N</u>	<u>Riser</u>	<u>+2</u>	<u>15</u>	<u>Sch 40</u>
<u>2</u>	<u>N</u>	<u>#105/67 screen</u>	<u>15</u>	<u>25</u>	<u>Sch 40</u>

9) CEMENTING DATA [Rule 338.44(1)]  
 Cemented from 13 ft. to 0 ft. No. of sacks used 6-50#  
 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  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pileless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

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     Bailor     Jetted     Estimated  
 Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

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

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

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

ADDRESS \_\_\_\_\_ (Street or RFD) (City) (State) (Zip)

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

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

# AD-2

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

Please use black ink.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

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

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

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

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

5) GPS  
33°02'37"N  
94°50'44"W

6) WELL LOG:  
 Date Drilling: \_\_\_\_\_  
 Started 4/26 <sup>18</sup> 2001  
 Completed 4/26 <sup>18</sup> 2001

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

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

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

From (ft.)	To (ft.)	Description and color of formation material	CASING, BLANK PIPE, AND WELL SCREEN DATA:					
			Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From To	Gage Casting Screen	
<u>0</u>	<u>2</u>	<u>top soil</u>	<u>2</u>	<u>N</u>	<u>Riser</u>	<u>+2</u>	<u>15</u>	<u>See 40</u>
<u>2</u>	<u>5</u>	<u>red &amp; gray clay w/ silt</u>	<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>15</u>	<u>25</u>	<u>See 40</u>
<u>5</u>	<u>10</u>	<u>red &amp; gray clay w/ silt</u>						
<u>10</u>	<u>25</u>	<u>gray silty clay w/ tan streaks</u>						

9) CEMENTING DATA [Rule 338.44(1)]  
 Cemented from 12 ft. to 2 ft. No. of sacks used 5-50#  
 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  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pileless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

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     Bailor     Jetted     Estimated  
 Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

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

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

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

ADDRESS \_\_\_\_\_ (Street or RFD)    (City)    (State)    (Zip)

(Signed) Richard M. Kelly (Licensed Well Driller)    (Signed) \_\_\_\_\_ (Registered Driller Trainee)

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

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

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

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

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

5) GPS  
33°02'38"N  
94°50'37"W

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

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

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

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

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

CASING, BLANK PIPE, AND WELL SCREEN DATA:					
Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>7</u>	<u>Sec 40</u>
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>7</u>	<u>17</u>	<u>Sec 40</u>

(Use reverse side if necessary)

9) CEMENTING DATA [Rule 336.44(1)]  
Cemented from 2 ft. to 5 ft. No. of sacks used 2 1/2 - 50  
Method used bentonite pellets  
Cemented by \_\_\_\_\_  
Distance to septic system field lines or other concentrated contamination \_\_\_\_\_ ft.  
Method of verification of above distance \_\_\_\_\_

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

10) SURFACE COMPLETION  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 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  Bailor  Jetted  Estimated  
Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

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

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

12) PACKERS: NA Type \_\_\_\_\_ Depth \_\_\_\_\_

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

COMPANY NAME \_\_\_\_\_ (Type or print) WELL DRILLER'S LICENSE NO. TX 52694-M  
ADDRESS \_\_\_\_\_ (City) (State) (Zip)  
(Signed) [Signature] (Licensed Well Driller) (Signed) \_\_\_\_\_ (Registered Driller Trainee)

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

# AD-4

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

Please use black ink.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

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

2) ADDRESS OF WELL: County Camp Rt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-584  
(City) (State) (Zip)

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

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

5) GPS  
 33° 02' 43" N  
 94° 50' 33" W

6) WELL LOG:  
 Date Drilling: \_\_\_\_\_  
 Started 4/26 <sup>19</sup> 2001  
 Completed 4/26 <sup>19</sup> 2001

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

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

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

From (ft.)	To (ft.)	Description and color of formation material	Casing, Blank Pipe, and Well Screen Data:		Gage Casing Screen
			Dia. (in.)	Setting (ft.)	
0	5	red silty clay with gray streaks	2 N riser	+2 19	Sch 40
5	30	gray silty clay with red streaks	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 #  
 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  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 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     No    If yes, submit "REPORT OF UNDESIRABLE WATER"  
 Type of water? \_\_\_\_\_    Depth of strata \_\_\_\_\_  
 Was a chemical analysis made?  Yes     No

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

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

ADDRESS \_\_\_\_\_ (City) \_\_\_\_\_ (State) \_\_\_\_\_ (Zip)

(Signed) Sally M. Davis (Licensed Well Driller)    (Signed) \_\_\_\_\_ (Registered Driller Trainee)

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



# SOIL BORING LOG

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

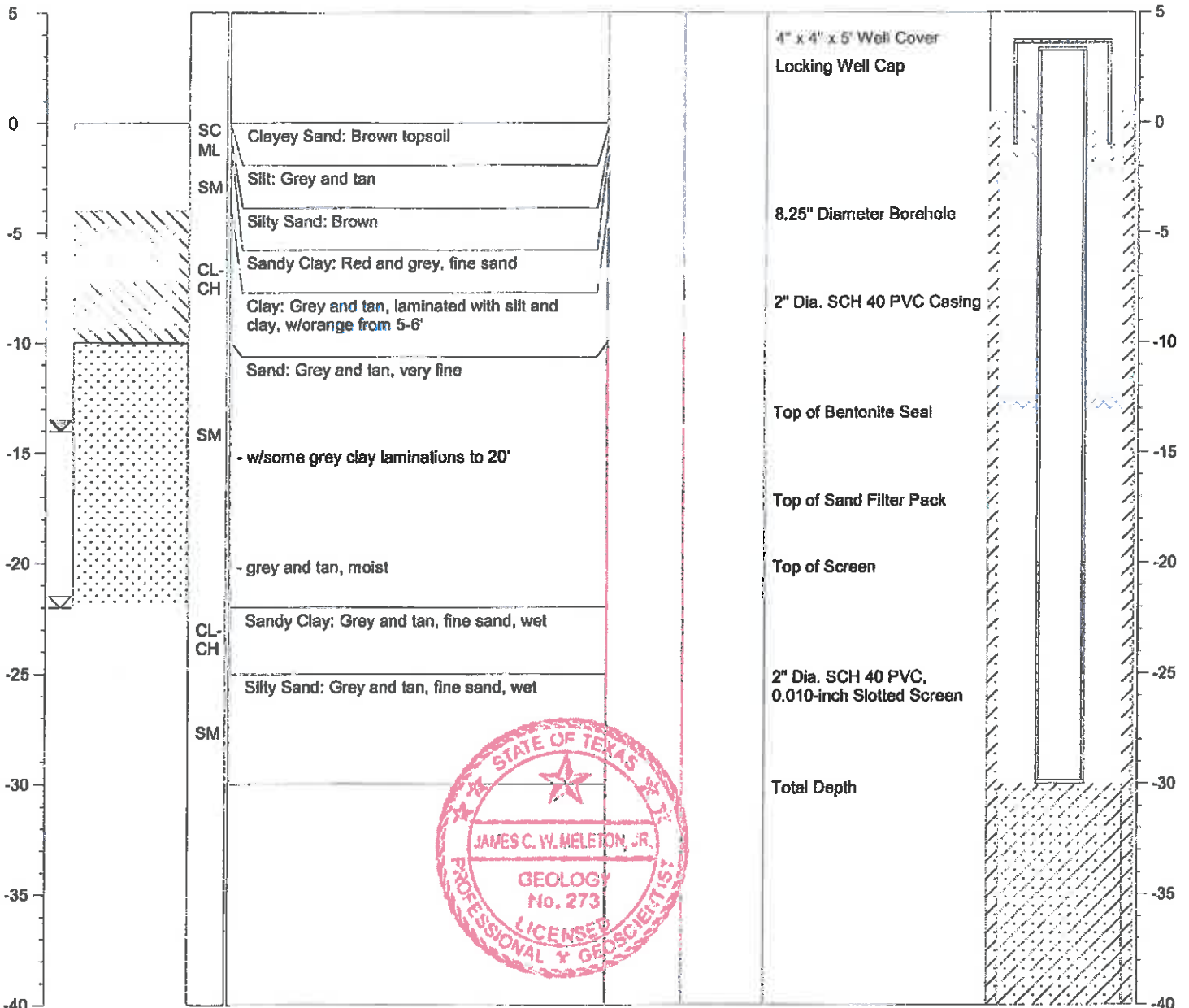
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

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

NOTES: Latitude: 33.04527  
 Longitude: 94.84258

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

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







# SOIL BORING LOG

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

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

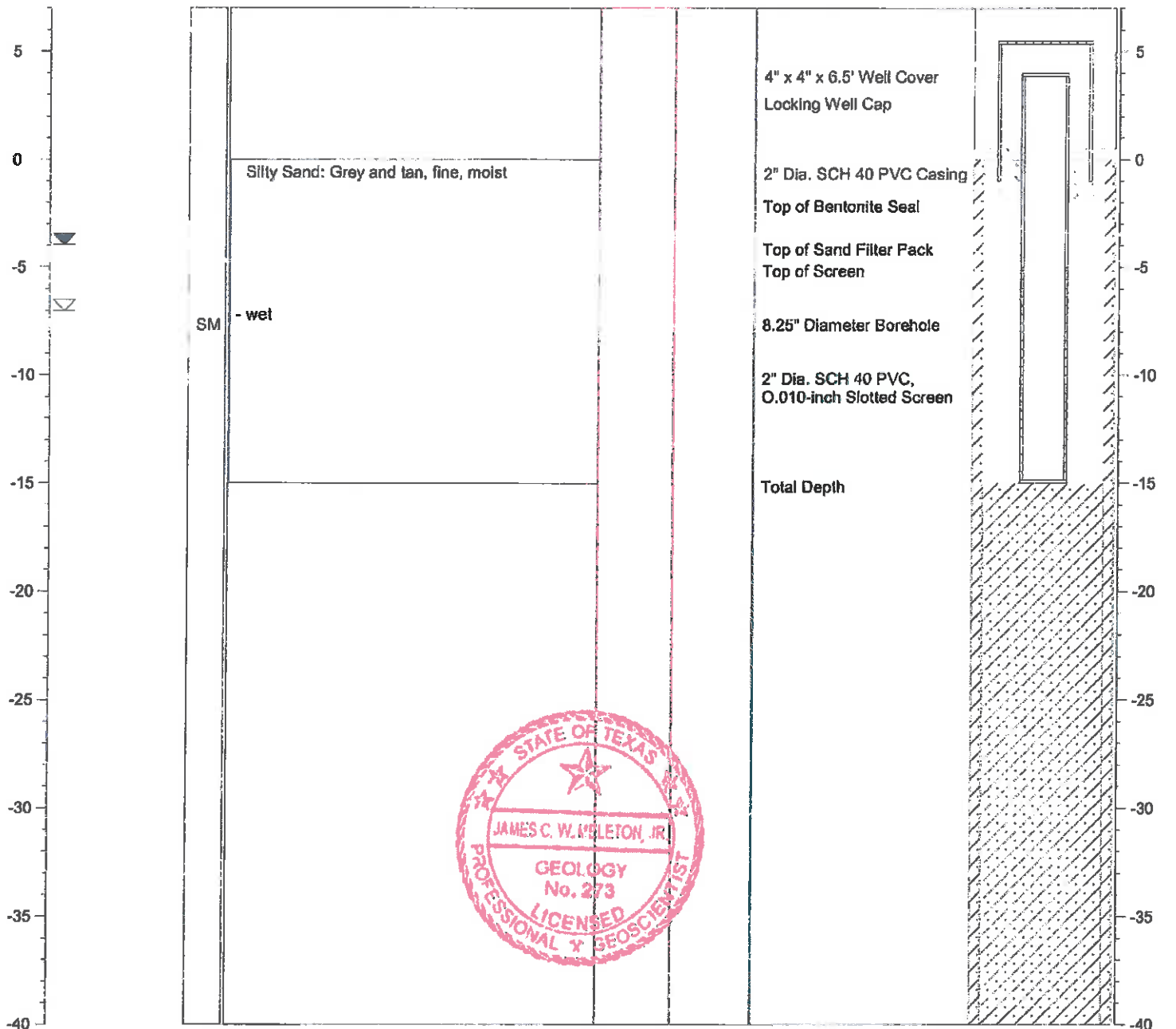
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.04531  
 Longitude: 94.84230

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

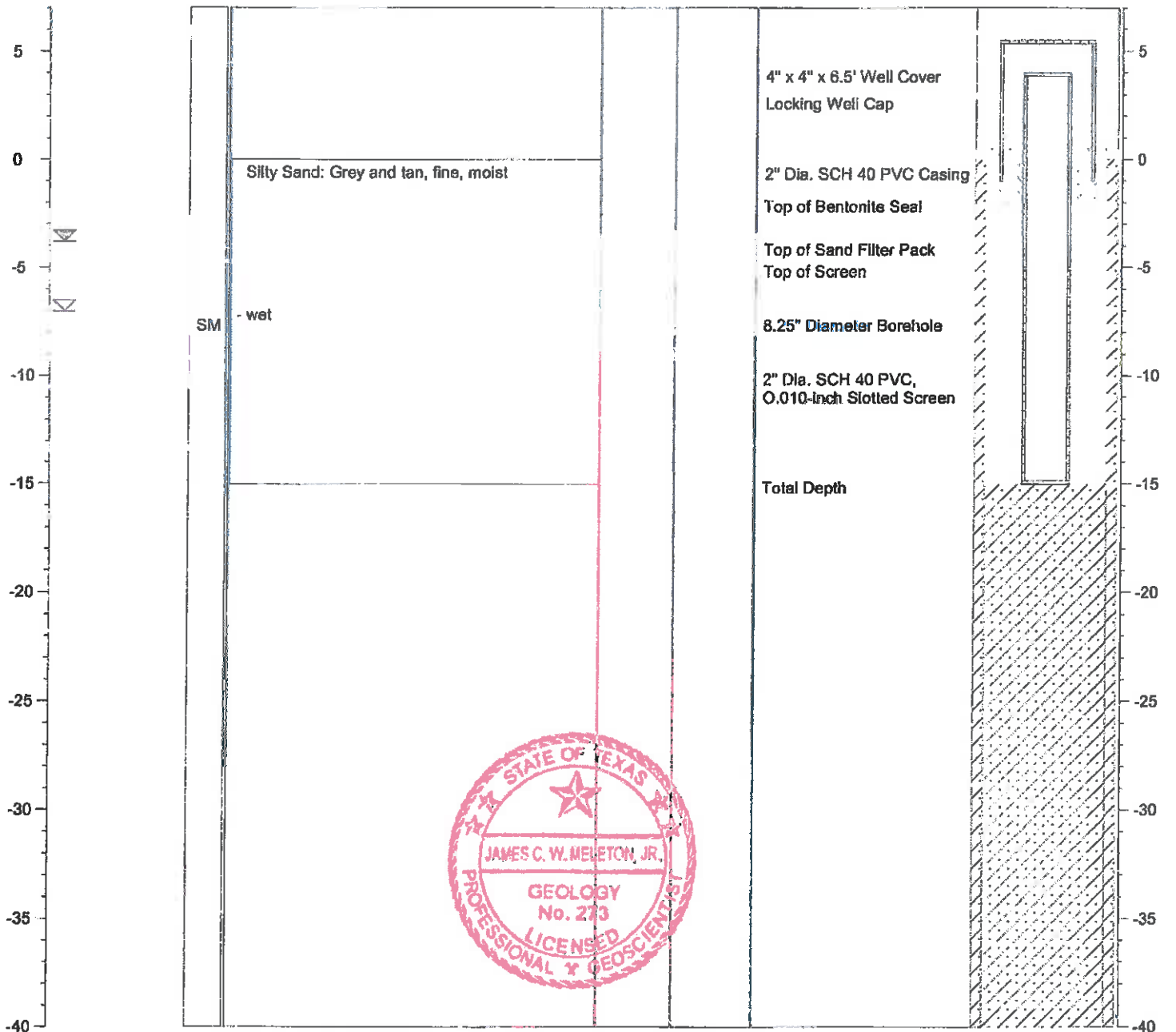
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

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

NOTES: Latitude: 33.04507  
 Longitude: 94.84244

≡ Water level during drilling  
 ≡ Water level in completed well

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

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

Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side		<b>State of Texas</b> <b>WELL REPORT</b>		Texas Water Well Drillers Advisory Council P.O. Box 13087 Austin, TX 78711-3087 512-239-0530																											
1) OWNER <u>Southwestern Electric Power</u> ADDRESS <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u> <small>(Name) (Street or RFD) (City) (State) (Zip)</small>		2) ADDRESS OF WELL: County <u>Camp</u> <u>Titus</u> <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u> GRID # <u>16-58-4</u> <small>(Street, RFD or other) (City) (State) (Zip)</small>		3) TYPE OF WORK (Check): <input checked="" type="checkbox"/> New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Reconditioning <input type="checkbox"/> Plugging																											
4) PROPOSED USE (Check): <input checked="" type="checkbox"/> Monitor <input type="checkbox"/> Environmental Soil Boring <input type="checkbox"/> Domestic <input type="checkbox"/> Industrial <input type="checkbox"/> Irrigation <input type="checkbox"/> Injection <input type="checkbox"/> Public Supply <input type="checkbox"/> De-watering <input type="checkbox"/> Testwell If Public Supply well, were plans submitted to the TNRCC? <input type="checkbox"/> Yes <input type="checkbox"/> No		5) <u>33°03'13"N</u> <u>94°51'00"W</u> ↑		6) WELL LOG: Date Drilling: Started <u>1-11-2001</u> Completed <u>1-11-2001</u>																											
7) DRILLING METHOD (Check): <input type="checkbox"/> Driven <input type="checkbox"/> Air Rotary <input type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Bored <input type="checkbox"/> Air Hammer <input type="checkbox"/> Cable Tool <input type="checkbox"/> Jetted <input type="checkbox"/> Other _____		8) Borehole Completion (Check): <input type="checkbox"/> Open Hole <input type="checkbox"/> Straight Wall <input type="checkbox"/> Underreamed <input checked="" type="checkbox"/> Gravel Packed <input type="checkbox"/> Other _____ If Gravel Packed give interval ... from <u>16</u> ft. to <u>30</u> ft.		DIAMETER OF HOLE <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Dis. (in.)</th> <th>From (ft.)</th> <th>To (ft.)</th> </tr> </thead> <tbody> <tr> <td><u>8 1/4</u></td> <td>Surface</td> <td><u>30</u></td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		Dis. (in.)	From (ft.)	To (ft.)	<u>8 1/4</u>	Surface	<u>30</u>																				
Dis. (in.)	From (ft.)	To (ft.)																													
<u>8 1/4</u>	Surface	<u>30</u>																													
From (ft.)    To (ft.)    Description and color of formation material <u>0 - 10</u> <u>red &amp; gray clay with orange streaks</u> <u>10 - 20</u> <u>gray/black clay with tan clay</u> <u>20 - 25</u> <u>stiff clay with lignite streak</u> <u>25 - 30</u> <u>fine gray sand</u>  <u>AP-5</u>		CASING, BLANK PIPE, AND WELL SCREEN DATA: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Dia. (in.)</th> <th rowspan="2">New or Used</th> <th rowspan="2">Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial</th> <th colspan="2">Setting (ft.)</th> <th rowspan="2">Gage Casting Screen</th> </tr> <tr> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td><u>2</u></td> <td><u>N</u></td> <td><u>riser</u></td> <td><u>+2</u></td> <td><u>20</u></td> <td><u>sch 40</u></td> </tr> <tr> <td><u>2</u></td> <td><u>N</u></td> <td><u>#10 slot screen</u></td> <td><u>20</u></td> <td><u>30</u></td> <td><u>sch 40</u></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>				Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen	From	To	<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>20</u>	<u>sch 40</u>	<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>20</u>	<u>30</u>	<u>sch 40</u>						
Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen																										
			From	To																											
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>20</u>	<u>sch 40</u>																										
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>20</u>	<u>30</u>	<u>sch 40</u>																										
9) CEMENTING DATA [Rule 338.44(1)] Cemented from <u>16</u> ft. to <u>0</u> ft. No. of sacks used _____ _____ ft. to _____ ft. No. of sacks used _____ Method used <u>Dentonite</u> Cemented by _____ Distance to septic system field lines or other concentrated contamination _____ ft. Method of verification of above distance _____		10) SURFACE COMPLETION <input checked="" type="checkbox"/> Specified Surface Slab Installed [Rule 338.44(2)(A)] <input checked="" type="checkbox"/> Specified Steel Sleeve Installed [Rule 338.44(3)(A)] <input type="checkbox"/> Pileless Adapter Used [Rule 338.44(3)(b)] <input type="checkbox"/> Approved Alternative Procedure Used [Rule 338.71]																													
13) TYPE PUMP: <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input type="checkbox"/> Submersible <input type="checkbox"/> Cylinder <input type="checkbox"/> Other _____ Depth to pump bowls, cylinder, jet, etc., _____ ft.		11) WATER LEVEL: Static level <u>11' 9"</u> ft. below land surface    Date <u>1-11-01</u> Artesian flow _____ gpm.    Date _____																													
14) WELL TESTS: Type test: <input type="checkbox"/> Pump <input type="checkbox"/> Bailor <input type="checkbox"/> Jetted <input type="checkbox"/> Estimated Yield: _____ gpm with _____ ft. drawdown after _____ hrs.		12) PACKERS: <u>NA</u> Type _____    Depth _____																													
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No    If yes, submit "REPORT OF UNDESIRABLE WATER" Type of water? _____    Depth of strata _____ Was a chemical analysis made? <input type="checkbox"/> Yes <input type="checkbox"/> No		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 _____ <small>(Type or print)</small>		WELL DRILLER'S LICENSE NO. <u>TX 52694-M</u>																													
ADDRESS _____ <small>(Street or RFD) (City) (State) (Zip)</small>		(Signed) <u>[Signature]</u> (Licensed Well Driller)    (Signed) _____ (Registered Driller Trainee)																													

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



# SOIL BORING LOG

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

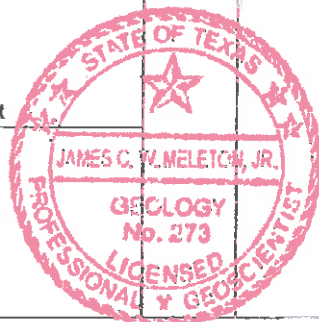
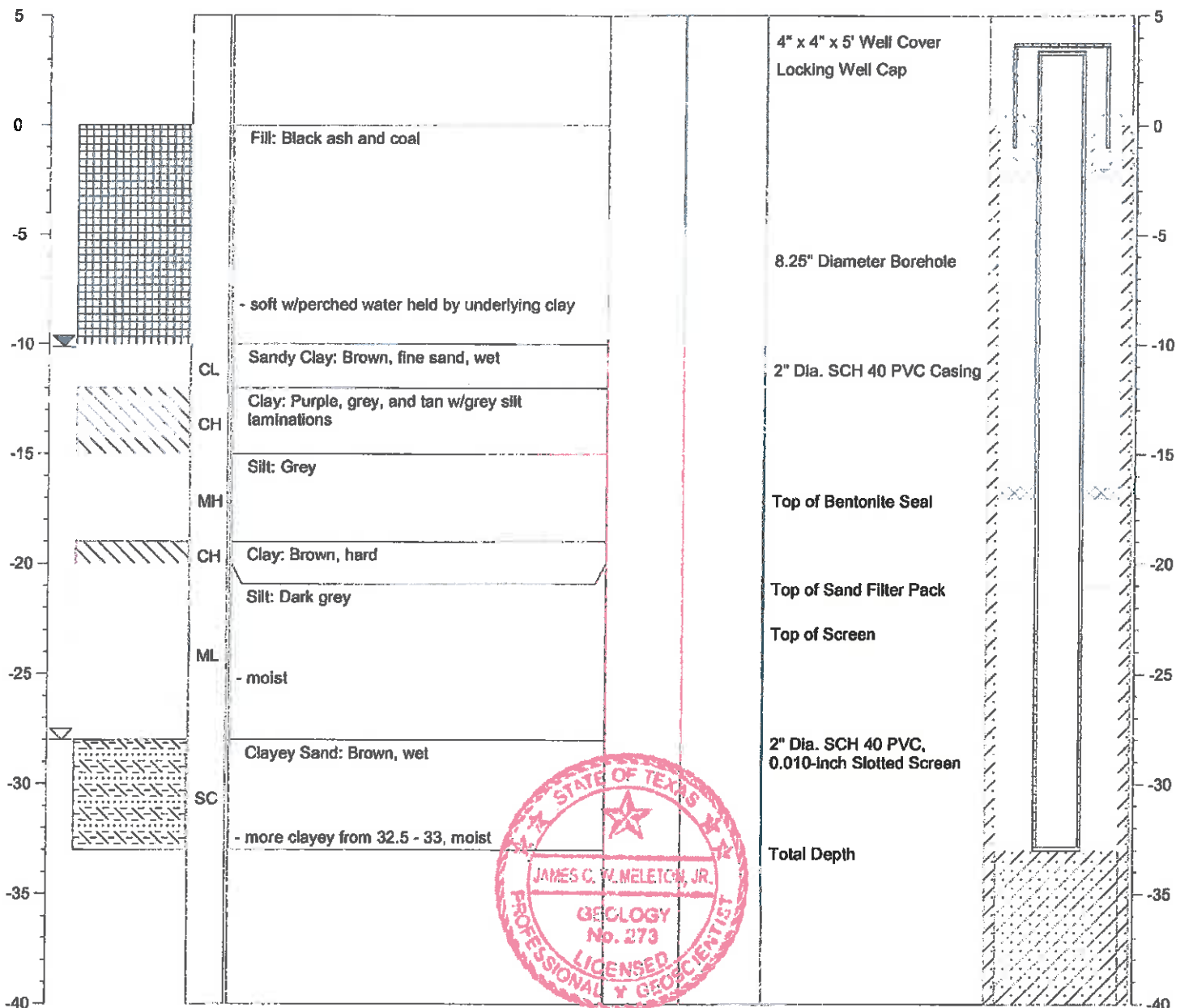
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

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

NOTES: Latitude: 33.05235  
 Longitude: 94.84757

☒ Water level during drilling  
 ☒ Water level in completed well

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

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

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

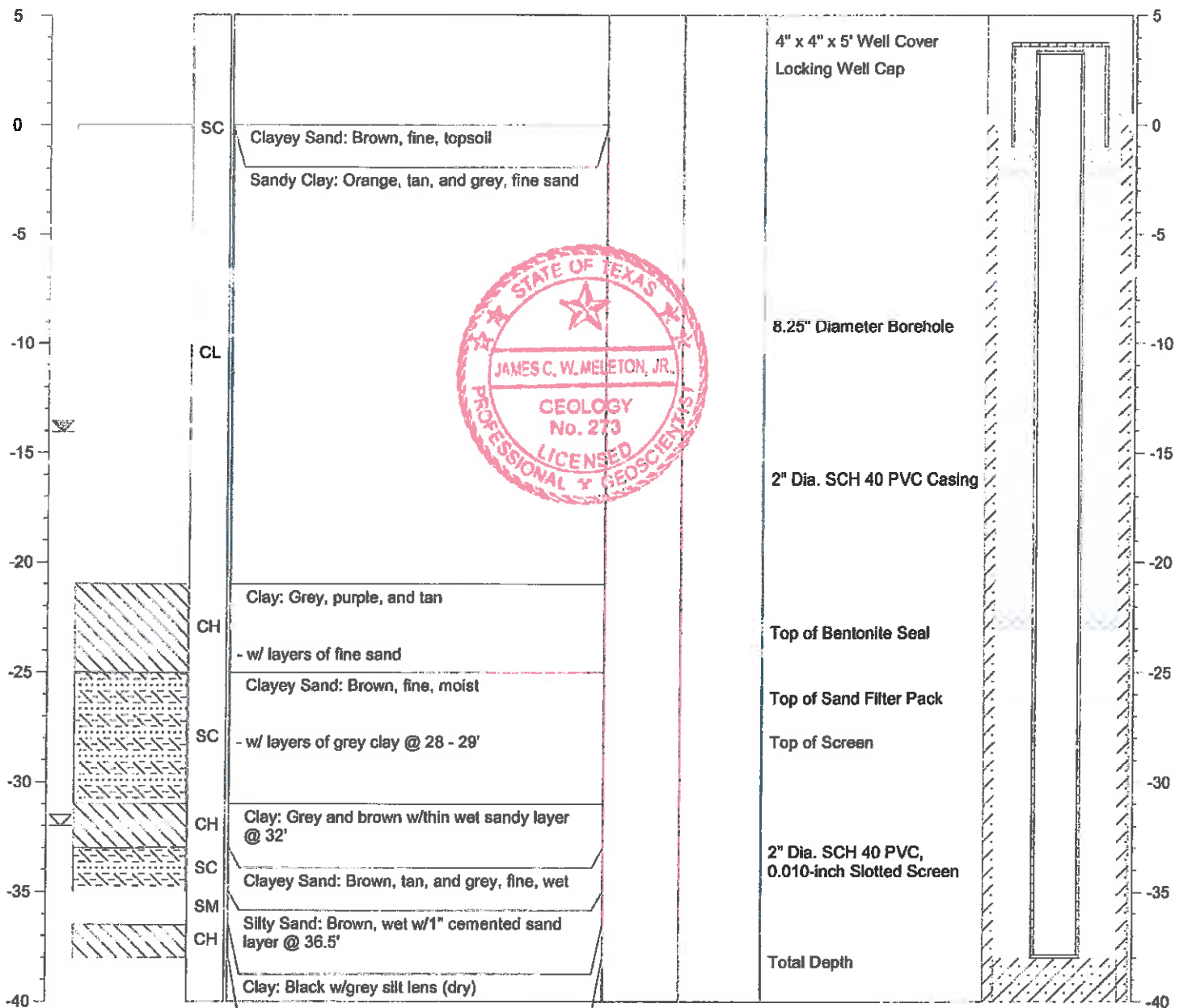
DRILLING CO.: **WEST Drilling**  
 DRILLER: **Tom McCullough**  
 METHOD OF DRILLING: **Hollow-stem Auger**  
 SAMPLING METHODS: **Split-spoon**  
 DATE DRILLED: **9/24/09**

NOTES: **Latitude: 33.05257**  
**Longitude: 94.84219**

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

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

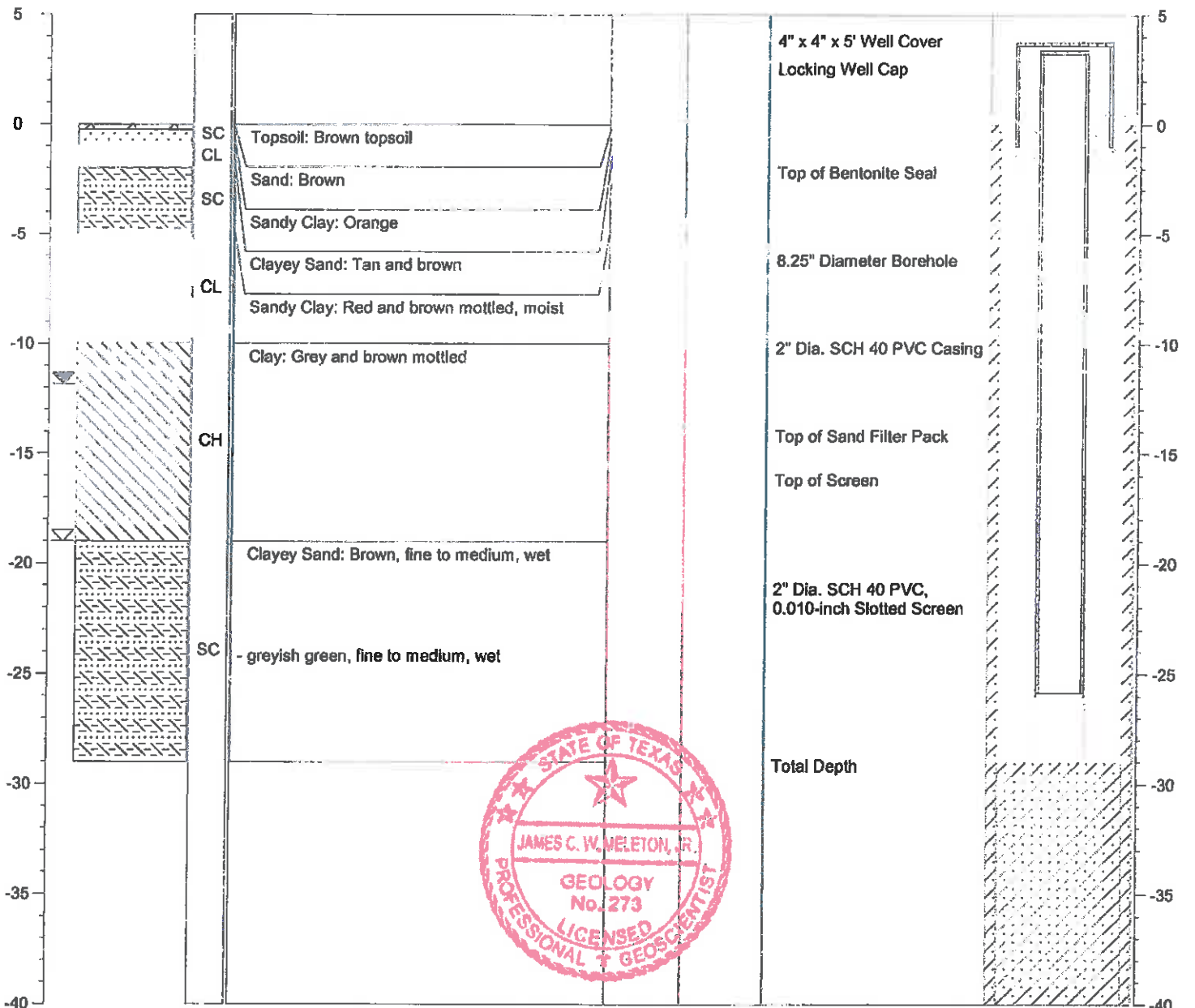
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.05187  
 Longitude: 94.84026

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

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

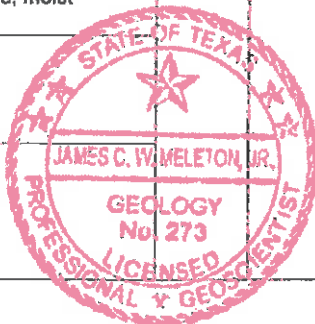
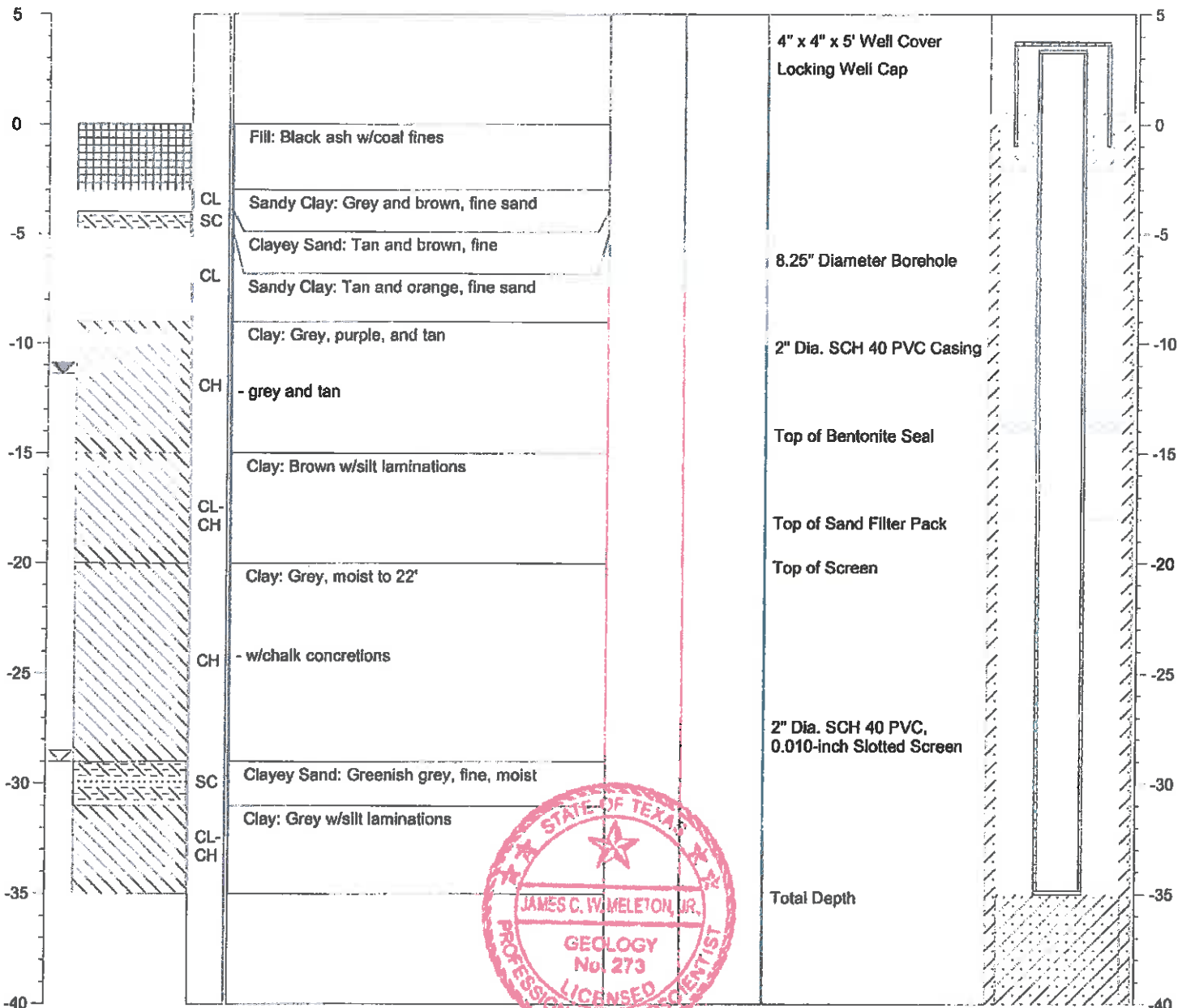
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.04995  
 Longitude: 94.84196

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

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

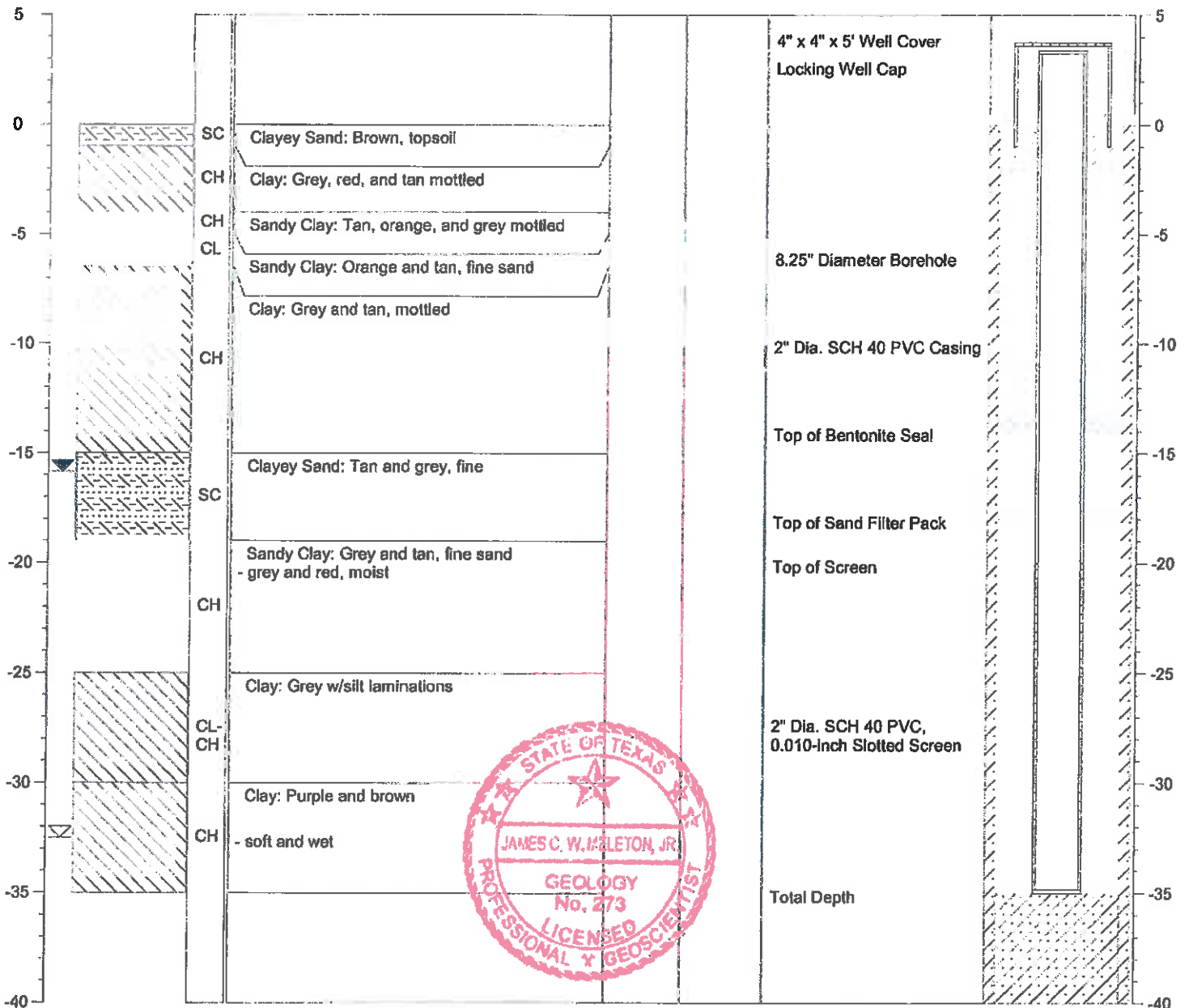
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04881  
 Longitude: 94.84047

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

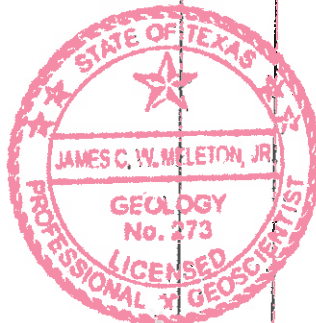
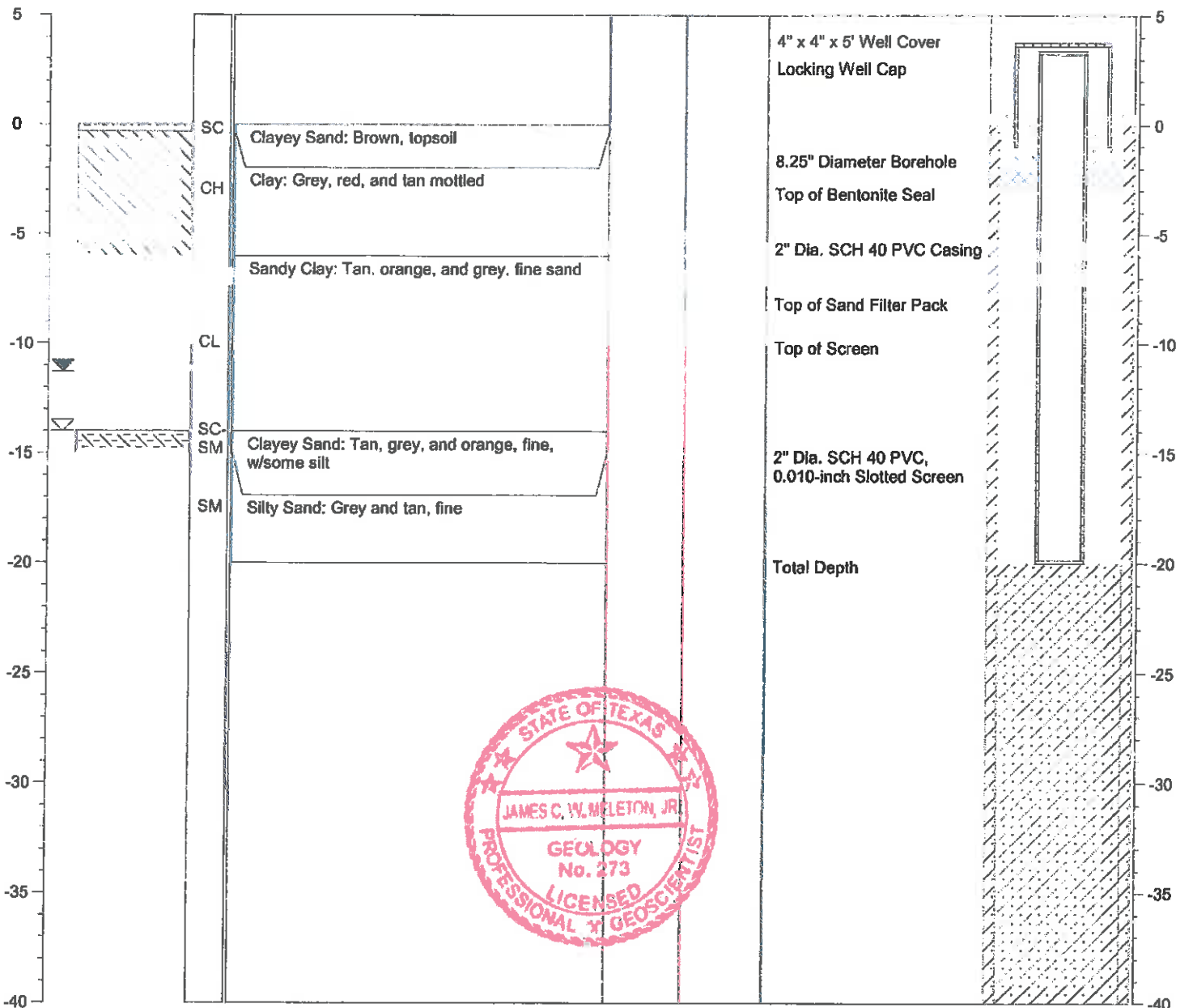
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

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

NOTES: Latitude: 33.04824  
 Longitude: 94.84177

☒ Water level during drilling  
 ☒ Water level in completed well

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

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

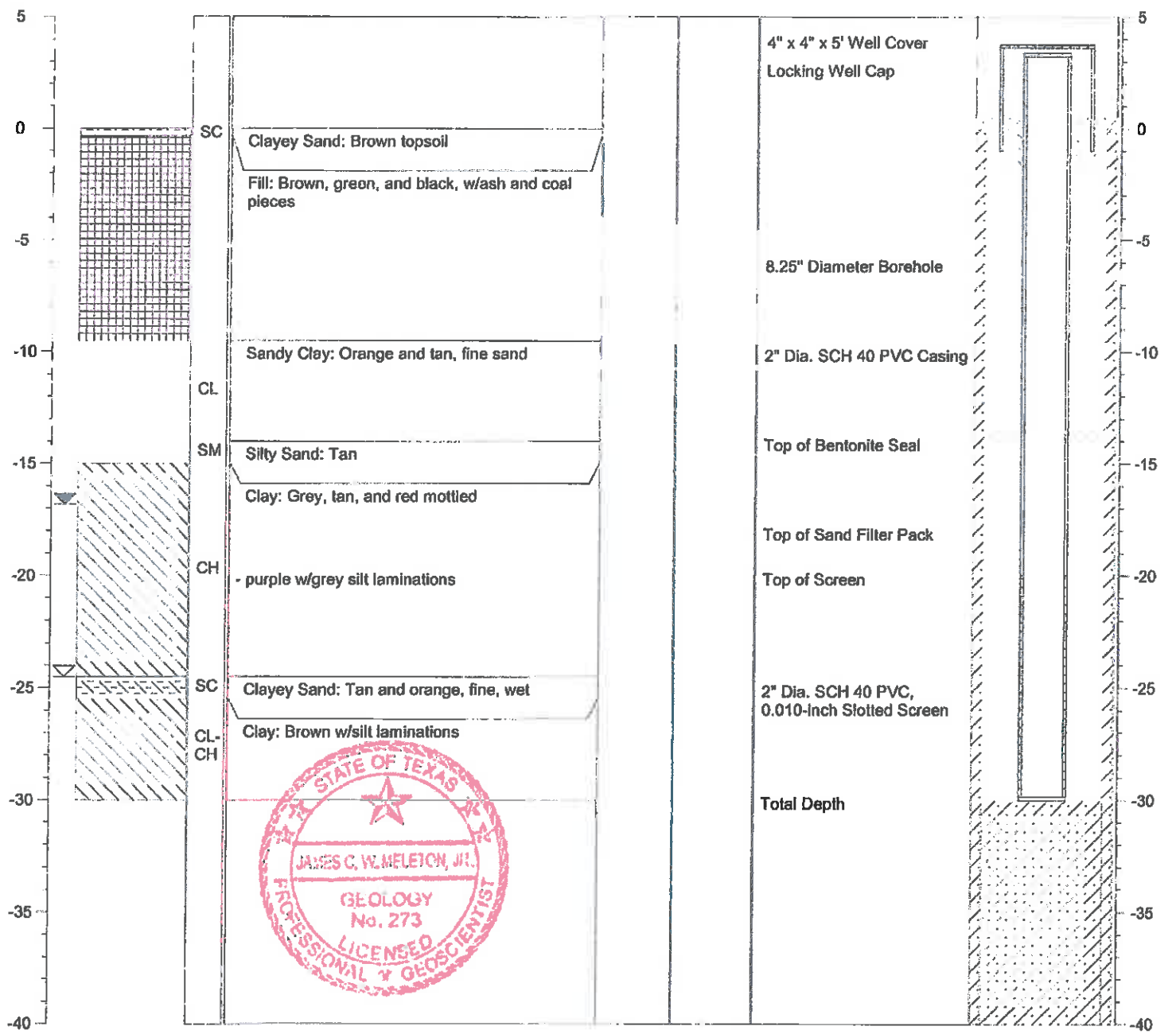
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

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

NOTES: Latitude: 33.04901  
 Longitude: 94.84977

☒ Water level during drilling  
 ☒ Water level in completed well

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

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

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

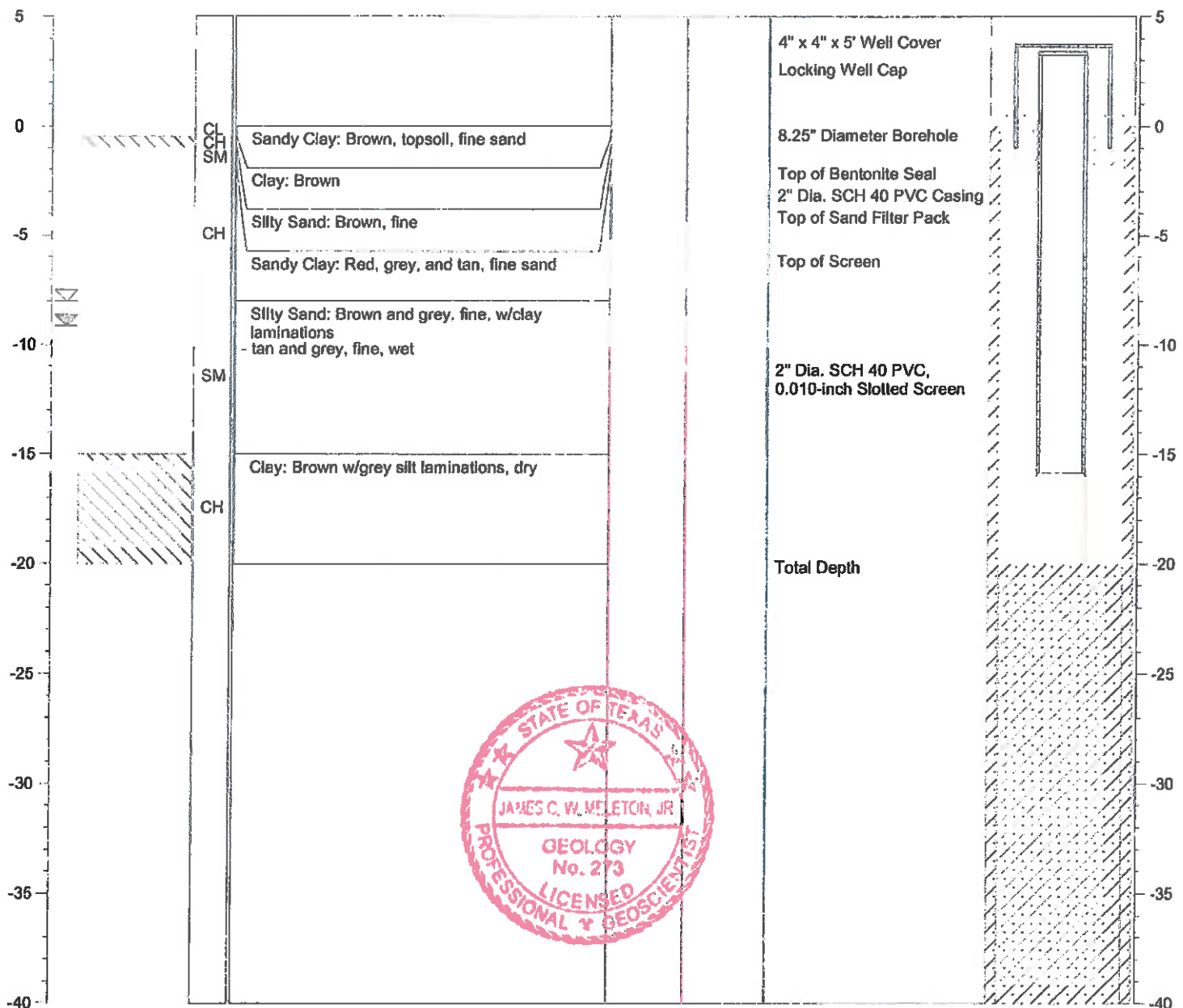
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04918  
 Longitude: 94.84275

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

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

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

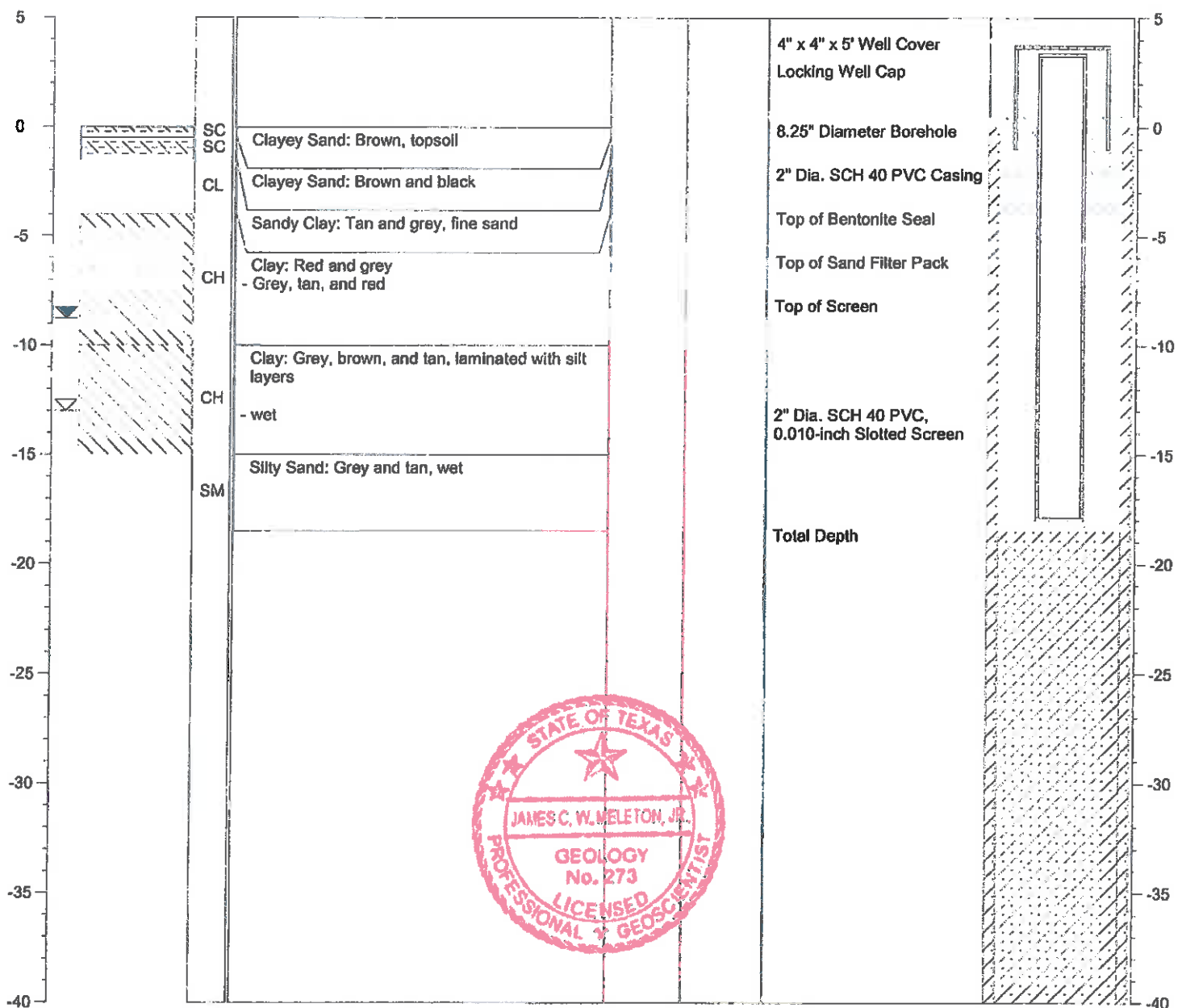
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

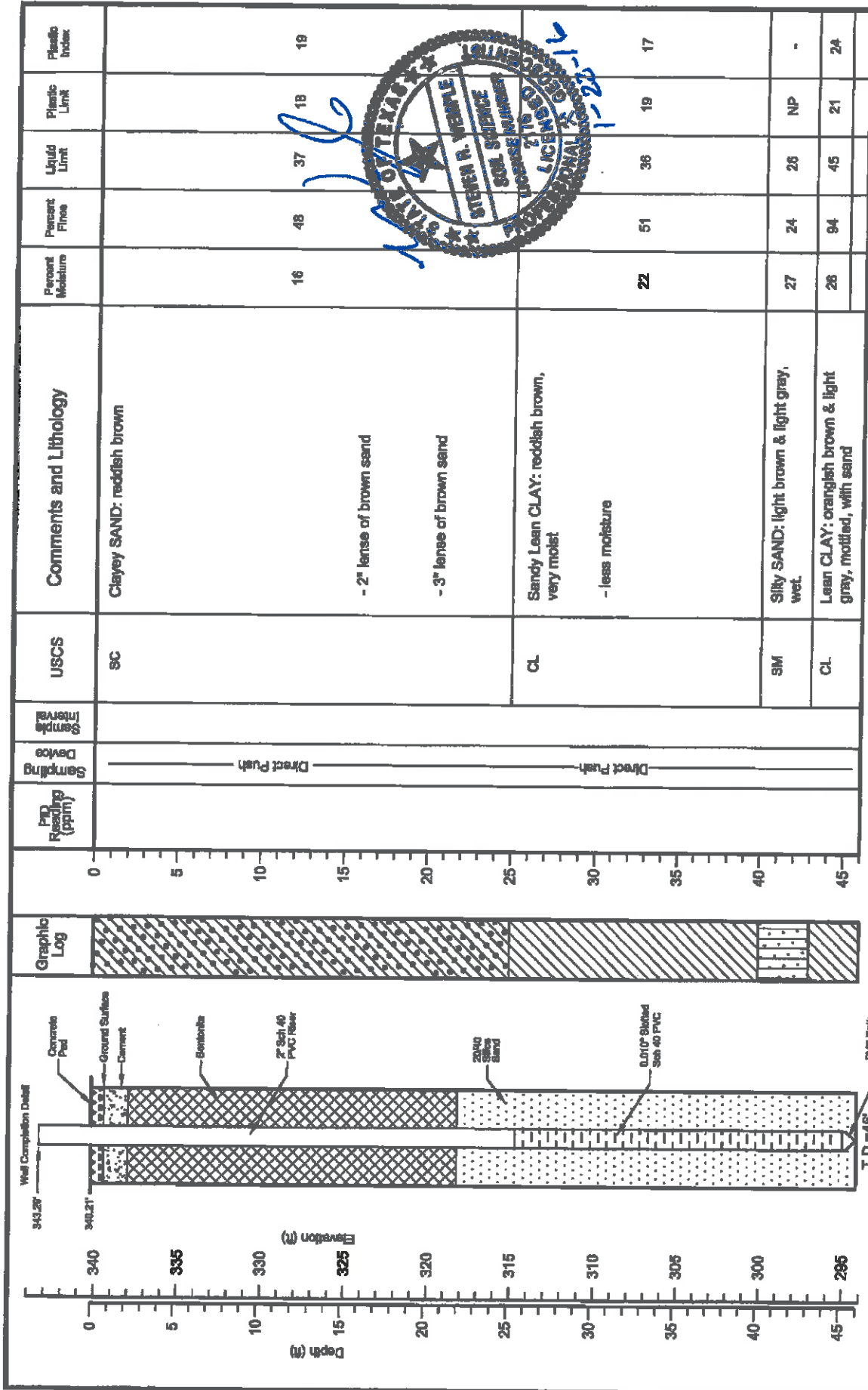
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04715  
 Longitude: 94.84256

☒ Water level during drilling  
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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Depth (ft)	Elevation (ft)	USCS	Comments and Lithology	Percent Moisture	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index
0 - 25	340.21 - 315	SC	Clayey SAND: reddish brown  - 2" lense of brown sand  - 3" lense of brown sand	16	48	37	18	19
25 - 40	315 - 300	CL	Sandy Lean CLAY: reddish brown, very moist  - less moisture	22	51	36	19	17
40 - 45	300 - 295	SM CL	Silty SAND: light brown & light gray, wet.  Lean CLAY: orangish brown & light gray, mottled, with sand	27	24	28	NP	-
				26	94	45	21	24



WEST Drilling, Inc.  
101 Industrial Drive  
Waco, Texas 76765

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

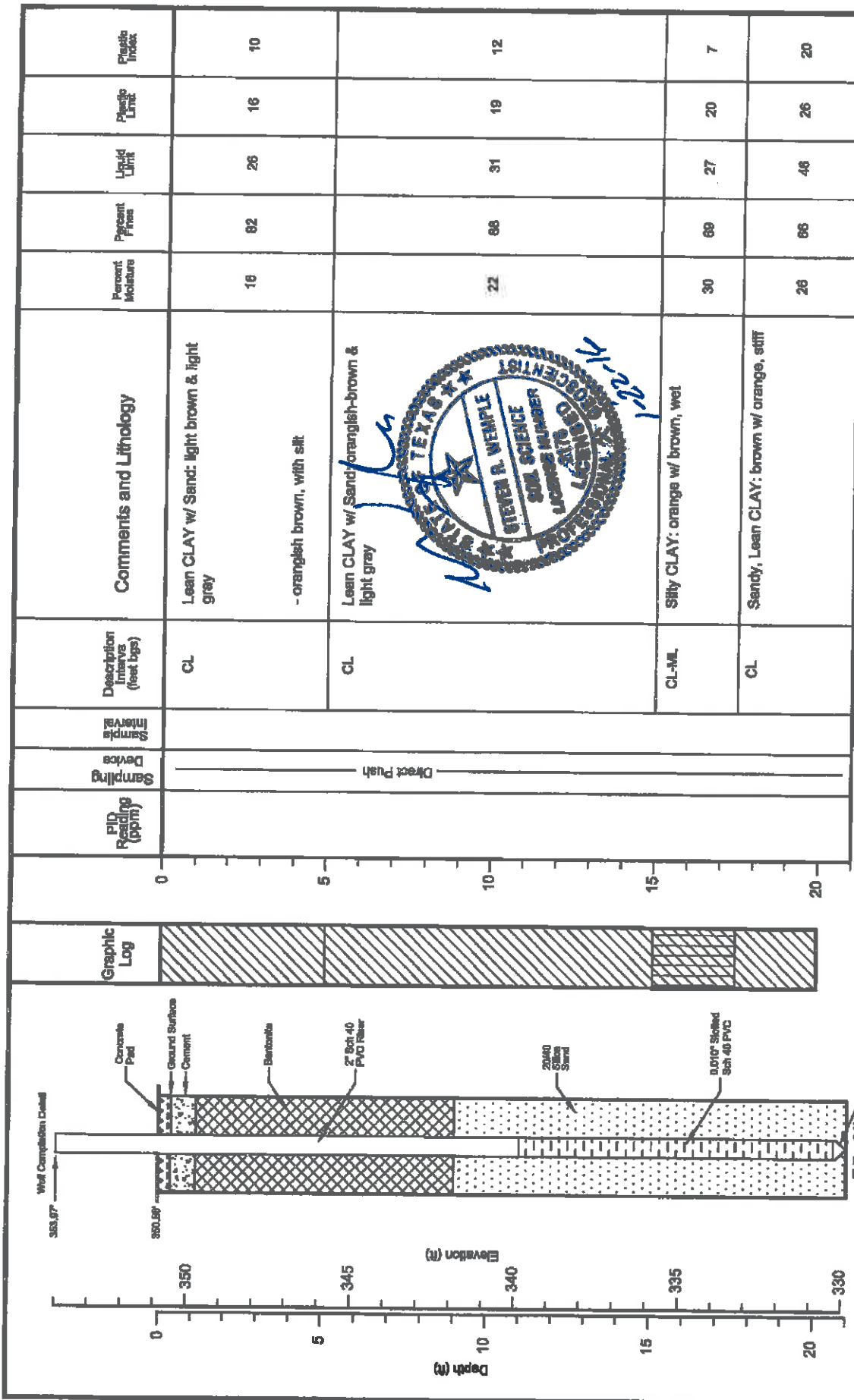
Logged by: Robert Williams, PE  
Driller: Robert Williams  
Date Completed: 12/12/15  
Depth to Product: NA

Welsh Power Station  
Pittsburg, Texas

Log of Boring  
AD-15

PROJECT NO.: -  
SCALE: AS SHOWN  
FILE NAME: JR Main Power Plant LOGS.dwg

DRAWN BY: HDS  
CHECKED BY: SRW



Depth (m)	Elevation (m)	PID Reading (ppm)	Sampling Device	Sample Interval	Description Intervals (feet bags)	Comments and Lithology	Percent Moisture	Percent Fine	Liquid Limit	Plastic Limit	Plastic Index
5	345		Direct Push			- orangish brown, with silt					
10	340					Lean CLAY w/ Sand: orangish-brown & light gray	22	68	31	19	12
15	335					Silty CLAY: orange w/ brown, wet	30	69	27	20	7
20	330					Sandy, Lean CLAY: brown w/ orange, stiff	26	66	46	26	20



**west**  
**D R I L L I N G**  
 environmental & geotechnical  
 WEST Drilling, Inc.  
 101 Industrial Drive  
 Waco, Texas 76786

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

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

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

Log of Boring  
 AD-16  
 PRODUCT NO. --  
 SCALE AS SHOWN  
 FILE NAME: \\R\Welsh Power Plant LOGS.dwg

# WELL LOG

AD-16R

DEPTH	SAMPLE ANALYZED	TYPE	ORGANIC VAPOR (ppm)	SAMPLE DESCRIPTION	SYMBOL	COMPLETION
0-5		SS		(0-15') SILTY CLAY (CL), BROWN TO ORANGE-BROWN, STIFF, DRY.	[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
5-10		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
10-15		SS		(15-18') SILTY CLAY AND SANDY CLAY, ORANGE-BROWN TO LIGHT GRAY, MOIST.	[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
15-20		SS		(18-27') SILTY CLAY AND SANDY CLAY, DARK BROWN TO GRAY, MOIST TO WET.	[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
20-25		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
25-30		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
30-35		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
35-40		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
40-45		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]
45-50		SS			[Symbol: Diagonal lines]	[Symbol: Diagonal lines]

TOTAL DEPTH = 27' BGS



WELL: AD-16R  
 AEP CLIENT: WELSH POWER PLANT  
 PROJECT: BOTTOM ASH STORAGE POND  
 LOCATION: WELSH POWER PLANT  
 DATE: 4/12/17  
 DRILLING METHOD: HSA  
 CASING: 2" PVC, 2' AGL-12' BGL  
 SCREEN: 2" PVC, 12'-27' BGS  
 CEMENT: 0-2' BGS  
 BENTONITE: 2-10' BGS  
 SAND PACK: 10-27' BGS  
 GROUND ELEV. / TOP OF CASING ELEV.: 350.55' / 353.49'

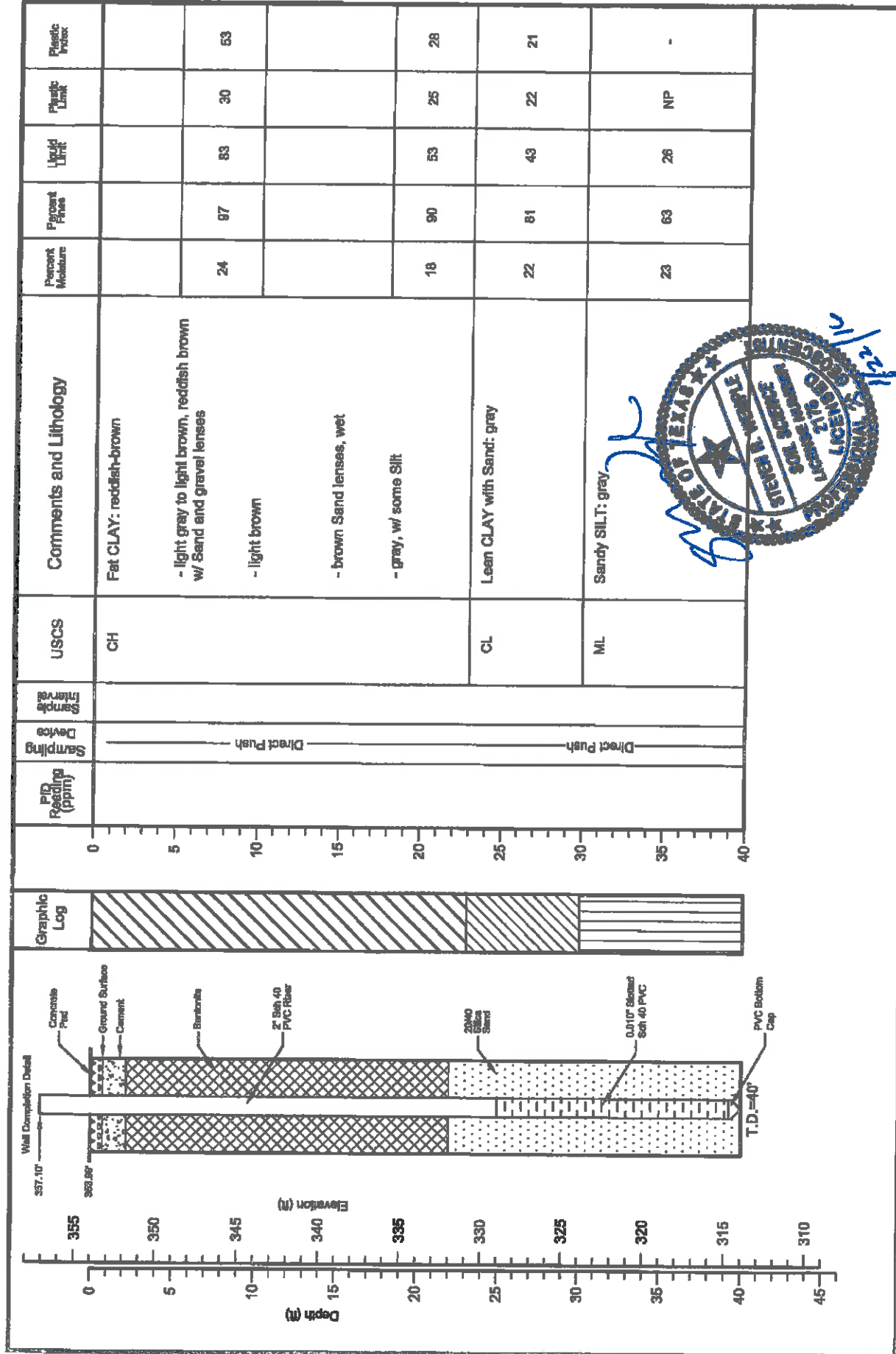
CT - CUTTINGS  
 SB - SPLIT BARREL(5')  
 SS - SPLIT SPOON(2')

HC LEVEL  
 WATER LEVEL

SAND  
 SILT  
 CLAY

FILL/CONCRETE  
 BENTONITE  
 GRAVEL

START: FINISH:



Depth (m)	Elevation (m)	Graphical Log	PIG Reading (ppm)	Sampling Device	USCS	Comments and Lithology	Percent Moisture	Percent fines	Liquid Limit	Plastic Limit	Plastic Index
0	357.10	Concrete Pad									
0	356.86	Ground Surface									
0	355	2" 40 PVC Riser		Direct Push	CH	Fat CLAY: reddish-brown					
0	350	20# Sand				- light gray to light brown, reddish brown w/ sand and gravel lenses	24	97	83	30	53
0	345	0.010" 80# 40 PVC				- light brown					63
0	340					- brown sand lenses, wet					
0	335					- gray, w/ some silt	18	90	53	25	28
0	330				CL	Lean CLAY with sand: gray	22	81	43	22	21
0	325										
0	320				ML	Sandy SILT: gray					
0	315						23	63	26	NP	-
0	310	PVC Bottom Cap									

**west**  
 DRILLING  
 environmental & geotechnical  
 WEST Drilling, Inc.  
 101 Industrial Drive  
 Westborough, Texas 75165

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

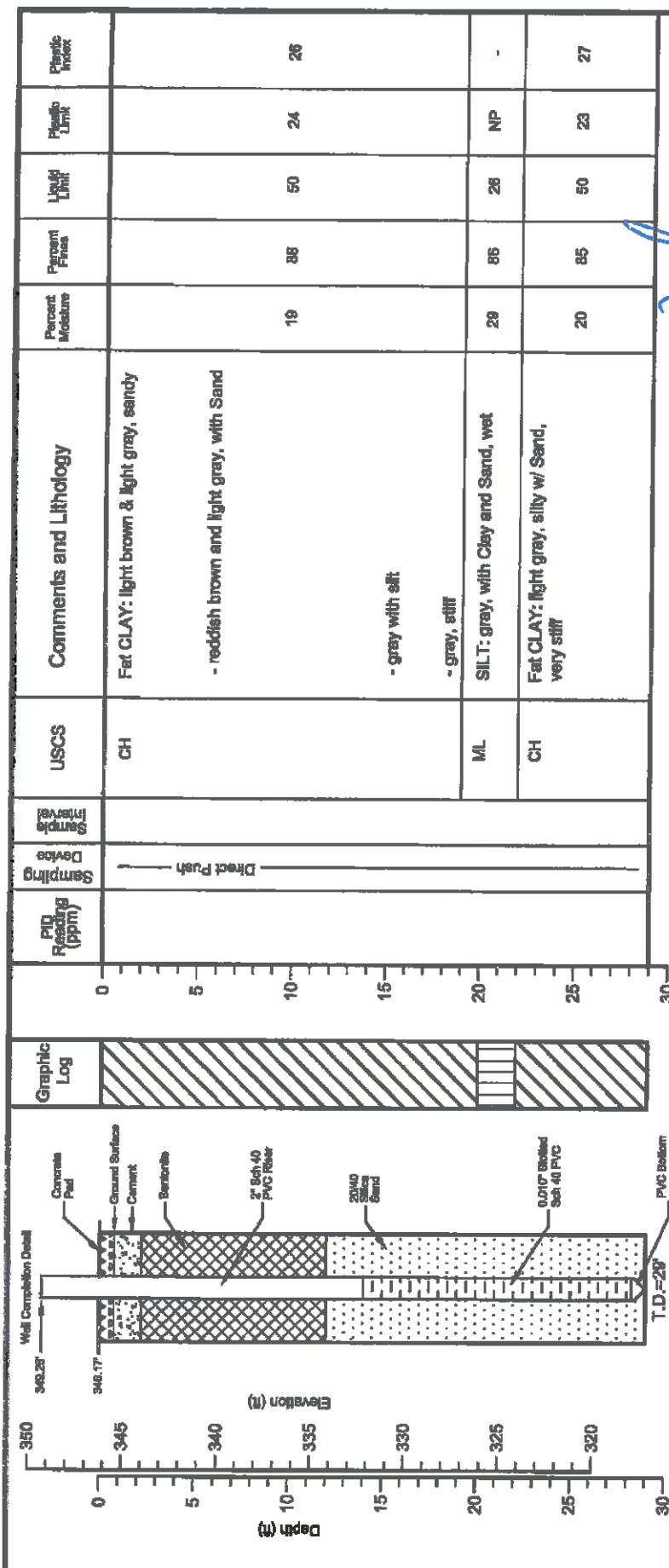
Logged by: Robert Williams, PE  
 Driller: Robert Williams  
 Date Completed: 12/11/15  
 Depth to Product: MA

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

Log of Boring  
 AD-17

PROJECT NO: ---  
 SCALE: AS SHOWN  
 FILE NAME: J:\Welsh Power Plant LOGS.dwg





Depth (ft)	Elevation (ft)	PIG Reading (ppm)	Sampling Device	USCS	Comments and Lithology	Percent Moisture	Percent Fines	Limit	Plastic Limit	Plastic Index
0	346.28		Direct Push	CH	Fat CLAY: light brown & light gray, sandy	19	88	50	24	26
5	345				- reddish brown and light gray, with Sand					
10	340				- gray with silt					
15	335				- gray, stiff					
20	330			ML	SILT: gray, with Clay and Sand, wet	29	86	28	NP	-
25	325			CH	Fat CLAY: light gray, silty w/ Sand, very stiff	20	85	50	23	27
30	320									



<b>west</b> DRILLING Environmental & Geotechnical WEST Drilling, Inc. 101 Industrial Drive Waco, Texas 76766		DATE: 12/11/15 Drilling Method: H.S.A. Bit Diameter: 7.25" Depth to Water: -	Logged by: Robert Williams, PE Driller: Robert Williams Date Completed: 12/11/15 Depth to Product: NA	Welsh Power Station Pittsburg, Texas	Log of Boring AD-18
		PROJECT NO. —	SCALE: AS SHOWN		
		DRAWN BY: HDS	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: <b>July 23, 2009</b>	Logged By: <b>Kush S. Chohan</b>	Checked By:
Drilling Method: <b>Hollow Stem Auger</b>	Drill Bit Size/Type:	Total Depth of Borehole: <b>37 feet bgs</b>
Drill Rig Type: <b>Mobil B61</b>	Drilling Contractor: <b>Total Support Services</b>	Approximate Surface Elevation: <b>367 feet MSL</b>
Groundwater Level and Date Measured:	Sampling Method(s): <b>SPT, Tube</b>	Hammer Data: <b>140 lb, 30 in drop, Auto-hammer</b>
Borehole Backfill: <b>Bentonite Chips</b>	Location: <b>On the Northern edge of proposed chemical pond along the screening berm.</b>	

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

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	Soil Resistance, lb/in <sup>2</sup>	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 gray CLAY, little fine sand, occasional horizontal sand seams. Wet. (cont.)						SPT 11, 15, 22, 25. 24' recovered. SPT 6, 11, 18, 24. 24' recovered.
		SS	29		Soft	ML		Dark grey-black fine SAND, with clay, frequent hard clay lenses (1-3"). Wet.	28.37	NP	57.5			
		SS	34		Hard	CL		Black CLAY, trace to little fine sand, trace silt. Dry						
332	35							Bottom of Boring at 37 feet bgs						
327	40													
322	45													
317	50													
312	55													
307	60													
302	65													

Figure

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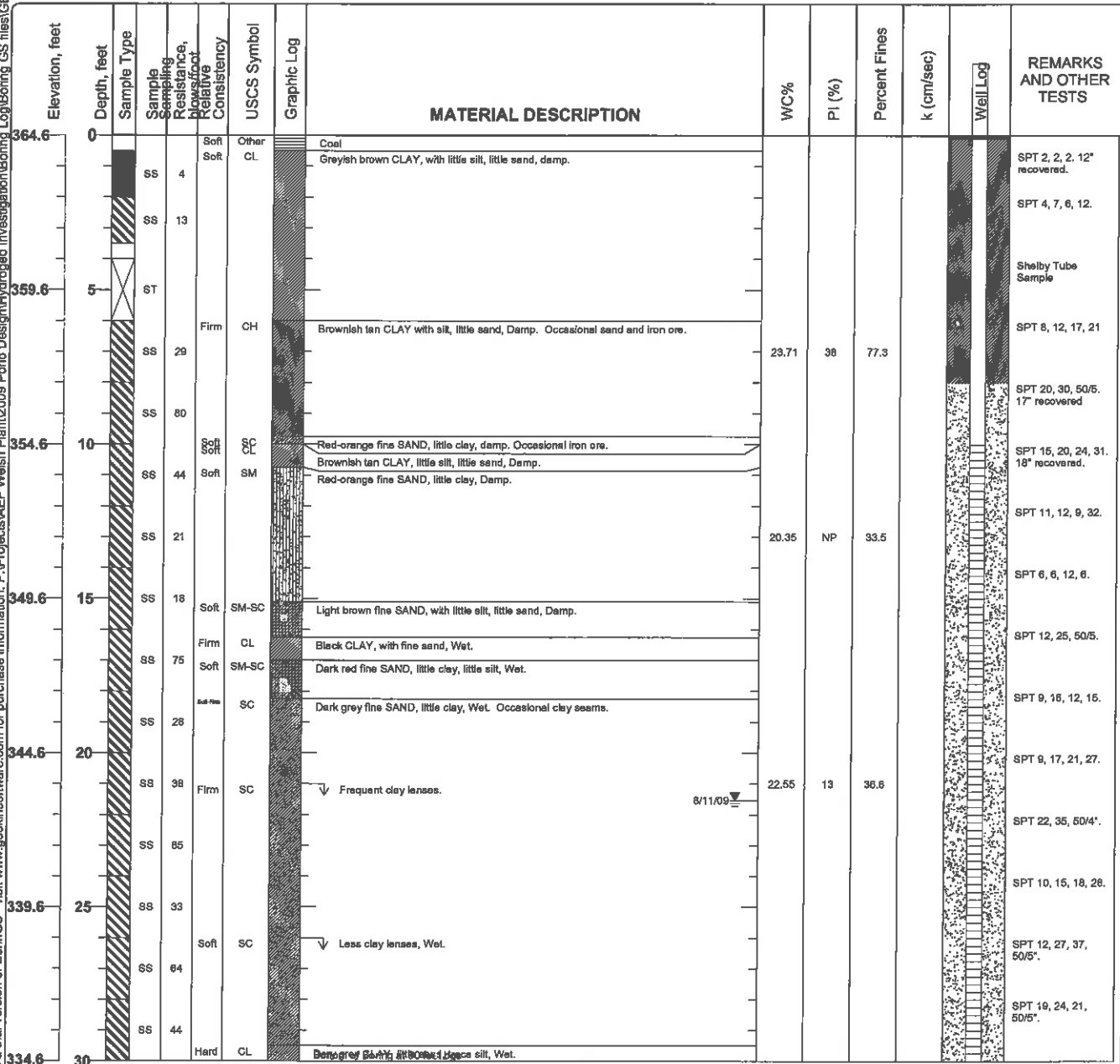
Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

## Log of Boring GB-02

Sheet 1 of 1

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

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Figure

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



JOB NAME: AEP Welsh Power Plant

JOB NO.: TXL0064

DATE/TIME: 8/7/2009

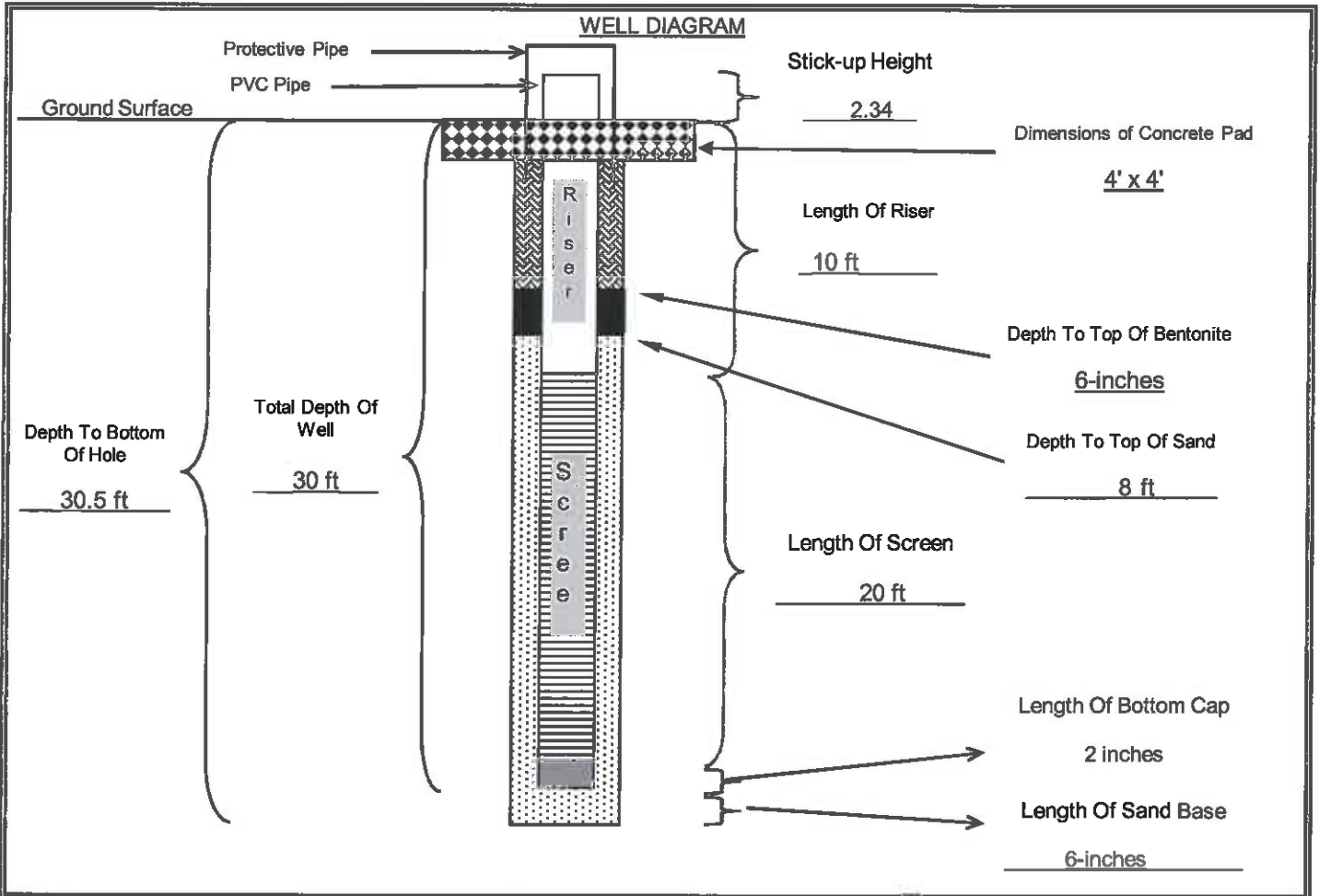
WELL LOCATION: \_\_\_\_\_

WELL NO.: \_\_\_\_\_

FIELD REP: Kush Chohan

**GB-02**

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



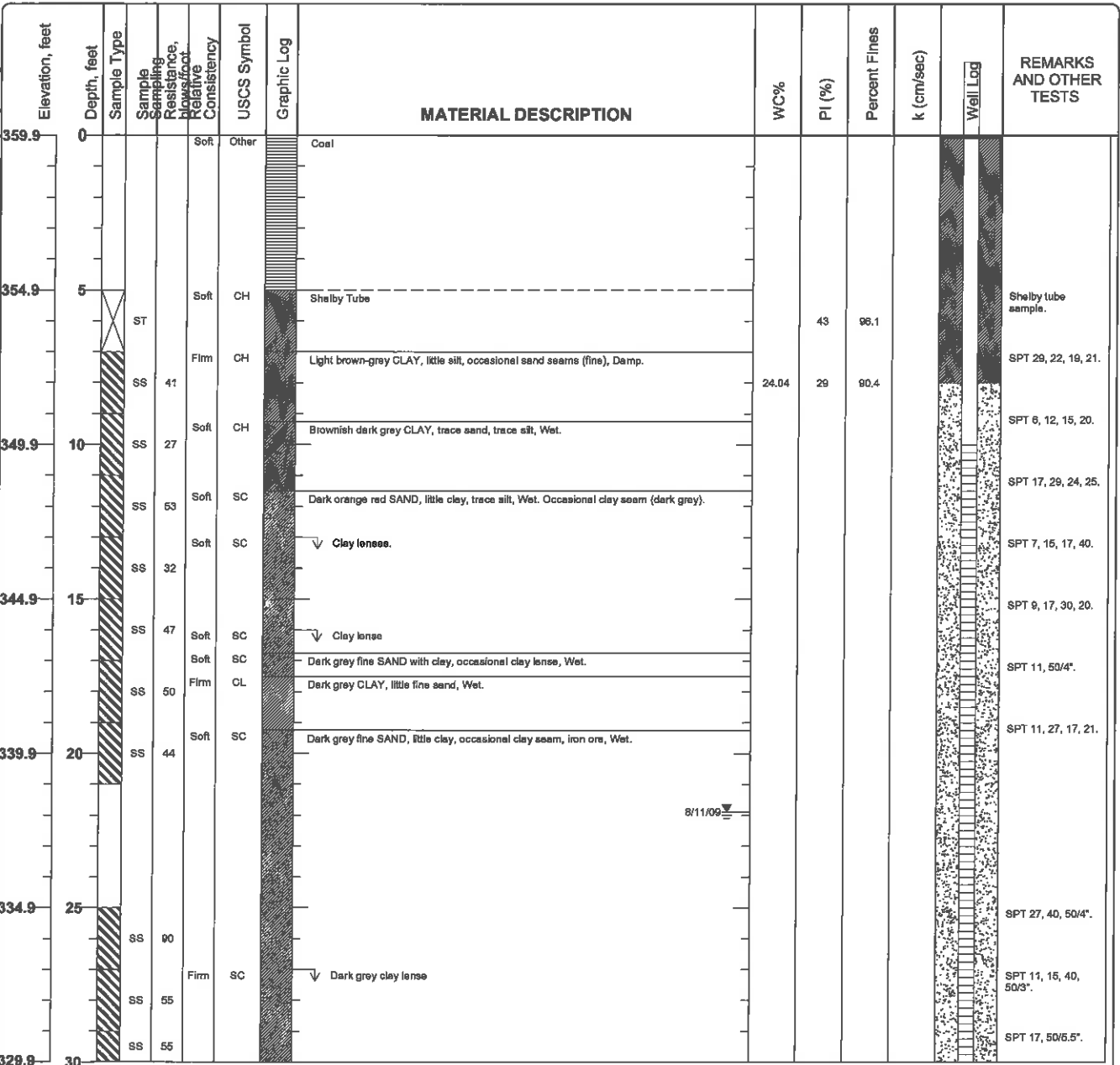
	<b>Cement/Bentonite Grout</b>		<b>Sand Pack</b>		<b>Neat Concrete</b>		<b>Bentonite</b>		<b>Bottom Cap</b>
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>							
	DATE: <u>August 7th, 2009</u>	CHECKED BY: _____	DATE: _____						

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

Log of Boring GB-03  
 Sheet 1 of 2

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

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Figure

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

Log of Boring GB-03  
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Description	Resistance, lb/in <sup>2</sup>	Moisture Content, %	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 grey CLAY, trace silt, trace fine sand.						SPT 17, 50/6.5".	
								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														

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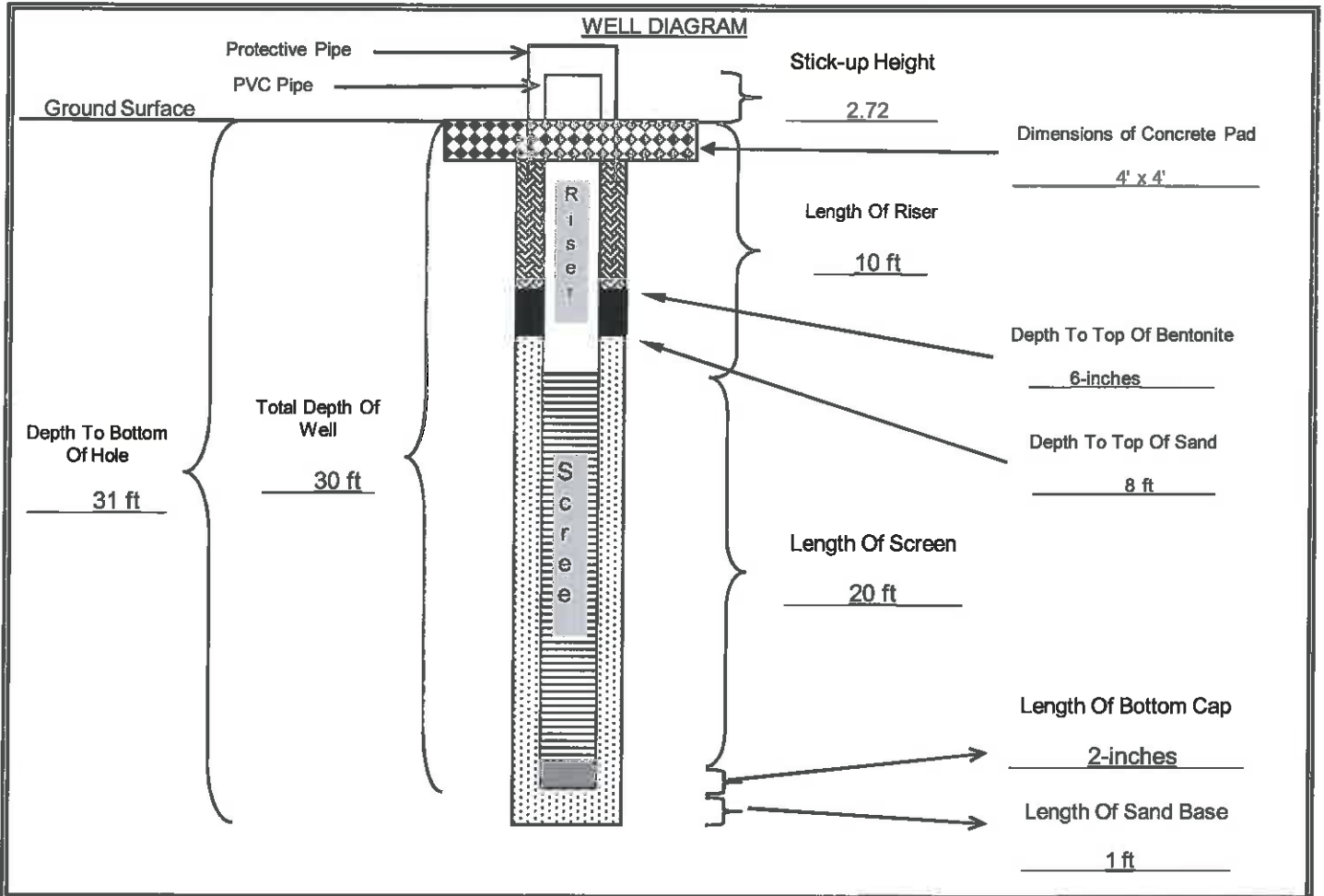
Figure

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



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

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



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

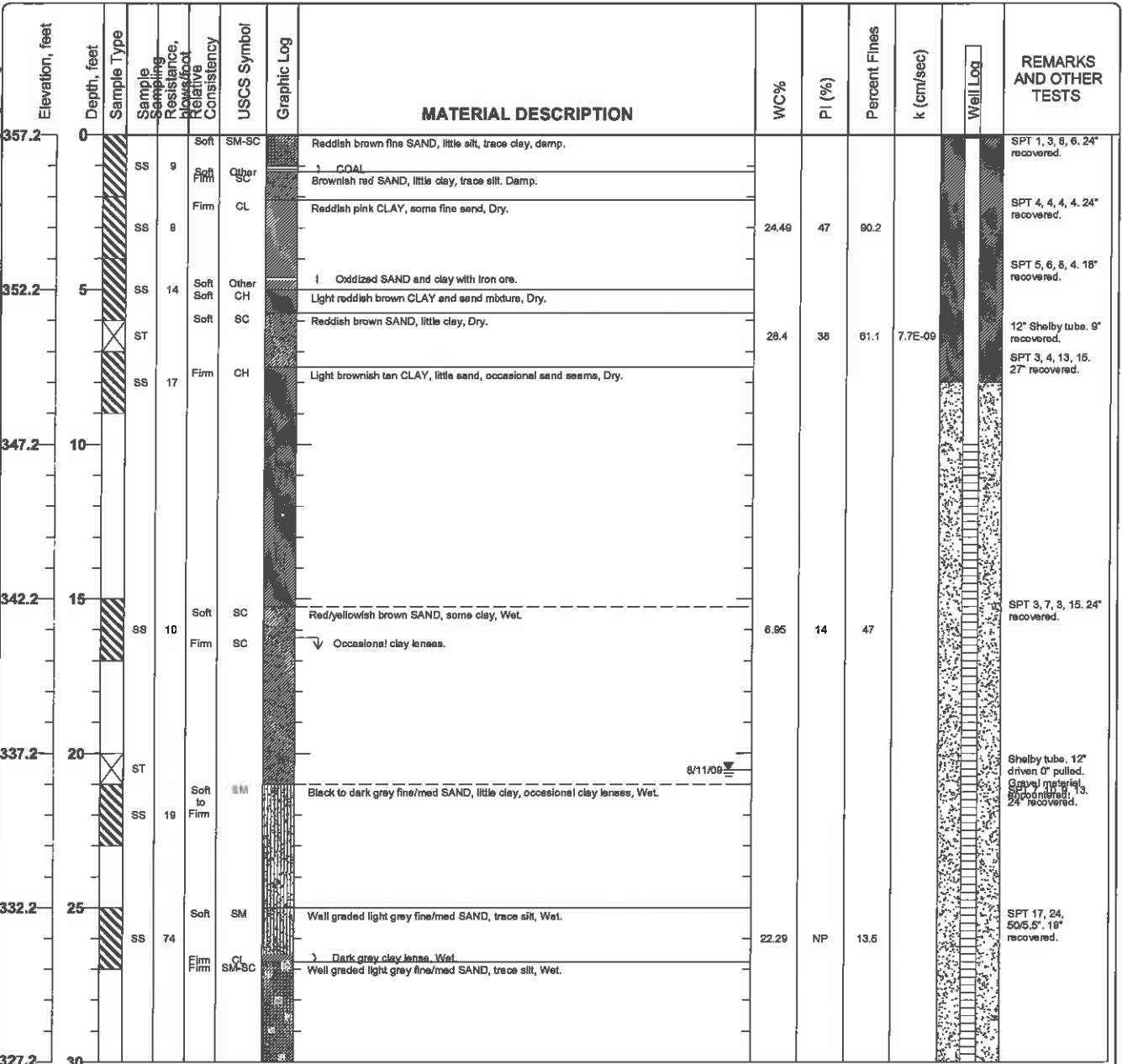


Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

Log of Boring GB-04  
 Sheet 1 of 2

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

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Figure

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

Log of Boring GB-04  
 Sheet 2 of 2

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Elevation, feet	Depth, feet	Sample Type	Sample Description	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 shelly 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, 18, 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)**



JOB NAME: AEP Welsh Power Plant

JOB NO.: TXL0064

DATE/TIME: 24-Jul-09

WELL LOCATION: \_\_\_\_\_

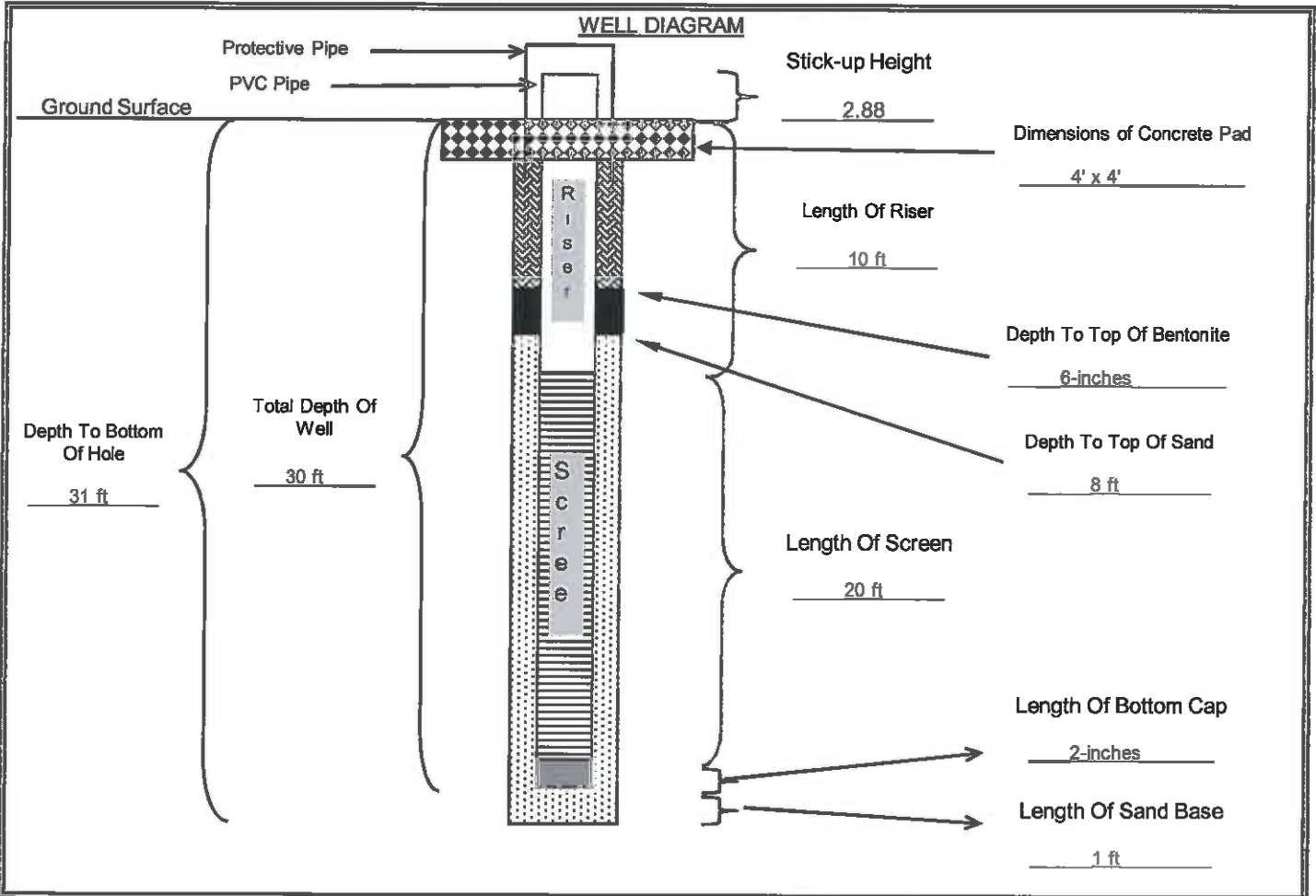
WELL NO.: \_\_\_\_\_

FIELD REP: \_\_\_\_\_

**GB-04**

Kush Chohan

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



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

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

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

**Log of Boring GB-05**  
**Sheet 1 of 2**

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

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Elevation, feet	Depth, feet	Sample Type	Sample Resistance, blow/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	SS	7	Firm	CH	Dark fine SAND with brown organic material and roots.							SPT 2, 2, 5, 5, 24" recovered
		SS	11			Dark red/grey CLAY, trace silt. Dry.	23.37	44	68.8				SPT 4, 4, 7, 9, 24" recovered.
		SS	14								7E-07		SPT 5, 6, 8, 13, 24" recovered
352.5	5	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 at SPT 5, 7, 11, 11, 24" recovered.
		SS	18	Firm	CH	Light tan CLAY, trace sand, Dry.							
		SC		Soft	SC	Dark red SAND, trace of CLAY, Damp.							
		SC				Light tan CLAY, trace fine sand, Dry.							
		SS	18	Soft	SC	Dark red SAND, little clay, frequent clay seams, Damp							SPT 6, 7, 11, 14, 24" recovered.
347.5	10	SS				Frequent clay seams							
		SS	35	Soft	SC	Rad/orange fine SAND, trace clay, trace coarse sand, poorly sorted, Moist.							SPT 11, 22, 13, 14, 24" recovered.
		SS	77	Firm	CL	Brownish grey CLAY, trace sand, Moist.							SPT 17, 27, 50/5", 17" recovered.
		SC		Soft	SC	Tanish grey fine SAND, some clay, Wet.							
342.5	15	ST					19.9	13	35.7	8.6E-07			Shelby tube. Pushed 12" recovered at SPT 11, 13, 10, 14, 24" recovered.
		SS	23	Soft	SM	Dark grey coarse SAND/GRAVEL mix, some fine sand, trace clay, Wet.	27.08	NP	32.3				
		SS	19	Soft	SM-SC	Red fine SAND, trace clay, Moist. cemented. Moist.							SPT 7, 8, 11, 13, 24" recovered.
337.5	20	SS		Firm	SC	Black fine SAND, occasional clay, Wet.							
		CL		Firm	CL	Dark grey CLAY, little sand, Wet.							
		SS	22	Firm	SM	Black fine SAND, some medium sand, some clay, Wet.	32.23	NP	35.5				SPT 8, 10, 12, 15, 24" recovered.
		CL		Firm	CL	Dark grey CLAY, little sand, Wet.							
		SM		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.
		SM		Firm	SM	Frequent clay seams.							
332.5	25	ST											Shelby tube. 12" driven 0" recovered.
		SS	40	Hard	CL	Dark grey CLAY, trace of sand, Dry.							SPT 15, 19, 21, 27, 24" recovered.
		SS	22										SPT 10, 11, 11, 50/5", 23" recovered.
327.5	30	ST		Very Hard	CL	Dark grey CLAY, frequent iron stone/ore. Rig chatter driller comments	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

Printed with a trial version of BorinCSS - visit www.gookinssoftware.com for purchase information: F:\Projects\AEP Welsh Plant\2009 Pond Design\Hydrogeo Investigation\Boring Log\Boring\_GS\_files\GB-05\_bgs JKSC\_AEP.tpl

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

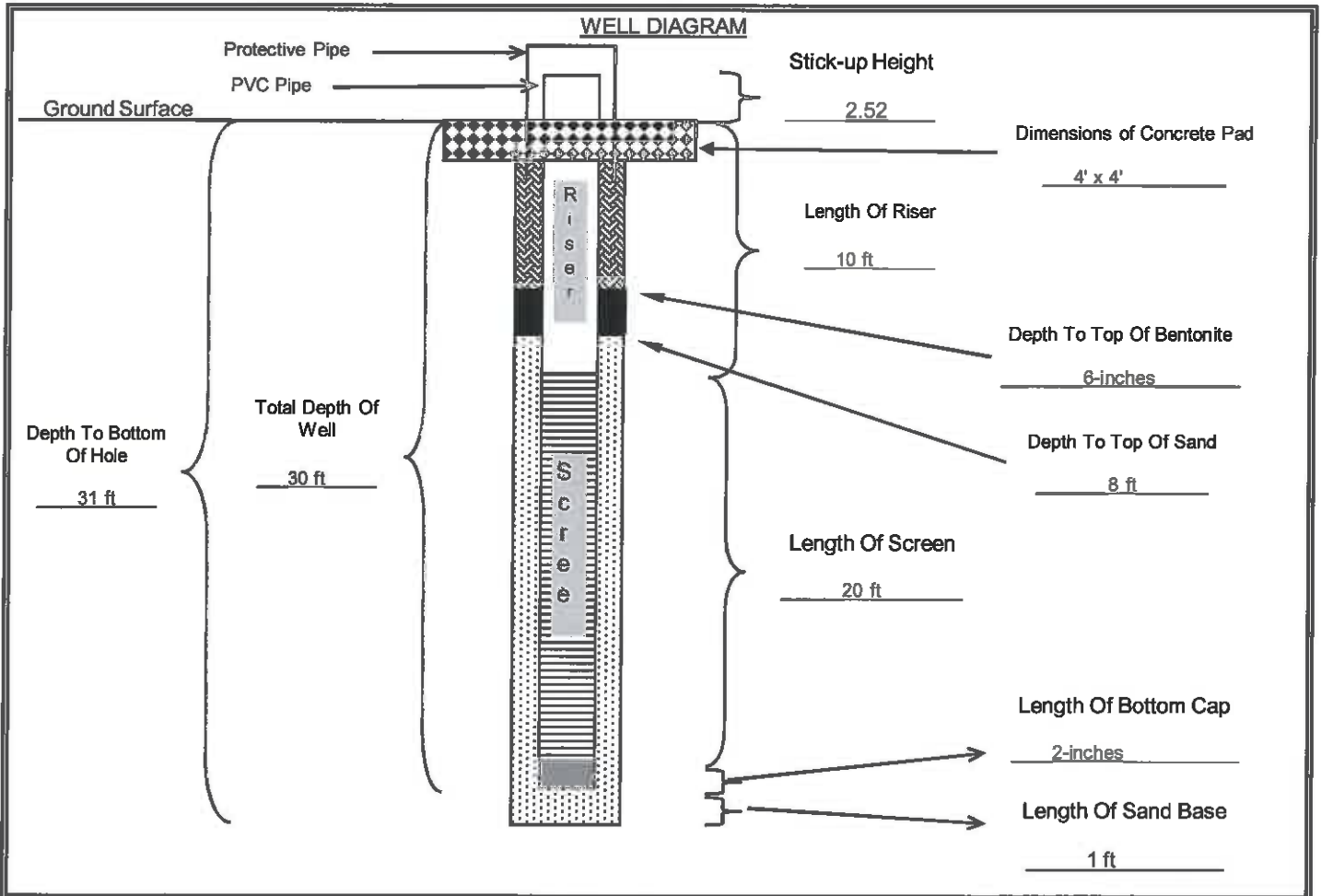
Figure

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



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

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



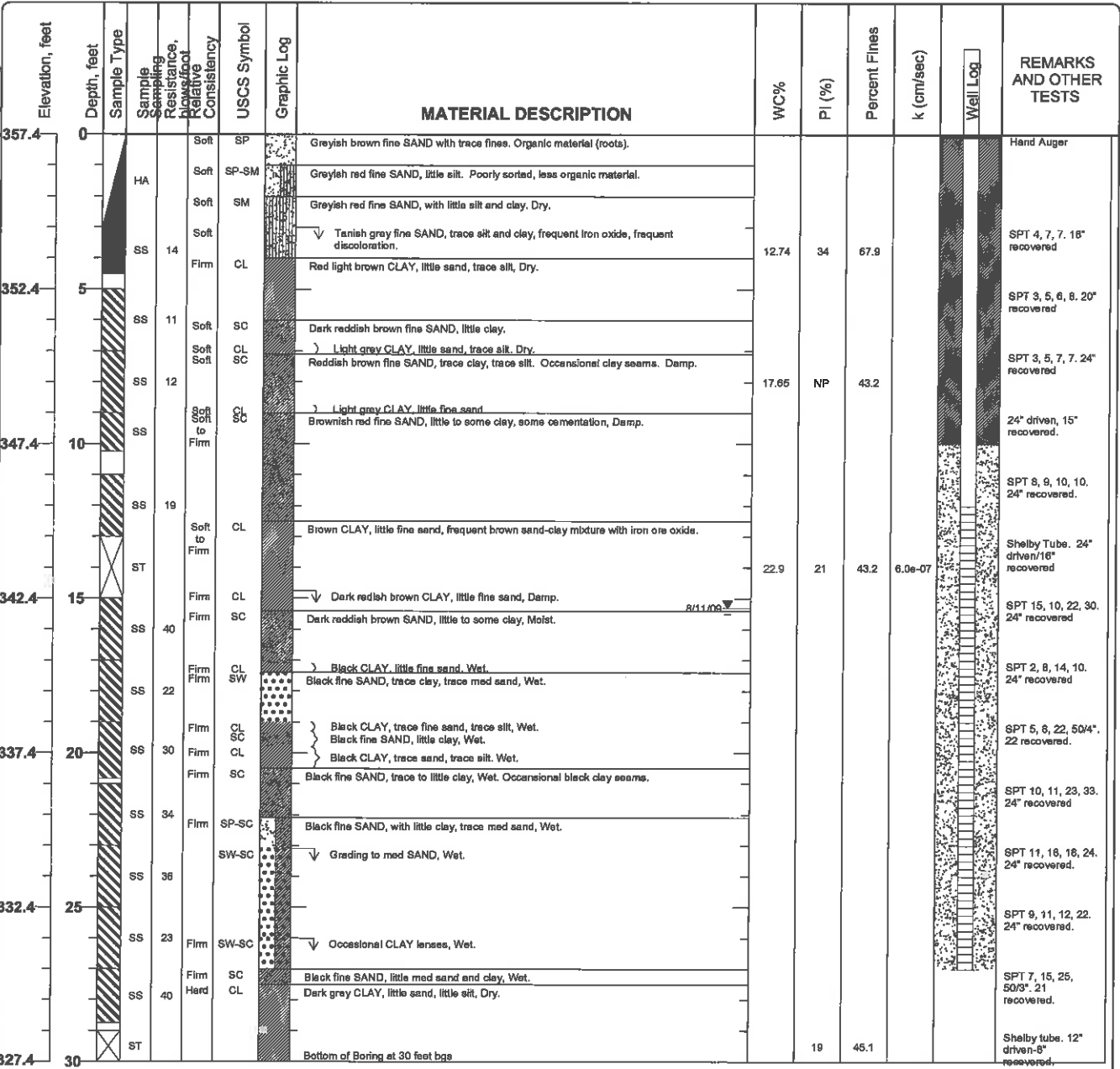
	Cement/Bentonite Grout	Sand Pack	Neat Concrete	Bentonite	Bottom Cap
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>			
	DATE: <u>6-Aug-09</u>	CHECKED BY: _____	DATE: _____		

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

Log of Boring GB-06  
 Sheet 1 of 1

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

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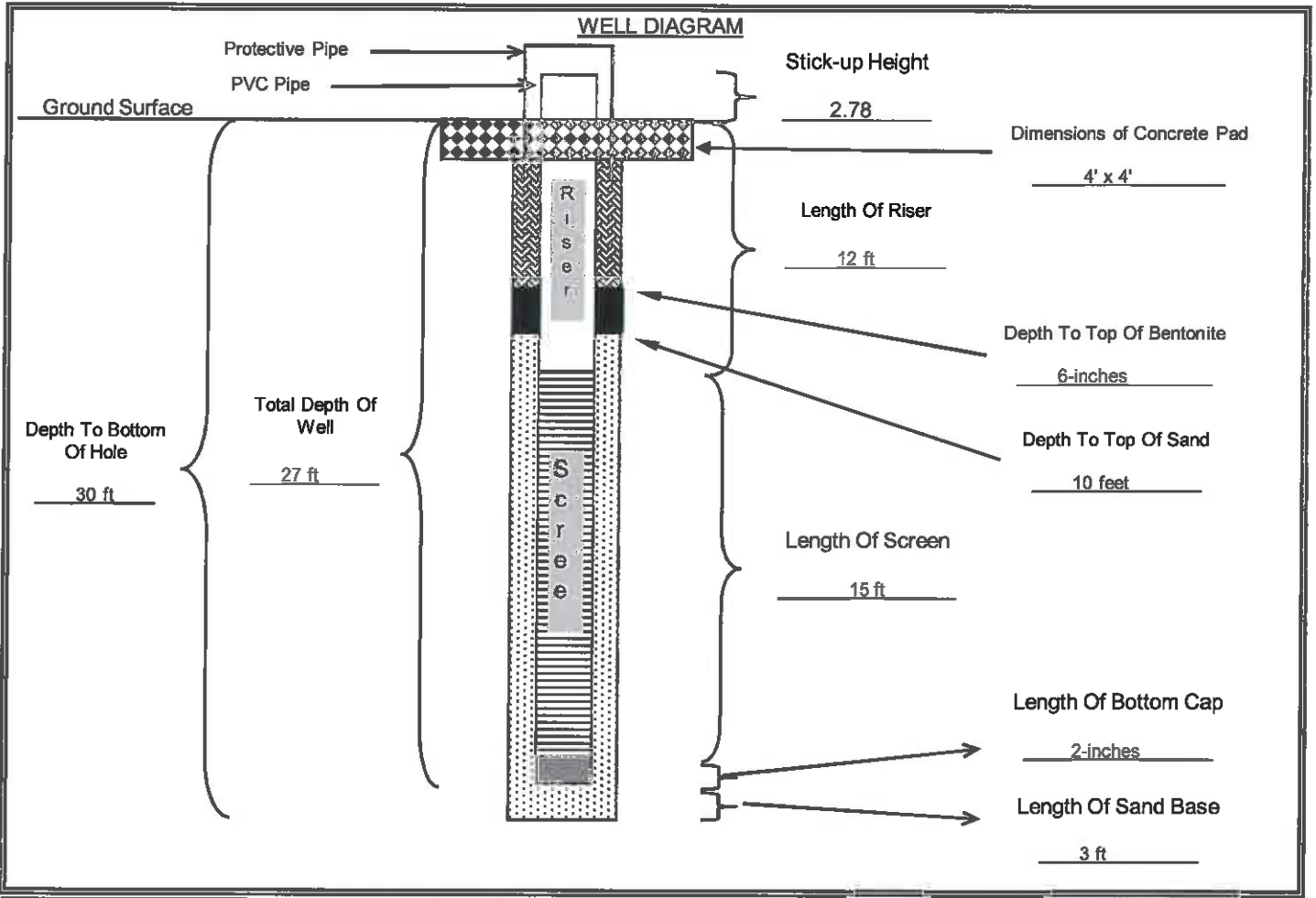
Figure

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



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

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



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





# SOIL BORING LOG

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

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

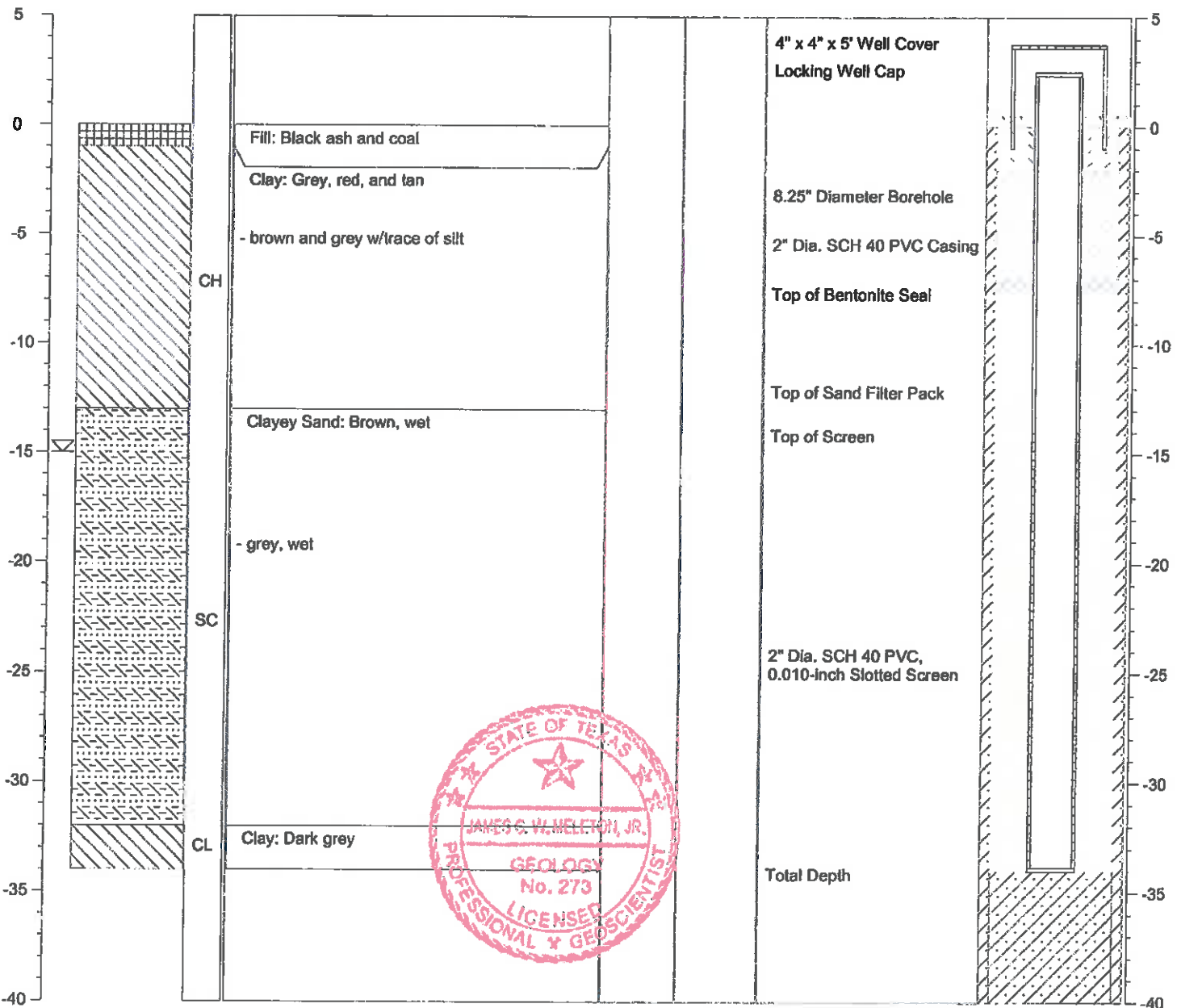
DRILLING CO.: **WEST Drilling**  
 DRILLER: **Tom McCullough**  
 METHOD OF DRILLING: **Hollow-stem Auger**  
 SAMPLING METHODS: **Split-spoon**  
 DATE DRILLED: **12/1/09**

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

≡ Water level during drilling  
 ≡ Water level in completed well

Page 1 of 1

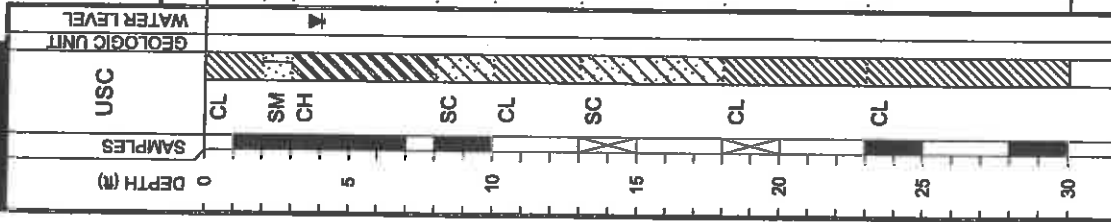
DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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**LOG OF BORING B-1**

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

BORING TYPE: Flight Auger

DATE: 10/27/09  
SURFACE ELEVATION: 324.1

FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit				
P=4.0 SF	1.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
N=7	2.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
P=1.5	3.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
P=1.75	4.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
N=15	1.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
N=35	2.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
P=4.5+	3.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%
P=4.5+	4.0	3.0	1.0	1.0	1.0	20	38	63	PL 16 TL 54	19	+40 Sieve=10% +4 Sieve=1%

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

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

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





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**MATERIAL DESCRIPTION**

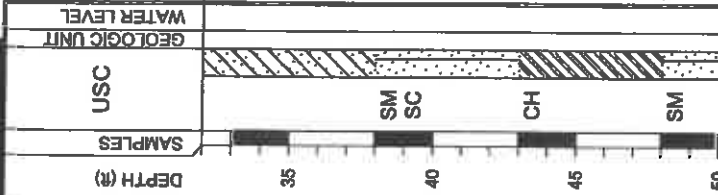
-red and tan

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

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

SILTY SAND(SM) black and gray

Bottom of Boring @ 50'



WATER LEVEL  
GEOLOGIC UNIT

**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

FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Ou (tsf) ▲ 4 ■ PPR (tsf) ◆ Torvane (tsf) ◆ 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			MOISTURE CONTENT (%)	ATTEBERG LIMITS (%) LL PL PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Moisture Content	Liquid Limit				
P=2.5	● 40, ▲ 2, ■ 1.0, ◆ 1.0	110	1.5	10	1	20	22	12	15	7	48	+40 Sieve=0%, +4 Sieve=0%
SF	● 40, ▲ 2, ■ 1.0, ◆ 1.0	110	1.5	10	1	20	22	12	15	7	48	+40 Sieve=0%, +4 Sieve=0%
P=4.5+	● 40, ▲ 2, ■ 1.0, ◆ 1.0	110	1.5	10	1	20	22	12	15	7	48	+40 Sieve=0%, +4 Sieve=0%
SF	● 40, ▲ 2, ■ 1.0, ◆ 1.0	110	1.5	10	1	20	22	12	15	7	48	+40 Sieve=0%, +4 Sieve=0%

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'

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

# Piezometer B-2

ENVIRONMENTAL LOG			Well No. B-2		Location Pittsburg, Texas		Page 1 of 2	
Client: Welsh Power Plant		Phase	Task	Surface Elev.				
Project No: G3242-095								
Depth Feet	Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details	
							T.O.C. Elev.	
0		Ground Surface				0		
5		SANDY LEAN CLAY(CL) hard; red and tan -very stiff				5		
10		-stiff -very stiff; reddish brown				10		
15		SANDY LEAN CLAY(CL) hard; red and tan				15		
20		-very stiff				20		
25						25		

Continued Next Page

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



**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Well No. B-2

Location Pittsburg, Texas

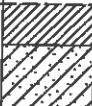

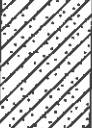

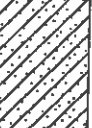

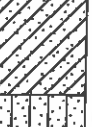

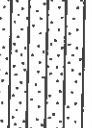

Project No: G3242-095

Phase

Task

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	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						





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**LOG OF BORING B-3**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE

10/27/09

SURFACE ELEVATION

339.6

DEPTH (ft)	USC	GEOLOGIC UNIT	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	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (L) PLASTIC LIMIT (PL) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
										Plastic Limit	Moisture Content	Liquid Limit				
0	SC			N=11	●						23	52	18	34	87	+40 Sieve=3%, +4 Sieve=0%
5	CH			P=1.0	■						21	51	19	32	86	+40 Sieve=3%, +4 Sieve=0%
10				P=3.5	■						21	54	20	34	85	+40 Sieve=10%, +4 Sieve=1%
15	CH			P=3.75	■						23	61	24	37	81	+40 Sieve=11%, +4 Sieve=0%
20				P=2.5	■						22	42	22	20	35	+40 Sieve=1%, +4 Sieve=0%
25	CH			P=4.5+	■											
30	SC			N=56	●											

**MATERIAL DESCRIPTION**

CLAYEY SAND(SC) medium dense; gray and red  
EAT CLAY(CH) stiff; red and tan; with sand seams  
-very stiff  
EAT CLAY WITH SAND(CH) very stiff; brown; with ferric joints  
-red and tan; layered; with ferric seams  
EAT CLAY(CH) hard; gray, with sand seams  
CLAYEY SAND(SC) very dense; gray; with sand seams

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

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

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



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**MATERIAL DESCRIPTION**

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

--gray and green

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

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

Bottom of Boring @ 50'

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

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

**LOG OF BORING B-3**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

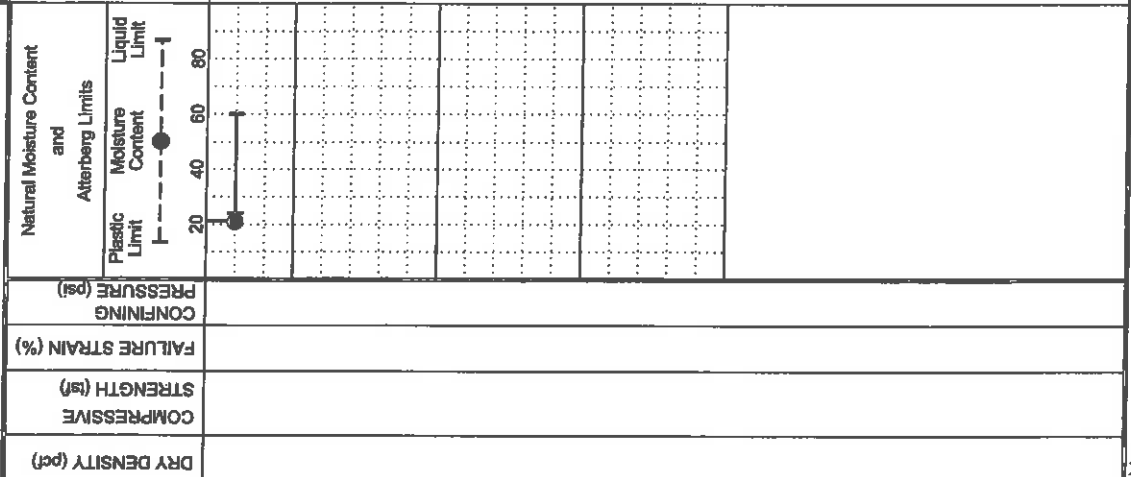
PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE 10/27/09

SURFACE ELEVATION 339.6

MOISTURE CONTENT (%)	21	OTHER TESTS PERFORMED (Page Ref. #)	+40 Sieve=1%, +4 Sieve=0%
ATTERBERG LIMITS(%)	LIQUID LIMIT	TL	60
	PLASTIC LIMIT	PL	24
	PLASTICITY INDEX	PI	36
MINUS #200 SIEVE (%)	95		



FIELD STRENGTH DATA	BLOW COUNT	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	DRY DENSITY (pcf)	PPR (tsf)	Torsions (tsf)
P=4.5+	20					1.0	1.0
P=4.5+	40					2.0	2.0
P=3.5	60					3.0	3.0
P=4.5+	80					4.0	4.0

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

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



Pipe 200m dia B-4

**DATE** 10/27/09  
**SURFACE ELEVATION** 340.6

**LOG OF BORING B-4**  
**PROJECT:** Welsh Power Plant  
 Pittsburgh, Texas  
**PROJECT NO.:** G3242-08  
**BORING TYPE:** Flight Auger

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DEPTH (ft)	USC SAMPLES	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT				DRY DENSITY (pcf)	COMPRESSION STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)			OTHER TESTS PERFORMED (Page Ref. #)
				●	▲	■	◆					PL	PI	T	PL	PI	
0																	
1			N=19	1	2	3	4										
2			SF														
3			P=4.5														
4			P=3.25														
5			P=3.25														
6																	
7			N=9														
8			P=4.0														
9																	
10			P=2.75														
11																	
12																	
13																	
14																	
15																	
16																	
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21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

**Water Level**  Measured:  Fetched:   
 Water level @ 18' and open to 48' upon completion.

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

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



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**MATERIAL DESCRIPTION**

-hard; light gray; layered and with silt seams

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

-light gray

-layered and with sand seams; with lignite

Bottom of Boring @ 50'

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

Water Level  
Water Observations:  
completion.

Edt.:  Measured:  Perched:   
Water level @ 18' and open to 48' upon

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

**LOG OF BORING B-4**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

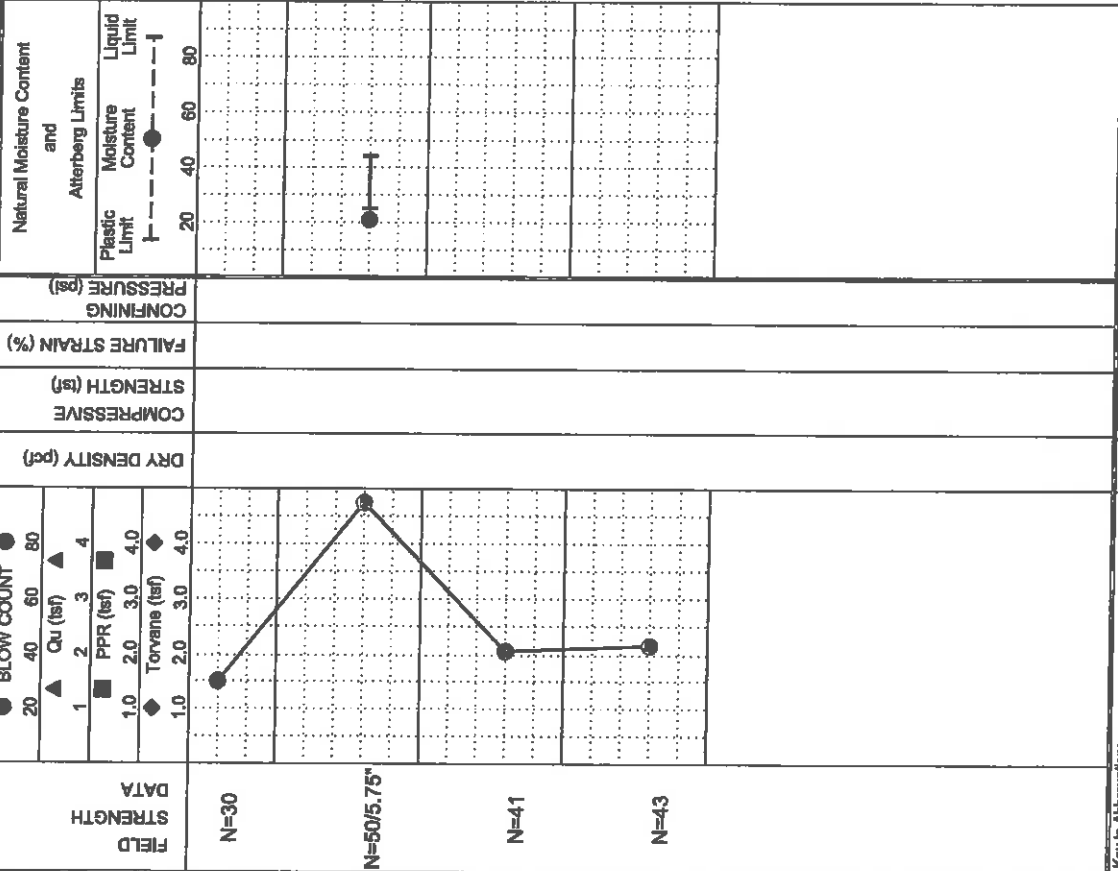
DATE

10/27/09

SURFACE ELEVATION  
340.6

ATTERBERG  
LIMITS(%)

MOISTURE CONTENT (%)		ATTERBERG LIMITS(%)		MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
LIQUID LIMIT	PLASTIC LIMIT	LIQUID LIMIT	PLASTIC LIMIT		
44	25	19	83		+40 Sieve=1% +4 Sieve=0%



DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits
				Plastic Limit, Liquid Limit

Notes:

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

# Piezometer B-4

ENVIRONMENTAL LOG			Well No. B-4		Location Pittsburg, Texas		Page 1 of 2	
Client: Welsh Power Plant		Phase	Task	Surface Elev.				
Project No: G3242-095								
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details		
0	<b>Ground Surface</b>				0	T.O.C. Elev.		
5	<u>SILTY SAND(SM)</u> medium dense; tan; with gravel -fannish orange -hard; orangish tan				5			
10	<u>SANDY LEAN CLAY(CL)</u> dark brown -very stiff; white				10			
15	<u>CLAYEY SAND(SC)</u> medium dense; tan -orangish gray; with sand seams				15			
20	<u>SANDY LEAN CLAY(CL)</u> stiff; orangish tan				20			
25	<u>FAT CLAY(CH)</u> very stiff; orangish tan; with ferric seams				25			

Continued Next Page

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

Page 2 of 2

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



P.E. Zouker B-5

DATE: 10/27/09

SURFACE ELEVATION: 340.0

OTHER TESTS PERFORMED (Page Ref. #)

LOG OF BORING B-5

PROJECT: Weish Power Plant  
Pittsburgh, Texas

BORING TYPE: Flight Auger

PROJECT NO.: G3242-09

FIELD STRENGTH DATA

SOIL CLASSIFICATION

DRY DENSITY (pcf)

COMPRESSIVE STRENGTH (tsf)

FAILURE STRAIN (%)

CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits

MOISTURE CONTENT (%)

MINUS #200 SIEVE (%)

PLASTIC LIMIT

LIQUID LIMIT

PLASTICITY INDEX

BLOW COUNT

Cu (tsf)

PPR (tsf)

Torvane (tsf)

FIELD STRENGTH

LEAN CLAY WITH SAND (CL) stiff; red and tan

LEAN CLAY (CL) hard; red and tan

FAT CLAY (CL) very stiff; brown and tan

FAT CLAY WITH SAND (CH) hard; red and tan

SANDY LEAN CLAY (CL) very stiff; red and gray; with sand seams

CLAYEY SAND (SC) very loose; tan, red, and gray

FAT CLAY WITH SAND (CH) stiff; red and gray

WATER LEVEL

USC

SAMPLES

DEPTH (ft)

CL

CL

CH

CH

CL

SC

CH

Water Level

Est. Measured: Perched:

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

Water Observations:

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'

Water Level

Water Level



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**MATERIAL DESCRIPTION**

SILTY CLAYEY SAND(SC) gray and red;  
saturated

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

-gray, tan, and red; with sand seams

SILTY SAND(SM-SC) red and gray

Bottom of Boring @ 50'

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

**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

FIELD STRENGTH DATA	BLOW COUNT 20 40 60 80 ▲ Qu (tsf) ▲ 4 1 2 3 4 ■ PPR (tsf) 4.0 ◆ Torvane (tsf) 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ks)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)	
						Plastic Limit	Liquid Limit		PL	PL	PL		PL
SF								25	51	31	20	87	+40 Sieve=6%, +4 Sieve=0%
P=4.5+													
P=4.5+													
SF													

Key to Abbreviations:

- N - SPT Data (Blow/Ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Est:

Measured:  Perched:

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

Notes:

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

Appendix P-5

ENVIRONMENTAL LOG			Well No. B-5			
Client: Welsh Power Plant			Location Pittsburg, Texas			
Project No: G3242-095	Phase	Task	Surface Elev.	Page 1 of 2		
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
0	Ground Surface				0	T.O.C. Elev.
5	LEAN CLAY WITH SAND(CL) stiff; red and tan		[Diagonal Hatching]	[Well Construction Diagram]	5	
10	LEAN CLAY(CL) hard; red and tan -very stiff		[Diagonal Hatching]	[Well Construction Diagram]	10	
15	FAT CLAY(CL) very stiff; brown and tan		[Diagonal Hatching]	[Well Construction Diagram]	15	
20	FAT CLAY WITH SAND(CH) hard; red and tan		[Diagonal Hatching]	[Well Construction Diagram]	20	
25	SANDY LEAN CLAY(CL) very stiff; red and gray; with sand seams		[Diagonal Hatching]	[Well Construction Diagram]	25	
	CLAYEY SAND(SC) very loose; tan, red, and gray		[Diagonal Hatching]	[Well Construction Diagram]		

Continued Next Page

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

Client: Welsh Power Plant

Well No. B-5

Location Pittsburg, Texas











Project No: G3242-095

Phase

Task

Surface Elev.

Page 2 of 2

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





Pic 7000 B-6

LOG OF BORING B-6

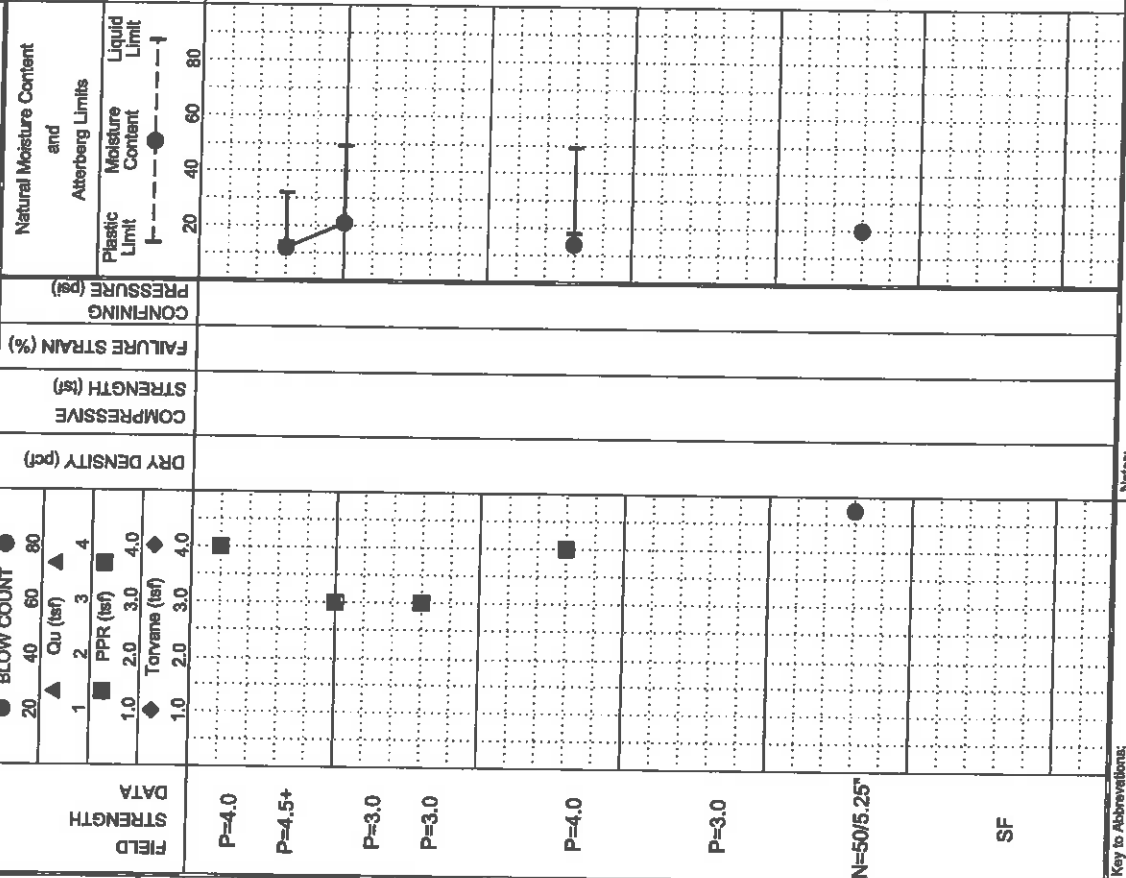
DATE: 10/27/09  
 SURFACE ELEVATION: 340.1

PROJECT: Welsh Power Plant  
 Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
12	32	14	18	60	+40 Sieve=0%, +4 Sieve=0%
21	49	20	29	93	+40 Sieve=2%, +4 Sieve=0%
14	49	18	31	65	+40 Sieve=0%, +4 Sieve=0%
20				18	+40 Sieve=0%, +4 Sieve=0%



DEPTH (ft)	FIELD STRENGTH	DRY DENSITY (pcf)	COMPRESSIONIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Atterberg Limits	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0-4	P=4.0											
4-5	P=4.5+											
5-10	P=3.0											
10-15	P=3.0											
15-20	P=4.0											
20-25	P=3.0											
25-30	N=50/5.25"											
30-35	SF											

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**MATERIAL DESCRIPTION**  
 FAT CLAY(CH) very stiff; red and gray; with ferric seams  
 SANDY LEAN CLAY(CL) hard; red and tan  
 -very stiff; red, gray, and brown; with gravel -with sand seams  
 SILTY SAND(SM) gray; saturated  
 -very dense; gray and red

Water Level: [Symbol] Measured: [Symbol] Perched: [Symbol]  
 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 - Torvans (tsf)  
 L - Lab Vane Shear (tsf)

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



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

**MATERIAL DESCRIPTION**

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

-dark green

LEAN CLAY(CL) hard; dark green; laminated with lignite

Bottom of Boring @ 50'

**LOG OF BORING B-6**

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

BORING TYPE: Flight Auger

FIELD STRENGTH DATA	BLOW COUNT 20 40 60 80 ▲ Cu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			
						Plastic Limit	Moisture Content	Liquid Limit	
P=4.5+	● 20 40 60 80	■ 1.0 2.0 3.0 4.0				20	40	60	80
P=4.5+									
P=4.5+									
P=4.5+									

MOISTURE CONTENT (%)	ATTERBERG LIMITS(%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
	LIQUID LIMIT	PLASTIC LIMIT	PL		
22	68	24	44	95	+40 Sieve=0%, +4 Sieve=0%

DATE: 10/27/09  
SURFACE ELEVATION: 340.1

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

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

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

Pipe 2000 B-6

ENVIRONMENTAL LOG			Well No. B-6			
Client: Welsh Power Plant			Location Pittsburg, Texas			
Project No: G3242-095			Surface Elev.			
Phase			Task			
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
0	Ground Surface				0	T.O.C. Elev.
0-5	FAT CLAY(CH) very stiff; red and gray; with ferric seams		[Diagonal Hatching]	[Diagonal Hatching]	0-5	
5-10	SANDY LEAN CLAY(CL) hard; red and tan -very stiff; red, gray, and brown; with gravel -with sand seams		[Diagonal Hatching]	[Diagonal Hatching]	5-10	
10-20	SILTY SAND(SM) gray; saturated		[Dotted Pattern]	[Dotted Pattern]	10-20	
20-25	-very dense; gray and red		[Dotted Pattern]	[Dotted Pattern]	20-25	

Continued Next Page

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



**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Project No: G3242-095

Phase



Task

Well No. B-6

Location Pittsburg, Texas

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">30</div> <div style="margin-bottom: 10px;">35</div> <div style="margin-bottom: 10px;">40</div> <div style="margin-bottom: 10px;">45</div> <div style="margin-bottom: 10px;">50</div> </div>	<p style="text-align: center;">FAT CLAY(CH) hard; brown; with sand seams</p> <p style="text-align: center;">—dark green</p> <p style="text-align: center;">LEAN CLAY(CL) hard; dark green; laminated with lignite</p>				<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">30</div> <div style="margin-bottom: 10px;">35</div> <div style="margin-bottom: 10px;">40</div> <div style="margin-bottom: 10px;">45</div> <div style="margin-bottom: 10px;">50</div> </div>	
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">55</div> <div style="margin-bottom: 10px;">60</div> </div>	<p style="text-align: center;">Bottom of Boring @ 50'</p>					





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**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	BLOW COUNT				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Atterberg Limits and Natural Moisture Content			MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
							BLOW COUNT	Qu (tsf)	PPR (tsf)	Torvane (tsf)					Plastic Limit	Moisture Content	Liquid Limit				
0																					
2						N=31	1	2	3	4						21		21	+40 Sieve=0%, +4 Sieve=0%		
3						N=36															
4						N=38															
6						N=59										23		15	+40 Sieve=0%, +4 Sieve=0%		
12						N=26															
14																					
22						P=4.5+															
28						P=4.5+															
30																					

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

Notes:

Key to Abbreviations:

- N - SPT Data (Blow/Ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Water Observations:  
@ 2' and open to 7' upon completion.

Ent:  Measured:  Punched:

Water Level: Bottom of Boring @ 30'

# Landfill Boring B-2

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**MATERIAL DESCRIPTION**

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

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

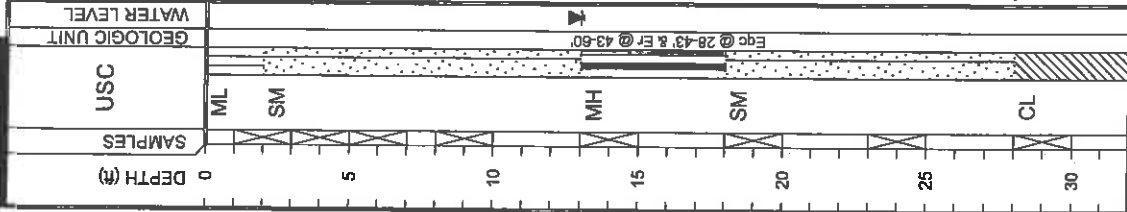
ASH (ELASTIC SILT (MH)) very loose; black; with fine-grained sand and lightly cemented gravel pieces; saturated

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

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

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

Est.:  Measured:  Perched:   
 Water level @ 13'



**LOG OF BORING B-2**

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

DATE  
 10/8/14

SURFACE ELEVATION  
 373.8

FIELD DATA STRENGTH	BLOW COUNT ● 20 40 60 80 ▲ Qu (tsf) 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Tonvane (tsf) 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (LL) PLASTIC LIMIT (PL) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit				
N=13	● 20 40 60 80 ▲ Qu (tsf) 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Tonvane (tsf) 1.0 2.0 3.0 4.0					46	59	+40 Sieve=27% +4 Sieve=16%			
N=29						40	40	+40 Sieve=19% +4 Sieve=2%			
N=18						200	134 92 42 100	+40 Sieve=0% +4 Sieve=0%			
N=9						91	61	+40 Sieve=11% +4 Sieve=1%			
N=0						18	30 15 15 63	+40 Sieve=1% +4 Sieve=0%			
N=1											
N=7											
N=6											

Notes:

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

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

Driller:  
 Tommy Cook

Logger:  
 B.Hobbs/O.Sanderson



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Tyler, Texas 75702  
(903) 595-4421

**MATERIAL DESCRIPTION**

**CLAYEY SAND(SC)** dense; light brown, light gray and reddish brown; moist; with fine-grained sand; mottled

**SILTY SAND(SM)** very dense; light brown, yellowish brown and light gray; moist; mottled; with fine-grained sand

**EAT CLAY(CH)** very stiff; dark brown and light brown; moist; with sand seams; laminated

-dark brown with light gray; moist; with silt seams

-hard; dark brown; moist

Bottom of Boring @ 60'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35	SC			
40	SM			
45	CH			
50				
55				
60				

Water Level  
Water Observations:  
Est.:  Measured:  Perched:   
Water level @ 13'

**LOG OF BORING B-2 (cont.)**

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

**PROJECT NO.:** G4207-146

**DATE** 10/8/14

**SURFACE ELEVATION**  
373.8

FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit				
P=3.5 P=2.75	1 2 3 4	110	1.39	4.3	21	20	30	18	LL PL PI	39	+40 Sieve=0% +4 Sieve=0%
N=78	1 2 3 4							16			
N=27	1 2 3 4							21		24	+40 Sieve=0% +4 Sieve=0%
P=4.0	1 2 3 4	98						25	LL PL PI	96	+40 Sieve=2% +4 Sieve=0%
N=37	1 2 3 4							24			

Notes:

Key to Abbreviations:

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

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  
**DRILL RIG:** B-61 HDX  
**BORING TYPE:** Rotary Wash/Flight Auger

**PROJECT NO.:** G4207-146

**DATE:** 10/8/14

**SURFACE ELEVATION:** 373.2

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
											Moisture Content	Plastic Limit	Liquid Limit	LL	PL		
0																	
3					N=7	1					24	31	19	12	41		+40 Sieve=21% +4 Sieve=11%
10					N=3	2											
13					N=0	3											
18					N=50/1"	4					56				14		+40 Sieve=71% +4 Sieve=28%
23					N=50/4"	3											
27					N=4	4											+40 Sieve=1% +4 Sieve=0%
30																	

### MATERIAL DESCRIPTION

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

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

--wet

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

--cemented layer from 23' to 27'

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

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

**Water Observations:**  
Seepage @ 13' while drilling.

**Notes:**

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

Driller: Tommy Cook

Logger: B. Hobbs/O. Sanderson





**ETTL  
ENGINEERS &  
CONSULTANTS**

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

**MATERIAL DESCRIPTION**

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

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

--hard

Bottom of Boring @ 60'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35				
40		SC		
45		CH		
50				
55				
60				

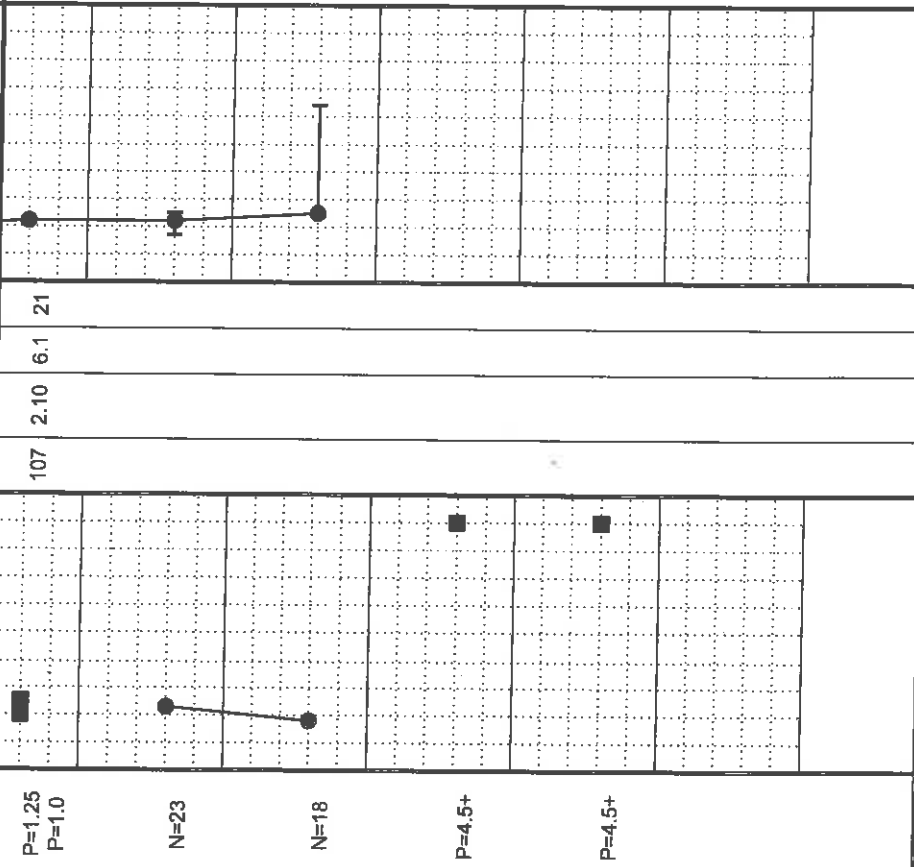
Egc @ 27.43 & Er @ 43.60

Water Level  
Water Observations:  
Est.  Measured:  Perched:   
Seepage @ 13' while drilling.

**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  
BORING TYPE: Rotary Wash/Flight Auger

FIELD DATA	STRENGTH	BLOW COUNT				Natural Moisture Content and Atterberg Limits	CONFINING PRESSURE (psi)	FAILURE STRAIN (%)	STRENGTH (tsf)	COMPRESSIVE STRENGTH (tsf)	DRY DENSITY (pcf)
		1	2	3	4						
P=1.25 P=1.0		▲	▲	▲	▲					107	
N=23		■	■	■	■						
N=18		◆	◆	◆	◆						
P=4.5+											
P=4.5+											



Notes:

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

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

Diller: Tommy Cook  
Logger: B. Hobbs/O. Sanderson

DATE: 10/8/14  
SURFACE ELEVATION: 373.2

ATTEBERG LIMITS(%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
25	64	24	40	90	+40 Sieve=7% +4 Sieve=0%

# Landfill Boring B-12



**ETTL ENGINEERS & CONSULTANTS**

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

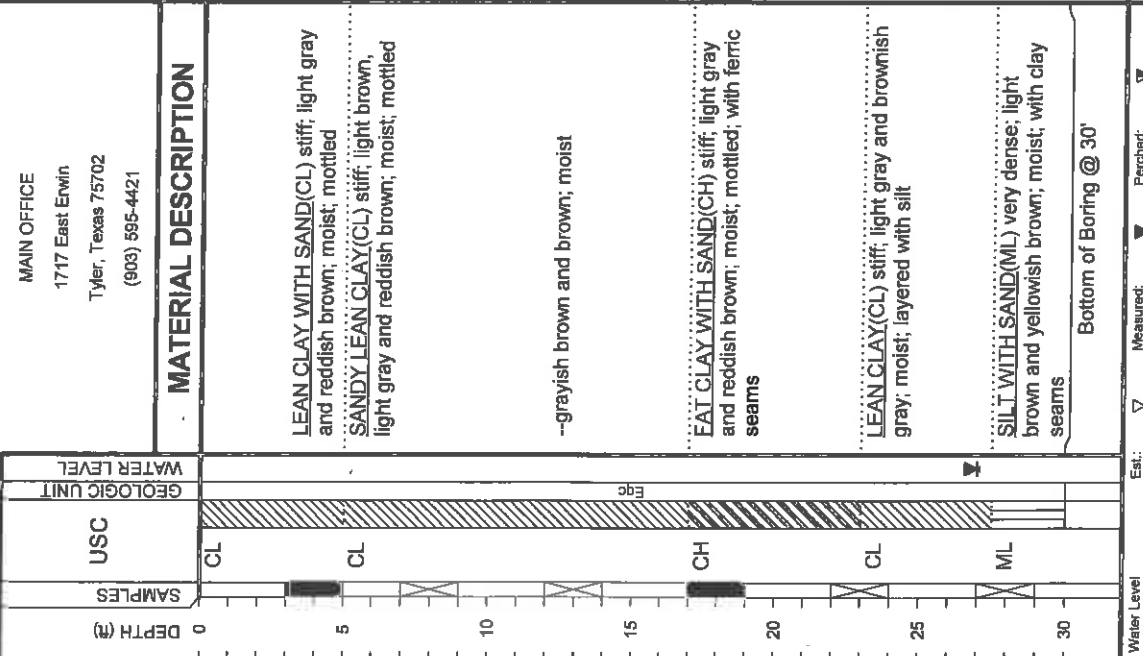
## LOG OF BORING B-12

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

**DATE:** 10/15/14  
**SURFACE ELEVATION:** 361.7

OTHER TESTS PERFORMED (Page Ref. #)

FIELD DATA	STRENGTH	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Moisture Content		Liquid Limit	PL	PL		
P=3.75								16	33	19	14	58	+40 Sieve=1% +4 Sieve=0%
N=15													
N=11													
P=3.75													
N=14								24	39	19	20	93	+40 Sieve=1% +4 Sieve=0%
N=53													



**Water Level** Est.:  Measured:  Perched:

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

**Notes:**

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

**GPS Coordinates:** N33.04713° W94.84486°

**Driller:** Lewis Drilling, Inc.  
**Logger:** O. Sanderson

# Landfill Boring B-13

**ETTL**  
**ENGINEERS &**  
**CONSULTANTS**

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

## MATERIAL DESCRIPTION

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

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

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

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

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

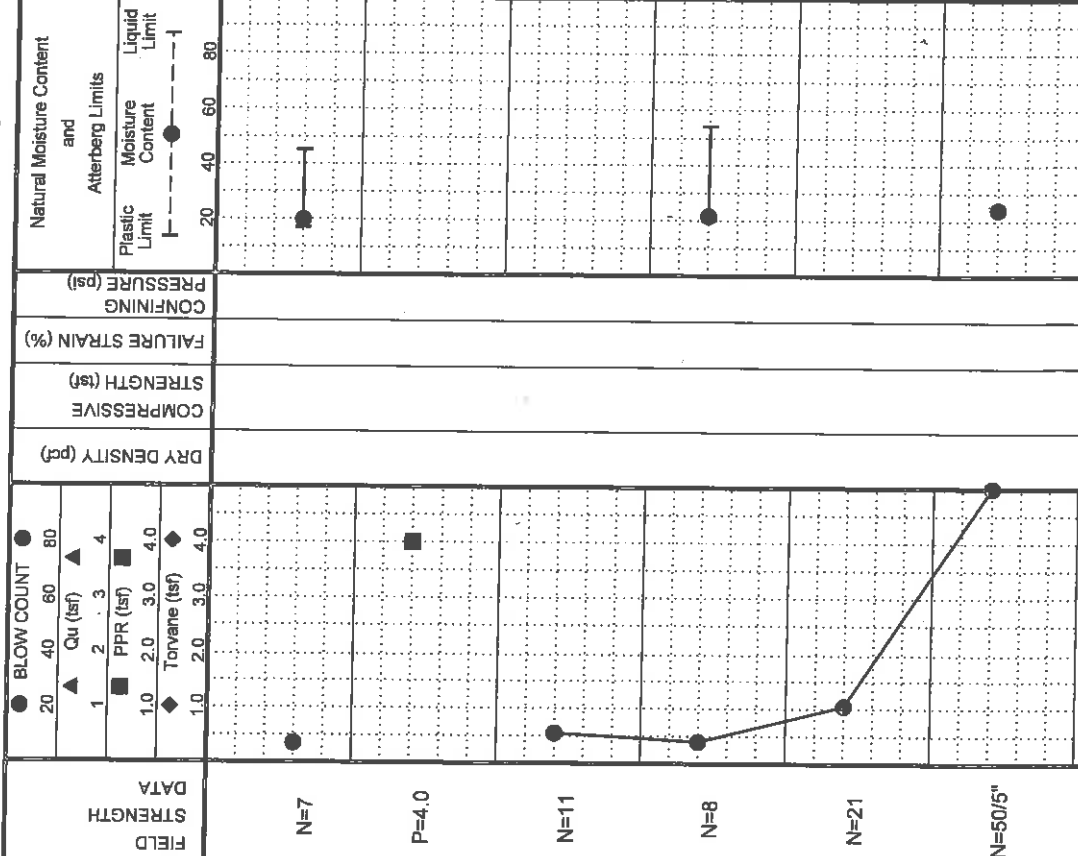
SILT WITH SAND (ML) very dense; light gray and yellowish brown; wet; with clay seams

Bottom of Boring @ 30'

## LOG OF BORING B-13

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

**PROJECT NO.:** G4207-146



DEPTH (ft)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	MINUS #200 SIEVE (%)	OTHER TESTS
7	20	45	17	28	76	+40 Sieve=1% +4 Sieve=0%
11	22	54	20	34	79	+40 Sieve=1% +4 Sieve=0%
30	24	80	17	34	80	+40 Sieve=0% +4 Sieve=0%

**DATE:** 10/15/14  
**SURFACE ELEVATION:** 361.4

**USC** (Soil Classification): CL, CL, SC, CH, CL, ML

**WATER LEVEL:** [Symbol]

**Est.:** [Symbol] Measured: [Symbol] Perched: [Symbol]

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

**Notes:**

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

**GPS Coordinates:** N33.047160°, W94.84384°

**Driller:** Lewis Drilling, Inc.  
**Logger:** O. Sanderson

# Landfill Boring B-14

## LOG OF BORING B-14

**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:**  
**BORING TYPE:** Flight Auger

**PROJECT NO.:** G4207-146

**DATE:** 10/14/14  
**SURFACE ELEVATION:** 347.2

**OTHER TESTS PERFORMED**  
(Page Ref. #)  
MINUS #200 SIEVE (%)  
ATTERBERG LIMITS(%)  
LIQUID LIMIT (LL)  
PLASTIC LIMIT (PL)  
PLASTICITY INDEX (PI)

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH	FIELD DATA				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
					BLOW COUNT	Qu (tsf)	PPR (tsf)	Torvane (tsf)					Moisture Content	Liquid Limit						
0																				
5	CL			N=9	1	2	3	4					20	40	60	80				
10	ML			N=11																
15	CL			P=4.0																
20				N=34																
25	SP SM			N=27																
30	CL			N=26																
30																				

**Water Level**  
Water Observations: completion.  
Est.: Measured: Perched: Water level @ 17' and caved to 23' upon completion.

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

**GPS Coordinates:** N33.04774°, W94.84290°  
**Driller:** Lewis Drilling, Inc.  
**Logger:** O. Sanderson

# Landfill Boring B-15

## LOG OF BORING B-15

DATE: 10/14/14  
 SURFACE ELEVATION: 348.2

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

PROJECT NO.: G4207-146

**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	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)		
0																		
5					FAT CLAY(CH) stiff; reddish brown and light gray; moist; mottled	N=10							24	59	21	38	85	+40 Sieve=0% +4 Sieve=0%
10					--very stiff, light gray, grayish brown and reddish brown; moist; layered	P=3.75							7					+40 Sieve=0% +4 Sieve=0%
15					SILTY SAND(SM) very dense; light brown; dry	N=59												
20					--medium dense; wet	N=21												
25					--very dense	N=56												
30					LEAN CLAY(CL) hard; dark brown; moist; with silt partings	P=4.5							25	45	22	23	92	+40 Sieve=0% +4 Sieve=0%
30					Bottom of Boring @ 30'													

Water Level: \_\_\_\_\_  
 Water Observations: Water level @ 17' and caved to 19' upon completion.  
 Est.:  Measured:  Perched:

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



## **Appendix B**

### **Photographic Log**

**Project Name:**

AEP – J. ROBERT WELSH POWER PLANT

**Location:**

PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**

OK001625.0001

**Photo No.**
**1**
**Date:**

8/20/2015

**Direction Photo Taken:**

North

**Description:**

Staging area west of landfill.

P8200493


**Project Name:**

AEP – J. ROBERT WELSH POWER PLANT

**Location:**

PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**

OK001625.0001

**Photo No.**
**2**
**Date:**

8/20/2015

**Direction Photo Taken:**


South Southeast



**Description:**

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


P8200495






<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 3	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West Northwest			
<b>Description:</b> Ditch between road and railway west of landfill, this ditch would be non-jurisdictional.			
P8200497			


 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 4	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> Northeast			
<b>Description:</b> Ground Water Monitoring Well AD-12 near northwest end of landfill.			
P8200501			






<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 5	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> East Northeast			
<b>Description:</b> View of plant from top of landfill. Primary ash pond is within the wooded area on left.			
P8200506			


 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 6	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> East Northeast			
<b>Description:</b> Drainage canal that drains from primary ash pond to clear water pond.			
P8200510			



<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 7	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West Northwest			
<b>Description:</b> Vegetated strip between landfill and road. This would be isolated due to lack of connectivity.  P8200521			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 8	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North			
<b>Description:</b> Dike between landfill and primary ash pond. Facility in the background.  P8200522			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>9</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West			
<b>Description:</b> Vegetated strip between landfill and road. This area would be isolated due to lack of connectivity.  P8200527			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>10</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North Northeast			
<b>Description:</b> Road east of landfill running toward facility and clear water pond.  P8200530			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>11</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> South			
<b>Description:</b> Top of landfill.  P8200534			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>12</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> Southeast			
<b>Description:</b> View of lined bottom ash storage pond.  P8200538			

**Project Name:**  
AEP – J. ROBERT WELSH POWER PLANT

**Location:**  
PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**  
OK001625.0001

**Photo No.**  
**13**

**Date:**  
8/20/2015

**Direction Photo Taken:**  
Southeast

**Description:**  
Lined bottom ash storage pond.

P8200545



**Project Name:**  
AEP – J. ROBERT WELSH POWER PLANT

**Location:**  
PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**  
OK001625.0001

**Photo No.**  
**14**


**Date:**  
8/20/2015



**Direction Photo Taken:**  
South


**Description:**  
Southside of lined bottom ash storage pond.



P8200547



<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>15</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West			
<b>Description:</b> East side of lined bottom ash storage pond.			
P8200560			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>16</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North			
<b>Description:</b> Upland with pine and ground water monitoring well AD-2 south of lined bottom ash storage pond.			
P8200563			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>17</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b>			
<b>Description:</b>  Outflow of water from plant into the northeast portion of the Primary Ash Pond.  P8200577			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>18</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b>  South Southwest			
<b>Description:</b>  Northeast portion of primary ash pond, view facing south-southwest.  P8200578			

