# ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

# H.W. Pirkey Power Plant Landfill Hallsville, Texas

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CHA8462

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## ATTACHMENTS

## LIST OF ACRONYMS

| | |
|---|---|
| AEP | American Electric Power |
| ASD | Alternative Source Demonstration |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| EBAP | East Bottom Ash Pond |
| EDS | Energy Dispersive Spectroscopic Analyzer |
| EPRI | Electric Power Research Institute |
| GSC | Groundwater Stats Consulting, LLC |
| GWPS | Groundwater Protection Standard |
| LCL | Lower Confidence Limit |
| LF | Landfill |
| MCL | Maximum Contaminant Level |
| QA | Quality Assurance |
| QC | Quality Control |
| SEM | Scanning Electron Microscopy |
| SSL | Statistically Significant Level |
| UTL | Upper Tolerance Limit |
| USEPA | United States Environmental Protection Agency |
| XRD | X-Ray Diffraction |

# SECTION 1

# INTRODUCTION AND SUMMARY

The H.W. Pirkey Plant, located in Hallsville, Texas, has four regulated coal combustion residuals (CCR) storage units, including the Landfill (LF, Figure 1). In February 2019, a semi-annual assessment monitoring event was conducted at the LF in accordance with 40 CFR 257.95(d)(1). The monitoring data were submitted to Groundwater Stats Consulting, LLC (GSC) for statistical analysis. Groundwater protection standards (GWPSs) were established for each Appendix IV parameter in accordance with the statistical analysis plan developed for the facility (AEP, 2017) and United States Environmental Protection Agency's (USEPA) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (Unified Guidance; USEPA, 2009). The GWPS for each parameter was established as the greater of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2). To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events.

Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPSs. An SSL was concluded if the lower confidence limit (LCL) of a parameter exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). The following SSLs were identified at the Pirkey LF:

- The LCL for cobalt at AD-34 was 0.272 milligrams per liter (mg/L), which exceeded the GWPS of 0.026 mg/L.

- The LCL for lithium at AD-34 was 0.145 mg/L, which exceeded the GWPS of 0.110 mg/L.

No other SSLs were identified (Geosyntec, 2019a).

## 1.1 CCR Rule Requirements

United States Environmental Protection Agency (USEPA) regulations regarding assessment monitoring programs for coal combustion residuals (CCR) landfills and surface impoundments provide owners and operators with the option to make an alternative source demonstration when an SSL is identified (40 CFR 257.95(g)(3)(ii)). An owner or operator may:

> *Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer or approval from the Participating State*

> *Director or approval from EPA where EPA is the permitting authority. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section….*

Pursuant to 40 CFR 257.95(g)(3)(ii), Geosyntec Consultants, Inc. (Geosyntec) has prepared this Alternative Source Demonstration (ASD) report to document that the SSLs identified for cobalt and lithium at AD-34 should not be attributed to the Pirkey LF.

## 1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSL could be attributed. Alternative sources were identified amongst five types, based on methodology provided by EPRI (2017):

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to show that the SSLs identified for cobalt and lithium at AD-34 were based on a Type V cause and not by a release from the Pirkey LF.

# SECTION 2

# ALTERNATIVE SOURCE DEMONSTRATION

The Federal CCR Rule allows the owner or operator 90 days from the determination of an SSL to demonstrate that a source other than the CCR unit caused the SSL. The methodology used to evaluate the SSLs identified for cobalt and lithium and the proposed alternative source are described below.

## 2.1 Proposed Alternative Sources

Initial review of site geochemistry, site historical data, and laboratory quality assurance/quality control (QA/QC) data did not identify ASDs due to a Type I (sampling causes), Type II (laboratory causes), or Type III (statistical causes) issue. As described below, the SSLs were attributed to impacts from a former lignite mining area, which is a Type V issue.

During the previous assessment monitoring event, SSLs for cadmium and cobalt were identified at AD-34 (Geosyntec, 2018). An ASD was generated which identified impacts from a former lignite mining area as the source for the elevated cadmium and cobalt concentrations (Burns and McDonnell, 2019). As shown in Figure 1, AD-34 is the only downgradient well in the LF monitoring network which is set within mine spoil in the former mining area (identified as Area A in the figure). Other nearby monitoring wells in the mine spoil include AD-25 and AD-26; however, neither is in the LF network.

Additionally, the previous ASD noted that the cobalt and cadmium concentrations in the leachate from the LF and from the LF stormwater runoff pond are several orders of magnitude lower than concentrations observed at AD-34. A comparison of the LF leachate and runoff values to the LCLs and the most recent sampling results finds that the LF liquids have significantly lower concentrations of both lithium and cobalt (Table 1), indicating that the LF is not a likely source for these constituents.

The previous ASD found that cadmium and cobalt concentrations at AD-25, AD-26, and AD-34 were comparable to each other but different from other network wells. A Piper diagram was generated to assess whether major ion concentrations are affected by screen placement in the mine spoil area (Figure 2). The Piper diagram shows that AD-34 groundwater appears more similar to AD-25 and AD-26 groundwater based on the distribution of major ions. Groundwater in the mine spoil area is dominated by sulfate and magnesium, whereas wells in the LF network have higher proportions of chloride, sodium, and potassium.

Monitoring wells AD-48, AD-49 and AD-52 through AD-55 were installed in the former mining area in 2019. When these wells are included on a Piper diagram, it is apparent they have chemistry similar to AD-34 (Figure 3). These findings suggest that impacts from the former lignite mine have affected the geochemistry of the groundwater at wells set within its footprint. The effect of the former lignite mining area on cobalt and lithium is described in more detail below.

### 2.1.1 Cobalt ASD

As described above, an ASD LF previously attributed the observed cobalt exceedance to impacts from the former lignite mining area (Burns and McDonnell, 2019). Additional sampling since completion of the previous ASD provides further evidence that the observed cobalt exceedances at AD-34 are due to impacts from the former mining area and are not related to the LF.

Boring logs from AD-48 through AD-50 and AD-52 through AD-57 (provided in Attachment A) were used to generate a cross-section to illustrate the extent of the fill associated with the former mining activities. Weathering of pyrite, which is present throughout the mine area, is responsible for low pH (3.3 to 6.3) and elevated sulfate (152 to 2,110 mg/L) in the groundwater (Table 2). Acidic pH and elevated sulfate concentrations are known effects of groundwater on mine waste (Johnson, 2003). As shown in Figure 4, cobalt is generally elevated wherever well screens are placed in the mine fill. Cobalt concentrations are below the GWPS in wells that are screened outside the footprint of the former mining area, such as AD-56 and AD-57. AD-48 and AD-53 are the only wells screened in mine spoils which do not have cobalt concentrations above the GWPS. However, AD-48 is set near an upgradient edge of the former mining area, and so is likely to be recharged by unimpacted groundwater. Additionally, it has slightly elevated pH compared to locations with higher cobalt concentrations AD-53 has much higher pH than the other mine spoil wells (6.3 SU in Table 2), which is consistent with low cobalt solubility at circumneutral pH (Izquierdo and Querol, 2012).

Soil was collected at select locations during the installation of monitoring wells AD-46 through AD-57 and analyzed for total cobalt. Additional samples were collected from borings advanced adjacent to existing wells AD-16 and AD-34. Cobalt was detected in all samples, with higher concentrations below 10 ft bgs, which suggests that it is naturally prevalent across the aquifer solid material (Table 3). A groundwater sample was collected from AD-34 and then passed through a 1.5-micron filter. The solid material retained on the filter was submitted for total metals analysis, with cobalt identified in the material at an estimated concentration of 2.2 milligrams per kilogram (mg/kg). This concentration is comparable to concentrations observed in the bulk soil within the footprint of the former mining area, ranging from 2.4 to 12 mg/kg (Figure 5).

Cobalt concentrations in the bulk soil samples are slightly higher in the former mining area, which could be an indicator that the fill material has higher proportions of cobalt-containing minerals (Table 3). Analysis by X-ray diffraction (XRD) identified pyrite and marcasite (both iron sulfides) at AD-34 at concentrations up to 2% by weight (Table 4). Cobalt is known to substitute for iron in crystalline iron minerals such as pyrite and marcasite due to their similar ionic radii (Krupka and Serne, 2002; Hitzman et al., 2019).

These lines of evidence, combined with the low concentrations of cobalt in the LF leachate and stormwater runoff pond, illustrate that the cobalt exceedance at AD-34 is not due to a release from the LF. Instead, the exceedance is due to changes in the groundwater chemistry associated with the former lignite mining area.

### 2.1.2 Lithium ASD

An SSL for lithium was not previously identified at the LF. As described below, the current exceedances can be attributed to impacts from the former mining area.

Lithium concentrations generally appear to be higher for wells that are located within the footprint of the former mining area (Figure 6). This relationship becomes more apparent when comparing concentrations for wells in the former mining area which are not set within the mine spoil. The observed lithium concentration at AD-50, which is screened in non-mine fill, is more than an order of magnitude lower than the concentrations at AD-52 and AD-53, both of which were installed immediately adjacent to AD-50 and screened within the mine spoil (Figure 7). Lithium concentrations are also below the GWPS at AD-39 (not shown on the cross-section), AD-56, and AD-57, which are set outside the footprint of the former mining area.

An ASD previously generated for lithium exceedances at Pirkey's East Bottom Ash Pond (EBAP) identified natural variation in the aquifer as the source of lithium near that unit. The ASD developed a proposed mechanism for lithium mobility in groundwater which pointed to desorption from clay minerals associated with naturally occurring lignite material as the source of lithium in both up and downgradient wells at the EBAP (Geosyntec, 2019b).

The total metal concentrations in the solid materials separated from the groundwater samples during filtration and the filtered groundwater concentrations were used to calculated partition coefficients values ($K_d$) for lithium, potassium, and sodium. These constituents were selected as they are all monovalent cations, and so have similar geochemical behavior. Partition coefficients are used to express the tendency of a chemical (e.g. lithium) to become adsorbed onto soil (or sediment). $K_d$ is a ratio of the amount of chemical adsorbed per unit weight of the soil to the concentration of the chemical in solution (i.e., groundwater), as shown in the following equation:

$$K_d = \frac{mg\ adsorbed/kg\ soil}{mg/L\ solution}$$

$K_d$ is characteristic of the soil, so its value varies with soil type. The $K_d$ values for groundwater and particulate collected from AD-34 were compared to literature $K_d$ values reported for organic-rich media such as bogs and peat beds (Table 5) (Sheppard et al., 2009; 2011). The calculated values are generally slightly lower than the literature values. However, the relationship between calculated $K_d$ values for different constituents is consistent with the literature, with potassium being the largest (most sorbable) and sodium the smallest (least sorbable). These results support the proposed mechanism; however, there is less sorbing capacity in soil near AD-34 due to natural variations in the aquifer material.

According to XRD analysis of soil collected adjacent to AD-34, approximately 90% of the soil is composed of quartz, which is an inert mineral. Small fractions (1-2%) of clay minerals (illite, smectite), which have adsorptive capacity were identified in the XRD pattern as well. Suspended solids were separated from groundwater collected from AD-34 and analyzed for chemical

composition and mineralogy by scanning electron microscopy (SEM) using an energy dispersive spectroscopic analyzer (EDS). Clay particles were identified in the backscattered electron micrographs of this sample by morphology (Attachment B). Aluminum was identified in the particles, which provides evidence for clay aluminosilicate minerals in addition to quartz.

The lines of evidence described above show that elevated lithium concentrations at AD-34 are not due to a release from the LF, particularly as the lithium concentration in LF leachate is much lower than in groundwater at wells set within the former mine area. Instead, changes associated with the former mining area appear to be mobilizing lithium which is natural present in the aquifer and likely associated with clay fractions in the soil aquifer material.

## 2.2 Sampling Requirements

As the ASD presented above supports the position that the identified SSLs are not due to a release from the Pirkey LF, the unit will remain in the assessment monitoring program. Groundwater at the unit will continue to be sampled for Appendix IV parameters on a semi-annual basis.

# SECTION 3

# CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.95(g)(3)(ii) and supports the position that the SSLs for cobalt and lithium at AD-34 identified during assessment monitoring in February 2019 were not due to a release from the Pirkey LF. The identified SSLs were, instead, attributed to impacts from a former lignite mining area. Therefore, no further action for cobalt or lithium is warranted, and the LF will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in Attachment C.

# SECTION 4

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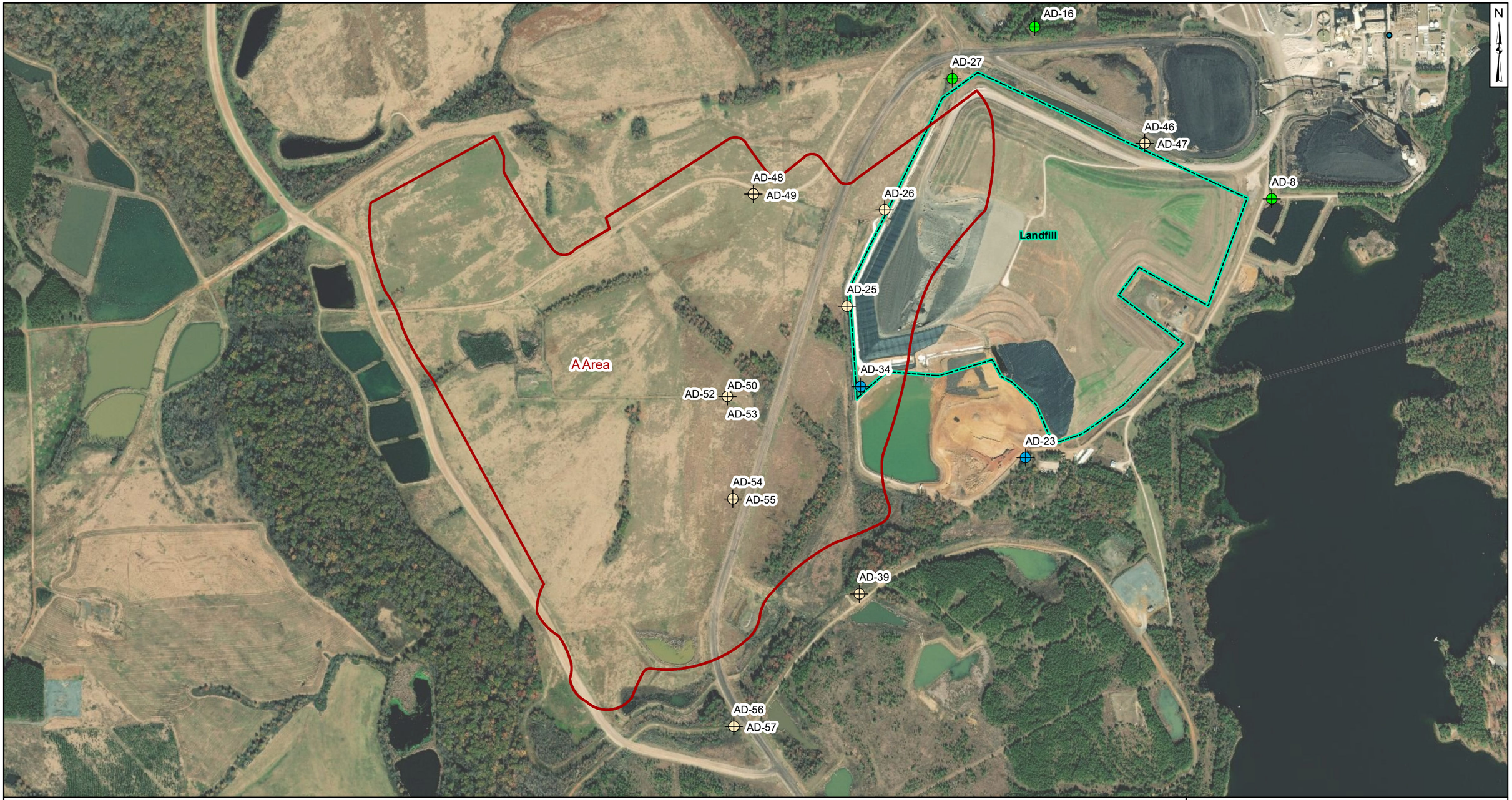
# FIGURES




**Legend**

- A Area
- Upgradient Wells
- Downgradient Wells
- Out of network

**Notes**

- Monitoring well coordinates, site features, and data provided by AEP.
- Area A is a former lignite (reclaimed) mine.

875 437.5 0 875 Feet

**Site Layout**

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2019/09/19

Figure **1**

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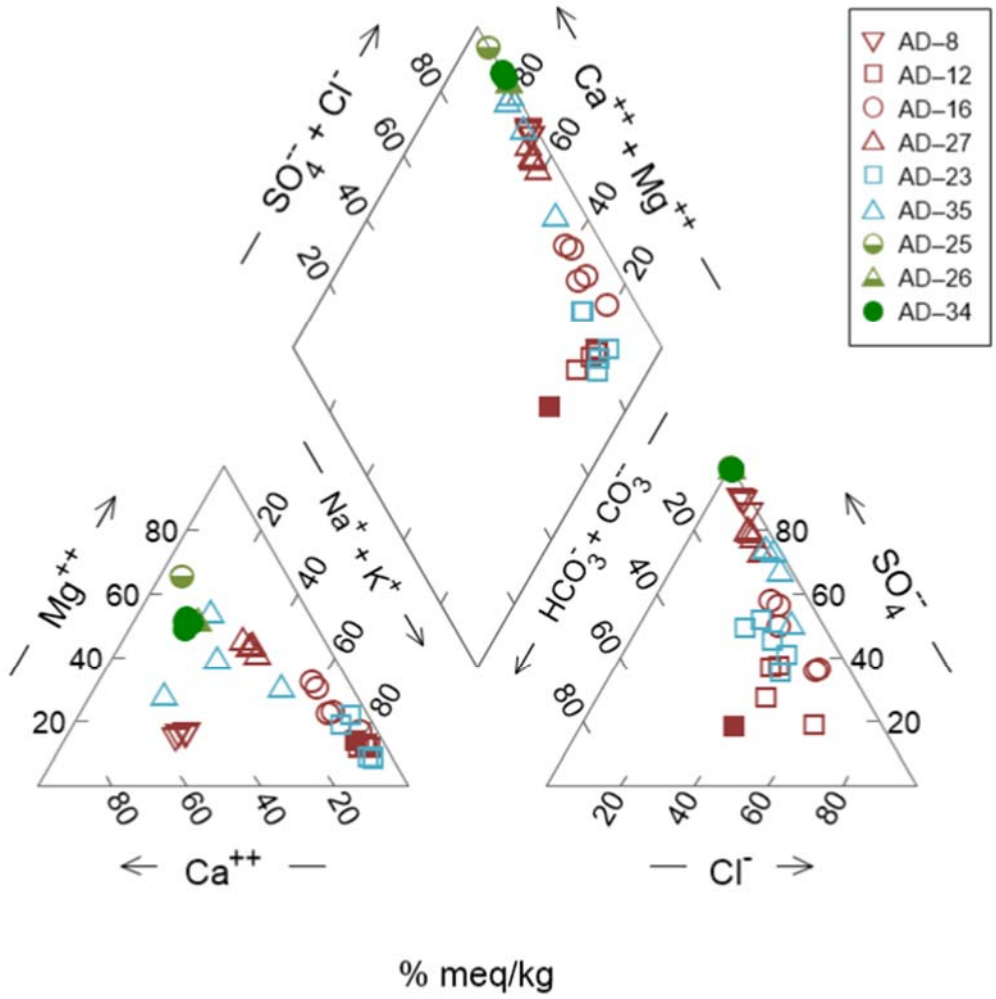



Notes: All data with complete data sets are shown except for AD-8 2/28/2019 data, which appeared to have an outlier.

Red symbology: Upgradient Locations
Blue symbology: Downgradient Locations
Green symbology: Downgradient locations screened in mine spoils.

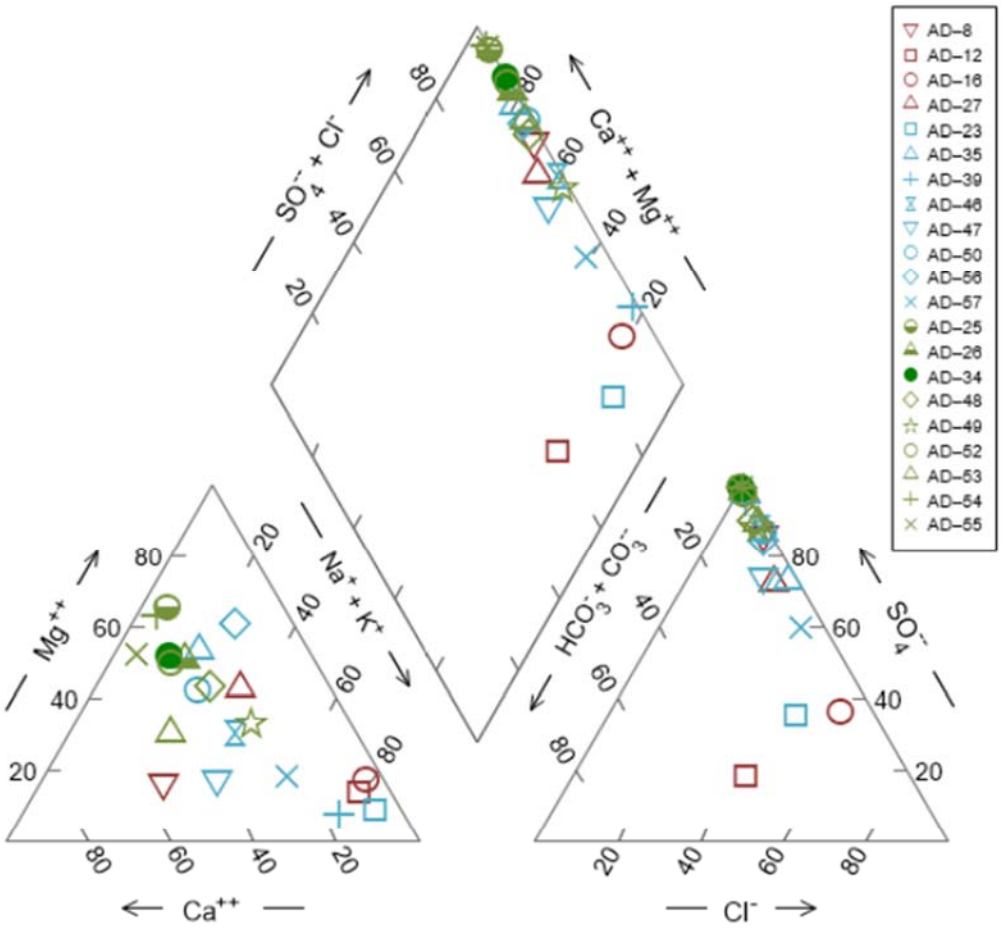
**Piper Diagram – Select Wells**
Pirkey Landfill

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | 19-Sep-2019

Figure 2

internal info: path, date revised, author




Notes: Wells in the LF network use February 2019 data, except AD-8 which used August 2018 due to an apparent outlier. Wells out of the network use August 2019 data.

Red symbology: Upgradient Locations
Blue symbology: Downgradient Locations
Green symbology: Downgradient locations screened in mine fill.

# Piper Diagram – Landfill Area Wells

Pirkey Landfill

Geosyntec consultants

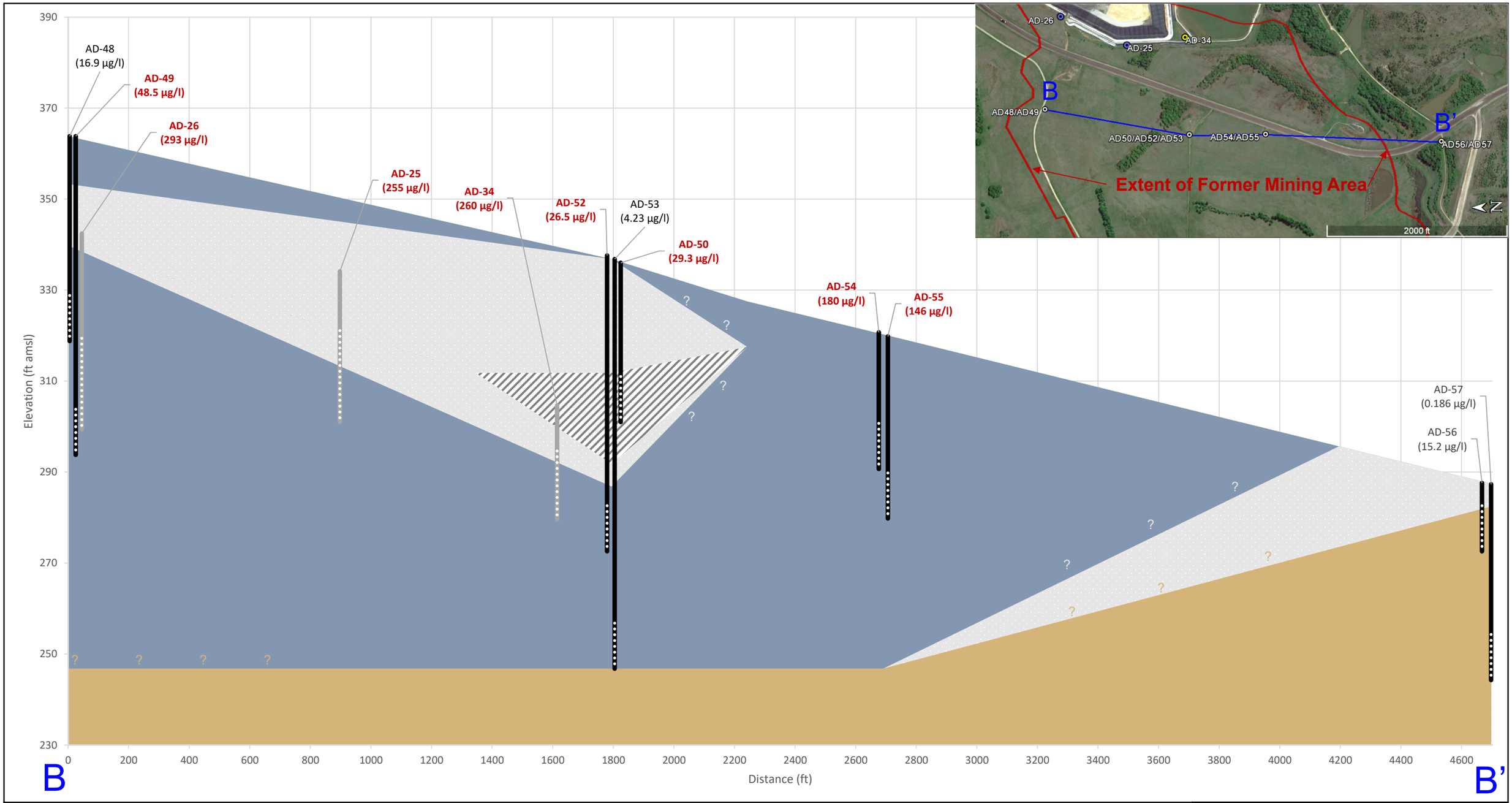
AMERICAN ELECTRIC POWER

Figure 3

Columbus, Ohio

19-Sep-2019

internal info: path, date revised, author




**Legend**

- Mine Spoil (clay, gray, lignite/other inclusions)
- Other Fill (sand to sandy clay, to clayey gravel, gray, some lignite/other inclusions)
- No recovery (assumed same lithology as Other Fill)
- Native sediments (gray sands and clays)
- Monitoring Well (Li Conc.)
- Projected Monitoring Well
- Well Screen
- Inferred Contact

Notes:

Gray wells are projected onto the plane of the cross section, and are generally screened within fill and mine spoil. Lithology for these wells was not used to construct cross section. Positions are approximate.

Cobalt concentrations in micrograms per liter (µg/l)

Groundwater results for all locations collected August 2019, except AD-34 collected February 2019

Bolded locations have concentrations which exceed the groundwater protection standard (GWPS) of 26 µg/L

**Landfill Area Cross Section with Cobalt Concentrations**

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

CHA8462 | September 2019

**Figure 4**

\\annarbor-01\data\Projects\AEP\Legal Department - ASD Review\Pirkey\2019-08 ASDs_2nd Round 2018\A-Landfill Area Cross section

| Location | AD-48/49 | |
|---|---|---|
| Depth (ft bgs) | 7-8 | 22 |
| Cobalt (mg/kg) | 3.1 | 12 |

| Location | AD-16 | |
|---|---|---|
| Depth (ft bgs) | 10 | 19 |
| Cobalt (mg/kg) | 0.17 | 0.44 |

| Location | AD-46/47 | |
|---|---|---|
| Depth (ft bgs) | 6-7 | 16-17 |
| Cobalt (mg/kg) | 1.5 | <6.4 |

| Location | AD-50/52/53 | |
|---|---|---|
| Depth (ft bgs) | 6 | 25 |
| Cobalt (mg/kg) | 5.5 | 2.4 |

| Location | AD-34 |
|---|---|
| Depth (ft bgs) | 24 |
| Cobalt (mg/kg) | 6.5 |

| Location | AD-56/57 | |
|---|---|---|
| Depth (ft bgs) | 8-9 | 9-10 |
| Cobalt (mg/kg) | < 1.1 | < 1.1 |

AD-16
AD-27
AD-46
AD-47
AD-8
AD-48
AD-49
AD-26
Landfill
AD-25
AD-34
A Area
AD-50
AD-52
AD-23
AD-55
AD-54
AD-39
AD-57
AD-56
N

**Legend**

Out of Network
Landfill
Landfill
A Area

**Notes**
- Monitoring well coordinates, site features, and data provided by AEP.
- Cobalt concentrations displayed in milligrams per kilogram (mg/kg).
- ft bgs: feet below ground surface.
- A Area is former lignite (reclaimed) mine.
- Non detectds are shown as less than the reporting limit.

600 300 0 600
Feet

**Cobalt Soil Values - Landfill Area**
**August 2019**

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2019/09/23

Figure **5**

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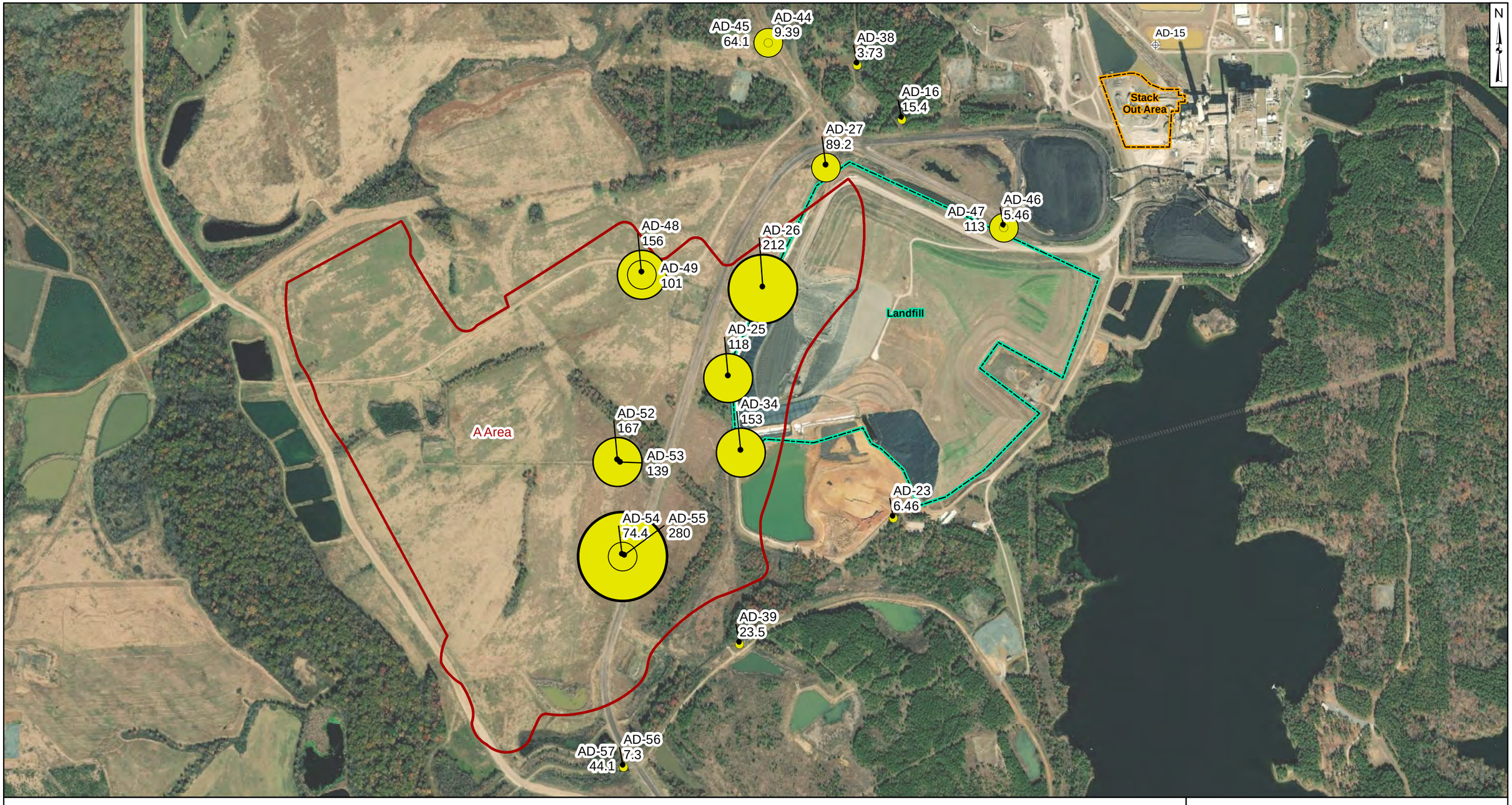


**Legend**

- A Area
- Landfill
- Stack Out Area

Notes

- Monitoring well coordinates, site features, and data provided by AEP.
- Location of AD-15 is approximate.
- Circle size is proportional to lithium concentration.
- Lithium concentrations displayed in micrograms per liter (ug/L) and are represented with data from the August 2019 sampling event. Wells AD-16, AD-23, AD-27, and AD-34 are representated with data from the Feburary 2019 sampling event.
- Area A is a former lignite (reclaimed) mine.

900 450 0 900
Feet

**Spatial Distribution of Lithium in Groundwater**

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2019/09/17

Figure **6**

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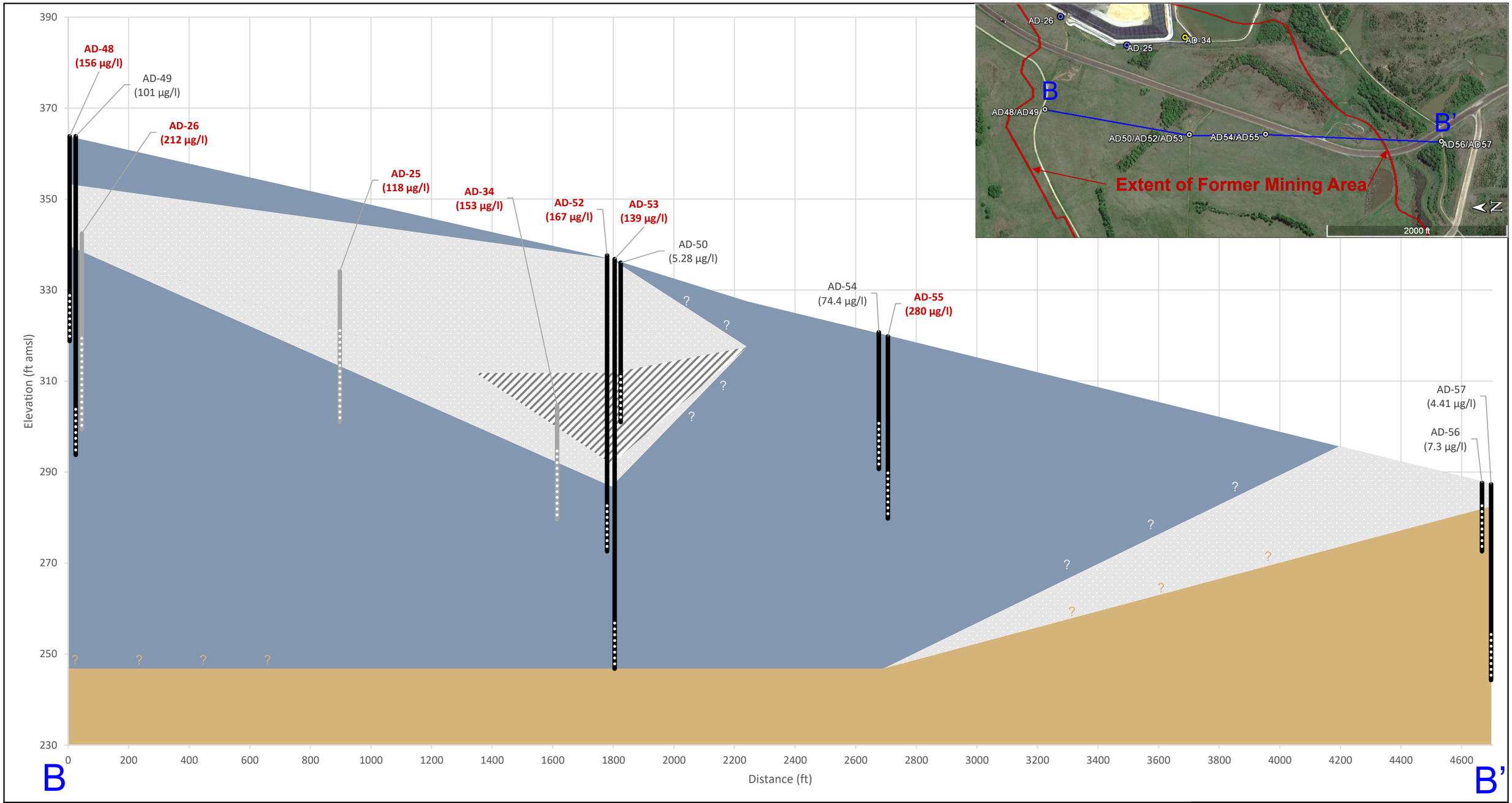


**Legend**

- Mine Spoil (clay, gray, lignite/other inclusions)
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- Well Screen
- Inferred Contact

Notes:

Gray wells are projected onto the plane of the cross section, and are generally screened within fill and mine spoil. Lithology for these wells was not used to construct cross section. Positions are approximate.

Lithium concentrations in micrograms per liter (µg/l)

Groundwater results for all locations collected August 2019, except AD-34 collected February 2019

Bolded locations have concentrations which exceed the groundwater protection standard (GWPS) of 110 µg/L

**Landfill Area Cross Section with Lithium Concentrations**

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

CHA8462 | September 2019

**Figure 7**

\\annarbor-01\data\Projects\AEP\Legal Department - ASD Review\Pirkey\2019-08 ASDs_2nd Round 2018\A-Landfill Area Cross section

# TABLES

**Table 1: Leachate and Stormwater Pond Data Comparison**
**East Bottom Ash Pond - H.W. Pirkey Plant**

*Geosyntec Consultants, Inc.*

| Sample | Sample Date | Cobalt Concentration (µg/L) | Lithium Concentration (µg/L) |
|---|---|---|---|
| Leachate | 2/11/2019 | 0.43 J | 42 |
| Leachate Stormwater Pond | 2/11/2019 | 0.50 J | 14 J |
| AD-34 | LCL | 272 | 145 |
| | 2/27/2019 | 260 | 153 |

Notes:

mg/L - milligram per liter

J - Estimated value. Result is less than the reporting limit but greater than or equal to the method detection limit.

LCL - lower confidence limit

**Table 2: Groundwater Concentrations**
**East Bottom Ash Pond - H.W. Pirkey Plant**

*Geosyntec Consultants, Inc.*

| Location | Included in Network? | Screened in Mine Fill? | Sample Date | pH (SU) | Cobalt Concentration (µg/L) | Lithium Concentration (µg/L) | Sulfate Concentration (mg/L) |
|---|---|---|---|---|---|---|---|
| AD-8 | Yes | No | 2/28/2019 | 5.7 | 0.8 J | 2.0 | 175 |
| AD-12 | Yes | No | 2/27/2019 | 5.2 | 1.37 | 6.88 | 3.6 |
| AD-16 | Yes | No | 2/27/2019 | 4.3 | 3.21 | 15.4 | 17.7 |
| AD-23 | Yes | No | 2/28/2019 | 5.1 | 1.0 J | 6.46 | 7.2 |
| AD-25 | No | Yes | 8/13/2019 | 3.6 | 255 | 118 | 775 |
| AD-26 | No | Yes | 8/16/2019 | 3.9 | 293 | 212 | 1490 |
| AD-27 | Yes | No | 2/28/2019 | 4.7 | 18.9 | 89.2 | 52.8 |
| AD-34 | Yes | Yes | 2/27/2019 | 4.7 | 260 | 153 | 970 |
| AD-35 | Yes - Abandoned | No | 8/20/2018 | 4.2 | 11.9 | 8.76 | 149 |
| AD-38 | No | No | 8/15/2019 | 4.2 | 5.46 | 3.73 | 6.1 |
| AD-39 | No | No | 8/16/2019 | 5.4 | 5.15 | 23.5 | 272 |
| AD-44 | No | No | 8/15/2019 | 4.5 | 4.92 | 9.39 | 17.4 |
| AD-45 | No | No | 8/15/2019 | 5.5 | 0.331 | 64.1 | 16.8 |
| AD-46 | No | No | 8/15/2019 | 4.8 | 13.6 | 5.46 | 231 |
| AD-47 | No | No | 8/15/2019 | 4.8 | 4.05 | 113 | 37.8 |
| AD-48 | No | Yes | 8/15/2019 | 5.6 | 16.9 | 156 | 152 |
| AD-49 | No | Yes | 8/15/2019 | 5.5 | 48.5 | 101 | 200 |
| AD-50 | No | No | 8/16/2019 | 5.3 | 29.3 | 5.28 | 302 |
| AD-52 | No | Yes | 8/16/2019 | 5.6 | 26.5 | 167 | 642 |
| AD-53 | No | Yes | 8/16/2019 | 6.3 | 4.23 | 139 | 322 |
| AD-54 | No | Yes | 8/16/2019 | 3.7 | 180 | 74.4 | 1290 |
| AD-55 | No | Yes | 8/16/2019 | 3.3 | 146 | 280 | 2110 |
| AD-56 | No | No | 8/16/2019 | 4.7 | 15.2 | 7.3 | 130 |
| AD-57 | No | No | 8/16/2019 | 4.0 | 0.186 | 44.1 | 45.1 |

Notes:
SU - specific units
µg/L - micrograms per liter
mg/L - milligrams per liter
J - Estimated value. Result is less than the reporting limit but greater than or equal to the method detection limit.

**Table 3: Soil Cobalt Data**
**Landfill - H.W. Pirkey Plant**

| Location ID | Sample Depth (ft bgs) | Cobalt (mg/kg) |
|---|---|---|
| **Bulk Soil Samples** | | |
| AD-16 | 10 | 0.17 |
| | 19 | 0.44 |
| AD-34 | 6 | 1.10 |
| | 24 | 6.50 |
| AD-46/47 | 6 | 1.5 J |
| | 16 | <6.40 |
| AD-48/49 | 7 | 3.1 J |
| | 22 | 12.0 |
| AD-50/52/53 | 6 | 5.5 J |
| | 25 | 2.4 J |
| AD-56/57 | 15 | < 1.1 |
| | 35 | <1.1 |
| Solid Material Retained After Filtration | | |
| AD-34 | 10-25 | 2.4 J |

Notes:
< - Not detected. Result shown as less than the method detection limit.
mg/kg- milligram per kilogram
ft bgs - feet below ground surface
J - Estimated value
Samples shaded gray were not collected from mine fill.
Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

**Table 4: AD-34 X-Ray Diffraction Results** *Geosyntec Consultants, Inc.*
**Landfill - H. W. Pirkey Plant**

| Depth | 6 ft bgs | 24 ft bgs |
|---|---|---|
| Quartz | 94 | 91 |
| O Feldspar | 2 | 2 |
| P Feldspar | 1 | 1 |
| Calcite | -- | -- |
| Dolomite | -- | -- |
| Siderite | 1 | 1 |
| Pyrite/Marcasite | 1 | 2 |
| Illite/Smectite | -- | 1 |
| Illite | 1 | 1 |
| Kaolinite | -- | -- |
| Chlorite | -- | -- |

Notes:
-- : not detected
Results are reported as percentages.

**Table 5: Calculated Site-Specific Partition Coefficients**
**Landfill - H. W. Pirkey Plant**

| Source | AD-34 | | | Literature Value |
|---|---|---|---|---|
| Unit | mg/L | mg/kg | L/kg | L/kg |
| **Element** | **Aqueous Phase** | **Adsorbed** | **Kd** | **Kd** |
| Li | 0.18 | 1.1 | 6 | 43-370 |
| K | 8.1 | 170 | 21 | 42-1200 |
| Na | 17 | 18 | 1 | 5.2-82 |

Notes:
mg/L: milligrams per liter
mg/kg: milligrams per kilogram
L/kg: liters per kilogram
Kd: partition coefficient
Adsorbed values are total metals concentrations reported by USEPA Method 6010B.
Literature values represent maximum and minimum values for the parameter as reported in Sheppard et al, 2009 (Table 4-1, all sites) and Sheppard et al, 2011 (Table 3-3 cultivated peat and wetland peat only).

# ATTACHMENT A

## Boring Logs

# Drilling Log

| | | | |
|---|---|---|---|
| BURNS McDONNELL | Project Name: AEP Pirkey CSM | Project No.: 111173 | Boring/Monitoring Well Number: SB-07 |
| | Coordinates: N 6872868 E 3201272.9 | Ground Elevation: 363.80 | Page: 1 of 5 |
| | Total Depth (feet): 70 / Hole Size (inches): 6.75" | Driller: J. Smith | |
| Drilling Rig: Ardco 4x4 | | Drilling Company: MHC X-Ploration | |
| Date: 2/28/2019 | Logged By: C. Hoglund | Reviewed by: | Approved by: |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 363 | 1 | SILT and very fine grained SAND, dark grayish Brown (10YR 4/2), trace to little clay, wet, low to medium consistency, low to medium plasticity; FILL. | | NA | NA | NA | NA | NA | NA | NA | Depth to water while drilling ▽<br>Depth to water after drilling ▼ |
| 362 | 2 | SAND, reddish Yellow (7.5YR 6/6), very fine to fine grained, poorly sorted, with rock fragments (gravel, ironstone, and sandstone), with to some clay, soft to medium consistency, medium to high plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 361 | 3 | | | | | | | | | | Log cuttings from 0'-5.0'. |
| 360 | 4 | - with clay below 4.0' | | | | | | | | | |
| 359 | 5 | | | | | | | | | | |
| 358 | 6 | CLAY, light Brown (7.5YR 6/4), trace silt, trace very fine grained sand, iron staining throughout, some inclusions (sandstone, and gravel), soft to medium; FILL. Mine Reclaim. | | | | | | | | | |
| 357 | 7 | CLAY, dark Gray (7.5YR 4/1), with very fine grained sand, some to little silt, with to some orange, red, and light gray clay, some inclusions (lignite, coal, ironstone, and gravel), damp, medium to stiff, medium to high plasticity; FILL. Mine Reclaim. | | MC | 1 | | NA | 2.9/5 | NA | NA | Sampled SB-7/7'-8' (1045) |
| 356 | 8 | | | | | | | | | | |
| 355 | 9 | - thin very fine grained sand seam, some to little clay, moist at 8.9' | | | | | | | | | |
| 354 | 10 | | | | | | | | | | No free water observed |
| 353 | 11 | SAND, Gray (10YR 5/1), very fine grained, poorly graded, little to some silt, damp to wet, silty sand seam at top, low to medium plasticity; SP. | | | | | | | | | |
| 352 | 12 | SAND, Gray (10YR 5/1), with silt, trace clay, few to trace inclusions (lignite, coal, and sandstone), damp, medium density; SP. | | MC | 2 | | NA | 4.5/5 | NA | NA | |
| 351 | 13 | SAND and GRAVEL, Gray (10YR 5/1), very fine grained sand, poorly sorted, little to some silt, damp, trace to few lignite clasts; | | | | | | | | | |
| 350 | | | | | | | | | | | |

AEP_PIRKEY_SOILBORINGLOGS.GPJ 5/9/19

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-07 |
| Page | 2 of 5 |
| Date | 2/28/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 349 | 15 | SAND and GRAVEL, Gray (10YR 5/1), very fine grained sand, poorly sorted, little to some silt, damp, trace to few lignite clasts;<br>- trace to few white to light gray angular sanstone rock fragments below 14.0' | | MC | 2 | | NA | 4.5/5 | NA | NA | |
| 348 | 16 | | | | | | | | | | |
| 347 | 17 | SAND, dark Gray (10YR 4/1), very fine grained, poorly sorted, with clay, trace muscovite flakes, trace to few lignite clasts, some silt, damp, soft, medium plasticity; SC. | | MC | 3 | | NA | 4.3/5 | NA | NA | |
| 346 | 18 | | | | | | | | | | |
| 345 | 19 | - moist, trace clay below 18.5' | | | | | | | | | |
| 344 | 20 | | | | | | | | | | |
| 343 | 21 | SAND, dark Gray (10YR 4/1), very fine grained, poorly graded, trace to little clay, trace to little silt, trace lignite-clay clasts, moist, medium to dense, low plasticity; SP-SC. | | | | | | | | | |
| 342 | 22 | SAND, Gray (10YR 5/1), very fine grained, poorly graded, some silte, few muscovite flakes, moist to wet; SP. | | MC | 4 | | NA | 2.5/5 | NA | NA | Sampled SB-7/22'-23' |
| 341 | 23 | - trace to few inclusions (lignite, coal, ironstone, sandstone, and gravel) below 23.0' | | | | | | | | | |
| 340 | 24 | CLAY, dark Gray (10YR 4/1) with very fine grained sand, some silt, trace to few inclusions (lignite, coal, sandstone, and gravel), damp, low to medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 339 | 25 | | | NA | NA | NA | NA | NA | NA | NA | Switch to rock drill bit at 25.0' feet. Begin logging from soil cuttings below 25.0' |
| 338 | 26 | CLAY, Gray (10YR 5/1), some silt, few very fine grained sand, little to some inclusions (coal, lignite, sandstone, ironstone, and gravel), medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 337 | 27 | | | | | | | | | | |
| 336 | 28 | | | | | | | | | | |
| 335 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-07 |
| Page | 3 of 5 |
| Date | 2/28/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 334 | 30 | CLAY, Gray (10YR 5/1), some silt, few very fine grained sand, little to some inclusions (coal, lignite, sandstone, ironstone, and gravel), medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 333 | 31 | | | | | | | | | | |
| 332 | 32 | | | | | | | | | | |
| 331 | 33 | CLAY, Gray (10YR 5/1), some silt, trace to little very fine grained sand, few to some inclusions (lignite, coal, sandstone, ironstone and gravel), medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 330 | 34 | | | | | | | | | | |
| 329 | 35 | | | | | | | | | | |
| 328 | 36 | | | | | | | | | | |
| 327 | 37 | | | | | | | | | | |
| 326 | 38 | | | | | | | | | | |
| 325 | 39 | | | | | | | | | | |
| 324 | 40 | | | | | | | | | | |
| 323 | 41 | | | | | | | | | | |
| 322 | 42 | | | | | | | | | | |
| 321 | 43 | | | | | | | | | | |
| 320 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-07 |
| Page | 4 of 5 |
| Date | 2/28/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 319 | 45 | CLAY, Gray (10YR 5/1), some silt, trace to little very fine grained sand, few to some inclusions (lignite, coal, sandstone, ironstone and gravel), medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 318 | 46 | | | | | | | | | | |
| 317 | 47 | | | | | | | | | | |
| 316 | 48 | | | | | | | | | | |
| 315 | 49 | | | | | | | | | | |
| 314 | 50 | | | | | | | | | | |
| 313 | 51 | | | | | | | | | | |
| 312 | 52 | | | | | | | | | | |
| 311 | 53 | | | | | | | | | | |
| 310 | 54 | | | | | | | | | | |
| 309 | 55 | | | | | | | | | | |
| 308 | 56 | | | | | | | | | | |
| 307 | 57 | | | | | | | | | | |
| 306 | 58 | | | | | | | | | | |
| 305 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-07 |
| Page | 5 of 5 |
| Date | 2/28/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | 60 | CLAY, Gray (10YR 5/1), some silt, trace to little very fine grained sand, few to some inclusions (lignite, coal, sandstone, ironstone and gravel), medium consistency, low to medium plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 303 | 61 | - some to with inclusions (ironstone, sandstone, coal, lignite, and red clay) below 59.0' | | | | | | | | | |
| 302 | 62 | | | | | | | | | | |
| 301 | 63 | | | | | | | | | | |
| 300 | 64 | | | | | | | | | | |
| 299 | 65 | - trace to few red clay clasts below 65.0' | | | | | | | | | |
| 298 | 66 | | | | | | | | | | |
| 297 | 67 | | | | | | | | | | |
| 296 | 68 | | | | | | | | | | |
| 295 | 69 | | | | | | | | | | |
| 294 | 70 | Boring terminated at 70 feet bgs. | | | | | | | | | Temporary Piezometer Installed on 2/28/2019 |
| | 71 | | | | | | | | | | |
| | 72 | | | | | | | | | | |
| | 73 | | | | | | | | | | |

# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-48 (SB-7S)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 300920.8669 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924528.403 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

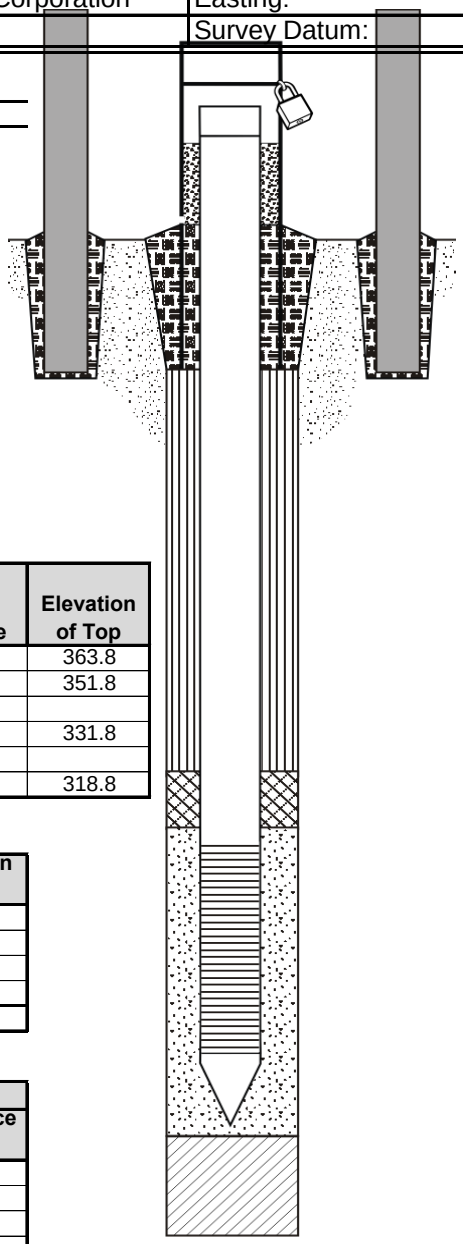
| Elevations | |
|---|---|
| Top of Casing (TOC) | 366.4 |
| Ground Surface (GS) | 363.8 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 3/3/2019 |
| Installation Complete | 3/3/2019 |
| Well Completed | 3/3/2019 |
| Development Start | 3/6/2019 |
| Development Complete | 3/6/2019 |

| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 12.0 | 363.8 |
| Bentonite Seal | 12 | 20.0 | 351.8 |
| Secondary Filter Pack | | | |
| Filter Pack | 32 | 13.0 | 331.8 |
| Backfill | 0 | | |
| Bottom of Borehole | 45 | | 318.8 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 35.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 332.09 |
| Bottom Cap | 0.28 | 322.09 |
| Total Depth from TOC | 44.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |



Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
Material: steel
Size: 4"
Length: 5'
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
Dimensions: 4' x 4' x 4"
Material: concrete

Annular Seal:
Type & Size: bentonite chips 3/8"
Manufacturer: Cetco
Amount Used: (included with bentonite seal)

Bentonite Seal:
Type & Size: pellets 3/8"
Manufacturer: PDS
Amount Used: 6 bags

Secondary Filter Pack:
Type & Size: --
Manufacturer: --
Amount Used: --

Primary Filter Pack:
Type & Size: sand 16/30
Manufacturer: U.S. Silica Company
Amount Used: 7.5 bags

Well Casing:
Type: PVC
Diameter: 2"
Sch. or Weight: Sch. 40
Manufacturer: Campbell Monoflex
Screen Type: PVC factory slot
Screen Slot Size: 0.010"
Bottom Cap Type: threaded

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: NA
Manufacturer: --
Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508722

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-7 shallow (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 27" N** |
| | | Longitude: | **094° 30' 08" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **3/3/2019** Drilling End Date: **3/3/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **45** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **32** | **45** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **32** | **Bentonite 6 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **45** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **35** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **35** | **45** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

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

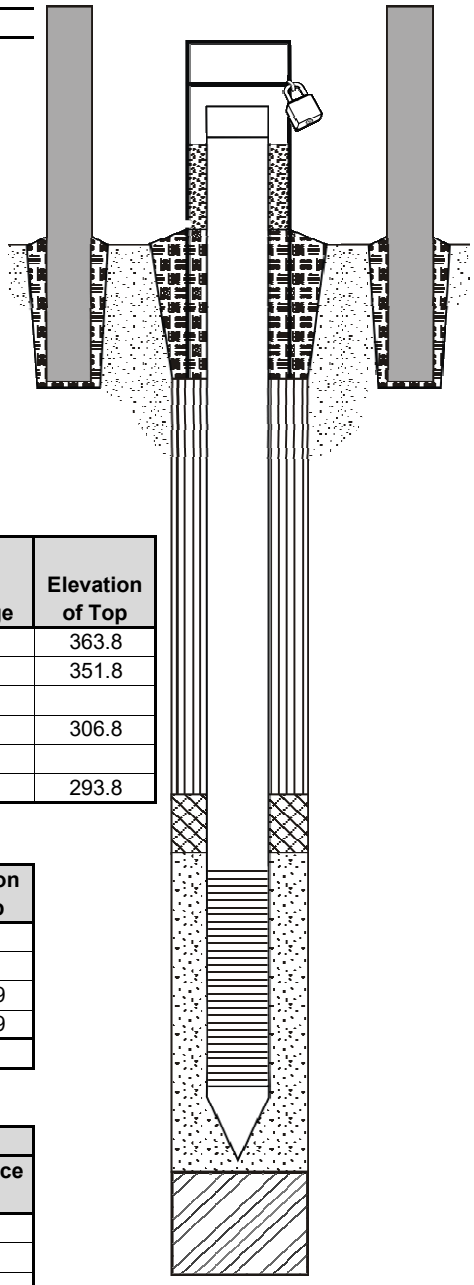
# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-49 (SB-7D)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 300924.7371 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924521.039 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

| Elevations | |
|---|---|
| Top of Casing (TOC) | 366.5 |
| Ground Surface (GS) | 363.8 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 2/28/2019 |
| Installation Complete | 2/28/2019 |
| Well Completed | 2/28/2019 |
| Development Start | 3/4/2019 |
| Development Complete | 3/4/2019 |



| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 12.0 | 363.8 |
| Bentonite Seal | 12 | 45.0 | 351.8 |
| Secondary Filter Pack | | | |
| Filter Pack | 57 | 13.0 | 306.8 |
| Backfill | 0 | | |
| Bottom of Borehole | 70 | | 293.8 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 60.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 307.19 |
| Bottom Cap | 0.28 | 297.19 |
| Total Depth from TOC | 69.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: bentonite chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: chips
- Manufacturer: NA
- Amount Used: 10 bags

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: 5 bags

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508720

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-7 deep (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 27" N** |
| | | Longitude: | **094° 30' 08" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **2/28/2019** Drilling End Date: **2/28/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **70** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **57** | **70** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **57** | **Bentonite 10 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **70** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **60** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **60** | **70** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

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

# Drilling Log

| | | | |
|---|---|---|---|
| BURNS McDONNELL | Project Name: AEP Pirkey CSM | Project No.: 111173 | Boring/Monitoring Well Number: SB-08 |
| | Coordinates: N 6871089.8 E 3201042.6 | Ground Elevation: 336.80 | Page: 1 of 7 |
| | Total Depth (feet): 93 / Hole Size (inches): 6.75" | Driller: J. Smith | |
| Drilling Rig: Ardco 4x4 | | Drilling Company: MHC X-Ploration | |
| Date: 2/24/2019 to 2/26/2019 | Logged By: C. Hoglund | Reviewed by: | Approved by: |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 336 | 1 | CLAY, Red (2.5YR 5/6), with silt, some very fine grained sand, little to some lignite and rock fragments, wet, medium to high plasticity, low consitency; FILL. | | | | | | | | | Depth to water while drilling ▽ / Depth to water after drilling ▼ |
| 335 | 2 | | | HA | 1 | | NA | 5/5 | | | |
| 334 | 3 | | | | | | | | | | Hand dig from 0.0'-5.0' |
| 333 | 4 | - with very fine grained sand below 4.0' | | | | | | | | | |
| 332 | 5 | | | | | | | | | | |
| 331 | 6 | CLAY, dark Gray (10YR 4/1) to dark grayish Brown (10YR 4/2), with silt, with very fine sand, damp, medium to stiff, low to medium plasticity; FILL.<br>- with silt to very fine sand lenses<br>- few to little iron staining lenses, few ironstone inclusions | | | | | | | | | |
| 330 | 7 | | | | | | | | | | |
| 329 | 8 | - trace to few very fine grained sandstone inclusions, little to some lignite and rock fragments below 7.0'<br><br>- increased very fine grained sand and inclusions below 8.0' | | MC | 1 | | NA | 4/5 | NA | NA | |
| 328 | 9 | | | | | | | | | | |
| 327 | 10 | | | | | | | | | | |
| 326 | 11 | SAND, Gray (10YR 6/1) to dark Gray (10YR 4/1), very fine grained, poorly sorted, trace silt, some light gray thin beds, trace to few black coal lenses and streaks, moist to damp, low to medium density; SP. | | | | | | | | | No free water observed |
| 325 | 12 | SAND, Gray (10YR 6/1) to dark Gray (10YR 4/1), very fine graded, poorly sorted, trace to little clay, few to some inclusions (sandstone, ironstone, lignite, and rock fragments), trace to few thin sandstone beds, damp to moist, low to medium plasticity; SP. | | MC | 2 | | NA | 3.2/5 | NA | NA | |
| 324 | 13 | | | | | | | | | | |
| 323 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-08 |
| Page | 2 of 7 |
| Date | 2/24/2019 to 2/26/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 322 | 15 | | | MC | 2 | | NA | 3.2/5 | NA | NA | |
| 321 | 16 | SAND, Gray (10YR 6/1) to dark Gray (10YR 4/1), with clay, some silt, few to some inclusions (sandstone, lignite, ironstone, and rock fragments), moist, low to medium density, low to medium plasticity; SC. | | | | | | | | | |
| 320 | 17 | - with iron staining, massive, below 16.3' | | MC | 3 | | NA | 2.1/5 | NA | NA | |
| 319 | 18 | | | | | | | | | | |
| 318 | 19 | | | | | | | | | | |
| 317 | 20 | | | | | | | | | | |
| 316 | 21 | | | | | | | | | | |
| 315 | 22 | | | | | | | | | | |
| 314 | 23 | | | MC | 4 | | NA | 0.6/5 | NA | NA | |
| 313 | 24 | | | | | | | | | | |
| 312 | 25 | | | | | | | | | | |
| 311 | 26 | No Recovery from 25.0'-45.0'. | NR | | | | | | | | |
| 310 | 27 | | | MC | 5 | | NA | 0/5 | NA | NA | |
| 309 | 28 | | | | | | | | | | |
| 308 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

Project Name: AEP Pirkey CSM
Project Number: 111173

Boring/Monitoring Well Number: SB-08
Page: 3 of 7
Date: 2/24/2019 to 2/26/2019

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 307 | 30 | No Recovery from 25.0'-45.0'. | NR | MC | 5 | | NA | 0/5 | NA | NA | |
| 306 | 31 | | | | | | | | | | |
| 305 | 32 | | | MC | 6 | | NA | 0/5 | NA | NA | |
| 304 | 33 | | | | | | | | | | |
| 303 | 34 | | | | | | | | | | |
| 302 | 35 | | | | | | | | | | |
| 301 | 36 | | | | | | | | | | |
| 300 | 37 | | | MC | 7 | | NA | 0/5 | NA | NA | |
| 299 | 38 | | | | | | | | | | |
| 298 | 39 | | | | | | | | | | |
| 297 | 40 | | | NA | NA | NA | NA | NA | NA | NA | Switch to rock drill bit. No Recovery. |
| 296 | 41 | | | | | | | | | | |
| 295 | 42 | | | | | | | | | | |
| 294 | 43 | | | | | | | | | | |
| 293 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-08 |
| Page | 4 of 7 |
| Date | 2/24/2019 to 2/26/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Recovery from 25.0'-45.0'. | NR | NA | NA | NA | NA | NA | NA | NA | |
| 292 | 45 | CLAY, Gray (10YR 6/1 to 5/1), with sand, some to few silt, some inclusions (sandstone, lignite, coal, and gravel), low to medium consistency, medium to high plasticity; CL. | | | | | | | | | Offset 6.0' north. Resume drilling. Begin logging from soil cuttings below 45.0'. |
| 291 | 46 | | | | | | | | | | |
| 290 | 47 | | | | | | | | | | |
| 289 | 48 | | | | | | | | | | |
| 288 | 49 | | | | | | | | | | |
| 287 | 50 | - increased lignite inclusions below 49.8' | | | | | | | | | |
| 286 | 51 | CLAY, Gray (10YR 6/1) to dark Gray (10YR 4/1), with sand, some silt, some to with inclusions (lignite, coal, red clay, ironstone, sandstone, and gravel), low to medium consistency, medium to high plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 285 | 52 | | | | | | | | | | |
| 284 | 53 | | | | | | | | | | |
| 283 | 54 | | | | | | | | | | |
| 282 | 55 | | | | | | | | | | |
| 281 | 56 | | | | | | | | | | |
| 280 | 57 | | | | | | | | | | |
| 279 | 58 | | | | | | | | | | |
| 278 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-08 |
| Page | 5 of 7 |
| Date | 2/24/2019 to 2/26/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 277 | 60 | CLAY, Gray (10YR 6/1) to dark Gray (10YR 4/1), with sand, some silt, some to with inclusions (lignite, coal, red clay, ironstone, sandstone, and gravel), low to medium consistency, medium to high plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 276 | 61 | | | | | | | | | | |
| 275 | 62 | | | | | | | | | | |
| 274 | 63 | | | | | | | | | | |
| 273 | 64 | | | | | | | | | | |
| 272 | 65 | | | | | | | | | | |
| 271 | 66 | | | | | | | | | | |
| 270 | 67 | | | | | | | | | | |
| 269 | 68 | | | | | | | | | | |
| 268 | 69 | | | | | | | | | | |
| 267 | 70 | | | | | | | | | | |
| 266 | 71 | | | | | | | | | | |
| 265 | 72 | | | | | | | | | | |
| 264 | 73 | | | | | | | | | | |
| 263 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-08 |
| Page | 6 of 7 |
| Date | 2/24/2019 to 2/26/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74 | CLAY, Gray (10YR 6/1) to dark Gray (10YR 4/1), with sand, some silt, some to with inclusions (lignite, coal, red clay, ironstone, sandstone, and gravel), low to medium consistency, medium to high plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 262 | 75 | | | | | | | | | | |
| 261 | 76 | | | | | | | | | | |
| 260 | 77 | | | | | | | | | | |
| 259 | 78 | | | | | | | | | | |
| 258 | 79 | | | | | | | | | | |
| 257 | 80 | | | | | | | | | | |
| 256 | 81 | | | | | | | | | | |
| 255 | 82 | | | | | | | | | | |
| 254 | 83 | | | | | | | | | | |
| 253 | 84 | | | | | | | | | | |
| 252 | 85 | | | | | | | | | | |
| 251 | 86 | | | | | | | | | | |
| 250 | 87 | | | | | | | | | | |
| 249 | 88 | | | | | | | | | | |

# Drilling Log, continued

| | | |
|---|---|---|
| BURNS McDONNELL | | Boring/Monitoring Well Number SB-08 |
| | Project Name AEP Pirkey CSM | Page 7 of 7 |
| | Project Number 111173 | Date 2/24/2019 to 2/26/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 89 | | | NA | NA | NA | NA | NA | NA | NA | |
| 247 | 90 | CLAY, light Gray (10YR 7/1), some silt, medium to stiff, low to medium plasticity; CL. | | | | | | | | | |
| 246 | 91 | | | | | | | | | | |
| 245 | 92 | | | | | | | | | | |
| 244 | 93 | Boring terminated at 93 feet bgs. | | | | | | | | | Temporary Piezometer Installed on 2/26/2019 |
| | 94 | | | | | | | | | | |
| | 95 | | | | | | | | | | |
| | 96 | | | | | | | | | | |
| | 97 | | | | | | | | | | |
| | 98 | | | | | | | | | | |
| | 99 | | | | | | | | | | |
| | 100 | | | | | | | | | | |
| | 101 | | | | | | | | | | |
| | 102 | | | | | | | | | | |
| | 103 | | | | | | | | | | |

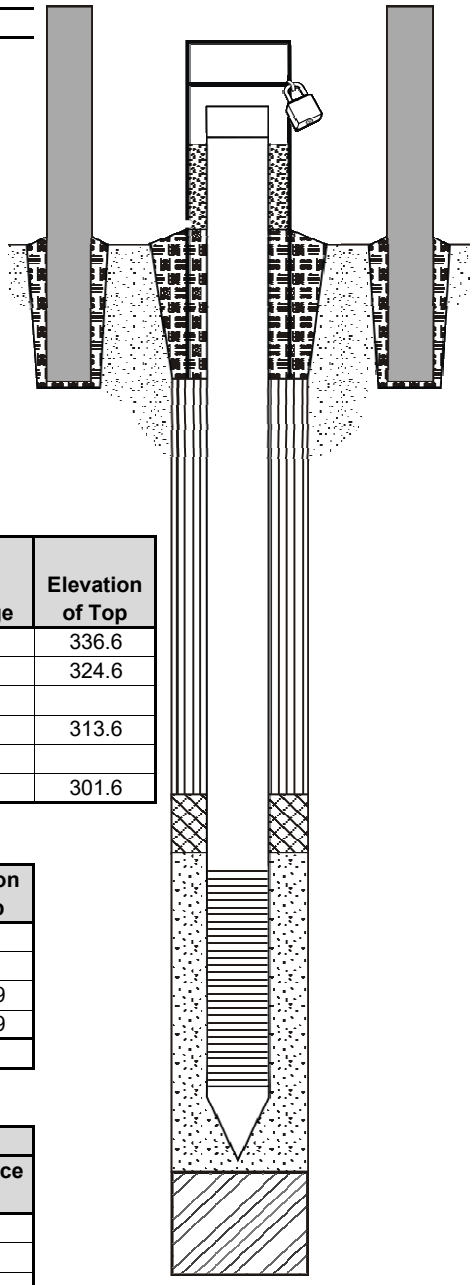
# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-50 (SB-8S)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 299140.5817 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924282.637 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

| Elevations | |
|---|---|
| Top of Casing (TOC) | 339.0 |
| Ground Surface (GS) | 336.6 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 2/27/2019 |
| Installation Complete | 2/27/2019 |
| Well Completed | 2/27/2019 |
| Development Start | 2/28/2019 |
| Development Complete | 3/1/2019 |



| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 12.0 | 336.6 |
| Bentonite Seal | 12 | 11.0 | 324.6 |
| Secondary Filter Pack | | | |
| Filter Pack | 23 | 12.0 | 313.6 |
| Backfill | 0 | | |
| Bottom of Borehole | 35 | | 301.6 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 25.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 314.69 |
| Bottom Cap | 0.28 | 304.69 |
| Total Depth from TOC | 34.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: Chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: Medium Chips
- Manufacturer: NA
- Amount Used: 4 bags

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: 2 bags

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508724

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-8 shallow (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 10" N** |
| | | Longitude: | **094° 30' 12" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **2/27/2019** Drilling End Date: **2/27/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **35** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **23** | **35** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **23** | **Bentonite 4 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **35** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **25** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **25** | **35** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

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

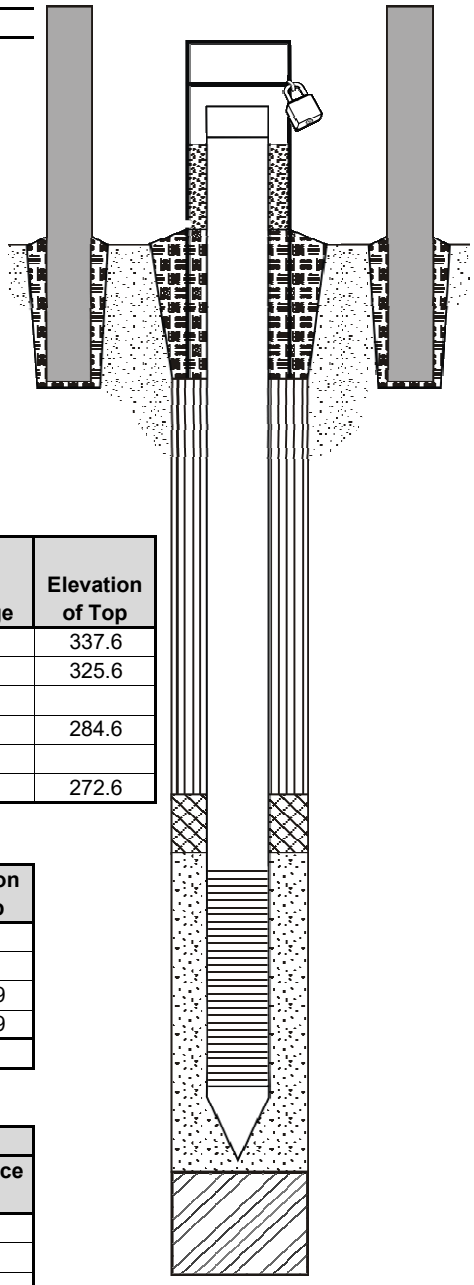
# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-52 (SB-8I)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 299148.2762 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924262.209 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

| Elevations | |
|---|---|
| Top of Casing (TOC) | 340.7 |
| Ground Surface (GS) | 337.6 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 2/27/2019 |
| Installation Complete | 2/27/2019 |
| Well Completed | 2/27/2019 |
| Development Start | 2/28/2019 |
| Development Complete | 3/1/2019 |



| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 12.0 | 337.6 |
| Bentonite Seal | 12 | 41.0 | 325.6 |
| Secondary Filter Pack | | | |
| Filter Pack | 53 | 12.0 | 284.6 |
| Backfill | 0 | | |
| Bottom of Borehole | 65 | | 272.6 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 55.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 286.39 |
| Bottom Cap | 0.28 | 276.39 |
| Total Depth from TOC | 64.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: Chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: Medium Chips
- Manufacturer: NA
- Amount Used: 4 bags

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: NA

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508729

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-8 medium (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 10" N** |
| | | Longitude: | **094° 30' 12" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **2/27/2019** Drilling End Date: **2/27/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **65** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **52** | **65** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **53** | **Bentonite 4 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **65** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **55** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **55** | **65** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

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

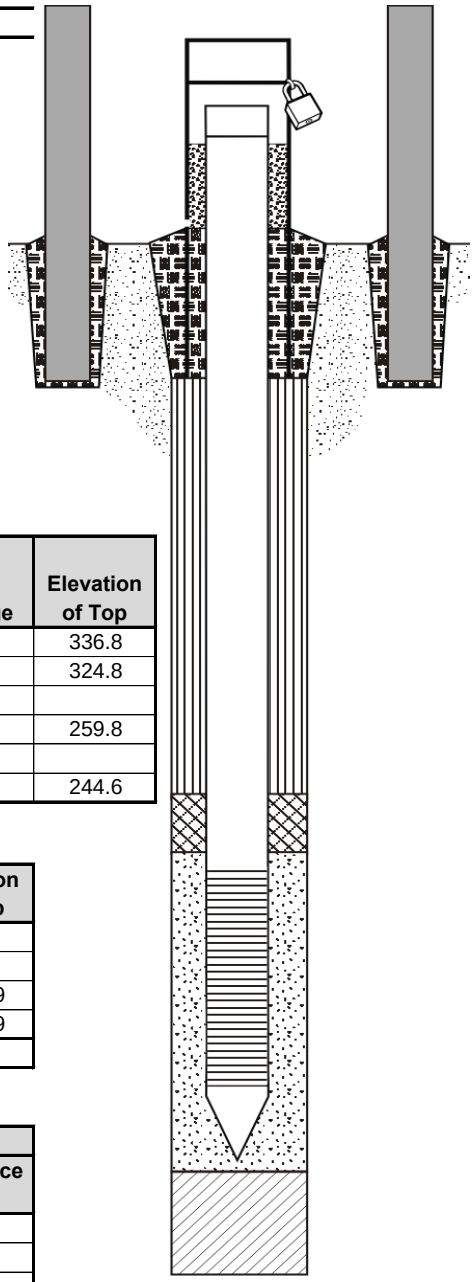
# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-53 (SB-8D)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 299148.8657 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924273.815 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

| Elevations | |
|---|---|
| Top of Casing (TOC) | 339.4 |
| Ground Surface (GS) | 336.8 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 2/24/2019 |
| Installation Complete | 2/26/2019 |
| Well Completed | 2/26/2019 |
| Development Start | 2/28/2019 |
| Development Complete | 3/1/2019 |



| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 12.0 | 336.8 |
| Bentonite Seal | 12 | 65.0 | 324.8 |
| Secondary Filter Pack | | | |
| Filter Pack | 77 | 16.0 | 259.8 |
| Backfill | 0 | | |
| Bottom of Borehole | 93 | | 244.6 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 80.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 261.39 |
| Bottom Cap | 0.28 | 251.39 |
| Total Depth from TOC | 89.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: Chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: Medium Chips
- Manufacturer: NA
- Amount Used: 16 bags

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: 6 bags

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508777

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-8 deep (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 10" N** |
| | | Longitude: | **094° 30' 12" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **2/24/2019** Drilling End Date: **2/26/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **93** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **77** | **93** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **77** | **Bentonite 15 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **90** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |
| **90** | **93** | **gray clay (old pit base?)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **80** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **80** | **90** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

# Drilling Log

| | | | |
|---|---|---|---|
| BURNS McDONNELL | Project Name: AEP Pirkey CSM | Project No.: 111173 | Boring/Monitoring Well Number: SB-09 |
| | Coordinates: N 6870180 E 3201109.5 | Ground Elevation: 319.80 | Page: 1 of 5 |
| | Total Depth (feet): 60 / Hole Size (inches): 6.75" | Driller: J. Smith | |
| Drilling Rig: Ardco 4x4 | | Drilling Company: MHC X-Ploration | |
| Date: 3/4/2019 | Logged By: D. Barker | Reviewed by: | Approved by: |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 319 | 1 | CLAY, Gray (7.5YR 6/1) to light Gray (7.5YR 7/1), with silt and sand, strong Brown (7.5YR 5/6 to 5/8) and Red (2.5YR 4/6 to 4/8), damp, soft, high plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | Log from soil cuttings from 0'-5'. |
| 318 | 2 | | | | | | | | | | |
| 317 | 3 | | | | | | | | | | |
| 316 | 4 | | | | | | | | | | |
| 315 | 5 | | | | | | | | | | |
| 314 | 6 | SILT, with clay, with very fine grained sand, very dark Gray (7.5YR 3/1) to dark Brown (7.5YR 3/2) to strong Brown (7.5YR 5/6), damp, soft, trace plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | Sampled SB-09 5'-6' |
| | | 3 Feet of slough (Based on driller's feel). | | | | | | | | | |
| 313 | 7 | | | | | | | | | | |
| 312 | 8 | | | | | | | 0.5/5 | | | |
| 311 | 9 | | | | | | | | | | |
| 310 | 10 | SAND, with silt, with clay, pinkish Gray (7.5YR 7/2) to strong Brown (7/5YR 5/6) to Red (2.5YR 4/6 to 4/8), very fine to fine grained, damp, loose; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | No free water observed |
| 309 | 11 | CLAY, trace silt, trace sand, very dark Gray (7.5YR 3/1) to dark Brown (7.5YR 3/2) to Brown (7.5YR 5/3), damp, soft, high plasticity; FILL. Mine Reclaim | | | | | | | | | |
| 308 | 12 | | | | | | | 0.5/5 | | | |
| 307 | 13 | | | | | | | | | | |
| 306 | | | | | | | | | | | |

Depth to water while drilling

Depth to water after drilling

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-09 |
| Page | 2 of 5 |
| Date | 3/4/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 305 | 15 | CLAY, trace silt, trace sand, very dark Gray (7.5YR 3/1) to dark Brown (7.5YR 3/2) to Brown (7.5YR 5/3), damp, soft, high plasticity; FILL. Mine Reclaim | | NA | NA | NA | NA | NA<br>0.5/5 | NA | NA | |
| 304 | 16 | SAND, with silt, with clay, very dark Gray (7.5YR 3/1) to dark Brown (7.5YR 3/2), very fine grained, damp; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 303 | 17 | 1 Foot of slough (Based on driller's feel). | | | | | | | | | |
| 302 | 18 | SILT and SAND and CLAY, pinkish White (7.5YR 8/2) to dark Red (2.5YR 3/6), very fine to fine grained; FILL. Mine Reclaim. | | | | | | 0.5/5 | | | |
| 301 | 19 | | | | | | | | | | |
| 300 | 20 | | | | | | | | | | |
| 299 | 21 | SILT, with sand, with clay, very dark Gray (7.5YR 3/1) to dark Brown (7.5YR 3/2), very fine to fine grained, damp, soft to hard, medium plasticity; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | Log from soil cuttings below 20.0'. Sampled SB-09 20'-21' |
| 298 | 22 | | | | | | | | | | |
| 297 | 23 | | | | | | | | | | |
| 296 | 24 | | | | | | | | | | |
| 295 | 25 | | | | | | | | | | |
| 294 | 26 | SILT and SAND and CLAY, reddish Yellow (7.5YR 6/6); FILL. Mine Reclaim. | | | | | | | | | |
| 293 | 27 | | | | | | | | | | |
| 292 | 28 | | | | | | | | | | |
| 291 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-09 |
| Page | 3 of 5 |
| Date | 3/4/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 290 | 30 | SILT and SAND and CLAY, reddish Yellow (7.5YR 6/6); FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 289 | 31 | | | | | | | | | | |
| 288 | 32 | | | | | | | | | | |
| 287 | 33 | | | | | | | | | | |
| 286 | 34 | | | | | | | | | | |
| 285 | 35 | | | | | | | | | | |
| 284 | 36 | | | | | | | | | | |
| 283 | 37 | | | | | | | | | | |
| 282 | 38 | | | | | | | | | | |
| 281 | 39 | | | | | | | | | | |
| 280 | 40 | SILT and SAND and CLAY, reddish Yellow (7.5YR 6/6), with cemented sand fragments, with lignite fragments; FILL. Mine Reclaim. | | | | | | | | | |
| 279 | 41 | | | | | | | | | | |
| 278 | 42 | | | | | | | | | | |
| 277 | 43 | | | | | | | | | | |
| 276 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-09 |
| Page | 4 of 5 |
| Date | 3/4/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 275 | 45 | SILT and SAND and CLAY, reddish Yellow (7.5YR 6/6), with cemented sand fragments, with lignite fragments; FILL. Mine Reclaim. | | NA | NA | NA | NA | NA | NA | NA | |
| 274 | 46 | | | | | | | | | | |
| 273 | 47 | | | | | | | | | | |
| 272 | 48 | | | | | | | | | | |
| 271 | 49 | | | | | | | | | | |
| 270 | 50 | SILT and SAND and CLAY, dark Gray (7.5YR 4/1), with cemented sand fragments, with lignite fragments, damp, soft to medium, high plasticity; FILL. Mine Reclaim. | | | | | | | | | |
| 269 | 51 | | | | | | | | | | |
| 268 | 52 | | | | | | | | | | |
| 267 | 53 | | | | | | | | | | |
| 266 | 54 | | | | | | | | | | |
| 265 | 55 | | | | | | | | | | |
| 264 | 56 | | | | | | | | | | |
| 263 | 57 | | | | | | | | | | |
| 262 | 58 | | | | | | | | | | |
| 261 | | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-09 |
| Page | 5 of 5 |
| Date | 3/4/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | NA | NA | NA | NA | NA | NA | NA | |
| 260 | 60 | Boring terminated at 60 feet bgs. | | | | | | | | | Temporary Piezometer Installed on 3/4/2019 |
| | 61 | | | | | | | | | | |
| | 62 | | | | | | | | | | |
| | 63 | | | | | | | | | | |
| | 64 | | | | | | | | | | |
| | 65 | | | | | | | | | | |
| | 66 | | | | | | | | | | |
| | 67 | | | | | | | | | | |
| | 68 | | | | | | | | | | |
| | 69 | | | | | | | | | | |
| | 70 | | | | | | | | | | |
| | 71 | | | | | | | | | | |
| | 72 | | | | | | | | | | |
| | 73 | | | | | | | | | | |

AEP_PIRKEY_SOILBORINGLOGS.GPJ 5/9/19

# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-54 (SB-9S)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 298239.4104 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924320.3597 |
| Driller: | Jason Smith | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

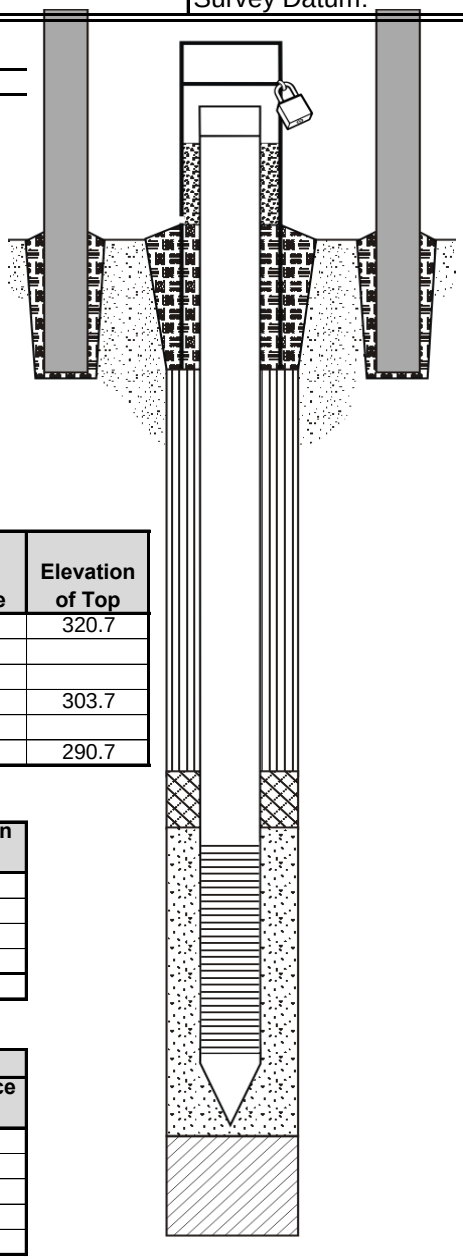
| Elevations | |
|---|---|
| Top of Casing (TOC) | 323.7 |
| Ground Surface (GS) | 320.7 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 3/5/2019 |
| Installation Complete | 3/5/2019 |
| Well Completed | 3/18-25/2019 |
| Development Start | 3/6/2019 |
| Development Complete | 3/6/2019 |

| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | | 17.0 | 320.7 |
| Bentonite Seal | 0 | | |
| Secondary Filter Pack | | | |
| Filter Pack | 17 | 13.0 | 303.7 |
| Backfill | 0 | | |
| Bottom of Borehole | 30 | | 290.7 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 30.00 | NA |
| Total Riser Cutoff | 7.12 | NA |
| Screen | 10.00 | 300.82 |
| Bottom Cap | 0.43 | 290.82 |
| Total Depth from TOC | 33.31 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |



Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
Material: steel
Size: 4"
Length: 5'
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
Dimensions: 4' x 4' x 4"
Material: concrete

Annular Seal:
Type & Size: bentonite chips 3/8"
Manufacturer: Cetco
Amount Used: 1 bag / 50 lbs

Bentonite Seal:
Type & Size: pellets 3/8"
Manufacturer: PDS
Amount Used: 1 bucket / 50 lbs

Secondary Filter Pack:
Type & Size: --
Manufacturer: --
Amount Used: --

Primary Filter Pack:
Type & Size: sand 16/30
Manufacturer: U.S. Silica Company
Amount Used: 7.5 bags / 375 lbs

Well Casing:
Type: PVC
Diameter: 2"
Sch. or Weight: Sch. 40
Manufacturer: Campbell Monoflex
Screen Type: PVC factory slot
Screen Slot Size: 0.010"
Bottom Cap Type: threaded

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: NA
Manufacturer: --
Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508781

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-9 shallow (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 01" N** |
| | | Longitude: | **094° 30' 11" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **3/5/2019** Drilling End Date: **3/5/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **30** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **17** | **30** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **17** | **Bentonite 1 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **30** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **20** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **20** | **30** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

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

# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-55 (SB-9D)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 298238.4991 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924332.0518 |
| Driller: | Jason Smith | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

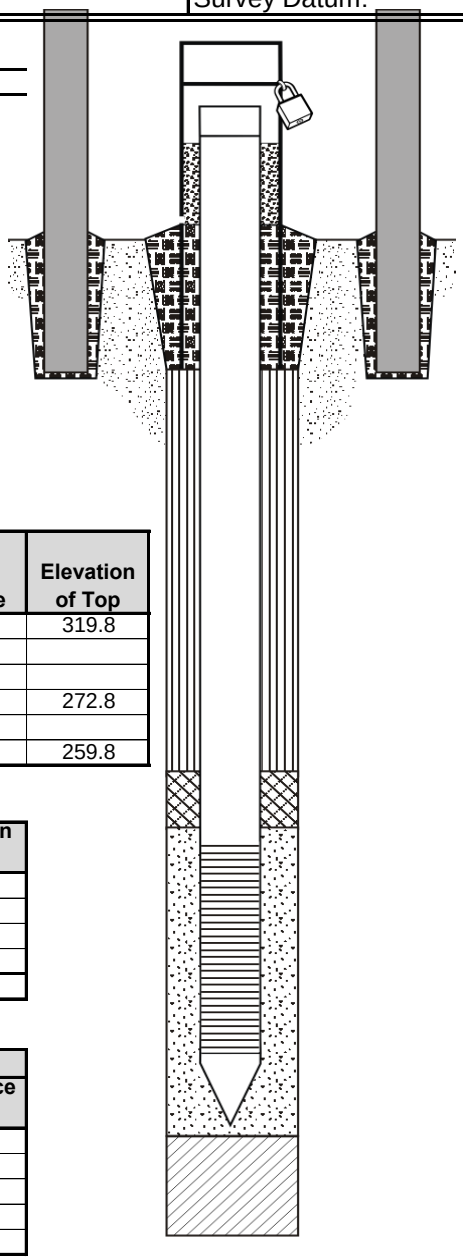
| Elevations | |
|---|---|
| Top of Casing (TOC) | 321.9 |
| Ground Surface (GS) | 319.8 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 3/4/2019 |
| Installation Complete | 3/4/2019 |
| Well Completed | 3/18-25/2019 |
| Development Start | 3/5/2019 |
| Development Complete | 3/5/2019 |

| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | | 47.0 | 319.8 |
| Bentonite Seal | 0 | | |
| Secondary Filter Pack | | | |
| Filter Pack | 47 | 13.0 | 272.8 |
| Backfill | 0 | | |
| Bottom of Borehole | 60 | | 259.8 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 60.00 | NA |
| Total Riser Cutoff | 7.89 | NA |
| Screen | 10.00 | 269.79 |
| Bottom Cap | 0.43 | 259.79 |
| Total Depth from TOC | 62.54 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |



Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
Material: steel
Size: 4"
Length: 5'
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
Dimensions: 4' x 4' x 4"
Material: concrete

Annular Seal:
Type & Size: bentonite chips 3/8"
Manufacturer: Cetco
Amount Used: 8 bags / 400 lbs

Bentonite Seal:
Type & Size: pellets 3/8"
Manufacturer: PDS
Amount Used: 2 buckets / 100 lbs

Secondary Filter Pack:
Type & Size: --
Manufacturer: --
Amount Used: --

Primary Filter Pack:
Type & Size: sand 16/30
Manufacturer: U.S. Silica Company
Amount Used: 5 bags / 250 lbs

Well Casing:
Type: PVC
Diameter: 2"
Sch. or Weight: Sch. 40
Manufacturer: Campbell Monoflex
Screen Type: PVC factory slot
Screen Slot Size: 0.010"
Bottom Cap Type: threaded

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: NA
Manufacturer: --
Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508779

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-9 deep (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 27' 01" N** |
| | | Longitude: | **094° 30' 11" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **3/4/2019** Drilling End Date: **3/4/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **60** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **48** | **60** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **12** | **Cement** |
| **12** | **48** | **Bentonite 10 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **60** | **tan and brown sandy, silty clay and occasional lignite inclusions (reclaim)** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **50** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **50** | **60** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

# Drilling Log

| | | | |
|---|---|---|---|
| BURNS McDONNELL | Project Name: AEP Pirkey CSM | Project No.: 111173 | Boring/Monitoring Well Number: SB-11 |
| | Coordinates: | Ground Elevation: | Page: 1 of 3 |
| | Total Depth (feet): 43 / Hole Size (inches): 6.75" | Driller: J. Smith | |
| Drilling Rig: Ardco 4x4 | | Drilling Company: MHC X-Ploration | |
| Date: 3/7/2019 | Logged By: J.Hermanson | Reviewed by: | Approved by: |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | SILT, Brown (7.5YR 4/2), with very fine grained sand, damp, low to medium, low to medium plasticity; FILL. | | | | | | | | | Depth to water while drilling ▽ |
| | 1 | clayey GRAVEL, gravel-sand-clay mixture, strong Brown (7.5YR 5/6), coarse grained gravel, fine grained sand, wet, trace to medium plasticity; FILL. | | MC | 1 | | NA | 4/5 | NA | NA | |
| | 2 | | | | | | | | | | |
| | 3 | | | | | | | | | | |
| | 4 | | | | | | | | | | |
| | 5 | CLAY, dark yellowish Brown (10YR 4/6), some sand, damp to moist, medium plasticity; CL. | | | | | | | | | |
| | 6 | | | | | | | | | | |
| | 7 | | | | | | | | | | |
| | 8 | SAND, light Gray (7.5YR 7/1), fine grained, trace clay, damp, medium density; SP. | | MC | 2 | | NA | 3/5 | NA | NA | |
| | 9 | CLAY, light Gray (7.5YR 7/1) with reddish Brown (5YR 5/9) mottling, some sand, damp to moist, trace to medium plasticity; CL. | | | | | | | | | |
| | 10 | SAND, pinkish Gray (7.5YR 7/2), fine grained, trace clay, wet, medium density; SP. | | | | | | | | ▽ | Free water observed at approximately 10.0' |
| | 11 | | | | | | | | | | |
| | 12 | CLAY, light reddish Gray (2.5YR 7/1), trace sand, damp, medium density, medium plasticity; CL. | | MC | 3 | | NA | 3/5 | NA | NA | |
| | 13 | | | | | | | | | | |

Depth to water after drilling ▼

AEP_PIRKEY_SOILBORINGLOGS.GPJ 5/9/19

# Drilling Log, continued

BURNS McDONNELL

| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-11 |
| Page | 2 of 3 |
| Date | 3/7/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | clayey GRAVEL, gravel-sand-clay mixture, strong Brown (7.5YR 5/6), fine grained gravel, fine grained sand, moist to wet; GC. | | MC | 3 | | NA | 3/5 | NA | NA | |
| | 16 | CLAY, light Gray (7.5YR 7/1), trace sand, damp to moist, soft to medium, medium plasticity; CL.<br>- increasing sand and moisture content below 15.6' | | | | | | | | | |
| | 17 | CLAY, light Gray (5YR 7/1), some sand, with sand laminations, damp to moist, medium to stiff, trace to medium plasticity; CL.<br>- increased moisture content below 17.5' | | MC | 4 | | NA | 4/5 | NA | NA | |
| | 18 | SAND, Gray (7.5YR 5/1), very fine grained, with clay laminations, trace iron ore laminations, dry, dense; SP. | | | | | | | | | |
| | 19 | | | | | | | | | | |
| | 20 | | | | | | | | | | |
| | 21 | | | MC | 5 | | NA | 4/5 | NA | NA | |
| | 22 | | | | | | | | | | |
| | 23 | | | | | | | | | | |
| | 24 | - iron ore laminations grade out, increased sand content below 24.0' | | | | | | | | | |
| | 25 | | | | | | | | | | |
| | 26 | | | | | | | | | | |
| | 27 | | | MC | 6 | | NA | 5/10 | NA | NA | |
| | 28 | | | | | | | | | | |

# Drilling Log, continued

BURNS McDONNELL

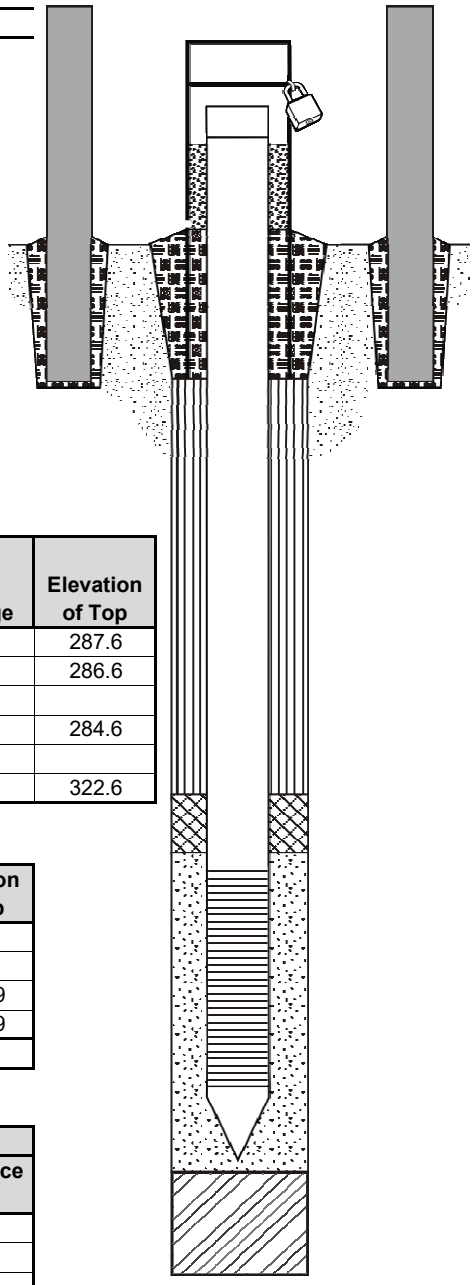
| | |
|---|---|
| Project Name | AEP Pirkey CSM |
| Project Number | 111173 |
| Boring/Monitoring Well Number | SB-11 |
| Page | 3 of 3 |
| Date | 3/7/2019 |

| Elevation (MSL) | Depth (feet bgs) | Description | Graphic Log | Sample Type | Sample Number | Blow Count | N Value | Sample Recovery/Length (feet) | Penetrometer (tsf) | PID Reading (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | SAND, Gray (7.5YR 5/1), very fine grained, with clay laminations, trace iron ore laminations, dry, dense; SP. | | MC | 6 | | NA | 5/10 | NA | NA | |
| | 31 | | | | | | | | | | |
| | 32 | | | | | | | | | | |
| | 33 | | | | | | | | | | |
| | 34 | | | | | | | | | | |
| | 35 | | | | | | | | | | |
| | 36 | | | MC | 7 | | NA | 8/8 | NA | NA | |
| | 37 | | | | | | | | | | |
| | 38 | | | | | | | | | | |
| | 39 | | | | | | | | | | |
| | 40 | SAND, dark Gray (7.5YR 4/1), very fine grained, trace clay, moist, medium density; SP. | | | | | | | | | |
| | 41 | | | | | | | | | | |
| | 42 | SAND, Gray (7.5YR 5/1), very fine grained, with clay laminations, dry, dense; SP. | | | | | | | | | |
| | 43 | Refusal on obstruction - End of boring at 43 feet bgs. | | | | | | | | | Abandoned with cement-bentonite grout on 3/7/2019 |

# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-56 (SB-11S)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 296233.6811 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924310.063 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch



| Elevations | |
|---|---|
| Top of Casing (TOC) | 290.0 |
| Ground Surface (GS) | 287.6 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 3/8/2019 |
| Installation Complete | 3/8/2019 |
| Well Completed | 3/8/2019 |
| Development Start | 3/10/2019 |
| Development Complete | 3/11/2019 |

| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 1.0 | 287.6 |
| Bentonite Seal | 1 | 2.0 | 286.6 |
| Secondary Filter Pack | | | |
| Filter Pack | 3 | 12.0 | 284.6 |
| Backfill | 0 | | |
| Bottom of Borehole | 15 | | 322.6 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 5.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 336.39 |
| Bottom Cap | 0.28 | 326.39 |
| Total Depth from TOC | 14.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: Chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: Medium Chips
- Manufacturer: NA
- Amount Used: 1 bag

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: 6 bags

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

# STATE OF TEXAS WELL REPORT for Tracking #508718

| | | | |
|---|---|---|---|
| Owner: | **AEP Pirkey Power Plant** | Owner Well #: | **SB-11 shallow (MW)** |
| Address: | **2400 FM 3251<br>Hallsville, TX 75650** | Grid #: | **35-36-6** |
| Well Location: | **2400 FM 3251<br>Hallsville, TX 75650** | Latitude: | **32° 26' 41" N** |
| | | Longitude: | **094° 30' 11" W** |
| Well County: | **Harrison** | Elevation: | **No Data** |
| Type of Work: | **New Well** | Proposed Use: | **Monitor** |

Drilling Start Date: **3/8/2019** Drilling End Date: **3/8/2019**

Borehole:

| *Diameter (in.)* | *Top Depth (ft.)* | *Bottom Depth (ft.)* |
|---|---|---|
| **6.75** | **0** | **15** |

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Filter Material* | *Size* |
|---|---|---|---|
| **3** | **15** | **Sand** | **16/30** |

Annular Seal Data:

| *Top Depth (ft.)* | *Bottom Depth (ft.)* | *Description (number of sacks & material)* |
|---|---|---|
| **0** | **1** | **Cement** |
| **1** | **3** | **Bentonite 5 Bags/Sacks** |

Seal Method: **Gravity**

Sealed By: **Driller**

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

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

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

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

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

Chemical Analysis Made: **Yes**

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

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

Company Information: **Mhc x-ploration corp**

**P.O. Box 7405**
**Tyler, TX 75711**

Driller Name: **James K. Collum** License Number: **3184**

Apprentice Name: **Jason Smith** Apprentice Number: **60448**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

| Top (ft.) | Bottom (ft.) | Description |
|---|---|---|
| **0** | **18** | **tan and brown sandy, silty clay and occasional gravel** |

Casing:
BLANK PIPE & WELL SCREEN DATA

| Dia (in.) | Type | Material | Sch./Gage | Top (ft.) | Bottom (ft.) |
|---|---|---|---|---|---|
| **2** | **Riser** | **New Plastic (PVC)** | **40** | **0** | **5** |
| **2** | **Screen** | **New Plastic (PVC)** | **40 0.010** | **5** | **15** |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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

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

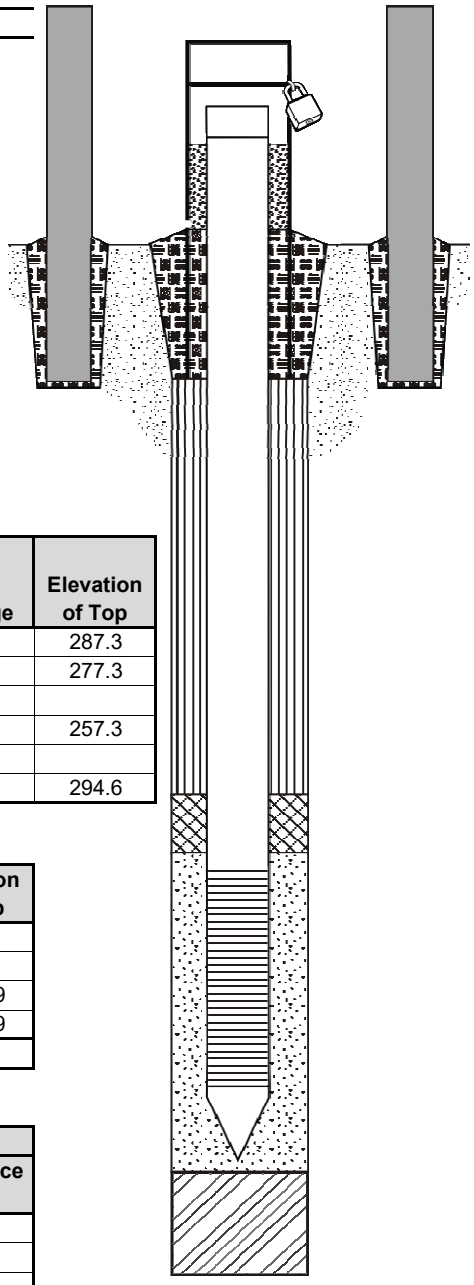
# Monitoring Well Construction Diagram

| | | | |
|---|---|---|---|
| **Project Number:** | 111173 | **Well Number:** | **AD-57 (SB-11D)** |
| **Project Name:** | AEP-Pirkey | **Property Owner:** | AEP |
| Geologist: | David Barker | Northing: | 296232.0764 |
| Drilling Company: | MHC X-Ploration Corporation | Easting: | 2924300.047 |
| Driller: | James K. Collum | Survey Datum: | Texas State Plane North Central (4202) |

Drilling Method: Rotary Wash
Borehole Diameter: 6.75-inch

| Elevations | |
|---|---|
| Top of Casing (TOC) | 290.0 |
| Ground Surface (GS) | 287.3 |
| Reference Point (RP) | ground surface |

| Dates | |
|---|---|
| Drilling/Installation Start | 3/7/2019 |
| Installation Complete | 3/8/2019 |
| Well Completed | 3/8/2019 |
| Development Start | 3/10/2019 |
| Development Complete | 3/11/2019 |



| Annular Material Measurements | Depth to Top from GS | Total Footage | Elevation of Top |
|---|---|---|---|
| Annular Seal | 0 | 10.0 | 287.3 |
| Bentonite Seal | 10 | 20.0 | 277.3 |
| Secondary Filter Pack | | | |
| Filter Pack | 30 | 13.0 | 257.3 |
| Backfill | 0 | | |
| Bottom of Borehole | 43 | | 294.6 |

| Casing Materials Measurements | Total Footage | Elevation of Top |
|---|---|---|
| Total Riser Installed | 33.00 | NA |
| Total Riser Cutoff | 0.69 | NA |
| Screen | 10.00 | 308.39 |
| Bottom Cap | 0.28 | 298.39 |
| Total Depth from TOC | 42.59 | |

| Groundwater Levels | | |
|---|---|---|
| Date & Time | Depth | Reference Point |
| | | |
| | | |
| | | |
| | | |
| | | |

Cap Type: J-plug
Lock Keyed to: AEP monitoring well

Protective Cover:
- Material: steel
- Size: 4"
- Length: 5'
- Pea Gravel (Y/N): N
- Weep Hole (Y/N): N
- Guage Mark (Y/N): Y

Bollards (# and type): 4 - steel

Surface Pad:
- Dimensions: 4' x 4' x 4"
- Material: concrete

Annular Seal:
- Type & Size: Chips
- Manufacturer: NA
- Amount Used: (included with bentonite seal)

Bentonite Seal:
- Type & Size: Medium Chips
- Manufacturer: NA
- Amount Used: 5 bags

Secondary Filter Pack:
- Type & Size: --
- Manufacturer: --
- Amount Used: --

Primary Filter Pack:
- Type & Size: sand 16/30
- Manufacturer: NA
- Amount Used: 5 bags

Well Casing:
- Type: PVC
- Diameter: 2"
- Sch. or Weight: Sch. 40
- Manufacturer: Environmental Manufacturing
- Screen Type: PVC factory slot
- Screen Slot Size: 0.010"
- Bottom Cap Type: threaded

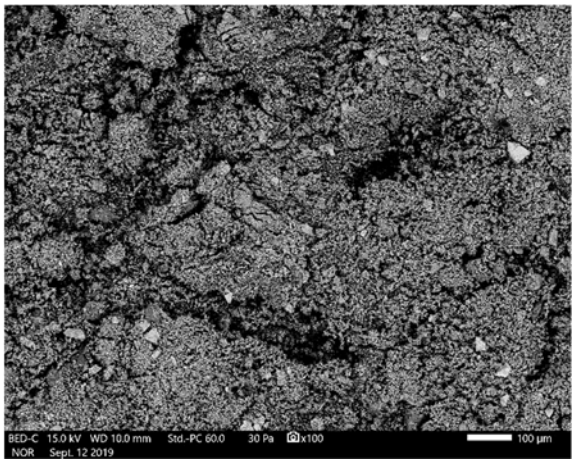
Centralizers (Y/N): N
- Material: --
- Number: --
- Depth(s): --

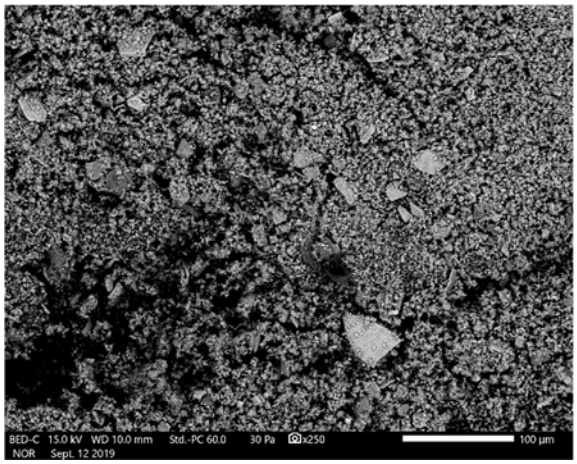
Backfill Material:
- Type & Size: NA
- Manufacturer: --
- Amount Used: --

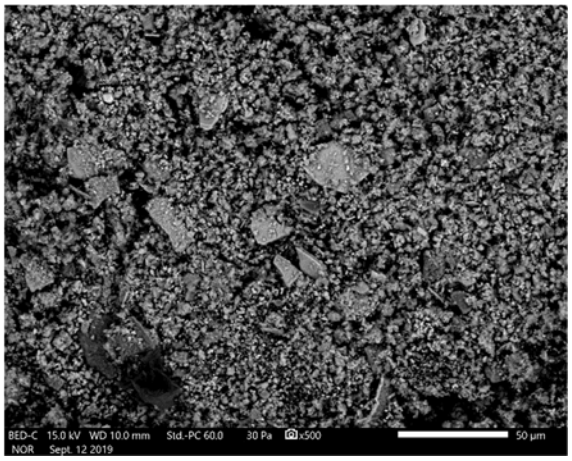
# ATTACHMENT B
# SEM/EDS Analysis

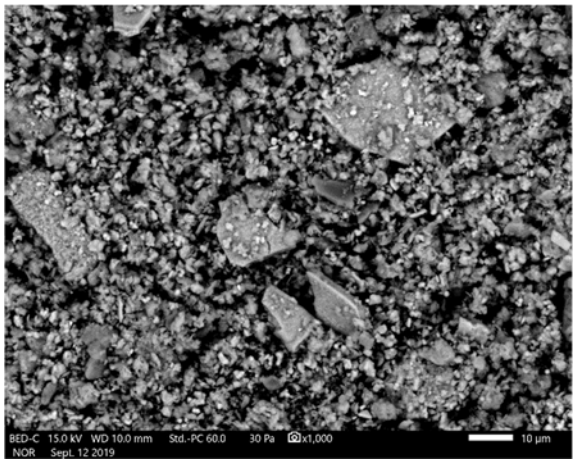
September 12, 2019

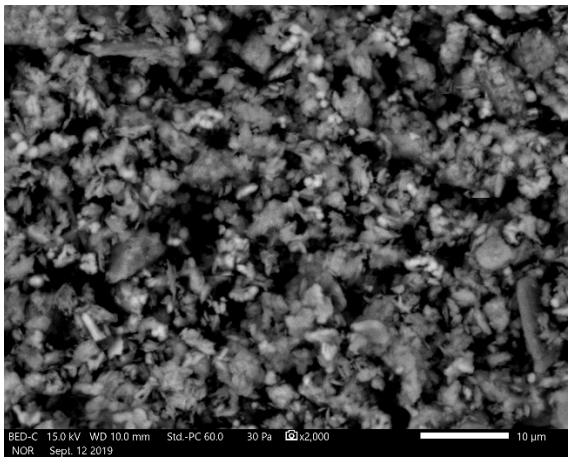
Geosyntec
CTLGroup 150350

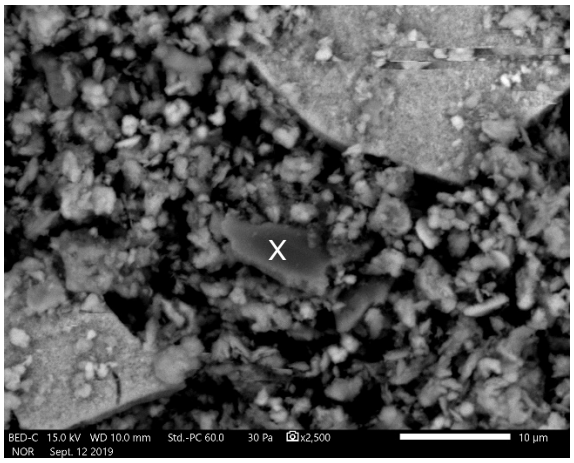


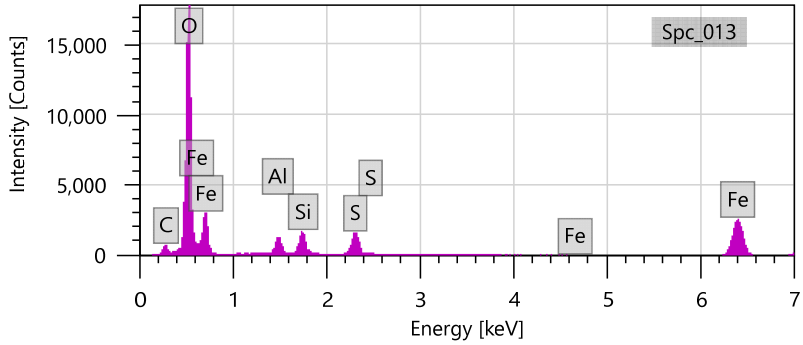




Sample AD-34. BSE spectrum is an area scan for the region shown at 2,000X. Most large blocky particles are quartz or feldspar. X is clay.

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# ATTACHMENT C
# Certification by Qualified Professional Engineer

## CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Pirkey FGD LF CCR management area and that the requirements of 40 CFR 257.95(g)(3)(ii) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature


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