

Pond 1 Groundwater Monitoring Network Evaluation Report

American Electric Power Service Corporation Clinch River Plant, Cleveland, Russell County, Virginia Project # 7362172422

Prepared for:



15 April 2019

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Re: Pond 1 Groundwater Monitoring Network Evaluation Report

Dear Mr. Miller:

Wood Environment & Infrastructure, Inc. (Wood) is pleased to provide American Electric Power (AEP) with the Groundwater Monitoring Network Evaluation Report for Pond 1 at the Clinch River Plant.

We very much appreciate working with AEP on this project. If you require additional information about this report, please feel free to contact Jon McDaniel at (276) 676-0426 or Konrad Quast at (865) 218-1090.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.

Konrad W. Quast, PhD Senior Hydrogeologist

Attachments

Jon McDaniel, P.E. Branch Manager



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15 April 2019

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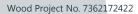




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ACRONYMS AND ABBREVIATIONS

Acronym	Definition					
AEP	American Electric Power					
APCO	Appalachian Power Company, a subsidiary of AEP					
bgs	below ground surface					
°C	degrees Celsius					
CCR	Coal Combustion Residual					
CFR	Code of Federal Regulations					
CFS	cubic feet per second					
cm/sec	centimeters per second					
CRLE	Clinch River Landfill Expansion					
CSM	conceptual site model					
CY	cubic yard(s)					
DEQ	Virginia Department of Environmental Quality					
DMME	Virginia Department of Mines Mineral and Energy					
DO	Dissolved oxygen					
٥F	degrees Fahrenheit					
ft	feet/foot					
ft/day	feet per day					
ft²/day	squared feet per day					
ft/hr	feet per hour					
GPD	gallons per day					
GPM	gallons per minute					
GPM/ft	gallons per minute per foot					
GWMP	Groundwater Monitoring Plan					
L	liter(s)					
L/min	liters per minute					
MGD	million gallons per day					
MCY	million cubic yards					
MW	megawatt					
NOAA	National Oceanic and Atmospheric Administration					
NTU	nephelometric turbidity units					
ORP	Oxidation-reduction potential					
PVC	polyvinyl chloride					
QA	quality assurance					
QC	quality control					
ID	identification					
ID	inner diameter					
K	hydraulic conductivity					



Acronym	Definition				
SPT	standard penetration test				
VAC	Virginia Administrative Code				
USDA	United States Department of Agriculture				
USEPA	United States Environmental Protection Agency				
USFWS	United States Fish and Wildlife Service				
USGS	United States Geological Survey				

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1.0 Introduction

American Electric Power Service Corporation (AEP) retained Wood Environment & Infrastructure Solutions (Wood), to prepare this Groundwater Monitoring Network Evaluation Report to document the results of the monitoring well network evaluation conducted for Pond 1 at the Clinch River Power Plant (Plant) in Russell County, Virginia.

The coal combustion units at the Clinch River Plant were permanently shut down on 2 September 2015, and most water flow to Pond 1 ceased shortly thereafter. Closure of Pond 1, including stormwater diversion, dewatering and grading of the CCR, and subsequent capping, was initiated in August 2014 and substantially completed in July 2018.

The closure for Pond 1 was permitted under the Virginia's solid waste regulations for CCR units: Virginia Administrative Code (VAC) Title 9 (Environment), Agency 20 (Virginia Waste Management Board), Chapter 81 (Solid Waste Management Regulations), Section 800, or 9VAC20-81-800. The permit application for the Pond 1 closure was started in October 2015, and the permit (SWP620) was issued in June 2017. Pond 1 is also subject to the federal CCR rule (40 CFR Part 257) but is considered an inactive impoundment (out of service, but still containing standing water when the rule took effect on 19 October 2015). Pond 1 is currently subject to 40 CFR Part 257, as amended in October 2016 to include *Extension of Compliance Deadlines for Certain Inactive Impoundments*.

Most of the piezometers and monitoring wells present prior to closure were abandoned as part of the unit closure, although a few were retained as piezometers. In mid-to-late 2017, 12 new monitoring wells were installed as the long-term groundwater monitoring network for the closed unit. Eight rounds of baseline groundwater monitoring, as required under the CCR rule, were performed between October 2017 and December 2018.

The information presented in this report has been developed through a review of background provided by AEP (including reports, plans, boring logs, field and analytical data), supplemented with information obtained from Virginia state agencies including the Department of Environmental Quality (DEQ) and Department of Mines Mineral and Energy (DMME), and federal agencies such as the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (USFWS), the U.S Environmental Protection Agency (USEPA), the U.S Department of Agriculture (USDA) and National Oceanic and Atmospheric Administration (NOAA). The list of reports and other documents and sources of data used in preparation of this report is provided in References (**Section 7.0**).

1.1 Purpose

This Groundwater Monitoring Network Evaluation Report has been prepared to document the results of the monitoring well network evaluation conducted for Pond 1 at the Plant in Russell County, Virginia. The groundwater monitoring network evaluation was conducted to evaluate the adequacy of the existing monitoring well network and, if applicable, to make recommendations for additional well installations.

Specifically, the existing monitoring well network at Pond 1 was evaluated for compliance with the coal combustion residuals (CCR) Final Rule issued by the U.S. Environmental Protection Agency (USEPA) on 17 April 2015. Regulations pertaining to Groundwater Monitoring and Corrective Action are contained in the Code of Federal Regulations (CFR) 40 CFR Sections (§) 257.90 through 98. The focus of this evaluation was on §257.91 (Groundwater Monitoring Systems).



1.2 Report Organization

Background information for the Plant and Pond 1 unit is provided in **Section 2.0**. The current understanding of hydrogeologic setting and groundwater flow system are described in **Section 3.0** and **4.0**, respectively. The groundwater monitoring system evaluation is provided in **Section 5.0** and the P.E. Certification is provided in **Section 6.0**. Finally, a list of references is provided in **Section 7.0**.



2.0 Background

2.1 Facility Description

The Plant is located on approximately 270 acres along the Clinch River, north of State Route (SR) 665, in Russell County, Virginia, close to the community of Carbo (**Figures 1 and 2**). The facility address is 3464 Power Plant Road, Cleveland, VA 24225, and the plant's geographic coordinates are 36° 55′ 58″ N / 82° 12′ 00″ W in DMS, or 36.932778 N / 82.200000 W in decimal degrees. The power plant itself is situated in a meander of the Clinch River (called Kiser Bend on historical topographic maps), and ancillary waste storage and disposal facilities are located across the river to the northeast, north and west.

The plant site is owned and operated by Appalachian Power Company (APCO), a public utility subsidiary of AEP. The facility was constructed between 1955 and 1956, and started operation in 1958. It originally consisted of three coal-powered generating units, each with 235 megawatt (MW) capacity. All power production from coal combustion ceased in September 2015. One of the units was decommissioned, and two of the generating units were converted to natural gas combustion. The facility currently generates power from two 242 MW gas-fired generating units. The plant is supplied primarily from surface water withdrawn from the Clinch River, and is equipped with wastewater treatment plants (domestic sewage and industrial) to treat various wastewater streams from the plant processes.

Two ponds (Pond 1 and Pond 2), located across the Clinch River on the west and east banks of Dumps creek north of the Plant, were used for sluicing and settling of coal combustion residual (CCR). Pond 2 was taken out of service in 1997, and subsequently dewatered, graded, covered with a membrane liner, and vegetated. Closure of Pond 2 was completed in 2013, and Pond 2 is not addressed in this report. The Plant facility also includes a landfill, referred to as the Clinch River Landfill Expansion (CRLE), located southwest of the plant and downstream of both the plant and the CCR ponds (**Figure 3**). The landfill is permitted under DEQ Solid Waste Permit 223 and is not discussed further in this report.

Pond 1 is located near the confluence of Dumps Creek and the Clinch River, northeast of the power generating units and north of the intersection of Route 616 and Route 665 (**Figure 3**). The Virginia Solid Waste Permit 620 Facility Boundary and CCR Unit Boundary of Pond 1 are outlined on the regional topographic map in **Figure 2**. Sluicing of new CCR to Pond 1 ceased in October 2015, as the coal-fired generation units were taken out of service. However, the pond continued to receive wastewater and sluiced solids during subsequent decommissioning of the coal combustion units. Final closure of Pond 1 (described below) was completed in July 2018.

2.2 Pond 1 History

Pond 1 was operated by APCO from 1958 (the year the power plant began operation) until late 2018 and has subsequently been closed. The following sections provide additional information on the pond history before and after closure.

2.2.1 Pre-Closure

Pond 1 was constructed between 1955 and 1956, at plant start-up. Based on boring log data, there is a layer of clay under portions of the CCR. However, there is no constructed clay layer or other liner between the CCR in Pond 1 and the underlying alluvium. Pond 1 was used for sluicing and settling of CCR, primarily fly ash, from 1958 until 2015. Settled solids were removed by dredging and landfilled remotely. The pre-closure layout of the pond is shown in **Figure 4**. The pond was composed of two cells (Ponds 1A and 1B), that were separated by a splitter dike constructed over placed CCR. Pond 1A was used as the primary settling pond, and Pond 1B was the clearwater (polishing) pond. Both ponds were maintained



with shallow serpentine channels on the surface of the CCR to increase the residence time of the sluiced water and aid in the settlement of the CCR. Sluiced ash and water entered at the west end of Pond 1A, excess (decant) water flowed from Pond 1A to Pond 1B, and polished water then discharged through the principal outlet structure located in the eastern end of Pond 1B. The discharged water flowed through the vertical outfall structure to a 36-inch spillway pipe, to a catch basin at the toe of Pond 1B, and from there through an underground 30-inch pipe to the Reclaim Pond at the southern toe of Pond 1A, just above the confluence between Dumps Creek and Clinch River. Water in the Reclaim Pond is pumped across the river to the industrial wastewater treatment plant, referred to as the Advanced WWTP, located at the power plant (**Figure 3**).

Pond 1 is considered a side-hill impoundment, built on the bank of Dumps Creek against steep hillsides to the north and west. The main dike runs parallel to the Clinch River on the south-southwest perimeter of Pond 1A, and parallel to Dumps Creek on the southeast of Ponds 1A and 1B. The original engineered earthen embankment rose approximately 35 feet from an original ground surface elevation of approximately 1,505 feet near the confluence of Dumps Creek with the Clinch River, to a crest elevation of 1540 feet. The original embankment was constructed of silty clay soil with shale and sandstone rock fragments. At least two subsequent vertical expansions of the embankment were performed, above and behind the original dike. The first expansion used a mixture of fly ash and bottom ash to raise the crest 10 feet to elevation 1550. Shale rock fill was used to raise the embankment again, to a final crest elevation of 1570 feet in 1971. After that, the nominal operating water levels in Ponds 1A and 1B were 1565 and 1558 feet, respectively (AEP, 2010).

During operation, Ponds 1A and 1B had a history of seepage and boils at the toe area and on the downstream face of the main dike along the southeast side of Pond 1B. The mitigation measures installed between the early 1980s and 2009 to control these seeps remain in place post-closure and continue to act as designed. Historical mitigation measures, currently still in-place to address potential ongoing seepage through the main embankment, include (AEP, 2010):

- A toe drain, consisting of a 10-inch diameter perforated pipe buried in a gravel blanket, installed along the toe in the early 1980s; and discharges into the reclaim pond,
- A 65-foot deep cutoff wall installed through the crest of the main dike in 1991, consisting of a cement-flyash and bentonite mix, extending laterally into the abutments and vertically down into the low permeability soils of the original embankment at an elevation of approximately 1505 feet; and,
- An inverted filter with a riprap revetment installed in 2009 on the lower half of the downstream slope to control seepage and provide protection against potential piping through the embankment.

Table 1 summarizes the basic pre-closure characteristics of Pond 1.

Table 1. Pond 1 Pre-Closure Dimensions

Characteristic	Dimension
Embankment Height (feet)	65
Embankment Crest Width (feet)	35
Embankment Length (feet)	3,150
Nominal Crest Elevation (feet)	1,570
Final Operating Pool Elevation in 1A/1B (feet)	1,566.6/1,557.2
Maximum Pool Surface Area (Acre)	21.0



Characteristic	Dimension
Closure Area (acres)	26
Volume of CCR (million cubic yards)	2.11

Source: AEP (2013); VA DEQ SWP 620 (June 2017).

2.2.2 Closure and Post-Closure

The post-closure layout and cover over Pond 1 is shown on the aerial photograph in Figure 5.

In anticipation of pond closure, construction of a diversion channel to the northwest and west side of Pond 1 (the Pond 1A Diversion Ditch) began in 2014. The diversion channel, separated from the CCR in the pond by a diversion berm, captures clean surface water runoff from drainage areas to the north and west and diverts it to the Clinch River downstream of the pond (at Outfall VPDES 503), preventing contact with the CCR in the pond.

Also, in 2014-2015, the shallow serpentine channels of Pond 1A were allowed to fill, and the incoming sluice lines were redirected from Pond 1A to unfilled portions of the serpentines in Pond 1B. The plant discontinued pumping of sluice water to Pond 1 in October 2015, although smaller-volume discharges of wastewater continued for some months during decommissioning of coal-fired units.

In 2016, the principal pond outfall located at the eastern end of Pond 1B was removed from service. The 42-inch weir inlet structure was removed, and the 30-inch outlet pipe was abandoned in-place with grout. Once the principal spillway was abandoned, excess water that accumulated in Pond 1 was pumped to the Reclaim Pond and from there to the industrial WWTP (consisting of a conventional and an advance WWTP) across the river at the power plant. Draining of the remaining free water in the pond was initiated in July 2017. The wastewater generated was first treated in a temporary pre-treatment facility set up onsite and adjacent to the Reclaim Pond, primarily for selenium removal. Effluent from the temporary pre-treatment facility was pumped into the reclaim pond. The treated effluent was then pumped to the Advanced WWTP for additional treatment before being discharged. Operation of the temporary treatment system ceased in November 2017 when Pond 1 was drained of free water, and the CCR at the surface was dry enough to be graded.

A second diversion ditch (Pond 1B Diversion Channel) was cut and lined with riprap, along the north side of Pond 1B, draining to an inlet structure (catch basin) at the northeast corner of the pond. The Pond 1B catch basin drains southwest through a 48-inch pipe to an existing pipe pit. The pit feeds into an existing tunnel that drains under the road (SR 665) and railroad into Dumps Creek at Outfall VPDES 504.

Final grades on the Pond 1 cover system were designed to drain to the diversion channels. The surface of the western cell (former Pond 1A) drains to a center channel (grass-lined), and then southwest to the 1A diversion channel. The surface of the eastern cell (former Pond 1B) drains uniformly to the northeast, to the 1B diversion channel.

During construction it was also necessary to construct an interceptor drain to capture upgradient seepage into the CCR from the hillside to the north of the Pond 1B Diversion Channel and transfer it to the Reclaim Pond for treatment prior to discharge. The interceptor drain piping is permanently routed beneath the Pond 1B Diversion Channel, connects to the 10 inch toe drain at the end of the Pond 1B Diversion Channel, and flows to the Reclaim Pond.

The engineered, multi-layer geosynthetic cover system constructed over the graded pond surface consists primarily of: a 30 millimeter flexible PVC geosynthetic membrane (FML), under a double-sided geocomposite drainage net, capped with 24 inches of vegetated soil cover.



Closure of Pond was substantially completed in July 2018. **Figure 5** shows the configuration of Pond 1 after closure, including the principal features affecting surface water flows in the immediate vicinity of the pond. It also includes the locations of the 12 monitoring wells that were installed in 2017 to make up the long-term groundwater monitoring network for the closed CCR unit.

wood.



3.0 Hydrogeologic Setting

The following sections provide an overview of the hydrogeologic setting of the Pond 1 site, including climate, physiography and surface drainage, soils and geology. This overview is based on published literature, data available from the DEQ, and previous studies at the site. More specifics regarding groundwater occurrence and flow at the site are provided in the following section (Groundwater Flow System).

3.1 Physiography

The site is located at the northwestern edge of the Valley and Ridge physiographic province, which lies between the Blue Ridge province to the east-southeast and the Appalachian Plateau province to the west-northwest. In Virginia, the Valley and Ridge province consists of two distinctly different sub-provinces, including the Great Valley on the southeast and a more mountainous northwestern sub-province known as the Ridge and Valley, where the site is located. The Ridge and Valley sub-province is characterized by elongate parallel ridges and valleys trending southwest to northeast. These parallel ridges and valleys, which resulted from differential erosion of the underlying linear belts of rock, are associated with a trellis drainage pattern.

In the vicinity of Pond 1, moderate to steep sloping uplands drain toward the meandering Clinch River and its tributaries including Dumps Creek (**Figure 2**). The Clinch River flows generally to the southwest toward the Tennessee River. The Plant is constructed inside a meander (Kiser Bend). Dumps Creek drains from the north and flows into the Clinch River across the river from the plant on its north side. Pond 1 is built against the hillside north-northeast of the plant just inside the confluence of Dumps Creek with the Clinch River. The Pond 1 area is separated from surrounding watersheds by ridges rising to elevations of 2,000 feet and higher. The closed (capped) surface of the Pond 1 ranges in elevation from approximately 1,560 to 1570 feet. According to information provided by AEP, the normal pool elevation of the Clinch River near the confluence with Dumps Creek is estimated to be 1490 feet.

It should be noted in discussions of elevations for the area that most published maps, including U.S. Geological Survey (USGS) and Virginia Department of Mines Mineral and Energy (DMME) maps of topography and geology, have elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD29), which is also commonly known as Mean Sea Level (MSL). Most modern surveys, including recent surveys performed at the site for construction and water level measurement purposes, are referenced to the North American Datum of 1988 (NAVD88). The difference between the two is about 0.5 feet in the area of the Clinch River Plant, using VERTCON, the conversion software maintained online by NOAA (elevation in feet NAVD88 = elevation in feet NGVD29 – 0.509 feet). Where the vertical datum is not specified in this report, the reported elevation should be considered approximate.

3.2 Climate and Water Budget

Virginia's Southwestern Mountain Region is considered a humid, subtropical area with 30 year daily average air temperatures ranging from 34.7 degrees Fahrenheit (°F) in the winter to 70.5 °F in the summer. The 30-year average annual precipitation is approximately 42.9 inches per year, with an average of 2.4 inches in October and an average of 4.6 inches in June (National Oceanic and Atmospheric Administration (NOAA), 2018).

There are no long-term climate stations in Russell County; the nearest stations are in Grundy (Buchanan County) and Abingdon (Washington County). Based on the records for these stations between 1971 and 2000, the average annual total precipitation over Russell County ranges from approximately 44 inches in lowest valley areas to slightly over 50 inches at highest elevations. The average seasonal snowfall is



somewhat dependent on elevation, with about 12 inches common in the lowest valleys, and more than 24 inches at higher elevations (USDA, undated).

Estimates of water budget components are available on the USGS website for the Upper Clinch River watershed in Virginia and Tennessee, Hydrologic Unit Code (HUC) 06010205 (USGS, 2019a). According to the data provided, the area-weighted annual precipitation over the watershed ranged from approximately 35 to 60 inches in 2000-2014, and the annual area-weighted actual evapotranspiration ranged between approximately 25 and 30 inches in the same period.

Rutledge and Mesko (1996, USGS Professional Paper 1422B) derived estimates of water budget components for the Valley and Ridge province using detailed streamflow recession and baseflow analyses in multiple basins over several years. The following are median values for the province based on their analysis:

Precipitation 43 inches/year
Evapotranspiration 26 inches/year
Streamflow 17 inches/year
Direct Runoff 6 inches/year
Groundwater Discharge 11 inches/year
Groundwater Recharge 12 inches/year

3.3 Surface Water Hydrology

The area of Pond 1 is drained by the Clinch River and its tributary Dumps Creek. The Clinch River rises near Tazewell, Virginia, and flows southwest for more than 300 miles, before joining the Tennessee River in Kingston, Tennessee.

The closest stream gauge maintained by the USGS (Station 03524000) is located approximately 4 miles upstream of the Clinch River Plant on the Clinch River in Cleveland (Russell County, Virginia). According to data provided on the USGS website for the station (USGS, 2019), the average annual flow in the Clinch River at Cleveland from 1921 to 2017 ranged from 300 to 1,252 cubic feet per second (CFS) and averaged 710 CFS; in million gallons per day (MGD), the average annual flow ranged from 194 to 809, and averaged 459 MGD. Based on 101 peak flow events between 1862 and 2017, peak flows ranged from 2,430 to 34,500 CFS (1,571 to 22,299 MGD). The median daily flow in the Clinch River at Cleveland (based on 98 years of data) ranges from approximately 100 CFS (65 MGD) in October to 1,000 CFS (650 MGD) in March. The river stage at Cleveland ranges from a low elevation close to 1,500 feet, up to a peak elevation of approximately 1,526 feet NAVD88, and 1,514 feet is considered flood stage.

Discharges from the Clinch River Plant are permitted under a Virginia Pollutant Discharge Elimination System (VPDES) permit, Permit VA0001015 (June 2016). According to the Fact Sheet attached to the permit, both the Clinch River and Dumps Creek are in Section 2 of the Clinch subbasin of the Tennessee – Big Sandy basin. Based on information in the Fact Sheet, the normal pool elevation of the Clinch River near the confluence with Dumps Creek is estimated to be 1490 feet and the low water pool elevation is 1,484 feet. According to information provided separately by AEP, the 100-year flood elevation is approximately 1,515 feet.

The following are the flows provided in the Fact Sheet for the two receiving streams, estimated from nearby gauging stations:



Table 2. Surface Water Flows in Principal Streams

Clinch River (above CRP intake)	MGD	CFS
1-Day, 10-Year (1Q10) Low Flow	31	48
7-Day, 10-Year (7Q10) Low Flow	36	56
1-Day, 10-Year (1Q10) High Flow	48	74
7-Day, 10-Year (7Q10) High Flow	61	95
30-Day, 5-Year (30Q5) Flow	48	74
Harmonic Mean Flow	154	239
Clinch River (below Dumps Creek)	MGD	CFS
1-Day, 10-Year (1Q10) Low Flow	25	39
7-Day, 10-Year (7Q10) Low Flow	29	45
1-Day, 10-Year (1Q10) High Flow	43	67
30-Day, 5-Year (30Q5) Flow	43	67
30-Day, 10-Year (30Q10) Low Flow	38	59
30-Day, 10-Year (30Q10) High Flow	97	150
Harmonic Mean Flow	155	240
Dumps Creek	MGD	CFS
1-Day, 10-Year (1Q10) Low Flow	1.84	2.8
7-Day, 10-Year (7Q10) Low Flow	2.11	3.3
1-Day, 10-Year (1Q10) High Flow	2.85	4.4
7-Day, 10-Year (7Q10) High Flow	3.59	5.6
30-Day, 5-Year (30Q5) Flow	2.89	4.5
Harmonic Mean Flow	9.06	14

In preparing for the closure of Pond 1, a study was performed of the drainage area in the vicinity of Pond 1, in order to support design of diversion ditches to intercept the run-on from surrounding uplands and carry it around the closed pond and directly to the receiving streams. The drainage area contributing run-on to the Pond 1 area totals 156.7 acres. **Figure 6** shows the total drainage area as well as six subdivided areas, including two subareas of the Pond surface (1A and 1B) and four upland subareas (001 through 004), as well as the surface water flow paths on and near the closed surface of the pond. The Pond 1A diversion ditch channel receives drainage from the western end of the pond surface (1A), and upland areas 001 and 002; it discharges to the Clinch River at VPDES permit Outfall 503. The Pond 1B diversion ditch channel receives drainage from the eastern end of the pond surface (1B), and upland areas 003 and 004. A catch basin collects flows from the Pond 1B diversion channel and transfers the water through a 48" diameter corrugated HDPE pipe, to a tunnel under an existing road to Dumps Creek, at VPDES permit Outfall 504. The design peak flows calculated for the lower section of the diversion ditch channels for 6-hour 0.9 probable maximum precipitation (PMP), using guidance from the NRCS Technical Release for Earth Dams and Reservoirs (TR-60), were 1,421 and 1,259 for the 1A and 1B ditches, respectively.



3.4 Surface Soils and Overburden

3.4.1 Regional Soils

Natural soils in the area of the site have been mapped by the Natural Resource Conservation Service (NRCS) of the USDA. The information is available in the published Soil Survey for Russell County (USDA, 2007), and online at the Web Soil Survey (WSS) site (USDA, 2019). **Figure 7** shows the soils mapped by the USDA in the vicinity of Pond 1.

The soils that are mapped near Pond 1 consist of well drained upland soils on summits, shoulders and back slopes, and floodplain soils located along floodplain steps of the Clinch River. The upland soils include the Berks, Chiswell, Groseclose, and Weikert soil series, and the floodplain soils include the Chagrin, Grigsby, Lobdell and Orrville Soil Series.

Due to historical activities at the site, much of the area adjacent to the pond is characterized as "Dumps, mine-Urban land complex" (map label 1B). This is a classification for soil that has been altered by cutting and filling, and which contains components of waste, typically coal and CCR in this area. These types of soils are difficult to characterize due to their heterogeneous nature. Land affected by cutting and/or filling will exhibit varying characteristics based on the degree of alteration and the composition of fill material.

3.4.2 Site Overburden Materials

Based on boring logs recorded during drilling and monitoring well installation in 2009 and 2017, as well as other historical borings, natural and manmade soils (unconsolidated materials) above bedrock, in and adjacent to Pond 1, have been characterized into the following general categories: waste fill, soil fill, alluvium and residuum overlying bedrock. The occurrence and characteristics of each are discussed briefly below.

<u>Waste fill.</u> The waste fill in Pond 1 consists primarily of CCR, including fly ash and bottom ash. Historical borings in Pond 1 performed for geotechnical evaluations have shown that the bottom of the CCR in Pond 1 is relatively flat, occurring between elevations of 1,495 and 1,500 feet. Assuming an average graded CCR surface elevation of 1,668 feet after closure, this corresponds to a thickness of approximately 70 feet, and the in-place volume of CCR is estimated to be 2.1 million cubic yards (MCY). The characteristics of the CCR were found to be locally variable; however, in the 2013 investigations as in previous investigations, the permeability of the CCR was found to be on the order of 0.07 feet per hour (ft/hr), corresponding to 1.7 feet per day (ft/day), or 6 x 10^{-4} centimeters per second (cm/sec).

Historical waste fill occurs outside the limits of the Pond 1 CCR unit, to the northwest. This fill consists of previously placed CCR during the operation of the pond. The material was placed as a valley fill and final grade is sloped to grade to the east with a terraced slope near Pond 1. Current finished grade elevations of the western area range from 1660 feet to approximately 1634 feet in the east at the crest of the terraced slope. Historical borings and drawings of Pond 1 indicate ash thickness may be on the order of 44 to 65 feet thick based on current finished grade elevations. The historical waste fill is capped with a clay cap ranging from 0.5 to 3.0 feet thick with an average thickness of 1.6 feet and is primarily grass covered. Current drainage flows west to east across the surface with a small grass lined drainage channel along the south side of the fill. All surface water runoff from this area is considered clean water and captured by the Pond 1A diversion channel.

<u>Soil fill</u>. Soil fill consists of naturally derived soils and/or weathered rock with little or minimal waste material content, that have been moved or placed by humans as result of construction and/or waste disposal activities. At this site, soil fill typically consists of sandy gravel, clayey gravel, silty sand, poorly



graded sand, sandy clay, and/or lean clay, and often includes weathered shale fragments. During monitoring well installations in 2017, seven borings (MW-1603, MW-1604, MW-1605, MW-1606, MW-1607, MW-1610, and MW-1612) were drilled into the embankment on the southeast, south and southwest of Pond 1. Fill soils in these borings were encountered from the ground surface to depths ranging from 14.0 ft. to 33.5 ft. below ground surface (bgs). Fill soils were also encountered at upgradient locations to the north and west (MW-1601, MW-1602, and MW-1611).

<u>Alluvium</u>. Alluvial soils are soils that were transported and deposited by moving water over geologic time and often contain organic material. During monitoring well installations in 2017, alluvial soils were encountered below the fill soils in the embankment borings closest to Dumps Creek and the Clinch River, (MW-1603, MW-1604, MW-1605, MW-1606, MW-1607, MW-1610, and MW-1612). The alluvial soils at this site typically consist of clay, sandy clay, sandy silt, silty sand, and poorly graded sand. Most alluvial soils contained organic material. Where present, alluvial soils were found to be 4 to 11 feet thick. In geotechnical borings drilled through the CCR, alluvial soils consisting of silty sand, sandy silt and clay with sand, generally less than 10 feet thick, were found underlying the CCR and overlying weathered shale bedrock.

Residuum and Highly Weathered Bedrock (HWR). Residual soils are soils that have weathered in-place from the parent bedrock. Residuum was encountered in borings MW-1601, MW-1602, MW-1608, MW-1609, and MW-1611 and typically consisted of clay, gravelly clay, clayey gravel, and sandy clay. Residual soils having a soil like structure, while exhibiting SPT N values greater than 100 blows per foot, were classified as highly weathered rock (HWR), and were encountered in borings for MW-1603, MW-1604, MW-1605, MW-1606, MW-1607, MW-1608, MW-1609, MW-1611 and MW-1612. The combination of residuum and HWR was found to be typically less than 5 feet thick in most borings. At the MW-1608 and MW-1611 locations, to the northwest and west of the pond, the combination was thicker (14.5 and 26 feet, respectively).

In general, natural soil covering over bedrock in upland areas was found to be thin (less than 5 feet). In the valleys, natural soil cover (including alluvium and residuum) ranged from 10 to 15 feet thick. In the borings along the Pond 1 embankment, between 14 and 36 feet of fill soils were found overlying natural soils. Based on borings completed through the CCR inside Pond 1, the CCR in Pond 1 is on the order of 70 feet thick and overlies a similar thickness (10 to 15 feet) of alluvium and weathered rock.

3.5 Bedrock Geology

The site is situated within the Valley and Ridge physiographic province, which is characterized by a northeast-southwest trending series of parallel ridges and valleys composed of folded and faulted Paleozoic sedimentary rock. The primary geomorphological features are mainly the result of differential weathering of various rock types, which include limestone, dolomite, shale, sandstone, and siltstone. Larger valleys may have a comparatively thin mantle of alluvial soils ranging in size from clay to coarse sand to boulders, and deeply weathered alluvium deposited near streams and rivers may be found both in low-lying areas and on hills, reflecting the dynamic geologic nature of the province.

The bedrock geology in the region of the site (including the USGS St. Paul and Carbo quadrangles) is mapped and described in DMME Publication 106 (Evans and Troensegaard, 1991). The structural setting of the area is reflective of episodes of uplift and mountain building to the east-southeast, resulting in a series of imbricate (shingle-stacked), repeating stratigraphic sequences that have been moved northwestward via relatively low angle thrust faults. The site is near the Alleghanian structural front that marks the northwest edge of the Valley and Ridge province. Along this front, older Cambrian and Ordovician-age rock formations have been thrust along low-angle faults from the southeast over younger rocks of Silurian to Pennsylvanian age to the northwest.



The local geology as mapped by Evans and Troensegaard (1991) is shown on the map in **Figure 8**. The bedrock underlying Pond 1 is locally influenced by the Dumps Fault, a component of the regionally extensive Clinchport fault system, which includes the Honaker fault to the southeast (Adkins, 2017). Along the Dumps Fault, dolomite and limestone of the Cambrian-age Rome Formation overlie younger clastic rock (shale, siltstone and sandstone) of Devonian and Mississippian ages. The younger rock to the northwest of the fault has been folded into an arched structure (the Sinkhole Valley Syncline), which includes the Mississippian Greenbrier Limestone along the centerline of the syncline, bracketed both to the northwest and southeast by the Mississippian Maccrady and Price Formations (undivided) the Devonian Chattanooga Shale. The formations that occur in the vicinity of Pond 1 are described by Evans and Troensegaard (1991) as follows:

Greenbrier Limestone (Lower Mississippian): limestone, light- to medium-gray, thin-bedded to massive, micritic, locally abundant fossils; grayish-red, shaley limestone and calcareous shale are present in the upper part of the section.

Macrady and Price Formations, undivided (Lower Mississippian): siltstone, grayish-red to greenish-gray, very thin- to medium-bedded, interbedded with shale, grayish-red, laminated to very-thin-bedded (Maccrady); and siltstone, light-olive-gray, thing to medium-bedded, sandstone, medium gray, fine-grained, medium-to thick-bedded, and shale, greenish-gray, laminated to thin bedded, interbedded with sandstone and siltstone (Price).

Chattanooga Shale (Devonian): shale, medium-gray to black, very fine-grained, laminated to thin-bedded, interbedded in upper section with siltstone, medium gray to grayish-yellow, thin-bedded.

Rome Formation (Cambrian): shale and siltstone, greenish-gray or grayish red, thinly laminated to very-thin-bedded), sandstone (greenish-gray, fine-to-medium-grained, thin-bedded), dolomite (dark-gray, fine- to medium-grained, massive) and limestone (light-gray, weathering to rusty-orange, argillaceous-ribbon-banded). The dolomite and limestone occur in discontinuous zones up to 50 feet thick, and constitute less than 30 percent of the section. As with the other formations, the Rome exhibits complex faulting and folding within the mapped area.

The Dumps Fault runs southwest to northeast regionally. To the northwest of Pond 1, it curves to the southeast, then east and back to the northeast beneath the footprint of Pond 1A, as shown in **Figure 8**. A branched section is joined just northwest of Pond 1 by a right-lateral fault, aligned north-northwest, that is associated with the St. Paul Fault to the northwest. Under Pond 1, the Dumps Fault is mapped as a single fault.

In 2017 twelve new monitoring wells were installed as the long-term groundwater monitoring network for Pond 1 after closure. The borings for these wells were advanced into bedrock by coring, and then widened for monitoring well construction using air rotary methods. **Figure 9** is a diagram illustrating the relative elevations of the wells, well construction, and the generalized geology in each boring.

North of the mapped location of Dumps Fault, the borings encountered black shale (presumed to be the Chattanooga Shale) down to finished depth, both downgradient of Pond 1 (at MW-1603, MW-1604, MW-1605, and MW-1612) and upgradient of Pond 1 (at MW-1601, MW-1602, and MW-1608). At the MW-1602 location, immediately north of Pond 1, the shale was found to be overlain by approximately 13 feet of thinly bedded, brown and gray sandstone, interpreted to be part of the Macrady-Price Formations (undivided).

To the south and west of the mapped fault, limestone (interpreted to be the Rome Formation) was encountered as the uppermost rock type in borings at the southern toe of Pond 1 (MW-1606, MW-1607 and MW-1610) and in the highlands to the west (MW-1609 and MW-1611). Two of the borings (MW-



1606 and MW-1609) were terminated in limestone without encountering shale. As expected close to the Dumps Fault, limestone was found to overlie black shale (presumed to be Chattanooga Shale) in three of the borings, where the contact between the limestone and the shale (interpreted to be the Dumps Fault) was encountered at elevations of approximately 1,477 feet (MW-1610), 1,454 feet (MW1607), and 1,439 feet (MW-1611). At the MW-1611 location, distinct shale zones were encountered interbedded with limestone up to an elevation of 1,527 feet; this indicates a potentially more complex, thicker fault zone than at the other locations, consistent with the branched, complex faulting mapped west of Pond 1 (**Figure 8**). In MW-1610 and MW-1611, monitoring wells were constructed to be screened across the fault zone. In MW-1607, the monitoring well was screened in the limestone above the fault, for consistency with the elevations of the screens in the other wells downgradient of Pond 1.

In general, the bedrock geology encountered in the 2017 monitoring well borings drilled in the vicinity of Pond 1 was found to be consistent with the geology as mapped by Evans and Troensegaard (1991), as shown in **Figure 8**. The eastern area of Pond 1 (east-northeast of the fault) is underlain by Chattanoogashale, and in the area north (upgradient) of the pond, the Maccrady and Price Formations (undivided) occur above the Chattanooga Shale. The area of Pond 1 that is southwest of the fault is underlain by limestone of the Rome Formation, thrust from the south over Chattanooga shale and separated from it by a fault zone. The new mapped location of the Dumps fault, based on the findings of the 2017 borings, is shown on the map in **Figure 10**.



4.0 Groundwater Flow System

An understanding of the groundwater flow system at the Clinch River Pond 1 site has been developed from the literature information discussed above, by analogy with sites in similar settings, and from review of previous investigations performed at the site. A summary of previous investigations is provided below, followed by a conceptual description of the groundwater flow system at the site, a description of the long-term groundwater monitoring system installed in 2017, and an analysis of the piezometric data collected at the site in 2017-2018.

4.1 Previous Investigations and Monitoring

This section is intended to provide an overview of the investigations performed at Pond 1 prior to closure. The results of these investigations were reviewed in developing the conceptual model of the groundwater flow system in the vicinity of Pond 1, as well as the design for the long-term groundwater monitoring system installed in 2017. Previous investigations performed at Pond 1 by AEP and its contractors have included geotechnical investigations, groundwater investigations and monitoring, and groundwater modelling. Boring and construction logs for historical (pre-closure) borings, piezometers and monitoring wells are provided in **Appendix A**, and specifically the wells and piezometers that have been retained for water level monitoring are documented in **Appendix A1**. Details of the installation and construction of monitoring wells installed in 2017, including boring and construction logs, are provided in the *Monitoring Well Installation Report (Wood, 2019)* included **Appendix B**.

4.1.1 Geotechnical Investigations (1985-2014)

Prior to 2013, the geotechnical investigations performed at Pond 1 were focused primarily on the embankment and its stability during ongoing operation of Ponds 1A/1B, for receiving sluiced water and settling CCR. Much of the previous drilling and testing was consolidated into a report prepared by AEP (2010) titled *Clinch River Power Plant, Bottom Ash Disposal Facility Pond 1 Stability Analysis*.

In 2013 additional geotechnical investigations were performed to characterize the CCR in Pond 1, behind the embankment, and to support an analysis of pond stability during and following closure. Auger borings were performed through the CCR, and in-situ testing using cone penetrometer methods was performed along three cross-sections across Ponds 1A/1B. The results were summarized by AMEC (2014a and 2014b).

4.1.2 Pre-Closure Groundwater Monitoring Systems

Piezometers were first installed at the site by AEP in 1985 to monitor water levels in the Pond 1 dike due to seepage derived from the impounded water. These piezometers were generally screened across portions of the dike soils to monitor piezometric levels due to influence of the impounded water. These piezometric levels were used for engineering stability calculations.

Additional B- and P- series piezometers were installed in 1990 as additional seepages were located along the Pond 1 dike and were used to monitor water levels before and after the installation of a cement-bentonite-fly ash cutoff wall in late 1990. The installation of the cutoff wall was recommended for embankment stability. As part of the installation, piezometers were installed upgradient and down gradient of the cutoff wall. Post construction piezometric levels were shown to increase upgradient of the cutoff wall and decrease downgradient of the cutoff wall. Water levels in these piezometers, along with the A-series piezometers, were monitored over several years from 1990 to 1994, and 2000 to 2017.

In 2009, eight piezometers (P-0901S, P-0901D, P-0902, P-0904, P-0906, P-0908S, P-0908D, and P-0909) and seven monitoring wells (MW-0910, MW-0911, MW-0912, MW-0913S, MW-0913D, MW-0914, and



MW-0915) were installed in the vicinity of Pond 1. The boring and well construction logs for piezometers and monitoring wells installed in 2009, along with selected borings performed before that date, are provided in **Appendix A**. The piezometers were screened generally across the saturated zone in the unconsolidated materials above bedrock. In the case of the paired piezometers (P-0901S/D and P-0908S/D), the deeper piezometer was finished with a short (8-ft) screen at or in the residuum at the soil-bedrock interface. Six of the monitoring wells were screened in shallow bedrock. One shallow well, MW-0913S, was installed to screen the unconsolidated material just above the bedrock surface. The monitoring wells were used for internal AEP informational purposes and initial groundwater quality monitoring prior to closure.

Most of the piezometers and monitoring wells installed in 2009, along with the previously installed piezometers, were abandoned as part of the Pond 1 closure in 2017. The following twelve were retained for piezometric monitoring as part of the long-term groundwater monitoring network: A-2R, A-3, P-5R, P-6R, P-0901S, P-0902, P-0904, P-0906, P-0908S, P-0909, MW-0913S and MW-0914. The logs for these piezometers are provided in **Appendix A1**. The logs for other historical piezometers and borings consulted in developing the conceptual site model for Pond 1 are provided in **Appendices A2 and A3**, respectively.

4.2 Groundwater Occurrence and Hydrostratigraphic Units

Hydrostratigraphic units are distinct manmade or geologic units with capacity to store and transmit subsurface water. The principal stratigraphic hydrostratigraphic units identified in the vicinity of Pond 1 include the unconsolidated (overburden) materials described above in Section 3.4.2, and the underlying bedrock described in Section 3.5.

Pond 1 was constructed on a riverbank terrace adjacent to Dumps Creek, just above its confluence with the Clinch River. The original ground surface appears to have been relatively flat, sloping up from a low point near the confluence with an elevation of about 1,505 feet, gently across the terrace and then steeply to highlands on the north and west. A relatively wide valley enters from the west, while shorter, steep and narrow valleys enter from the highlands on the north. The underlying bedrock surface would be expected to have a similar slope. Based on the monitoring well borings completed in 2017, the top of bedrock ranges in elevation from approximately 1,485 to 1,491 feet along Dumps Creek, and the bedrock surface was encountered at similar elevations in historical borings through the CCR. At the closest upgradient well locations outside the pond to the north (MW-1601 and MW-1602), the top of bedrock was encountered almost 100 feet higher, at elevations of 1,574 and 1,583 feet, respectively, and even higher at the well locations to the west (MW-1608, MW-1609, and MW-1611). These bedrock elevations reflect the very steep relief of the highlands adjacent to Pond 1 on the north and west.

Above the bedrock surface, natural soil overburden materials including residuum and alluvium are relatively thin, ranging in thickness from less than 5 feet in upland areas to 10-15 feet in valleys. Because these materials are thin, locally discontinuous, and inconsistently saturated, they are not distinguishable from the overlying manmade materials. Therefore, they do not represent a significant hydrostratigraphic unit that can be monitored as a separate unit from the manmade materials in the overburden. By contrast to the natural soils, the overlying manmade materials, and specifically the CCR contained within the Pond 1 embankment, have significant saturated thickness (on the order of 40 feet). Water in the saturated section of the CCR (and the thin underlying layer of natural soils) flows primarily toward the adjacent streams as seepage at the toe of the embankment. The water that discharges above an elevation of approximately 1510 feet is collected by the embankment toe drain system for transfer into the plant's onsite industrial wastewater treatment system. Potential secondary pathways for migration of the underground water that collects in the CCR of Pond 1 would be laterally below the level of the toe drain system into the surface streams, and/or downward into shallow bedrock.



Bedrock is typically most permeable near the contact with the overlying unconsolidated materials, where both primary porosity and secondary openings (from fracturing, including stress relief fracturing as well as fracturing associated with faulting, and solutioning) have been enlarged from the effects of weathering and subsurface water circulation. Therefore, in steep terrains with thin soil cover, shallow bedrock is generally the predominant groundwater flow zone. Groundwater flow in these terrains generally follows the topographic gradient, although locally flow is highly influenced by patterns of openings (faults, fractures, and solution openings) in the rock. Groundwater flowing through bedrock discharges to perennial streams, with the depth of circulation between recharge and discharge zones being dependent on the degree of topographic relief as well as the permeability of the rock.

Based on the flow conditions described above, two hydrostratigraphic units can be identified in the vicinity of Pond 1:

- 1. The overburden flow zone, consisting of manmade fill (CCR and embankment material), and thin, discontinuous natural soils consisting of alluvium and residuum. The majority of the discharge from this zone is collected by the toe drain system at the foot of the embankment, and water underflowing the toe drain (if any) would be expected to discharge as seepage into the adjacent surface streams. Although this zone contains and transmits subsurface water, it is not considered an aquifer, because it has limited extent and is made up of a significant portion of water material.
- The bedrock flow zone, consisting of the shallow bedrock that occurs near the surface, just below
 the soil-bedrock interface. This zone is considered the uppermost aquifer in the area.
 Groundwater flow in this zone would be expected to circulate laterally, or downward and then
 upward, into adjacent surface streams, following localized pathways associated with openings in
 the rock.

4.3 Groundwater Flow Zone Characteristics

4.3.1 Unconsolidated Overburden

The upper unconsolidated (overburden) zone consists of relatively heterogeneous surficial materials, including CCR (both bottom and fly ash), embankment materials (including regraded natural soils, shale fragments and some CCR), and a thin layer of natural alluvial and residual soils at the base. The permeability of this zone has been studied as part of the geotechnical analyses performed to evaluate the stability of the closed pond. In the Amec (2014) geotechnical model of the pond, K values ranging from 2.0×10^{-6} to 0.8 ft/hr (0.00005 to 19 ft/day) were assigned to the various overburden materials mapped in the embankment and underlying natural soils. In four samples collected from the CCR at depths of 16.5 to 40 feet in 2013, permeability testing yielded results for hydraulic conductivity of 5.0×10^{-5} to 1.1×10^{-3} cm/sec, with an average of 3.94×10^{-4} cm/sec (1.1 ft/day). According to the Amec (2014) report, AEP (2010) used a value for K of 2.000 ft/hr (1.7 ft/day) for the CCR in Pond 1.000

Yield and slug tests were performed on the seven monitoring wells installed in 2009, including six finished in shallow bedrock, and one just above the soil-bedrock interface (MW-0913S). The values of hydraulic conductivity calculated from slug tests in the 2009 wells ranged from 4.5×10^{-5} cm/sec to 4.9×10^{-4} cm/sec (0.13 to 1.4 ft/day). Well yields resulting in minimal drawdown (less than 0.1 ft) were determined for low-flow sampling purposes and were found to range from 0.045 to 4.0 liters per minute (L/min), equivalent to a range of 0.01 to 1 GPM.

4.3.2 Bedrock

The flow zone characteristics of the shallow bedrock zone (including hydraulic conductivity, storativity, and well yield) are influenced by rock type and localized openings in the rock and are therefore typically



also very heterogeneous in their distribution. Due to the relatively high degree of fracturing in the region, the hydraulic conductivity of the rock types found in the Valley and Ridge province would be expected to be higher on average than for the same rock types in less structurally stressed areas.

Hollyday and Hileman (1996, USGS Professional Paper 1422C) classified the rock types of the Valley and Ridge physiographic province into five hydrogeologic terranes. In their classification, the Maccrady and Price Formations, the Chattanooga Shale, and the Rome Formation are all classified as siliclastic rock. The siliclastic rock type includes rock units that are predominantly shale with little or no carbonate content, and siltstone, sandstone and conglomerate that consist of clay minerals, quartz grains or siliceous rock fragments. The Rome Formation is presumably included due to its high content of clastic rock layers interbedded with dolomite and argillaceous limestone, although in the area of the CRP Pond 1 site, it has been found to contain a significant portion of limestone (based on the 2017 and earlier borings).

In order to evaluate and compare the relative water-yielding properties of each terrane the Valley and Ridge province, Hollyday and Hileman (1996) performed statistical analyses on the available data for the specific capacity of supply wells throughout the region. The specific capacity of a well is the yield in gallons per minute (GPM) per foot of drawdown and is proportional to the transmissivity (hydraulic conductivity times saturated thickness) of the formation supplying the well. It should be noted that supply wells are typically completed in areas that offer the most favourable conditions for water yield within an available region. Compared to the other four hydrogeologic terranes in the province (alluvium, dolomite, limestone, and argillaceous carbonate rock), siliclastic rock is on the low end of the range of specific capacities, with the most productive wells in the terrane having an interquartile range of specific capacities from 70 to 280 GPM/ft. The corresponding generalized interquartile range of transmissivity values is 130 to 1,300 feet squared per day (ft²/day), based on additional analysis reported by Swain and others (2004, USGS Professional Paper 1422A).

More generally, Freeze and Cherry (1979) reported the following ranges of hydraulic conductivity for the three major rock types encountered in the area of the site:

- Shale: 10^{-11} to 10^{-7} cm/sec ($3x10^{-8}$ to $3x10^{-4}$ ft/day).
- Sandstone, limestone and dolomite: 10⁻⁸ to 10⁻⁴ cm/sec (3x10⁻⁵ to 0.3 ft/day).

4.4 Long-Term Groundwater Monitoring System (Completed 2017)

The long-term post-closure groundwater monitoring system for Pond 1, completed during closure of the pond in 2017, consists of the following three elements:

- 12 groundwater monitoring wells (MW-1601 through MW-1612), installed in shallow bedrock to collect piezometric (water level) data and water quality samples from the uppermost aquifer.
- 12 conventional piezometers, to collect piezometric data only, consisting of legacy monitoring wells and piezometers installed during pond operation and maintained during closure.
- 8 vibrating wire piezometers equipped with dataloggers, to collect piezometric data in the covered CCR.

Each element of the groundwater monitoring system is described in more detail below.

4.4.1 Monitoring Wells

Twelve wells were installed in 2017 as the principal component of the long-term post-closure groundwater monitoring network for Pond 1. The drilling, construction and development of the 2017 monitoring wells are fully documented in the *Monitoring Well Installation Report (Wood, 2019)* included **Appendix B**. Table 3 below is a summary showing the dates installed and some basic dimensions.



Figure 9 is a diagram illustrating the bedrock formations penetrated at each location and the relative position of the monitoring well screens. The locations of the wells are shown on **Figure 10**.

Table 3. Monitoring Well Construction Summary

Monitoring Well	Date Installed	Top of Casing Elevation (ft NAVD88)	Ground Surface Elevation (ft NAVD88)	Depth to Top of Bedrock (ft bgs)	Depth to Bottom of Well (ft bgs)	Length of Screen (ft)
MW-1601	7/10/2017	1,577.54	1574.41	0.7	100.5	10
MW-1602	6/29/2017	1,586.59	1584.09	0.9	92.6	10
MW-1603	6/26/2017	1,517.67	1515.35	24.0	46.5	10
MW-1604	6/23/2017	1,519.65	1517.15	31.8	55.5	10
MW-1605	6/14/2017	1,518.62	1516.00	30.0	47.4	10
MW-1606	6/13/2017	1,522.91	1520.46	34.1	50.8	10
MW-1607	6/14/2017	1,530.01	1527.43	39.1	58.0	10
MW-1608	7/13/2017	1,611.24	1608.53	14.5	147.5	10
MW-1609	7/31/2017	1,728.97	1725.31	4.5	144.5	10
MW-1610	8/15/2017	1,520.12	1517.59	29.3	49.5	10
MW-1611	8/9/2017	1,656.62	1653.86	26.0	224.2	10
MW-1612	11/18/2017	1,521.00	1518.10	33.5	62.0	10

All of the wells are constructed of 2-inch inner diameter flush-threaded PVC, with 10 feet of screen. The screens are set in bedrock and sand-packed, with the annulus above the sand pack being sealed to the ground surface. The wells are finished at the surface with a concrete pad and a steel protective casing.

The monitoring wells in the long-term network were located to yield representative samples of the dominant rock types, on both sides of, and across, the Dumps Creek fault. The seven downgradient wells are located at the CCR waste boundary, along the pond embankment. These wells were placed so that the surface pad and casing would be above the Clinch River 100-year flood level of 1,515 feet. Bedrock in the downgradient wells was encountered at 25 to 40 feet below ground surface, and the top of the screen in these wells is 6 to 18 feet below the top of bedrock. The downgradient wells include four wells finished in shale (MW-1603, MW-1604, MW-1612 and MW-1605), one well screened across the apparent fault zone (MW-1610), and two wells finished in limestone above the fault (MW-1606 and MW-1607). The screened intervals in most of these wells are set at or close to elevations 1,470 to 1,480 feet, below the river normal pool level of 1,494 feet.

The five upgradient/background wells are located north and west of the pond, with ground surface elevations 40 to 100 feet higher than the downgradient well locations, and with bedrock close to the surface. The screens in these wells were set deeper into bedrock, in order to intersect similar elevations in bedrock as the downgradient wells. The three upgradient/background wells on the north and northwest (MW-1601, MW-1602 and MW-1608) were installed in shale, with screens installed in vertical positions close to the screened intervals of the downgradient wells. One well on the far west (MW-1609) was intended to be screened across the fault, but shale was not encountered down to an elevation of 1475 feet; therefore, the screen was installed in limestone, in a position where sufficient apparent water yield was present, but significantly higher than the downgradient wells. Well MW-1611 was advanced to the deepest elevation (1,410 feet) and appeared to penetrate a complex fault zone associated with the Dumps Creek fault; the screen in this well was finished across a limestone-shale interface at an elevation lower than the screens in the downgradient wells.



Eight sampling events were conducted between October 2017 and December 2018 to collect samples from the new monitoring wells (note: MW-1612 was not installed in time for the first event and was therefore only sampled in the last seven events). The wells were sampled using dedicated pumps and low-flow sampling methods, to purge the wells until field geochemical parameters stabilized, prior to sample collection. The average pumping rate during purging was just under 0.3 L/min.

The following table (Table 4) summarizes the average turbidity and hydraulic performance parameters for each of the monitoring wells, based on averages over five events (the data for Events 3, 4 and 6 were not available at the time of report preparation).

Monitoring Well	Final Turbidity (NTU)	Purge Volume (L)	Purge Time (mins)	Purge Rate (L/min)	Purge Rate (GPM/ft)	Draw- down (ft)	Specific Capacity (GPM/ft)
MW-1601	1.72	8.2	29	0.28	0.075	16.33	0.0049
MW-1602	3.62	7.2	26	0.28	0.074	9.13	0.0089
MW-1603	0.50	6.9	25	0.28	0.073	1.15	0.0649
MW-1604	1.07	6.3	23	0.27	0.071	7.08	0.0112
MW-1605	1.50	6.3	22	0.28	0.074	13.49	0.0057
MW-1606	1.44	6.0	22	0.28	0.073	0.35	0.6578
MW-1607	1.07	6.3	22	0.28	0.075	17.27	0.0051
MW-1608	18.85	6.9	27	0.26	0.069	11.21	0.0065
MW-1609	0.57	6.6	23	0.28	0.075	0.15	0.5896
MW-1610	1.97	8.4	29	0.28	0.075	18.91	0.0040
MW-1611	3.17	8.3	36	0.24	0.063	13.95	0.0047
MW-1612	6.59	8.1	28	0.29	0.077	3.79	0.0204

Table 4. Monitoring Well Performance Summary

Purge rates prior to sampling averaged just under 0.3 GPM, using dedicated pumps. In general, the turbidity of the purged water was low in all wells, with final turbidity less than 5 nephelometric turbidity units (NTU) in most wells in most events. The turbidity in MW-1608 was slightly high in the first events (27 to 28 NTU) but dropped to less than 10 NTU in the last event. In MW-1612, the turbidity was 25 NTU the first time it was sampled but dropped to below 1 NTU in subsequent events.

The calculated specific capacities for each well are provided in Table 4. For a constant pumping rate, specific capacities decrease as drawdowns increase. It should be noted that specific capacities in small diameter wells pumped at low rates are not directly comparable to supply well specific capacities as discussed above in Section 4.4.2, but they are useful to evaluate the relative hydraulic performance of monitoring wells. Overall, the yields of the monitoring wells are low, with specific capacities in all monitoring wells less than 1 GPM/ft. Three wells (MW-1603, MW-1606, and MW-1609) had relatively low drawdowns (less than 2 feet), and specific capacities ranging from 0.06 to 0.6 GPM/ft. Three wells (MW-1602, MW-1604, and MW-1612) had somewhat higher drawdowns (3.8 to 9.1 feet), and specific capacities ranging from 0.009 to 0.02 GPM/ft. The remaining six wells (MW-1601, MW-1605, MW-1607, MW-1608, MW-1610, MW-1611) had relatively high drawdowns (11.2 to 18.9 feet) and low specific capacities (less than 0.0065 GPM/ft). In these six wells, the volume purged was approximately the same as the volume in storage within the drawdown interval, indicating very little inflow to the well from the surrounding formation during purging. In formations with such low yield, the representativeness of samples relies on long-term geochemical equilibration between the formation and the well, and low-purge or no-purge



methods are often most appropriate for sample collection, to minimize agitation of the water stored in the well.

Five of the six wells with the lowest yields are the wells located closest to the fault, including two wells screened across the fault (MW-1610 and MW-1611), and three wells screened in shale (MW-1608, MW-1605) and limestone (MW-1607). This suggests that the fault zone may act more as a hydraulic barrier than a conduit in this stretch of the Dumps Fault. The sixth well with low yield (MW-1601) is set relatively deep (90 feet) into the Chattanooga Shale, as is MW-1608, and the permeability of this formation would be expected to decrease significantly with depth from the surface. The three wells with medium specific capacities (MW-1602, MW-1604 and MW-1612) are finished in shallow to deep shale, and of the three wells with the highest specific capacities, one is finished in shale at a relatively shallow depth (MW-1603), and two in limestone (MW-1606 and MW-1609).

Overall, the yield from wells in the bedrock formations underlying Pond 1 is low. This is consistent with the relatively low values of hydraulic conductivity that would be expected in these formations, and therefore the rate of groundwater circulation through shallow bedrock is expected to be low.

4.4.2 Conventional Piezometers

Of the monitoring wells and piezometers installed during pond operation, 12 were retained as post-closure piezometers, to monitor water levels only. Table 5 below summarizes some basic dimensions for the piezometers, and the available well construction and boring logs are provided in **Appendix A1**.

Piezometer	Date Installed	Top of Casing Elevation (ft NAVD88)	Ground Surface Elevation (ft NAVD88)	Depth to Top of Bedrock (ft bgs)	Depth to Bottom of Well (ft bgs)	Length of Screen (ft)
A-2 R	9/11/1992	1575.1*	1567.8	Not specified	57.8	57.8
A-3	9/1/1985	1535.04	1532.9	Not specified	20.0	20.0
P-5R	9/15/1992	1519.66	1569.71	Not specified	59.4	43.2
P-6R	1/10/1998	1517.53	1515.0	Not specified	23.8	23.8
P-0901S	9/2/2009	1564.7*	1569.7	78.9	66.5	66.5
P-0902	9/14/2009	1517.86	1514.8	24.0	24.0	24.0
P-0904	9/17/2009	1572.98	1569.1	78.8	78.8	78.8
P-0906	9/3/2009	1521.99	1518.2	30.0	30.0	30.0
P-0908S	9/10/2009	1575.3*	1567.6	84.6	69.0	69.0
P-0909	9/11/2009	1522.94	1519.4	33.8	33.8	33.8
MW-0913S	9/24/2009	1520.87	1518.3	28.0	27.9	27.9
MW-0914	9/24/2009	1571.94	1567.8	Not specified	129.0	129.0

Table 5. Piezometer Construction Summary

4.4.3 Vibrating Wire Piezometers

Eight vibrating wire piezometers (VWPs) were installed in the CCR within Pond 1 in summer-fall 2017, to monitor water levels in the saturated CCR. The VWPs were installed along three lines, one through Pond 1A (VWP-1,2,3), and two through Pond 1B (VWP-4,5,6 and VWP-7,8). The instruments were installed at depths that would place them close to the bottom of the CCR, based on information from nearby borings. The final filter elevations are listed below in Table 6.



Vibrating Wire Piezometer	Date Installed	Bottom Elevation (ft NAVD88)
VWP-1	8/1/2018	1491.1
VWP-2	8/2/2018	1498.4
VWP-3	8/2/2018	1506.1
VWP-4	10/4/2018	1503.8
VWP-5	10/4/2018	1501.9
VWP-6	10/3/2018	1503.1
VWP-7	10/5/2018	1505.1

1498.4

Table 6. Vibrating Wire Piezometer Construction Summary

After completion and during subsequent testing, it was determined that the instruments or cables installed in Pond 1A (VWP-1,2,3) were damaged, and representative data could not be obtained from those VWPs. Therefore, only the data from the VWPs installed in Pond 1B (VWP-4 through VWP-8) are included and discussed in this report.

10/5/2018

4.5 Current Potentiometric Conditions

VWP-8

Water level conditions (also known as potentiometric or piezometric conditions) are monitored in both of the flow zones identified for Pond 1, using the three elements of the long-term monitoring system:

- The upper (overburden) zone, consisting of overburden manmade materials (including the CCR and the embankment) over a thin layer of natural alluvial and residual soils, is monitored through a combination of the VWPs (VWP-4 through VWP-8) and selected conventional piezometers (A-2R, A3, P-5R, P-6R, P-0901S, P-0902, P-0904, P-0906, P-0908S, P-0909, and MW-0913S).
- The lower (shallow bedrock) zone, which represents the uppermost aquifer for this site, is monitored with conventional piezometers (MW-0914) and the 12 monitoring wells installed in 2017 (MW-1601 through MW-1612).

Appendix C includes tables of potentiometric data and hydrographs (showing water level elevations over time) for the wells/piezometers in each element of the potentiometric monitoring system. **Figures 11 and 12** are potentiometric surface contour maps for the overburden and bedrock zones, respectively, based on data collected in December 2018.

A comparison of the hydrograph for the piezometers (for the period from 2016 through 2018) to a hydrograph provided by AEP for the period from late 2012 through most of 2017 (both in **Appendix C**), indicates that the water level in the CCR of Pond 1 dropped 5 to 10 feet when surface dewatering occurred in late 2015 and 2016, and has remained relatively stable through 2017 and 2018, with only minor seasonal fluctuations. A review of the hydrographs in **Appendix C** for all elements of the monitoring system (VWPs, conventional piezometers and monitoring wells) indicates that potentiometric conditions in both zones were relatively stable throughout the baseline monitoring period, and the contour maps in **Figures 11 and 12** can be considered representative for the entire baseline period (October 2017 to December 2018). Further discussion is provided below for the two hydrostratigraphic zones.

In the overburden zone, the VWP data indicate that after the initial dewatering and covering, water levels in the CCR have remained relatively stable. The data, collected daily, indicate that there are



short-term fluctuations (less than one foot over a few days) and longer-term fluctuations (on the order of 1 to 4 feet over a few weeks). The short-term fluctuations most likely correspond to a combination of barometric changes and short precipitation events, and the longer-term fluctuations represent seasonal changes in the water in storage in the CCR, in response to changes in recharge. Overall, the data show that water level in the CCR are generally above 1,550 feet on the northnorthwest of the pond, and decrease outward to the south, southeast and northeast.

Piezometers installed in the overburden close to the inner edge of the embankment yield data that are consistent with the VWPs, indicating the water level close to the edge of the outer edge of CCR is close to an elevation of 1,540 feet, and then drops steeply under the embankment down to the level of the toe drain collection system, just below an elevation of 1,510 feet. On the east-northeastern end of the Pond, where the CCR is thinnest, the gradient is less steep than under the rest of the embankment. The overall flow direction is to the southeast, and t the south under the south-southwest embankment.

In the shallow bedrock zone that underlies the overburden, the hydraulic gradient is steep in upland areas to the north and west and is more gentle under the terrace where Pond 1 is located. As in the overburden, the overall flow direction is to the southeast, toward Dumps Creek and its confluence with the Clinch River. Groundwater levels in the bedrock drop fairly evenly from an elevation of about 1,550 feet on the upgradient edge of the pond, to below 1,500 feet along Dumps Creek. Water levels in shallow bedrock appear to be uniformly lower beneath Pond 1 than water levels in the overburden.

Water level data from two bedrock wells were excluded from the potentiometric interpretation for shallow bedrock in **Figure 12**:

- The hydrographs for the 2017 monitoring wells show that while the levels in most wells were stable, the level in MW-1601 (an upgradient well north of Pond 1) continued to rise after installation through the baseline monitoring period, indicating that the yield in this well is so low that the water level was not able to recover completely between sampling events.
- The water level in MW-1611 (the deep well screened across the fault, west and sidegradient of Pond 1) also rose slowly after installation through sampling event 6, and decreased between events 6 and 8. The highest water level observed in this well has been 1,472.97 feet in event 6, and that level is lower than the lowest potential discharge zone for the area (the Clinch River at an elevation of 1,494 to 1,500 feet). These data indicate that the yield in this well is also very low, and it is not able to yield representative water level data for the shallow bedrock zone.

5.0 Groundwater Monitoring System Evaluation

The following section reviews the post-closure groundwater monitoring system for Pond 1 in terms of the requirements of the federal CCR Rule (40 CFR §257).

5.1.1 CCR Rule Definitions and Requirements

As defined in the federal CCR Rule (§257.53 Definitions):

- Aquifer means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.
- Groundwater means water below the land surface in a zone of saturation.



• *Uppermost aquifer* means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.

The performance standard for groundwater monitoring systems in the CCR Rule (§257.91) states that the system should consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:

- Accurately represent the quality of background groundwater, and
- Accurately represent the quality of the groundwater passing the waste boundary of the CCR unit in the uppermost aquifer, and
- Monitor all potential contaminant pathways.

5.1.2 Uppermost Aquifer

Two hydrostratigraphic zones have been identified at the Pond 1 site:

- 1. The overburden flow zone, consisting of manmade fill (CCR and embankment material), and thin, discontinuous natural soils consisting of alluvium and residuum. The majority of the discharge from this zone is collected by the toe drain system at the foot of the embankment, and water underflowing the toe drain (if any) would be expected to discharge as seepage into the adjacent surface streams. Although this zone contains and transmits subsurface water, it is not considered an aquifer, because it has limited extent and is made up of a significant portion of water material.
- The bedrock flow zone, consisting of the shallow bedrock that occurs near the surface, just below
 the soil-bedrock interface. This zone is considered the uppermost aquifer in the area.
 Groundwater flow in this zone would be expected to circulate laterally, or downward and then
 upward, into adjacent surface streams, following localized pathways associated with openings in
 the rock.

Hydraulic data collected during sampling have shown that well yield in the shallow bedrock flow zone is variable, but overall low and insufficient for water supply (by comparison to water supply studies performed elsewhere in the Valley and Ridge physiographic province). Although the area is traversed by a fault (the Dumps Fault), this feature does not appear to have significantly affected the permeability of the bedrock. Permeability in clastic bedrock formations typically decreases with depth, and therefore, no significant groundwater flow zone is expected to occur at depth.

5.1.3 Monitoring Well and Piezometer Locations

The long-term groundwater monitoring system consists of three elements:

- Monitoring wells completed in the uppermost aquifer (shallow bedrock), used for water level monitoring and sample collection;
- Conventional piezometers used for water level monitoring only; and
- Vibrating wire piezometers (VWPs) completed at the base of the CCR.

Water levels in the overburden zone are monitored using a combination of VWPs in the CCR and conventional piezometers (located close to or along the embankment), for comparison to water levels in the uppermost aquifer (shallow bedrock). Water levels in the shallow bedrock are monitored using the monitoring wells installed in 2017, and one piezometer (a former monitoring well, MW-0914). Based on data collected in these systems, the gradient is downward from the overburden to the groundwater flow



zone. However, the rate of downward flow would be expected to be limited by the low permeability of the bedrock. The largest portion of subsurface water discharge from the overburden is expected to be into the embankment toe drain system, where it is collected for treatment at the plant's industrial WWTP.

The construction, topographic siting and geologic setting of the monitoring wells installed in 2017 are depicted diagrammatically in **Figure 9**. The network consists of seven downgradient wells and five upgradient and/or background wells. The downgradient wells are arrayed along the embankment to the east, southeast and south of the CCR, and screened in bedrock just below the level of the Clinch River. The upgradient/background wells are located in upgradient and sidegradient areas to the north and west of the CCR in Pond 1. Both sets include wells screened on both sides of the Dumps Fault, and within the two dominant rock types, shale and limestone. Therefore, the groundwater monitoring system can be considered to representatively monitor the water quality at the Pond 1 site in the uppermost aquifer, including both background and downgradient groundwater quality.

5.1.4 Vertical Screening Levels

The vertical screening levels of the monitoring wells installed in 2017 are depicted diagrammatically in **Figure 9**. All of the screens in the seven downgradient wells (MW-1603, MW-1604, MW-1605, MW-1606, MW-1607, and MW-1612) are installed at similar elevations in shallow bedrock, just below the river of the Clinch River. To the north of the Pond, the screens in three background wells installed in shale (MW-1601, MW-1602, and MW-1608) are set at similar levels. The two wells on the west were installed in an attempt to locate Dumps Fault, and sample groundwater above and across the fault. Although the boring for MW-1609 did not encounter the fault, a water yielding zone in limestone was encountered and targeted in screening the well, at a level about 110 feet higher than the downgradient wells. In the boring for MW-1611, a complex fault zone was encountered, and the well was screened across the limestone-shale interface at an elevation about 40 feet below the downgradient wells. The wells can therefore be considered to adequately monitor the range of expected geochemical conditions, while focusing on the shallow bedrock zone that is just below the level of the Clinch River.

5.1.5 Summary

In summary, the groundwater monitoring system installed for long-term monitoring at Pond is appropriate and consistent with the requirements of the CCR Rule. Specifically:

- The upper (overburden) zone is hydraulically monitored with piezometers, in order to evaluate the hydraulic connection between this zone and the uppermost aquifer.
- Monitoring wells for groundwater sampling are installed in the uppermost aquifer.
- The monitoring wells are hydraulically positioned to represent background and downgradient water quality conditions.
- The monitoring wells (including both downgradient and background wells) are distributed across the dominant geologies affecting groundwater geochemistry.

Overall, the yield of the uppermost aquifer is low, and six of the wells have yield that may be too low to support traditional low-flow sampling. The six wells with low yield include three background wells (MW-1601, MW-1608, and MW-1611) and three downgradient wells (MW-1605, MW-1607, and MW-1610). All six might benefit from no-purge or low-purge methods, instead of traditional low-flow sampling, in order to produce representative samples.



6.0 P.E. Certification

By means of this certification, I certify that I have reviewed the available documents (discussed in this report) for the groundwater monitoring system at the closed Pond 1 at the AEP Clinch River Plant located in Russell County, Virginia, and have found that it meets the requirements in 40 CFR §257.91.



Jon McDaniel, P.E.
Printed Name of Registered Professional Engineer

Signature

049295 <u>Virginia</u> 15 April 2019 Registration No. Registration State Date



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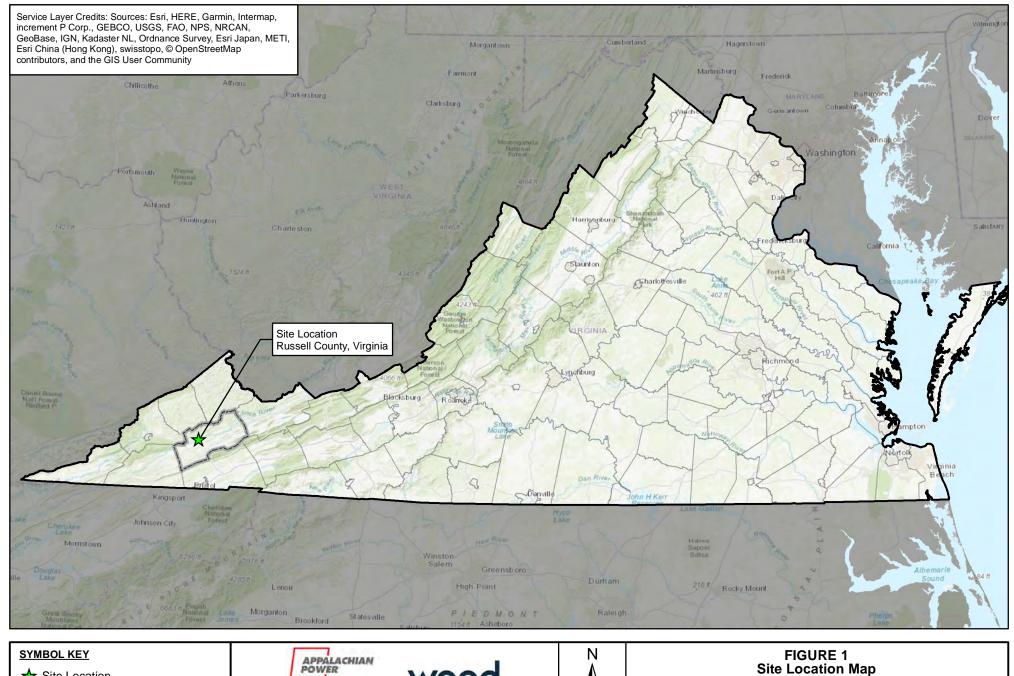


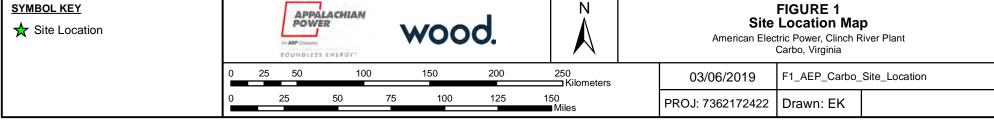
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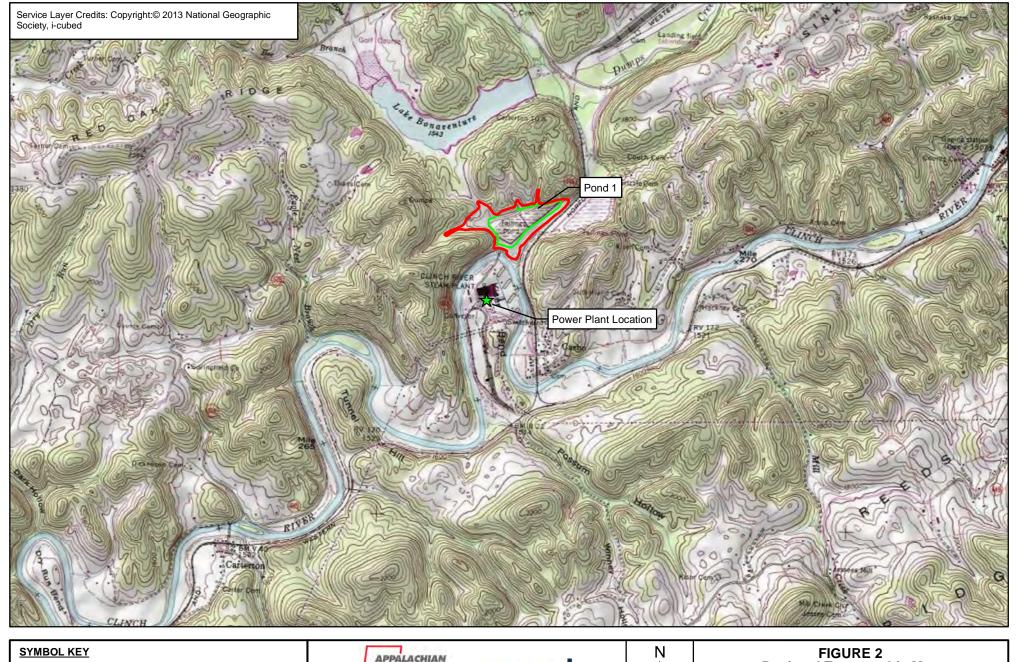
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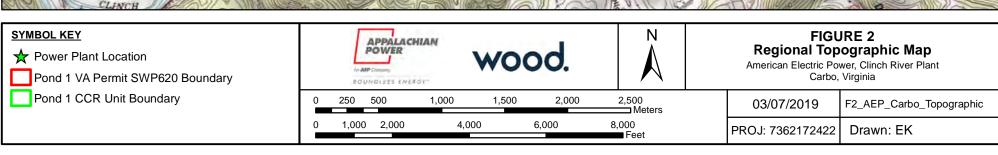
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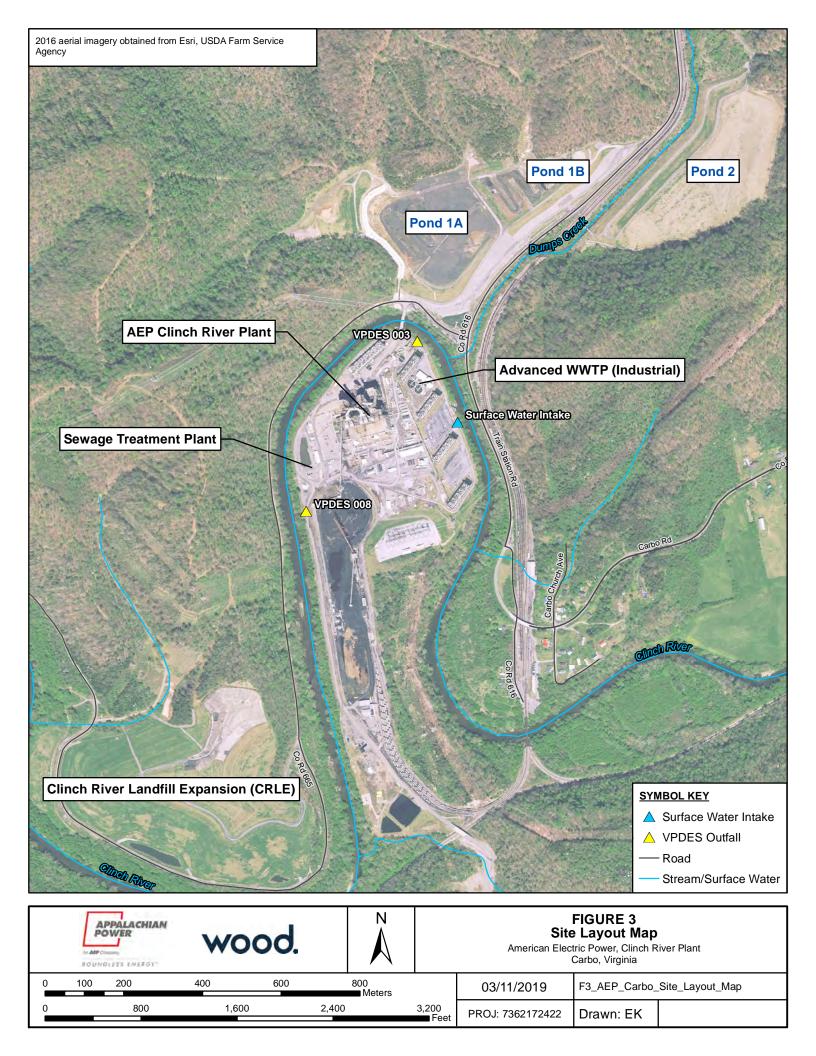
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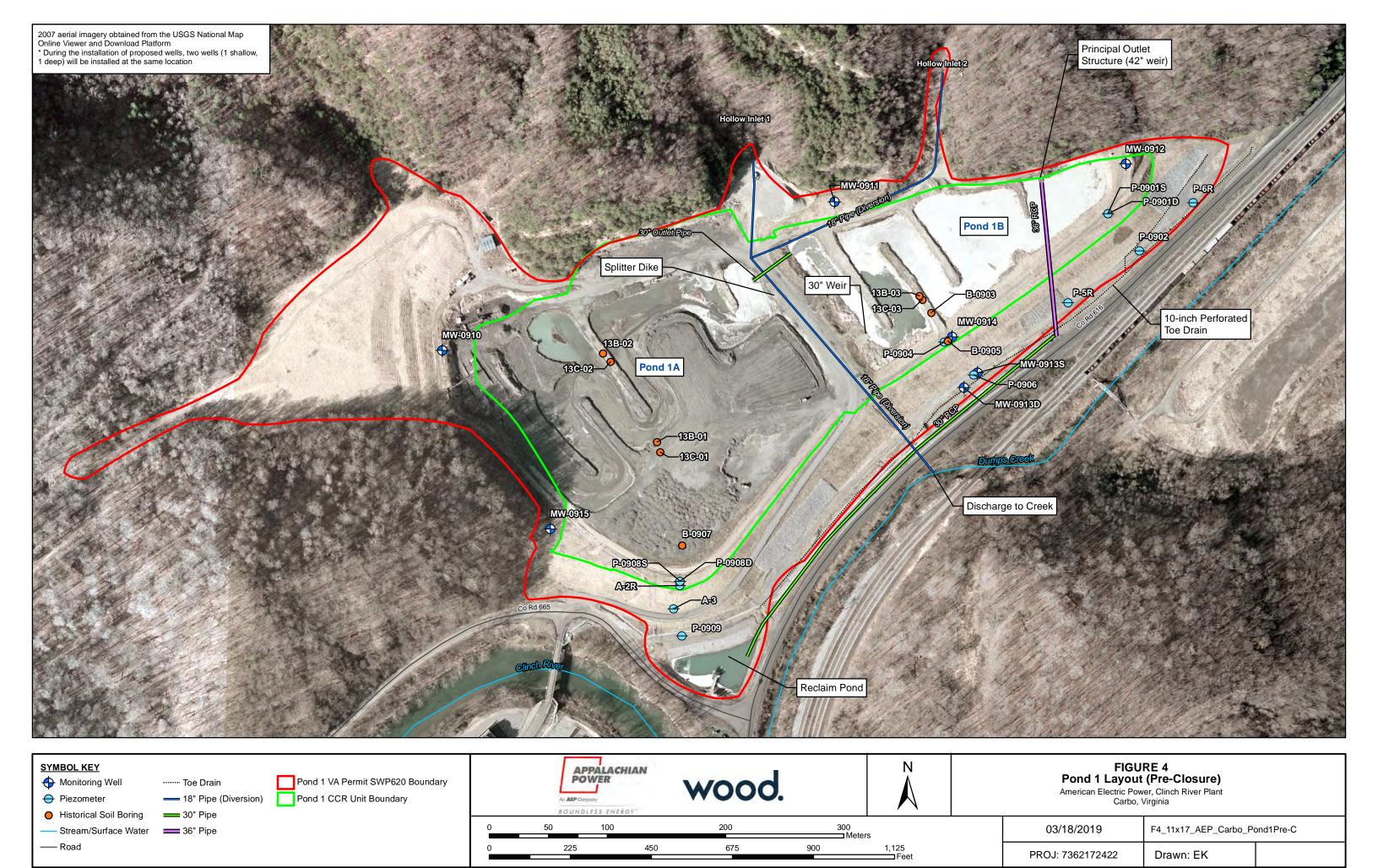


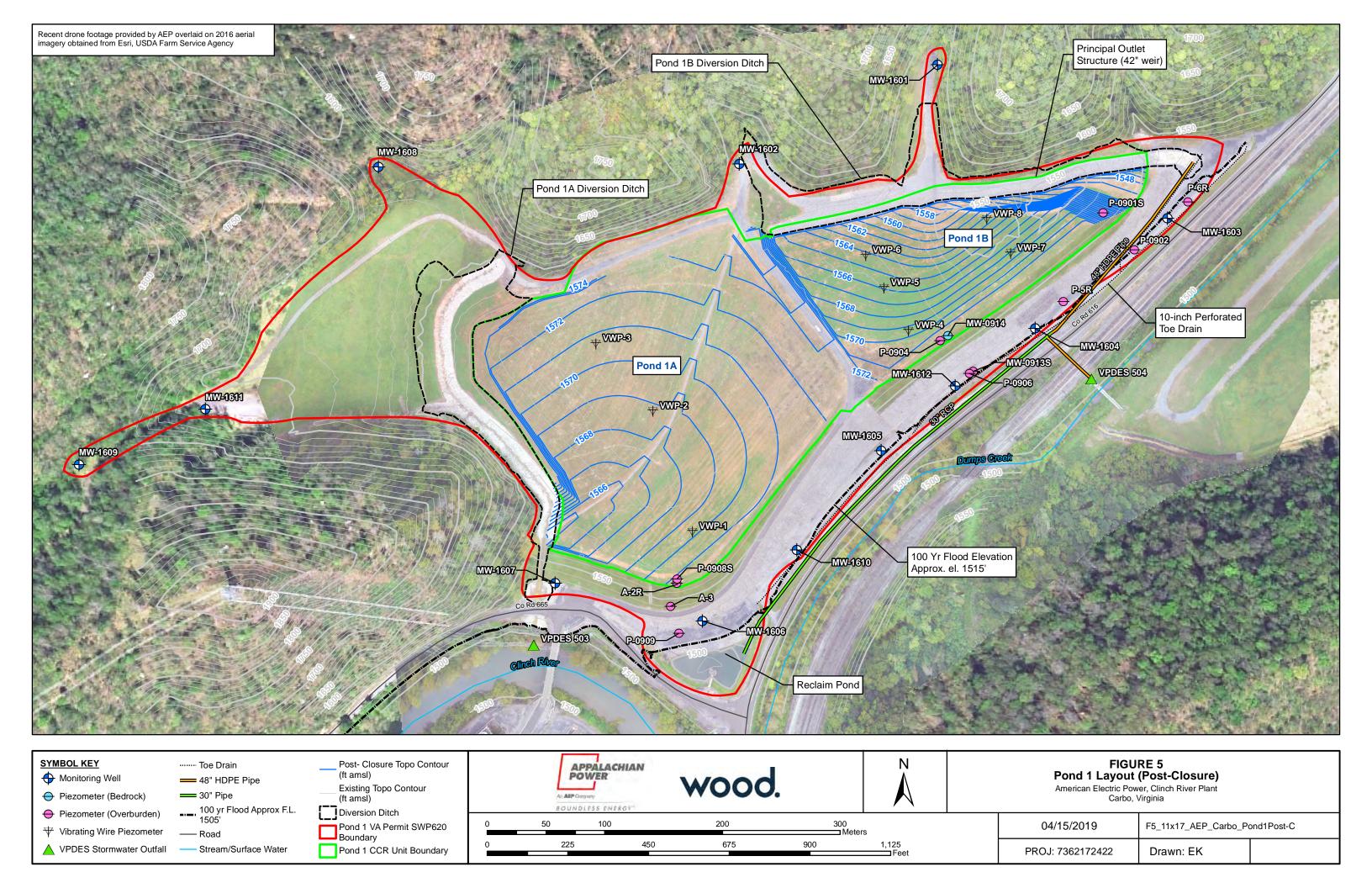


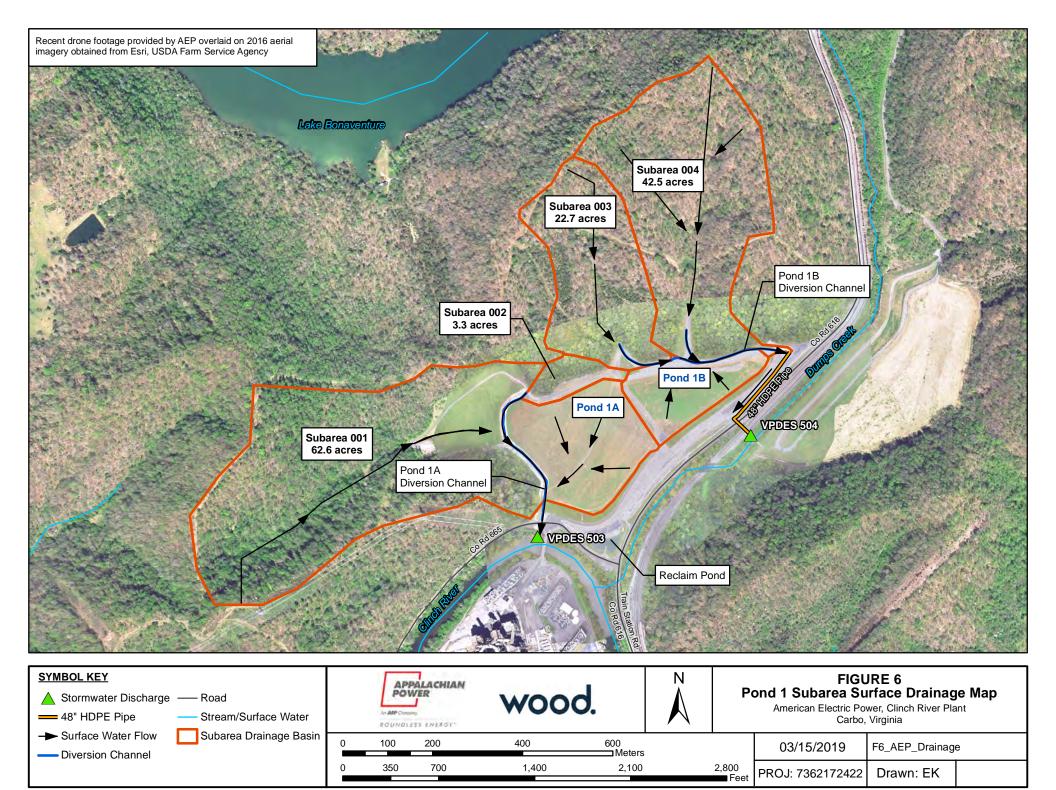


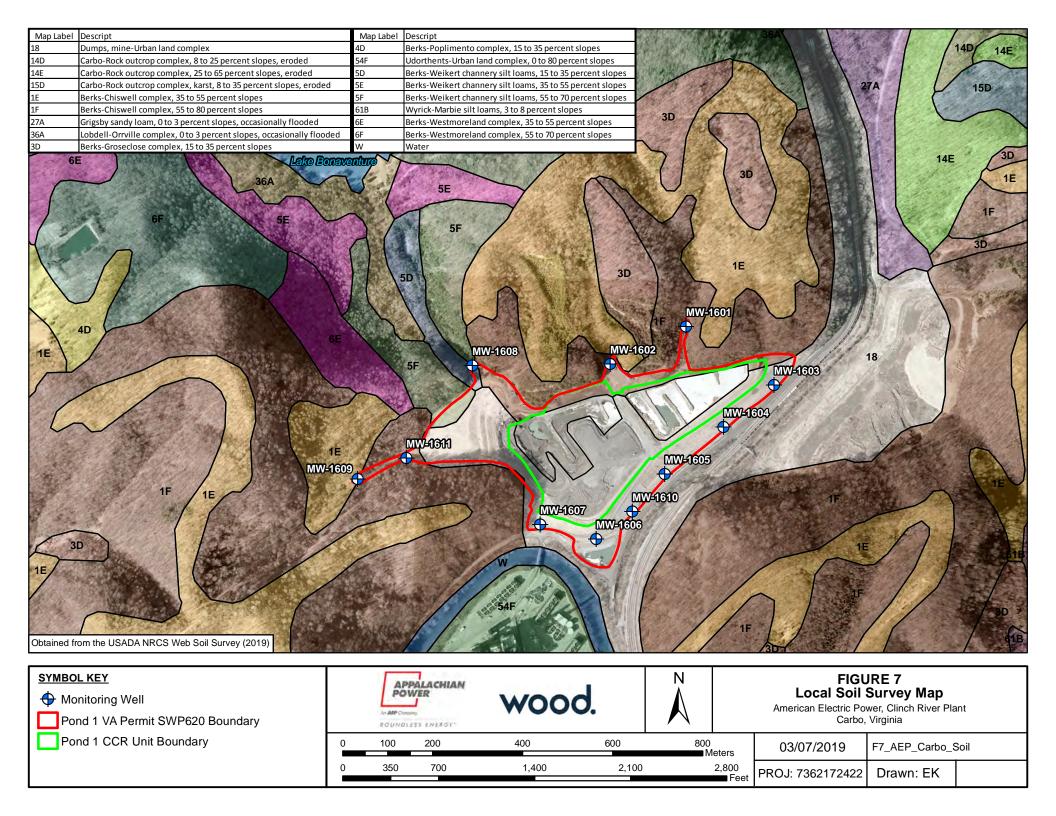


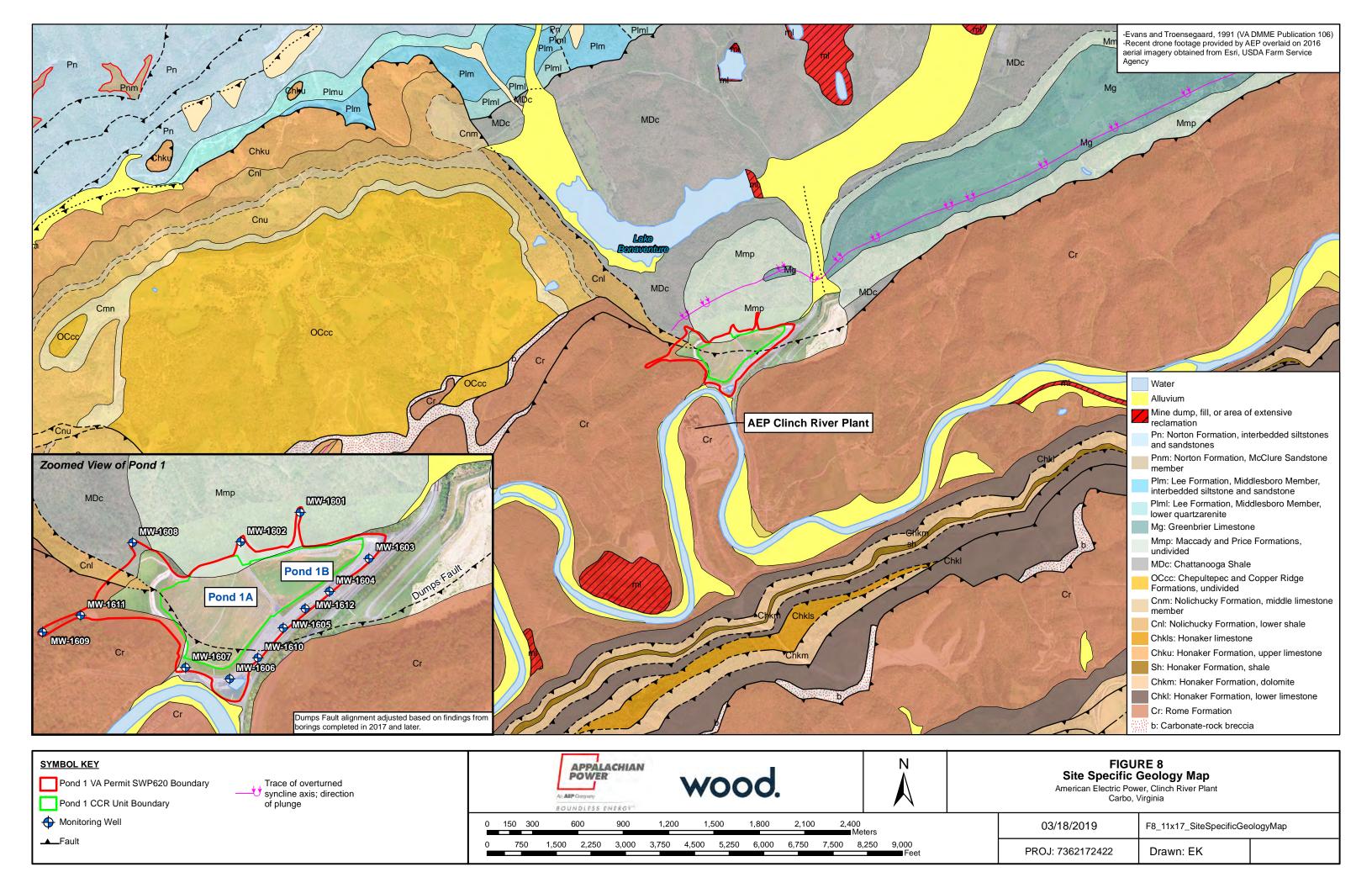


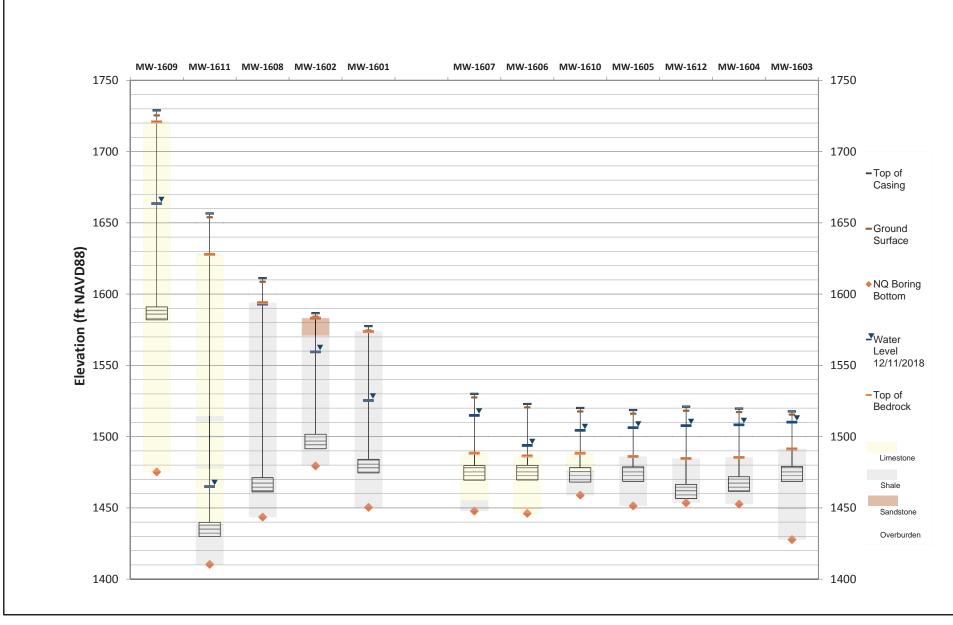


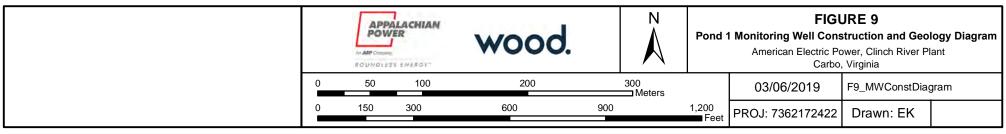


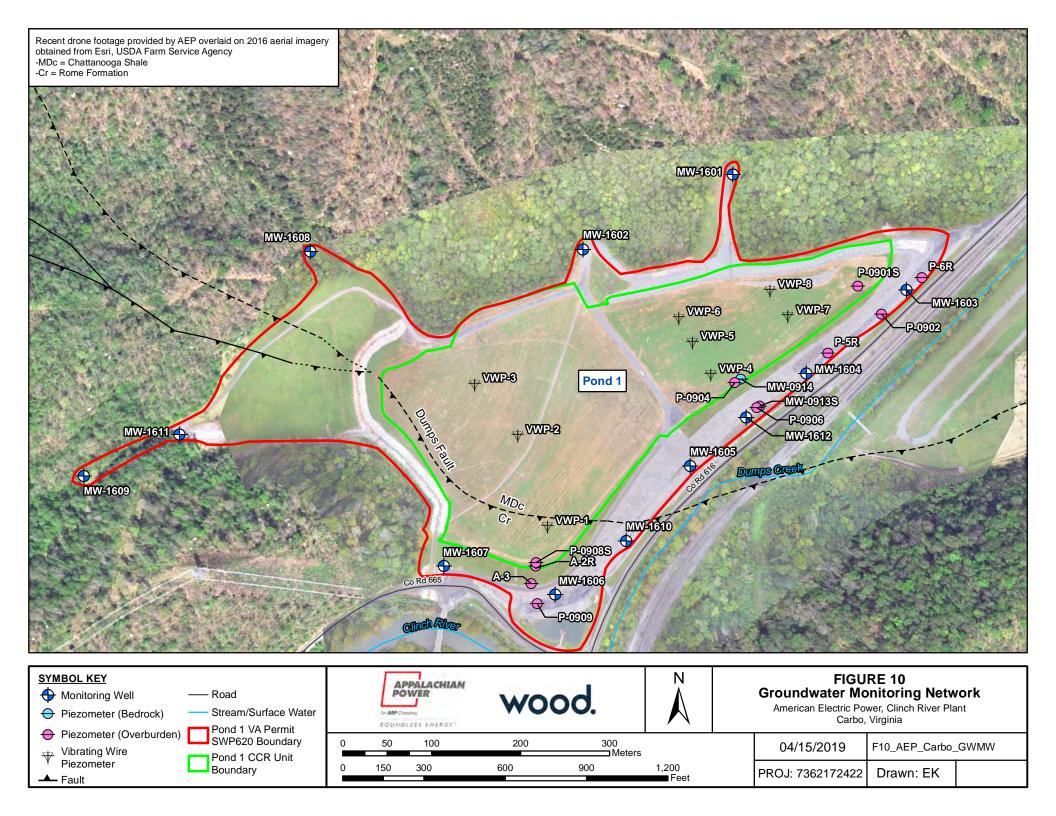


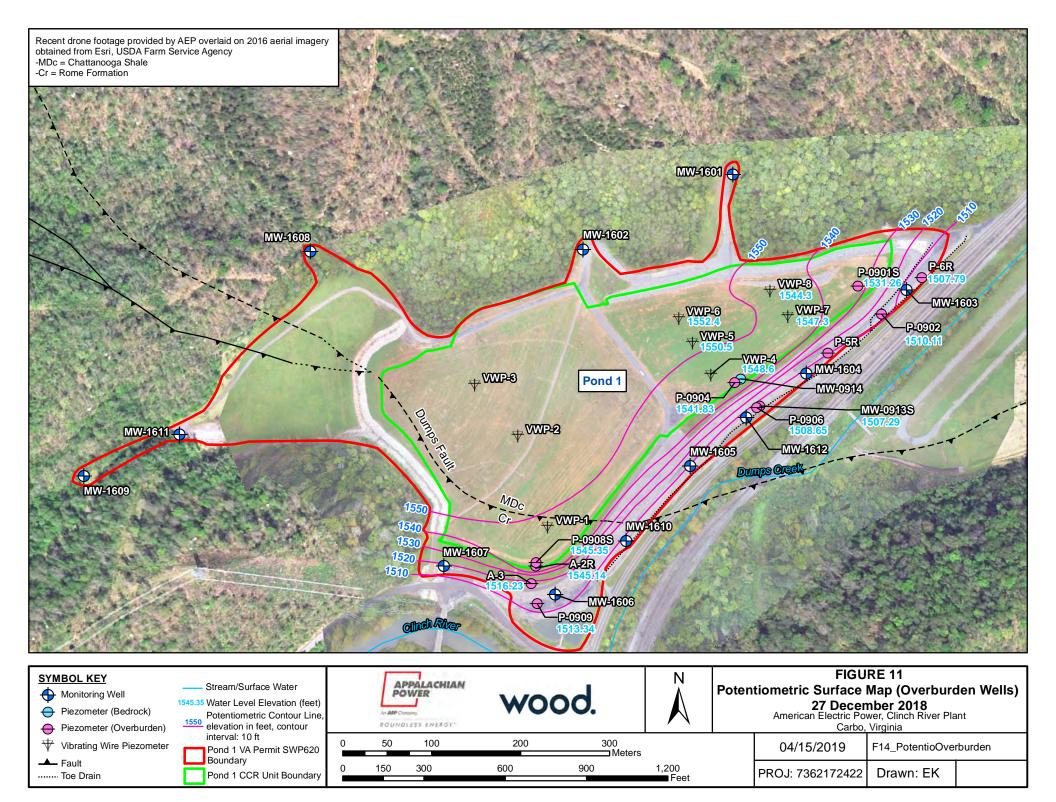


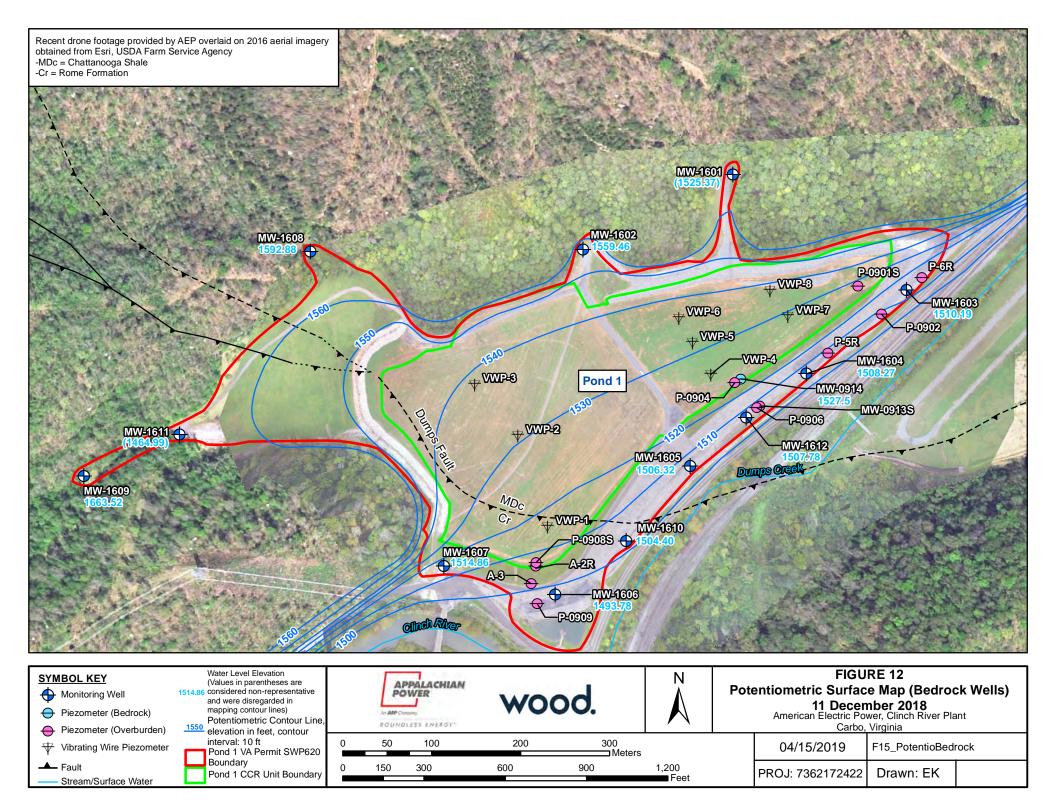














Appendices

wood.

Appendix A Historical Boring and Well Construction Logs

wood.

Appendix A1 Existing Piezometers (Currently In-Place)



JOB NUMBER				, 0, 10			
COMPANY APPALACHIAN PO	OWER COMPANY		WELL	No. <u>A-2</u>	<u>R</u> E	BORING No. A-2R	INSTALLED <u>9/11/92</u>
PROJECT CLINCH RIVER PLA	ANT ASH PONDS						
COORDINATES N 10,931.2 E	11,488.9						
SYSTEM	_						
		_		7			
		Ļ]		TOP RISER: 1569.54 I	FT.
GROUND ELEVATION 1567.79 FT.				1111113	V/XV		
•							
GROUT SEAL: VOLCLAY							
CHOOT SEAL, VOLUEAT							
						TOP BENTONITE SEA	M · 1557 70 FT
BENTONITE SEAL:						TOP BEINTOINIE SEA	AL. 1001.1911.
SCREEN: dia., , 43.8							•
= = = 3000LEN: dia., 143.0							
MANAGE MANAGE							
GRAVEL PACK:	·					TOP GRAVEL PACK:	1555 70 ET
						TOP GIVAVEE PACIC.	1555.7511.
RISER PIPE: 1.0, dia.,						TOP SCREEN: 1554.3	o FT
TrioErr II E. 1.0, dia.,			==			101 0011EE11. 1004.0	
			= =				
SPACERS, DEPTH:			= =				
	•		=				
			= =				
			= =				
700							
2			==		<u> </u>	BOTTOM SCREEN: 1	510.59 FT.
T T							
] 2,743.89			BOTTOM WELL: 1509	9.99 FT.
CK_ASH_FUNDS.GF3 AEF.CUT 97.53.1						BOTTOM CDAVEL D	NCK- 1507 70 ET
						BOTTOM GRAVEL PA	AUN.,1007.79 FT.
\$						POTTOM POPING: 40	507 70 CT
ני						BOTTOM BORING: 15	JQ1.101.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



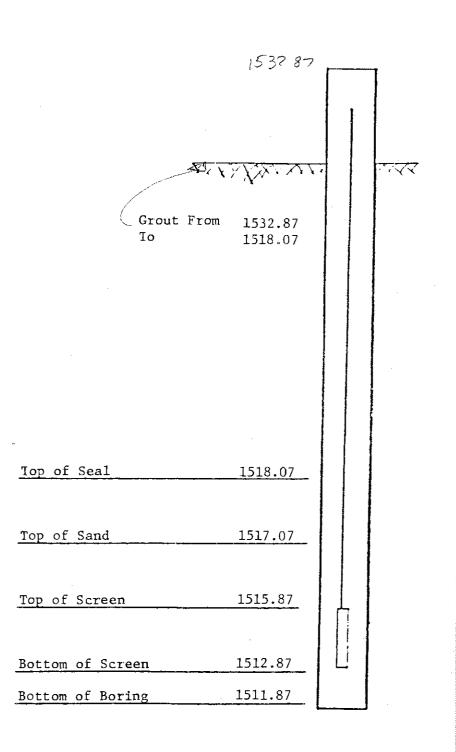
			BER _					-				7 501(11)						
											BORING NO. A-2R DATE 5/23/17 SHEET 1 OF 1							
PF	ROJ	IECT	_CLI	NCH F	RIVER	PLANT	ASH	PO	ND\$		ВС	RING START 9/11/92 BORING FINISH	1 <u>9/</u>	11/92				
CC	OOF	RDIN	IATES _	N 10	<u>,931.2</u>	E 11,4	188.9											
GF	રા૦૪	JND	ELEVA	TION_	1567.8	SY	'STEM				HGT. RISER ABOVE GROUND 1.75 DIA 1.0							
W	ate	r Lev	el. ft	<u>⊽</u> 2:	2.1	Y	-	Ī	· · · · · · · · · · · · · · · · · · ·		DEPTH TO TOP OF WELL SCREEN 13.4 BOTTOM 57.2							
\vdash	ME					-		+-			WELL DEVELOPMENT BACKFILL SAND							
\vdash	ATE			9_1	5-92				•	FIELD PARTY TJH-TLS RIG CME-7								
SAMPLE	NUMBER	SAMPLE	DE IN F	IPLE PTH EET TO	STAN PENET RESIS BLOV	IDARD RATION TANCE	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	nscs	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES				
			TKOW		BLOV				5 -			NO SAMPLES WERE TAKEN. HOLE BAILED PRIOR TO INSTALLATION TO 56.5 FT. AND RECOVERING. SWL AFTER INSTALLATION 51.4		TOP OF				
_							-		15 —				:目:	BENTONITE SEAL 10.0. TOP OF GRAVEL PACK 12.0. TOP OF SCREEN				
									20 -					13.4.				
									25 -					·				
									35 –	-				•				
									40									
									45	-								
									50 -		:							
11.00									55 -					BOTTOM OF SCREEN 57.2.				
4EP.6D1 34								·						BOTTOM OF GRAVEL PACK 60.0.				
TYPE OF CASING USED							D					•						
NQ-2 ROCK CORE								PIEZOM SLO	METER	R TY ED :	PE: PT = OPEN TUBE POROUS TIP, SS SCREEN, G = GEONOR, P = PNEUMATI	S = 0	PEN TUBE					
HW CASING ADVANCER 4" WELL						4"		WELLT	YPF.	0	W = OPEN TUBE SLOTTED SCREEN, G	= M	GEOMON					
Y NW CASING 5"						3" 6"			· · ·									
SW CASING 6" AIR HAMMER 8"											RECORDER		<u> </u>					

AEP CIVIL ENGINEERING LABORATORY LOG OF BORING

JOS NO	
COMPANY App	lachian Power
PROJECT Cli	nch River Plant
LOCATION OF E	Pond No. 1
WATER LEVEL	
Tame	
DATE	

BORING No. A-3 DATE 9-85	SHEET 1 of 1
Type of Borine Piezometer	RIGCME-75
CASING USEDSIZE	DRILLING MUD USED
BORING BESUN BOR	HE COMPLETED
GROUND ELEVATION 1532.87	AEFERRED TO
Top of Pine 1535 04	DATUM
FIELD PARTY: Smith-Bumgarner	

- 1" PVC Rizer Pipe
- 3' PVC .01 inch slots well screen
- 4" Steel Protector set in concrete





JOB NUMBER _____ COMPANY APPALACHIAN POWER COMPANY WELL No.P-0901S BORING No. B-0901S INSTALLED 9/2/09 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 3,522,487.0 E 10,403,787.3 SYSTEM TOP RISER: 1573.29 FT. GROUND ELEVATION 1569.66 FT. GROUT SEAL: TOP BENTONITE SEAL: 1569.66 FT. BENTONITE SEAL: SCREEN: dia.,,61.5 GRAVEL PACK: TOP GRAVEL PACK: 1564.66 FT. RISER PIPE: , dia., TOP SCREEN: 1564.66 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1503.16 FT. BOTTOM WELL: 1503.16 FT. BOTTOM GRAVEL PACK: 1503.16 FT.

BOTTOM BORING: 1485.76 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION



						AEF	CIVILE			ERING LABURATURY		<u> </u>				
JC	DB I	NUM	BER _					LU	G U	FBORING						
C	ОМІ	PAN'	Y <u>AP</u>	PALA	CHIAN PC	WER CO	<u>MPANY</u>		ВС	RING NO. B-0901S DATE 5/23/17 S	HEET_	1 OF 2				
PI	RO.	JECT	CLI	NCH F	RIVER PLA	NT ASH	PONDS		ВС	RING START 9/2/09 BORING FINIS	ян <u>9/</u> :	2/09				
C	001	RDIN	IATES_	N 3,5	22,487.0	E 10,403,	787.3		PIEZOMETER TYPE WELL TYPE							
G	ROI	JND	ELEVA	TION_	1569.7	SYSTEM_			HG	T. RISER ABOVE GROUND 0 D	IA					
V	/ate	r Lev	/el, ft	∇	Y		<u> </u>		DEPTH TO TOP OF WELL SCREEN 5.0 BOTTOM 66.5							
⊢-	IME						-		WE	ELL DEVELOPMENT BACKFII	_L <u>S</u> /	AND				
⊢	ATE							=	FIE	LD PARTY MACTEC/Tri-State R	iG <u>C</u> l	ME-75				
							RQD DEPTH % FEET									
ш	! <u> </u>	щ	ı	1PLE PTH	STANDAR		RQD DEPTH	₽	တ	SOIL / ROCK		DRILLER'S				
	NUMBER	SAMPLE	l	EET	PENETRAT RESISTAN	CE ON S	% IN	14 S	၁		WELL					
N,	3	SA	FROM		BLOWS /	F백위	% FEET	18 J	כן	IDENTIFICATION	>	NOTES				
\vdash	1	SS	0.0	2.0	5-12-26			XX		FILL: Hard, Red to Brown, CLAY (CL), with Silt		 				
								\mathbb{X}		and Rock Fragments, Moist						
								XX	SM	Stiff to Very Stiff, Brown, Silty SAND (SM), with	- 1					
	2	ss	4.0	6.0	11-9-6	1.1	_	1:1:1	JIVI	Sand and Rock Fragments, Moist						
							5 -]: :								
								411								
	3	ss	8.0	10.0	13-7-7	1.2		+: :								
L							10 -	111								
							10	-								
	4	ss	12.0	14.0	7-10-8	1,8		1:1								
] []			:					
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	5	ss	16.0	18.0	7-5-6	1.0		+111								
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				!				411								
F	6	SS	20.0	22.0	3-4-5	1.1	20 -	+:11								
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	٠		-0.0	00.0			20	1 1	ĺ							
								7:11								
	9	ss	32.0	34.0	4-5-6	2.2		+		·	1					
		-	02.0	"""					SM	SPOIL: Firm to Loose, Dark Brownish Gray,	1					
				ļ			35 -]]:]		Silty SAND (SM), with Coal Fragments, Moist						
	10	SS	36.0	38.0	2-1-5	1.7		-			_					
1	۱۰	-	30.0	30.0	2-,-5	'''			CH	FILL: Very Stiff to Hard, Brown to Gray, Silty CLAY (CH), with Rock Fragments, Coal and						
5/23/17								1	1	Sand, Wet to Moist						
	11	SS	40.0	42.0	8-8-9	2.0	40	=	-	NOTE: 10 Gallons of Water Put in Hole at 58.0'						
9.G	'	33	40.0	42.0	0-0-9	2.0		-		Below Ground Surface to Clean Augers Because Steel Kept Getting Stuck in Hole and						
			TYP	FOF	CASING U	SED			1	Continued Next Page						
CR_ASH_PONDS.GPJ_AEP.GDT		1		OCK C												
	Х		6" x 3.2	5 HSA	UINE.				TER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE TTED SCREEN, G = GEONOR, P = PNEUMATIC							
콹			9" x 6.2		DVANCER	4"			, ·							
쌃	NW CASING ADVANCER 4 WELL TYPE									W = OPEN TUBE SLOTTED SCREEN,	<u>- Mc</u>	GEUMUN				
AP			SW CA AIR HA			6" 8"	\dashv	RECORDER								
~ _						. <u> </u>					•					



MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive

Abingdon, VA

Telephone: 276-676-0426

Fax: 276-676-0761

BORING NO.:

MW-0913S

SHEET 1 OF 1

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

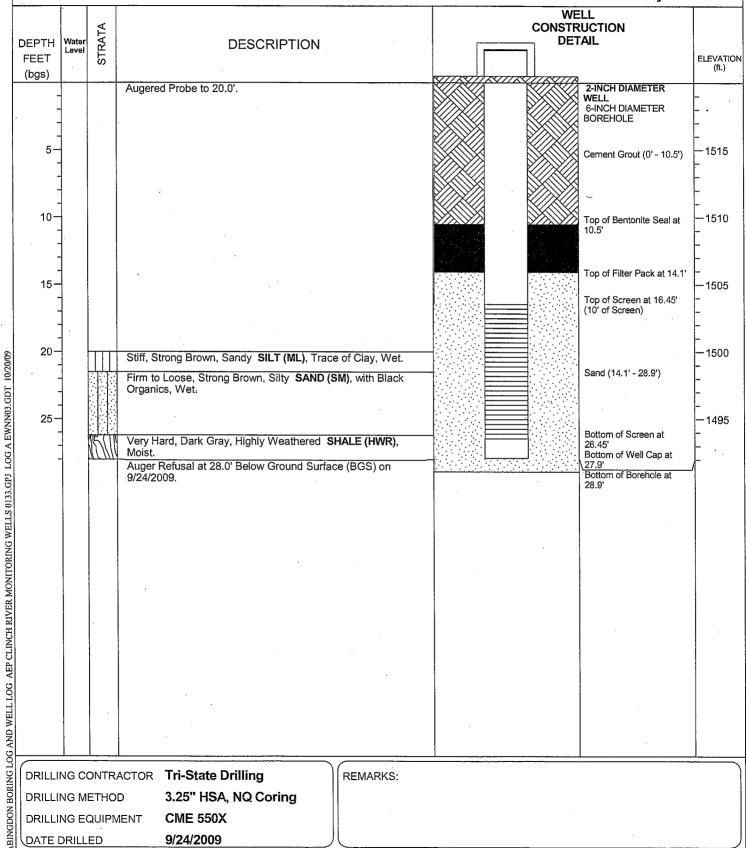
Carbo, Virginia 3050-09-0133

PROJECT NO .: LOGGED BY:

Nick Smith

CHECKED BY:

Rvan Rasnake



DRILLING CONTRACTOR

Tri-State Drilling

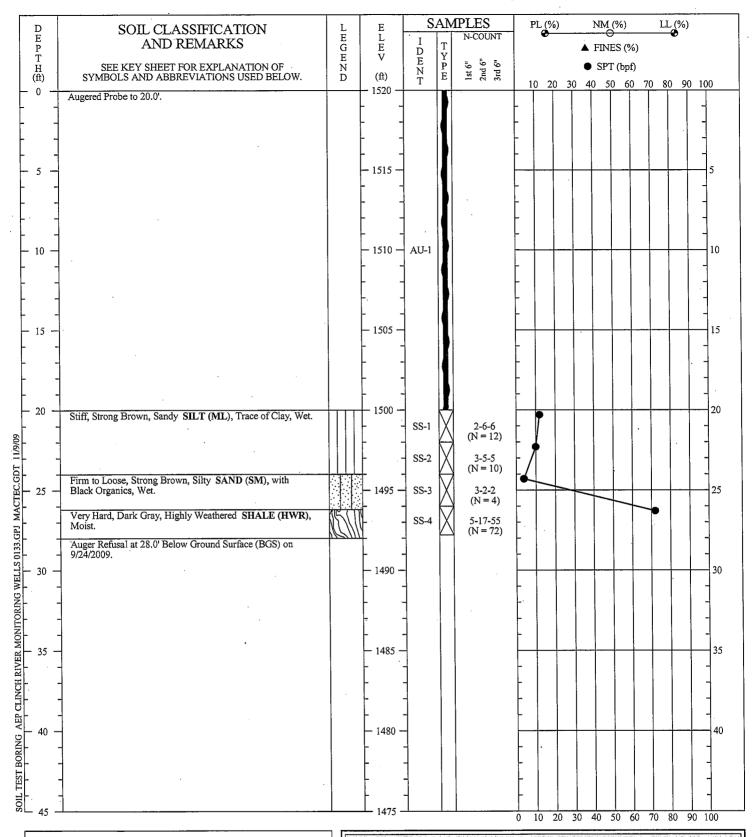
DRILLING METHOD

3.25" HSA, NQ Coring

DRILLING EQUIPMENT

CME 550X

9/24/2009 DATE DRILLED



DRILLER:

Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD: HOLE DIA.: 3.25" HSA, NQ Coring

REMARKS:

Nick Smith LOGGED BY: CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0913S

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

September 24, 2009

PROJECT NO.: 3050-09-0133 PAGE 1 OF 1



AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



	NUM	_	DALA	CHIAN	DOM	ED C/	- OMD	ANIV		D.C	DING NO	MIN ODA	200ATE 5	104147	OUEET	- 4 05 4		
								<u>AN</u> Y NDS			RING NO. RING STAR					T_1_OF_1_ 0/24/09		
								5.4								<i>7</i> 24,03		
				1518.3							ST. RISER A							
			<u> </u>		<u> </u>				\equiv							<u> </u>		
TIM		****	<u></u>		<u> </u>			·			DEPTH TO TOP OF WELL SCREEN 16.45BOTTOM 26.45 WELL DEVELOPMENT YES BACKFILL							
DA							_			FIELD PARTY MACTEC RIG CME-550X								
	1						 			1	I							
SAMPLE	SAMPLE	DE IN F	SAMPLE STANDARD DEPTH PENETRATION IN FEET RESISTANCE ROM TO BLOWS / 6"			RQD %	DEPTH IN FEET	GRAPHIC LOG	nscs			./ROCK IFICATION		WELL	DRILLER'S NOTES			
			T	-					\bowtie		FILL: Crus	hed Stone t	from Road					
									\otimes	017			rown Silty S		, ,			
										СН	<u> </u>		ragments, iv wish Brown,		- -/			
						5 -					Coal Fragme							
												cause of the Use SS Sa	e Difficulty o	f Augering,				
										CH			Y (CH), Mo	ist to Wet				
_								10 -										
										ML	ASH: Firm	Gray San	dy SILT (MI	.). with Roc	ck			
								.				ragments,		-,,				
											NOTE: No	Recovery						
-	+-							15 -		ML	Soft, Gray,	, Sandy SIL	T (ML), with	Rock				
											Fragments	s, Wet						
								,										
								20 –										
								20 -		ML	Stiff, Stron Clay, Wet		andy SILT (ML), Trace	of			
											Olay, Wel							
								25 –		SM	Firm to Loc with Black	ose, Strong Organics, V		y SAND (S	M),			
								-				, Dark Gray WR), Moist	, Highly We	athered				
									F		SHALL (II	vviv, ivioist	•			Auger Refusal @		
																28.0' Below Ground Surface on 09/24/2009		
=																		
175																		
5											•							
TYPE OF CASING USED								1	1	I	t							
X NQ-2 ROCK CORE								PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE							PEN TUBE			
5 X 6" x 3.25 HSA 9" x 6.25 HSA										D SCREEN, G = GEONOR, P = PNEUMATIC								
HW CASING ADVANCER 4"								WELL T	YPE:	O'	W = OPEN	N TUBE S	SLOTTED	SCREE	N, GM =	GEOMON		
\$ 	NW CASING 3" SW CASING 6"										RECORE							



MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

PROJECT:

MW-0914

SHEET 1 OF 3

LOCATION:

Carbo, Virginia

PROJECT NO.: 3050-09-0133

LOGGED BY:

Nick Smith

AEP Clinch River Monitoring Wells

CHECKED BY: Ryan Rasnake

DEDTU	Water	ATA	DECODIDATION			WELL CONSTRUCTION DETAIL	
DEPTH FEET (bgs)	Level	STRATA	DESCRIPTION		×//×///×//	7377737774	ELEVATION (ft.)
			Augered Probe to 110.9'.			2-INCH DIAMETER WELL	
						6-INCH DIAMETER BOREHOLE	_
. 4						BOREHOLE	_
_							-
5-							—1565
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40-	4						153
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45-	1						-152
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DRILLING METHOD

3.25" HSA, NQ Coring

DRILLING EQUIPMENT

CME 550X

9/16/2009

DATE DRILLED



MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

MW-0914

SHEET 2 OF 3

PROJECT: LOCATION:

Carbo, Virginia

PROJECT NO.: 3050-09-0133

LOGGED BY:

Nick Smith

AEP Clinch River Monitoring Wells

CHECKED BY: Ryan Rasnake

PTH	Water Level	STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL	
EET	Level	STF			ELEVATION (ft.)
- <u>-</u> -			Augered Probe to 110.9'.		
- 55—				Cement Grout (0' - 108.8')	- - -1515
-					-
60-					1510
- 65 –	,				- - -1505
-					-
70-					- 1500 -
- - -	-				- - -
75 –					1495
80-					- - 1490
					- -
85-					- 1485 -
90-	-				- - -1480
30	-				-
95-	- - -				- 1475
	- - -				- - -
100-	- - -				1470 - -
105-					- - -1465
	90-	ogs)	90- 100- 100-	Augered Probe to 110.9'. Augered Probe to 110.9'. 65- 70- 88- 90- 90- 100-	995 Augered Probe to 110.9'. Cameral Grout (0' - 108.8') Cameral Grout (0' - 108.8')



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BORING NO.:

MW-0914

SHEET 3 OF 3

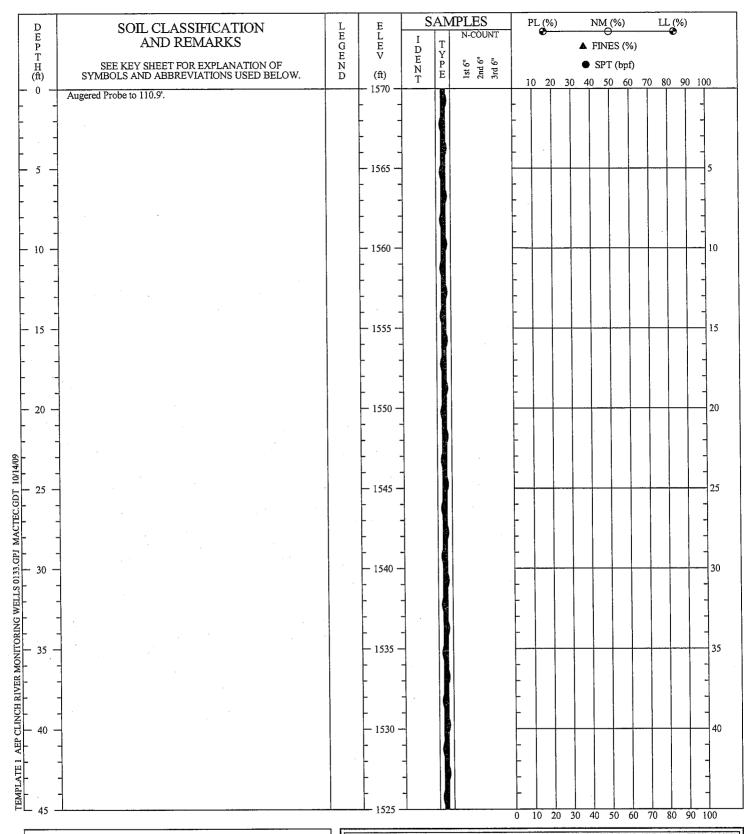
PROJECT: LOCATION:

Carbo, Virginia

PROJECT NO.: 3050-09-0133

AEP Clinch River Monitoring Wells

			LOGGED	WELL	Rasnake
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION	CONSTRUCTION DETAIL	ELEVATI
110-			Augered Probe to 110.9'.	Top of Bentonite Seal a	
115—			Soft, Medium Dark Gray, Moderately Close Joint Spacing, Slightly to Moderately Weathered SHALE, Bedding at 75 to 80 Degrees. INCLUSIONS: White Hard Calcite Streaks Along Bedding Plane.		-
-				Top of Filter Pack at 11	-
- 120 <i>-</i> -				(10' of Screen)	- - - 1450 - -
- - 125—			INCLUSIONS: Deformed Bedding at 125.6'.	Sand (116' - 130')	- - - 1445
130-			INCLUSIONS: Deformed Bedding at 125.6.	Bottom of Screen at 128.45' Bottom of Well Cap at 129'	- - - - 1440
- - - 135				Bottom of Borehole at 130'	- 1425
			Auger Refusal at 110.9' Below Ground Surface (BGS) on 9/16/2009. Coring Terminated at 135.9' Below Ground Surface (BGS) on 9/16/2009. Boring Terminated at 135.9' Below Ground Surface (BGS) on 9/16/2009.		-1435



DRILLER: Tri-State Drilling
EQUIPMENT: CME 550X
METHOD: 3.25" HSA, NQ Coring

HOLE DIA.: REMARKS:

LOGGED BY: Nick Smith CHECKED BY: Ryan Rasnake

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SOIL TEST BORING RECORD

BORING NO.: MW-0914

PROJECT: AEP C

AEP Clinch River Monitoring Wells

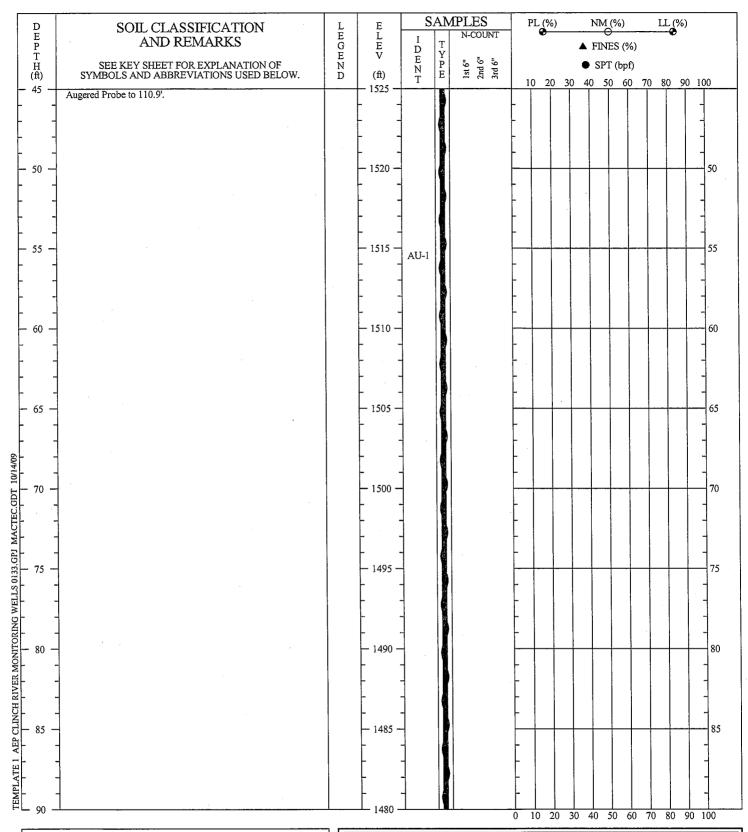
LOCATION:

DRILLED: September 16, 2009

PROJECT NO.: 3050-09-0133

PAGE 1 OF 4





DRILLER: Tri-State Drilling
EQUIPMENT: CME 550X
METHOD: 3.25" HSA, NQ Coring

HOLE DIA.: REMARKS:

LOGGED BY: Nick Smith CHECKED BY: Ryan Rasnake

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SOIL TEST BORING RECORD

BORING NO.: MW-0914

PROJECT: AEP Clinch River Monitoring Wells

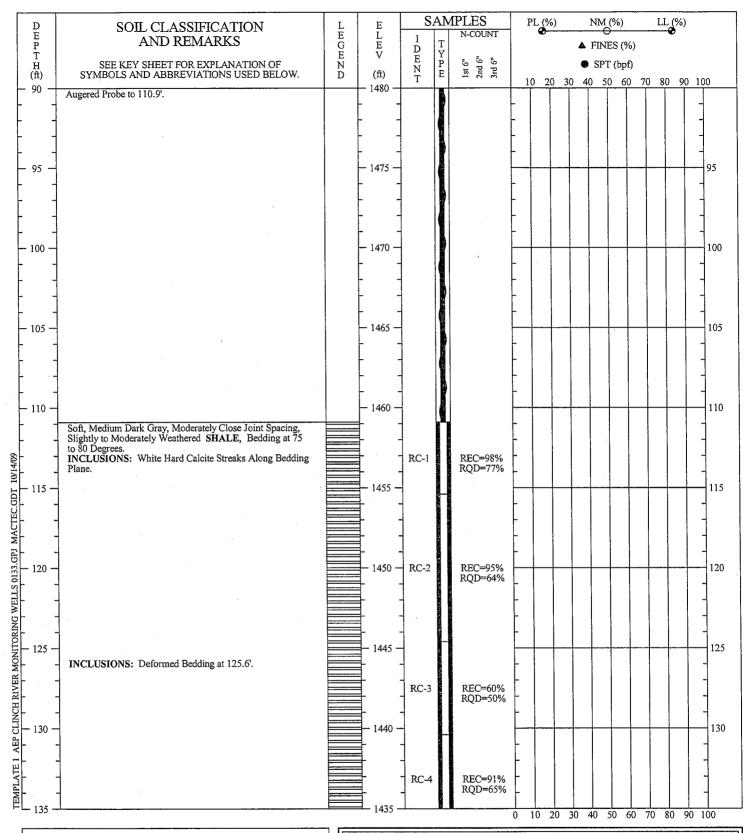
LOCATION:

DRILLED: September 16, 2009

PROJECT NO.: 3050-09-0133

PAGE 2 OF 4





DRILLER:

Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA.:

REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

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SOIL TEST BORING RECORD

BORING NO.: MW-0914

PROJECT:

AEP Clinch River Monitoring Wells

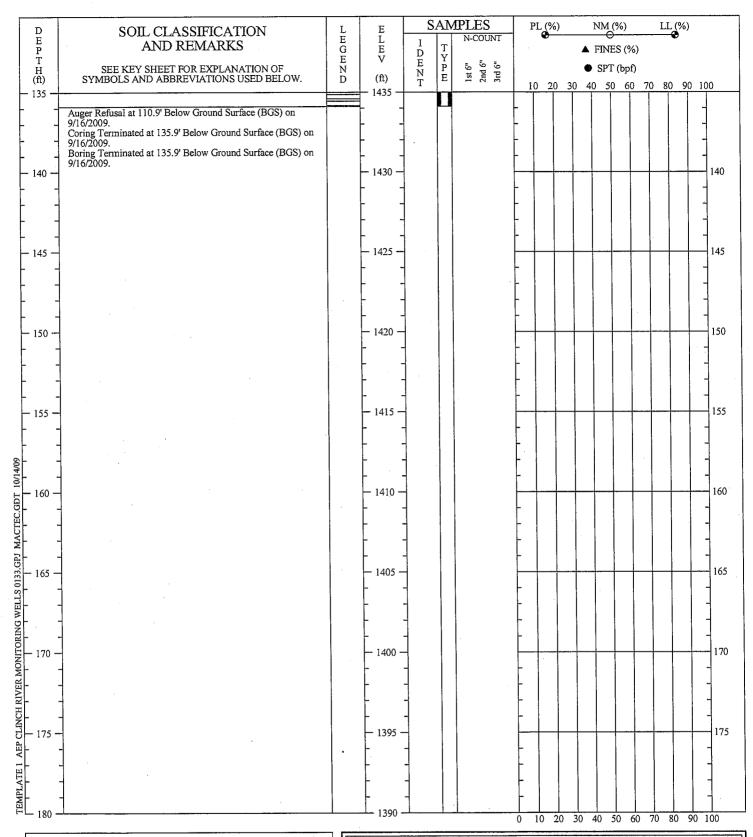
LOCATION:

DRILLED:

September 16, 2009

PROJECT NO.: 3050-09-0133 PAGE 3 OF 4





DRILLER: Tri-State Drilling
EQUIPMENT: CME 550X
METHOD: 3.25" HSA, NQ Coring

HOLE DIA.: REMARKS:

LOGGED BY: Nick Smith CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0914

PROJECT: AEP Clinch River Monitoring Wells

LOCATION:

DRILLED: September 16, 2009

PROJECT NO.: 3050-09-0133

PAGE 4 OF 4



AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



 JOB NUMBER

 COMPANY APPALACHIAN POWER COMPANY
 BORING NO. B-0901S DATE 5/23/17 SHEET 2 OF 2

 PROJECT CLINCH RIVER PLANT ASH PONDS
 BORING START 9/2/09 BORING FINISH 9/2/09

SAMPLE	SAMPLE	SAM DEF IN F FROM	PLE PTH EET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	uscs	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
12	SS	44.0	46.0	7-9-7	1.6		45			Augers won't Cut. NOTE: Tube Refusal @ 0.9'		
13	ss	48.0	50.0	5-6-12	.7		- 50 —					
14	SS	52.0	54.0	11-11-11	1.6		- - - -					
15	SS	56.0	58.0	4-6-7	.5		55 — - - -					
16	SS	60.0	62.0	15-11-12	.9		60 -			·		
17	SS	64.0	66.0	8-7-9	1.5		65 –					
18	SS	66.0	68.0	7-4-7	2.0		- - -		СН	Stiff, Reddish Brown, Silty CLAY (CH), with Large Rock Fragments, Moist		
19	ss	72.0	74.0	3-4-5	1.9		70 – - - -		CH	Firm, Light Gray to Brown, Silty CLAY (CH), with Sand, Moist Stiff, Brown, Sandy SILT (ML), with Clay, Moist		
20	ss	76.0	78.0	11-15-50/4			75 – -		SM	Very Dense, Gray, Silty SAND (SM), with Rock Fragments, Wet		
21 1	SS RC	78.0 79.0	79.0 84.0	50/6		42	- 80		_	Very Hard, Gray, Highly Weathered SHALE (HWR), wet. NOTE: Material Too Hard for a UD Tube.		Auger Refusal @ 78.9' Below Grou
							-			Auger Refusal at 78.9' Below Ground Surface on 09/02/2009 Moderately Hard, Gray, Close Joint Spacing, Moderately Weathered SHALE		Surface on 09/20/2009 Coring & Boring Terminated @ 83 Below Ground Surface on 09/20/2009



JOB NUMBER _ COMPANY APPALACHIAN POWER COMPANY WELL No.P-0902 BORING No. B-0902 INSTALLED9/14/09 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 3,522,383.5 E 10,403,874.4 SYSTEM TOP RISER: 1517.86 FT. GROUND ELEVATION 1514.81 FT. **GROUT SEAL:** TOP BENTONITE SEAL: 1514.81 FT. BENTONITE SEAL: SCREEN: dia., , 170.0 GRAVEL PACK: TOP GRAVEL PACK: 1509.81 FT. RISER PIPE: , dia., TOP SCREEN: 1507.81 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1490.81 FT. BOTTOM WELL: 1490.81 FT. BOTTOM GRAVEL PACK: 1490.81 FT.

BOTTOM BORING: 1485.81 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY



IOB	NII INA	IDED						LO	G O	F BORING					
		-		CHIAN POWE		- OMP	ΔΝΥ		BC	ORING NO. B-0902 DATE 5/23/17 SHEET 1 OF 1					
				RIVER PLANT						ORING START 9/14/09 BORING FINISH 9/14/09					
				22,383.5 E 1						EZOMETER TYPE WELL TYPE					
				1514.8 sy						ST. RISER ABOVE GROUND 0 DIA					
_				1014.0 01	O I LIVI			$\overline{}$	DEPTH TO TOP OF WELL SCREEN 7.0 BOTTOM 24.0						
_		vel, ft	<u> </u>	<u> </u>		Ā				ELL DEVELOPMENT BACKFILL SAND					
TIM						_				ELD PARTY MACTEC/Tri-State RIG CME-75					
DAT	E									LED FAICH MIAOTEO/TH-State RIG CHIE-73					
SAMPLE	SAMPLE	DE	MPLE PTH EET	STANDARD PENETRATION RESISTANCE		RQD %	DEPTH IN FEET	SRAPHIC LOG	nscs	SOIL / ROCK ☐ DRILLER'S IDENTIFICATION S NOTES					
<u> </u>		FROM		BLOWS / 6"	_ %		FEEI	<u> </u>							
2	SS	0.0 2.5	2.0 4.5	4-3-4 13-14-10	2.0		5 -		ML	Crushed Stone ASH: Very Stiff, Grayish Brown, Sandy SILT (ML), with Coal and Rock Fragments, Moist to Wet					
3	ss	6.5	8.5	3-3-3	2.2		10 -		ML ML						
4	ss	10.5	12.5	0-0-0	0		-		ML ML	Very Soft, Gray, SiLT (ML), with Sand and Small Rock Fragments, Wet					
5	SS		17.0 21.0	0-1-3 0-0-0	.7 1.6		15 –		CH	<u> </u>					
7	SS	22.5	24.0 29.0	11-22-50/3	1.0	26	20		ML	Firm, Light Gray, Silty CLAY (CH), with Brown Water Staining Throughout and Root Fragments and Mica, Moist to Wet Very Soft, Brown to Gray, Silty CLAY (CH), with Water Staining and Organics, Wet Auger Refusal @					
							25 -			Firm, Gray, Silty SAND (ML), Wet Very Hard, Gray, Highly Weathered SHALE (HWR), Moist Soft, Gray, Moderately Close Joint Spacing, Moderately Weathered, SHALE, 0 to 30 Degree Joint Inclination Coring & Boring Terminated @ 29.0' Below Ground Surface on 09/14/2009					
שבייפחו איפאונ															
2		TYP	E OF (CASING USE)		•								
X		6" x 3.2 9" x 6.2	5 HSA		4"		SLO	этті	ED 8	PE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SCREEN, G = GEONOR, P = PNEUMATIC					
HW CASING ADVANCER 4" WELL NW CASING 3"									0	W = OPEN TUBE SLOTTED SCREEN, GM = GEOMON					
7		SW CA	SING		6"					RECORDER					

AIR HAMMER



JOB NUN	MBER	MUNITURII	NG VI	/ELL (JONS	IRUCI	ION	
COMPAN	IY APPALACHIAN PO	OWER COMPANY		WELL	No. <u>P-0</u>	904	BORING No. B-0904 INSTALLED9/17/09	
PROJEC	T CLINCH RIVER PLA	ANT ASH PONDS	_					
COORDI	NATES N 3,522,130.4	E 10,403,332.8						
SYSTEM	<u></u>							
					_			
				T	ļ		TOP RISER: 1572.98 FT.	
0001111								
GROUNL	ELEVATION 1569.14 FT.	X/XXX/XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		3				
		•						
WIIIII								
	GROUT SEAL:							
	DENTONITE CEAL.						TOP BENTONITE SEAL: 1569.14 FT.	
	BENTONITE SEAL:							
		•						
	SCREEN: dia., , 72.8							
===								
	GRAVEL PACK:							
	GRAVEL FACA.	•					TOP GRAVEL PACK: 1565.14 FT.	
				:				
}	RISER PIPE: , dia.,						TOP SCREEN: 1563.14 FT.	
	SPACERS, DEPTH:			置				
	o. 7.02.10, 52. 71.							
:								
							BOTTOM SCREEN: 1490.34 FT.	
							•	
				(<u>)</u> () () () () ()			BOTTOM WELL: 1490.34 FT.	
) 							BOTTOM GRAVEL PACK: 1490.34 FT.	
i I							POTTOW POR 112 / 122 - 2	
i			V/////	///////	1111///		BOTTOM BORING: 1480.34 FT.	

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY



LOG OF BORING JOB NUMBER COMPANY APPALACHIAN POWER COMPANY BORING NO. **B-0904** DATE **5/23/17** SHEET **1** OF **2** PROJECT CLINCH RIVER PLANT ASH PONDS BORING START 9/17/09 BORING FINISH 9/17/09 COORDINATES N 3,522,130.4 E 10,403,332.8 WELL TYPE PIEZOMETER TYPE GROUND ELEVATION 1569.1 SYSTEM HGT. RISER ABOVE GROUND 0 DIA DEPTH TO TOP OF WELL SCREEN 6.0 BOTTOM 78.8 Water Level, ft BACKFILL SAND WELL DEVELOPMENT TIME FIELD PARTY MACTEC/Tri-State RIG CME-75 DATE E RQD SAMPLE **STANDARD** SAMPLE NUMBER DEPTH GRAPHIC PENETRATION E SO RESISTANCE O SO PENETRATION DEPTH SOIL / ROCK DRILLER'S SAMPL 100 ÆFF nsc IN IN FEET **IDENTIFICATION** NOTES **FEET** FROM TO BLOWS / 6" SS 0.0 1.5 6-10-8 TOPSOIL FILL: Very Stiff to Hard, Reddish Brown to SS 2.0 2 4.0 7-9-11 Brown, Silty CLAY (CL), with Sand, Mica and Weathered Shale Fragments, Moist 3 SS 4.0 6.0 9-16-19 4 SS 6.0 8.0 9-12-13 1.4 10 · Stiff, Tan to Brown, Silty CLAY (CL), with 5 SS 10.0 12.0 11-49-7 2.0 CL Weathered Shale, Moist мн Soft, Gray, Clayey SILT (MH), with Highly Weathered Shale Fragments, Moist ML 6 SS 14.0 16.0 1.5 6-11-12 FILL: Very Stiff, Reddish Brown, Clayey SILT 15 (ML), with Weathered Rock Fragments and Mica, Moist SS 19.0 7 21.0 5-9-12 0 20 Very Stiff, Gravish Brown, Silty CLAY (CL), 8 SS 21.0 22.5 9-17-15 with Weathered Shale Fragments, Moist SM CL ASH: Firm, Grayish Brown, Silty SAND (SM), SS 23.0 25.0 2.0 9 5-3-3 SM with Coal and Rock Fragments, Moist FILL: Soft, Brown, Silty CLAY (CL), with Shale 25 Fragments, Moist NOTE: UD 4 had No Recovery SS 27.0 0 10 29.0 3-1-1 ASH: Loose to Very Loose, Gravish Brown, Silty SAND (SM), with Coal and Rock Fragments, Moist to Wet. ML. 30 11 SS 30.0 32.0 1.9 11-9-8 NOTE: Wet from 28.3' and Below Very Stiff, Gray, Fine Sandy SILT (ML), with Fine Coal Fragments, Wet FILL: Very Stiff to Stiff, Brown to Gray, Silty 12 | SS | 34.0 36.0 3-5-6 1.1 CLAY (CL), with Weathered Rock Fragments, 35 Wet to Moist NOTE: SS Used Because of Difficult Augering 13 l SS 38.0 40.0 5-4-6 40 14 SS 40.0 42.0 6-10-10 Very Stiff, Brown to Gray Throughout, Clayey SILT (ML), with Weathered Shale Fragments TYPE OF CASING USED GP Continued Next Page NQ-2 ROCK CORE PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE 6" x 3.25 HSA X SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC 9" x 6.25 HSA HW CASING ADVANCER WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON **NW CASING** 3" 6" **SW CASING**

RECORDER

AIR HAMMER

8"

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



FRO	JEC I	CLII	ACII I	RIVER PLANI	AOI	FOI	NDO		ВΟ	RING START <u>9717/09</u> BORING FINISF	<u> </u>	17709
SAMPLE NUMBER	SAMPLE	SAM DEF IN F FROM		STANDARD PENETRATION RESISTANCE BLOWS / 6"	エボリ	RQD %	DEPTH IN FEET	GRAPHIC LOG	nscs	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
15	SS	42.0	44.0	6-8-14	1.2		45 -		CL	and Organics, Moist NOTE: Material Encountered Very Stiff - Used SS to Get Recovery Very Stiff, Reddish Brown to Brown		
16	SS	46.0	48.0	9-9-13	2.2				OL	Throughout, Silty CLAY (CL), with Highly Weathered Shale Fragments and Organics, Moist to Wet NOTE: UD 13 had No Recovery - Tube was		
17	SS	50.0	52.0	6-6-10	1.3		50 -			Bent During Pushing		
18	SS	54.0	56.0	4-9-13	.9	-	55 -					
19	ss	58.0	60.0	3-6-8	0		60 -		CL	Hard, Brown, Silty CLAY (CL), with Highly		
20	ss	61.0 63.0	63.0 65.0	5-49-16 2-4-6	.7		0.5	111111111111111111111111111111111111111	CL	Weathered Shale Fragments, Moist Stiff to Very Stiff, Brown to Gray, Silty CLAY (CL), with Highly Weathered Shale Fragments and Organics, Wet		
22	ss ss	65.5 67.5	67.5 69.5	12-7-10 3-6-6			65 -		ML	Stiff, Tan, Clayey SILT (ML), with Weathered		
0.4		70.0	74.0	4.5.0			70 -		CL ML CL	Rock Fragments and Organics, Wet Stiff, Grayish Brown, CLAY (CL), with Silt and Mica, Moist Stiff, Brown, Clayey, SILT (ML), with		
24	SS	72.0	74.0	4-5-8	2.2		75 -		SM	Weathered Rock Fragments, Moist Stiff, Brown, Silty CLAY (CL), with Weathered Rock Fragments, Moist ALUVIAL: Very Loose, Gray, Coarse SAND		
25 26 1	SS SS RC	76.0 78.0 78.5	78.0 78.5 88.8	0-0-0 24-50/2		0				(SM), with Silt, Wet Very Hard, Dark Gray, Highly Weathered SHALE (HWR)		Auger Refusal &
		70.3	30.0				80 -			NOTE: SS Used Because Rough Material in Hole Bottom. NO RECOVERY: From Data From MW-0914 and SPT-26 in this Hole, the Material Not Recovered is Shale, with Joint Inclinations Between 75 and 95 Degrees from Horizontal Soft, Dark Gray, Moderately Close Jointing, Moderately Weathered SHALE, Joint		Begin Coring @ 78.8' Below Ground Surface on 09/17/2009
K ASH PUNDS GPJ AEP GDI 3723717										Inclination of 75 to 90 Degrees		Coring & Boring Terminated @ 88.8' Below Ground Surface on 09/17/2009



JOB NUMBER COMPANY APPALACHIAN POWER COMPANY WELL No.P-0906 BORING No. B-0906 INSTALLED9/3/09 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 3,522,038.9 E 10,403,414.5 SYSTEM TOP RISER: 1521.98 FT. GROUND ELEVATION 1518.15 FT. GROUT SEAL: TOP BENTONITE SEAL: 1518.15 FT. BENTONITE SEAL: SCREEN: dia., , 24.0 **GRAVEL PACK:** TOP GRAVEL PACK: 1513.15 FT. RISER PIPE: , dia., TOP SCREEN: 1512.15 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1488.15 FT. BOTTOM WELL: 1488.15 FT. BOTTOM GRAVEL PACK: 1488.15 FT.

BOTTOM BORING: 1483.15 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



			BER _					_		LO	00	DOMINO		
			_		<u>CHIAN</u>							RING NO. <u>B-0906</u> DATE <u>5/23/17</u> SH		·
F	RO.	JECT	CLII	NCH F	RIVER F	PLANT	ASI	l PO	NDS		ВС	RING START <u>9/3/09</u> BORING FINISH	9/	3/09
C	00	RDIN	IATES_	N 3,5	<u>22,038</u>	<u>.9 E 1</u>	0,40	3,414	4.5		PI	ZOMETER TYPE WELL TYPE	·	
G	RO	UND	ELEVA	TION_	<u>1518.1</u>	SY	STEM				HG	T. RISER ABOVE GROUND 0 DIA	·	<u>-</u>
V	Vate	er Lev	vel, ft	Δ		Ī		Ā	,		DE	PTH TO TOP OF WELL SCREEN 6.0 BOTTOM	_30	0.0
1	IME	=									W	ELL DEVELOPMENT BACKFILL	·	
	DAT	E									FIE	ELD PARTY MACTEC/Tri-State RIG	<u>C</u>	ME-75
_	- 1								1					
L		삗	SAM DEF		PENET	DARD RATION		RQD	DEPTH	일	Ø	SOIL / ROCK	_	DRILLER'S
7	NUMBER	SAMPLE	INF		PENETI RESIST	TANCE	TO SO	%	IN	GRAPHI LOG	SC	IDENTIFICATION	WELL	NOTES
١	ᄚᄫ	Ŋ	FROM	то	BLOW	/S / 6"	L TIÑ	70	FEET	ত	⊃		_	110125
Γ	1	SS	0.0	2.0	8-1	9-5	.4			\bowtie		FILL: Crushed Stone from Road		
								1			SM	FILL: Firm, Grayish Brown, Silty SAND (SM), with Rock and Coal Fragments, Moist	}	
	2	SS	2.5	4.5	7-6	6-7	1.5				"	Stiff, Reddish to Yellowish Brown, Silty CLAY		
_									5 -			(CH), with Rock and Coal Fragments, Moist		
	3	ss	6.0	8.0					.		1	NOTE: Because of the Difficulty of Augering, Elected to Use SS Sample		
	Ĭ		0.0	0.0					-	-		Elected to ose of Cample		
	4	SS	8.0	10.0	5-3	3-2	2.0] [СН	Soft, Brown, Silty CLAY (CH), Moist to Wet		
-									10 -					
									-		ML	ASH: Firm, Gray, Sandy SILT (ML), with Rock		
	5	SS	12.0	14.0	12-1	10-6	2.0					and Coal Fragments, Wet.		
												NOTE: No Recovery		
+									15 -		ML	Soft, Gray, Sandy SILT (ML), with Rock		
	6	SS	16.0	18.0	1-0)-1	2.0					Fragments, Wet		
			:											
L									20 -					
	7	SS	20.0	22.0	0-3	3-6	2.0] 20 -		ML	Stiff, Gray, Sandy SILT (ML), with Rock		
										 	CL	Fragments, Wet		
						_						(CL), with Sand, Moist		
-	8	SS	24.0	26.0	0-2	2-2	1.5		25 -	 	SM	Soft, Brown, Silty SAND (SM), with Clay, Moist		
.									·		SM	Very Dense, Brown, Silty SAND (SM), with		
	9	ss	27.5	28.5	15-	50/6]] []		Clay, Moist		
	10		28.5	30.0						Ë		Very Hard, Gray, Highly Weathered, SHALE		
r	1	RC	30.0	35.0				0	30 -	Ħ		(HWR), Moist Moderately Hard, Gray, Moderately Close to		Auger Refusal @
												Close Jointing, Slight to Moderately Weathered		30.0' Below Ground Surface on
												SHALE		09/03/2009
L									35 -					
									33					Coring & Boring
													,	Terminated @ 35.0' Below Ground
3														Surface on
5														09/04/2009
5														
Z -			TYPE	E OF (CASING	2 LISEI	ה ח	1	<u></u>		.1			L
5												- DT OPEN TUBE POPONO TIP OO		DEN TUDE
計	Х		NQ-2 R 6" x 3.2	5 HSA	<u> </u>							PE: PT = OPEN TUBE POROUS TIP, SS SCREEN, G = GEONOR, P = PNEUMATIO		HEN TUBE
<u>;</u> }			9" x 6.25 HW CAS		DVANCE	R	4"					·		OFOMO!!
3		ļ	NW CA	SING	- v, 1110L		3"		WELL T	YPE:	<u> </u>	W = OPEN TUBE SLOTTED SCREEN, G	VI =	GEUMUN
<u>.</u>			<u>SW CAS</u> AIR HAI				6" 8"					RECORDER		

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY MONITORING WELL CONSTRUCTION



JOB NUMBER _____ COMPANY APPALACHIAN POWER COMPANY WELL No.P-0900S BORING No. B-0908S INSTALLED9/10/09 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 3,521,467.0 E 10,402,599.5 SYSTEM TOP RISER: 1571.36 FT. GROUND ELEVATION 1567.63 FT. GROUT SEAL: TOP BENTONITE SEAL: 1567.63 FT. BENTONITE SEAL: SCREEN: dia.,, 62.0 **GRAVEL PACK:** TOP GRAVEL PACK: 1562.63 FT. RISER PIPE: , dia., TOP SCREEN: 1560,63 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1498.63 FT. BOTTOM WELL: 1498.63 FT. BOTTOM GRAVEL PACK: 1498.63 FT.

BOTTOM BORING: 1478.13 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOE	NUN	BER						LO	G O	F BORING	
		_		CHIAN POWI	ER CC	- OMP.	ANY		ВС	ORING NO. B-0908S DATE 5/23/17 SHEET 1 OF 2	
PRO	OJEC	r_CLI	NCH F	RIVER PLANT	ASH	PO	NDS			PRING START 9/10/09 BORING FINISH 9/10/09	_
CO	ORDI	NATES	N 3,5	21,467.0 E1	0,402	2,599	9.5		PIE	EZOMETER TYPE WELL TYPE	
GR	םאטכ	ELEVA	TION_	1567.6 SY	STEM				HG	T. RISER ABOVE GROUND 0 DIA	
Wa	ter Le	vel, ft	$\overline{\Sigma}$	Ţ.		Ā	•		DE	PTH TO TOP OF WELL SCREEN 7.0 BOTTOM 69.0	
TIM	ΙE								WE	ELL DEVELOPMENT BACKFILL	
DA	TE								FIE	LD PARTY MACTEC/Tri-State RIG CME-75	
	1	SAN	MPLE	STANDARD	 	RQD	DEPTH IN FEET	Τ.			
SAMPLE	SAMPLE	l	PTH	PENETRATION			DEPTH	일	CS	SOIL / ROCK 크 DRILLER'S .	,
SAM	SAM		EET	RESISTANCE		%	EEET	LO	S N	SOIL / ROCK ☐ DRILLER'S . IDENTIFICATION S NOTES	
1	SS	FROM 0.0	TO 2.0	BLOWS / 6" 5-9-7	2.0			33%		TOPSOIL	
'		0.0	2.0	3-3-7	2.0		-		ML	ASH: Stiff, Brownish Gray, Sandy SILT (ML),	
										with Coal, Clay and Rock Fragments, Moist	
2	ss	4.0	6.0	2-3-3	2.0						
							5 –				
							-		МН	FILL: Stiff, Gray, Clayey SILT (MH) with Sand	
3	ss	8.0	10.0	19-15-12			-		CL	\and Coal Fragments, Moist	
4	SS	10.0	12.0	6-5-9			10 -			Very Stiff to Hard, Brown to Gray, Silty CLAY	
"	33	10.0	12.0	0-5-9			-			(CL), with Sand, Rock and Limestone Fragments, Moist to Wet	
5	SS	12.0	14.0	12-1-15						No Recovery NOTE: Wet 19.8' to 20.0' Below Ground	
6	ss	14.0	16.0	15-23 - 18						Surface on 09/10/2009	
		ĺ					15 –				
7	SS	16.0	18.0	9-11-12	.1		-	╞═╡			
8	SS	18.0	20.0	20-30-20			-				
9	SS	20.0	22.0	11-13-12			20 –				
		20.0	22.0	11-10-12			-				
10	SS	22.0	24.0	15-14 - 14			-				
11	ss	24.0	25.5	23-47-50/6			n= -		ML	Hard, Gray, Sandy SILT (ML), with Coal Fragments and Clay, Moist to Wet	
12	ss	25.5	26.5	40-50/3			25 –				
13	SS	26.5	27.0	50/6			-				
14	SS	27.0 28.0	27.5 30.0	50/6 40-40 - 22			-				
16	SS	30.0	32.0	6-7-9	.4		30 -		ML	Vary Ciff to Hand Oran Condu Cil T (MI) with	
'	"	30.0	32.0	0-7-9	.4		-		IVIL	Very Stiff to Hard, Gray, Sandy SILT (ML), with Coarse Sand, Wet	
17	ss	32.2	34.2	9-9-17			-			NOTE: Water Introduced to Hole. Used to Air Auger Drilling	
18	ss	34.2	36.2	9-10-11						Auger Drinking	
	"		00.2	3 ,0 11			35 –				
19	ss	36.5	38.5	9-13-15	2.0		-				
<u>-</u>							•				
<u>-</u>							40 –		CL	Stiff to Very Stiff, Grayish Brown, Silty CLAY	
20	SS	40.5	42.5	3-4-6	2.0		-			(CL), with Shale Rock Fragments, Moist	
2	·	TYPI	E OF C	ASING USE)					Continued Next Page	
S X		NQ-2 R 6" x 3.2	OCK CC	RE						PE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE	
红		9" x 6.2	5 HSA				SLO	OTTE	ED S	SCREEN, G = GEONOR, P = PNEUMATIC	
3		HW CA		OVANCER	4" 3"		WELL T	YPE:	Ol	W = OPEN TUBE SLOTTED SCREEN, GM = GEOMON	
3		SW CA			6"					RECORDER	

AIR HAMMER

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOB NUMBER ____

COMPANY APPALACHIAN POWER COMPANY PROJECT CLINCH RIVER PLANT ASH PONDS

BORING NO. <u>B-0908S</u> DATE <u>5/23/17</u> SHEET <u>2</u> OF <u>2</u>

BORING START 9/10/09 BORING FINISH 9/10/09 SAMPLE STANDARD RQD SAMPLE NUMBER DEPTH SAMPLE PENETRATION RESISTANCE BLOWS / 6" SCS DEPTH SOIL / ROCK DRILLER'S WELL 90 IN IN FEET % **IDENTIFICATION** NOTES **FEET** FROM TO 46.5 45 6-6-11 22 SS 46.5 48.5 5-10-11 1.0 ML Firm, Yellowish Brown, Silty SAND (ML), with -SS-49.5 7-10-12 50 Clay and Shale Fragments, Moist Yellowish Brown, Silty CLAY (CL), with CL Weathered Rock Fragments, Moist 24 SS 52.5 54.5 4-7-12 Very Stiff to Hard, Grayish brown to Orange-Brown, Silty CLAY (CL), with Highly SS 56.5 55 -25-54.5 Weathered Shale Fragments and Organics, Moist SS 58.0 60.0 1.1 26 5-7-11 60 27 SS 61.0 63.0 7-8-10 2.0 65 28 SS 65.0 67.0 4-7-7 1.6 SS 68.5 70.5 29 7-12-14 70 -30 SS 70.5 72.5 5-15-13 RESIDUAL: Very Stiff, Dark Gray to Brown. ML Clayey SILT (ML), Trace of Fine Sand, Moist 31 SS 72.5 74.5 4-4-6 2.0 NOTE: Used Split Spoon to Sample Due to Material in Bottom of Hole. 75 32 SS 76.0 78.0 3-4-7 2.3 ML Stiff, Dark Gray, Sandy SILT (ML), Moist to Wet 80 33 SS 83.0 Firm, Dark Gray, Silty SAND (SM), with Shale 81.0 5-11-9 SM Fragments, Wet 34 SS 83.0 84.5 15-11-50/6 SM Very Dense, Whitish Gray, Coarse to Fine Grained, Silty SAND (SM), with Rock 35 SS 84.5 50/1 84:6 85 53 Auger Refusal @ Fragments, Wet 1 RC 84.6 89.5 84.6' Below Ground Moderately Hard, Light Gray to Gray, Surface on ASH_PONDS.GPJ AEP.GDT 5/23/17 Moderately Close Joint Spacing, Moderately 09/10/2009 Weathered SHALE Coring & Boring Terminated @ 89.5' Below Ground Surface on 09/10/2009

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY MONITORING WELL CONSTRUCTION



JOB NUMBER COMPANY APPALACHIAN POWER COMPANY WELL No.P-0909 BORING No. B-0909 INSTALLED9/11/09 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 3,521,314.6 E 10,402,604.5 SYSTEM TOP RISER: 1522.94 FT. GROUND ELEVATION 1519.35 FT. **GROUT SEAL:** TOP BENTONITE SEAL: 1519.35 FT. BENTONITE SEAL: SCREEN: dia., , 26.8 GRAVEL PACK: TOP GRAVEL PACK: 1514.35 FT. RISER PIPE: , dia., TOP SCREEN: 1512.35 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1485.55 FT. BOTTOM WELL: 1485.55 FT. BOTTOM GRAVEL PACK: 1485.55 FT.

BOTTOM BORING: 1481.05 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOB		_	אואס	CHIAN	DOWE	=D C	- OMD	A RIV		D.C	DINONO P.0000 DATE E/22/47 OF		1 05 3
				RIVER							RING NO. <u>B-0909</u> DATE <u>5/23/17</u> SH RING START <u>9/11/09</u> BORING FINISH		-
				21,314							EZOMETER TYPE WELL TYPE		
				1519.3							T. RISER ABOVE GROUND 0 DIA		
Wat	er Le	vel, ft	Σ		Ţ		Ā			DE	PTH TO TOP OF WELL SCREEN 7.0 BOTTOM	1 <u>3</u> :	3.8
ТІМІ										W	ELL DEVELOPMENT BACKFILL		
DAT	Έ									FIE	ELD PARTY <u>MACTEC/Tri-State</u> RIG	<u>_C</u>	ME-75
		SAN	MPLE	STAN	DARD	>	RQD			1			
SAMPLE	SAMPLE		PTH	DENIET	0.471041			DEPTH IN FEET	텣	SO	SOIL / ROCK	-	DRILLER'S
SAM	SAM		FEET	RESIS	TANCE		%	FEET	SRAPH 106	S N	IDENTIFICATION	WELL	NOTES
	_	FROM	TO	BLOW	/S / 6"	<u>n</u> z		FEET		SM	ASH: Firm, Grayish Brown, Silty SAND (SM),		
									1:1:1	SIVI	with Coal and Rock Fragments, Moist		
]			
								_		ML	Hard to Very Stiff, Gray, Sandy SILT (ML), with		
								5-			Small Coal Fragments, Wet		
										СН	FILL: Very Stiff, Brown, Silty CLAY (CH), with		
										1	Weathered Rock Fragments, Moist		
								10 -		СН	NOTE: Material Too Hard for UD Tube Soft, Silty CLAY (CH), with Rock Fragments,		
											Wet to Moist		
									\vdash	1			
								15 -		1			
								,13					
									E	CH	Stiff, Gary to Brown, Silty CLAY (CH), Moist	•	
										"	Carly to brown, only OEAT (OT), Worst		
								20 -		МН	ALLUVIUM: Stiff, Dark Gray, Clayey SILT		
									==		(MH), Trace of Sand, Moist		
											NOTE: Streaks of Black Throughout		
						1		25 -					
										ML	Very Soft, Dark Gray to Brown, Sandy SILT		
											(ML), with Clay, Wet		
									-	SM	Very Loose, Dark Gray to Brown, Silty SAND		
								30 -		:	(SM), with Streaks of Dark Red to Brown Clay Throughout, and Rock Fragments, Wet		
											· · · · · · · · · · · · · · · · · · ·		
			-							-	\Very Hard, Yellowish Brown, Highly Weathered ∫		
								35 -	-=		SHALE (HWR), with Silt, Moist		Auger Refusal & Rock Coring Begins
											Soft, Dark Gray to Brown, Close Joint Spacing, Highly Weathered SHALE, Wet		@ 33.8' Below Ground Surface on
:									=		riiginy vocationed of the , voc		09/11/2009
5										1			Coring & Boring
													Terminated @ 38.8' Below Ground
				CASING	USE	D		-			Continued Next Page		
X			OCK CO	DRE			-				PE: PT = OPEN TUBE POROUS TIP, SS		PEN TUBE
		9" x 6.2	5 HSA	DVANOT	· D	4 11					SCREEN, G = GEONOR, P = PNEUMATIO		
		NW CA	SING	DVANCE	Κ	4" 3"		WELL 1	TYPE:	: O'	W = OPEN TUBE SLOTTED SCREEN, G	M = 1	GEOMON
		SW CA	SING MMER			6" 8"					RECORDER		

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOB NUMBER ______

COMPANY APPALACHIAN POWER COMPANY BORING NO. B-0909 DATE 5/23/17 SHEET 2 OF 2

PROJECT CLINCH RIVER PLANT ASH PONDS BORING START 9/11/09 BORING FINISH 9/11/09

NUMBER	SAMPLE	SAM DEF IN FI FROM	PLE PTH EET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	nscs	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
												Surface on 09/11/2009
	:											
				,								
										·		
										,		_
										·		

AEP CIVIL ENGINEERING LABORATORY MONITORING WELL CONSTRUCTION



JOB NUMBER _ WELL NO. 7-6 BORING No. 7-6 INSTALLED 1-10-93 COMPANY APCO-Clinch River PROJECT Fly ash Pond COORDINATES Fiez. Z.5 TOP CASING: GROUND ELEVATION SWL - 7.7 mags. from top of plastic. 6.25 dia. GROUT SEAL: 25-30 Quik grout BENTONITE SEAL: 35-40 bent pellets SCREEN: /"x 2,5" GRAVEL PACK: 100 16 # 4 17.8 TOP GRAVEL PACK: 19.8' TOP SCREEN: RISER PIPE: / " COMMENTS: Replacement piez. for (P-6 Abandoned) sugered over Removed metal driven piez. tremie grouted up boring. New piez Approx. offset 22.3 BOTTOM SCREEN: 5' from old one, 23.75 BOTTOM WELL: 23.75 BOTTOM GRAVEL PACK: 23.75 BOTTOM BORING:

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY MONITORING WELL CONSTRUCTION



JOB NUMBER COMPANY APPALACHIAN POWER COMPANY WELL No.P-5R BORING No: B-5R INSTALLED9/15/92 PROJECT CLINCH RIVER PLANT ASH PONDS COORDINATES N 11,495.5 E 12,659.2 SYSTEM TOP RISER: 1571.38 FT. GROUND ELEVATION 1569.71 FT. **GROUT SEAL: VOLCLAY** TOP BENTONITE SEAL: 1558.01 FT. BENTONITE SEAL: SCREEN: dia.,, 43.2 **GRAVEL PACK:** TOP GRAVEL PACK: 1554.71 FT. RISER PIPE: 0.8, dia., TOP SCREEN: 1553.51 FT. SPACERS, DEPTH: BOTTOM SCREEN: 1510.31 FT. BOTTOM WELL: 1509.71 FT. BOTTOM GRAVEL PACK: 1509.71 FT.

BOTTOM BORING: 1509.71 FT.

AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY



JOB	NUM	IBER _					_		LO	GO	F BORING
COM	IPAN	Y <u>API</u>	PALA	CHIAN	POW	ER C	OMP.	<u>AN</u> Y		ВС	ORING NO. B-5R DATE 5/23/17 SHEET 1 OF 1
PRO	JECT	T_CLIN	ICH F	RIVER	<u>PLANT</u>	ASH	I PO	NDS		ВС	DRING START <u>9/15/92</u> BORING FINISH <u>9/15/92</u>
COC	RDI	NATES_	N 11,	495.5	E 12,6	559.2				PII	EZOMETER TYPE SS WELL TYPE
GRO	UND	ELEVAT	ION_	1569.7	\$Y	STEM				Н	GT. RISER ABOVE GROUND 1.67 DIA 1.0
Wate	er Le	vel, ft	Z 3:	2.3	T		Ā			DE	EPTH TO TOP OF WELL SCREEN 16.2 BOTTOM 59.4
TIM		-							-	W	ELL DEVELOPMENT BACKFILL SAND
DAT			Q_1	6-92	<u> </u>				-		ELD PARTY TJH-TLS RIG CME-75
D/11			3-1	U-32	L						
SAMPLE	SAMPLE	SAMI DEP IN FE	TH	PENET RESIS		TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	uscs	SOIL / ROCK IDENTIFICATION DRILLER'S NOTES
75	75	FROM	ТО		VS / 6"	T TEC	70	5 - 10 - 20 - 35 - 40 - 55 - 55 - 55 - 55 - 55 - 55 - 5	GF	n	BAILED HOLE TO APPROXIMATELY 55.0 FT. PRIOR TO INSTALLATION. INTRODUCED WATER WHILE INSTALLING WELL TO WASHED OUT SAND BRIDGE. TOP OF BENTONITE SEAL 11.7. TOP OF GRAVEL PACK 15.0. TOP OF SCREEN 16.2.
5/23/17								60 -	-		BOTTOM OF SCREEN 59.4
-GDT											воттом оғ
PONDS.GPJ AEP.GDT 5/23/17		TYPE	OF (CASING	G USE	D		<u> </u>		<u> </u>	GRAVEL PACK 60.0
Š		NQ-2 RO		ORE				PIEZON	1ETE	R TY	PE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE
	-	6" x 3.25 9" x 6.25						SL	OTT	ED :	SCREEN, G = GEONOR, P = PNEUMATIC
AS		HW CAS		DVANCE	R	4"		WELL T	YDE.	\cap	W = OPEN TUBE SLOTTED SCREEN, GM = GEOMON
R.	1	NW CAS	SING			3"		**ELL	1-5		
₩ 		SW CAS AIR HAN				_6" 8"					RECORDER
											· · · · · · · · · · · · · · · · · · ·

AEP CIVIL ENGINEERING LABORATORY MONITORING WELL CONSTRUCTION



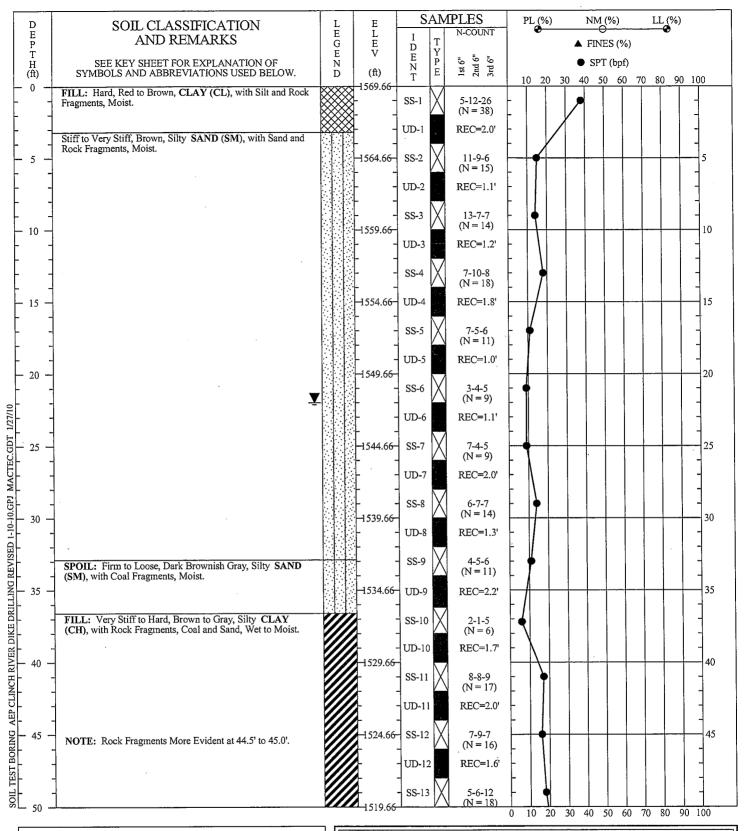
JOB NUMBER _ WELL NO. 7-6 BORING No. 7-6 INSTALLED 1-10-93 COMPANY APCO-Clinch River PROJECT Fly ash Pond COORDINATES Fiez. Z.5 TOP CASING: GROUND ELEVATION SWL - 7.7 mags. from top of plastic. 6.25 dia. GROUT SEAL: 25-30 Quik grout BENTONITE SEAL: 35-40 bent pellets SCREEN: /"x 2,5" GRAVEL PACK: 100 16 # 4 17.8 TOP GRAVEL PACK: 19.8' TOP SCREEN: RISER PIPE: / " COMMENTS: Replacement piez. for (P-6 Abandoned) sugered over Removed metal driven piez. tremie grouted up boring. New piez Approx. offset 22.3 BOTTOM SCREEN: 5' from old one, 23.75 BOTTOM WELL: 23.75 BOTTOM GRAVEL PACK: 23.75 BOTTOM BORING:

wood.

Appendix A2
Historical Piezometers and Monitoring Wells

MACT	EC E	Engine	eering and Consulting, Inc.	BORING NO. PROJECT LOCATION PROJECT NO LOGGED BY	Carbo, Virginia	linch River Dike Drilling Virginia 9-0131		
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION		WELL CONSTRUCTION DETAIL	ELEVATION FEET		
-			FILL: Hard, Red to Brown, CLAY (CL), with Silt and Rock Fragments, Moist.		Bentonite (0' - s	- - - 5) -		
5— 5— - - - 10—		<u>***</u>	Stiff to Very Stiff, Brown, Silty SAND (SM), with Sand and Rock Fragments, Moist.			- -1565.00 - - - - - -1560.00 -		
- 15— - - -						- - -1555.00 - - - - - - -1550.00		
20 — - - - - 25 — -	<u> </u>					- - - - -1545.00 - - -		
30- 30-					Sand (5' - 66.5	- 1540.00 - - -		
35- 35-			SPOIL: Firm to Loose, Dark Brownish Gray, Silty SAND (SM), with Coal Fragments, Moist. FILL: Very Stiff to Hard, Brown to Gray,			- -1535.00 - -		
40-			Silty CLAY (CH), with Rock Fragments, Coal and Sand, Wet to Moist.					
45-	-		NOTE: Rock Fragments More Evident at 44.5' to 45.0'.			- - 1525.00 - - - - - - - 1520.00		
DRILLI DRILLI DRILLI DATE	NG M	METHO QUIPN		Northing: Easting:	3522486.982 10403787.283	-		

MACT	EC E	ngine	eering and Consulting, Inc.	BORING NO. PROJECT LOCATION PROJECT NO. LOGGED BY		SHEET 2 OF 2 THE Drilling POP THE CKED BRyan Rasnak	
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION		WELL CONSTRUCTION DETAIL		
55-			FILL: Very Stiff to Hard, Brown to Gray, Silty CLAY (CH), with Rock Fragments, Coal and Sand, Wet to Moist. NOTE: 10 Gallons fo Water Put in Hole			- - - - -1515.00 - - -	
60 — - - - - 65 — -			at 58.0' Below Ground Surface to Clean Augers Because Steel Kept Getting Stuck in Hole and Augers won't Cut. NOTE: Tube Refusal at 0.9'. Stiff, Reddish Brown, Silty CLAY (CH),			1510.00 1505.00 	
70 – - - - -			with Large Rock Fragments, Moist. Firm, Light Gray to Brown, Silty CLAY (CH), with Sand, Moist. Stiff, Brown, Sandy SILT (ML), with Clay, Moist.	-	Bentonite (66.5' - 71.5')	- -1500.00 - - - - - - -1495.00	
75 – 80 –		15-(1)	Very Dense, Gray, Silty SAND (SM), with Rock Fragments, Wet. Very Hard, Gray, Highly Weathered SHALE (HWR), Wet. NOTE: Material Too Hard for a UD Tube.		Sand (71.5' - 78.9')	- - - - - -1490.00	
70 – 75 – 80 –			Auger Refusal at 78.9' Below Ground Surface (BGS) on 9/2/2009. Moderately Hard, Gray, Close Joint Spacing, Moderately Weathered SHALE. Coring Terminated at 83.9' Below Ground Surface (BGS) on 9/2/2009. Boring Terminated at 83.9' Below Ground Surface (BGS) on 9/2/2009.		Bentonite (78.9' - 83.9')		



DRILLER: Tri-State Drilling
EQUIPMENT: CME 75 Truck Rig
METHOD: 3.25" HSA
NORTHING: 3522486.982
EASTING: 10403787.283
LOGGED BY: Jon McDaniel
CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-0901

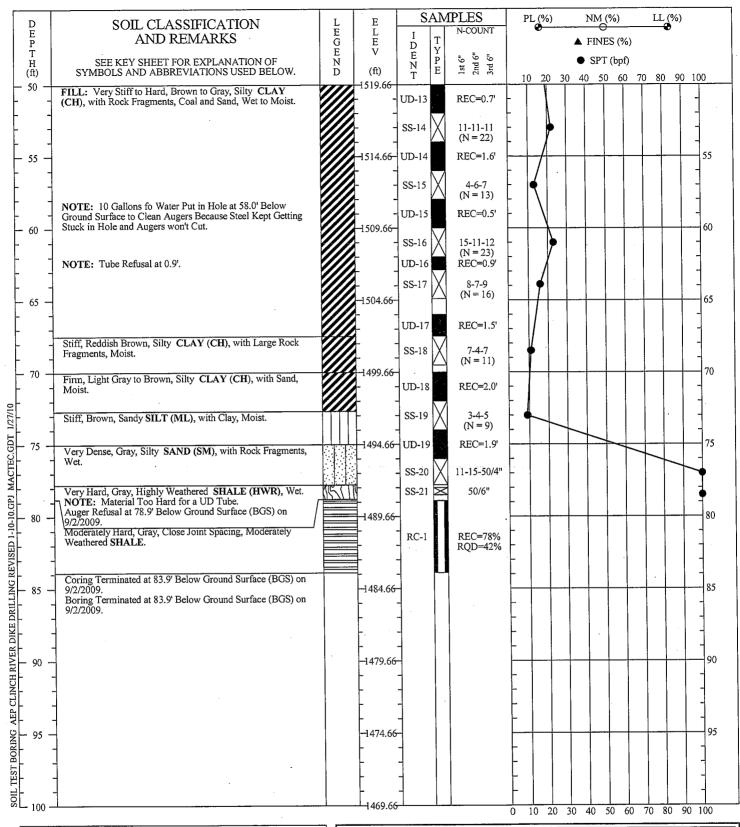
PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia DRILLED: September 2, 2009

PROJECT NO.: 3050-09-0131

PAGE 1 OF 2





Tri-State Drilling

EOUIPMENT:

CME 75 Truck Rig

METHOD: NORTHING .: 3.25" HSA

3522486.982

EASTING:

10403787.283

LOGGED BY:

Jon McDaniel CHECKED BY: Ryan Rasnake RDR

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:

B-0901

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

DRILLED:

September 2, 2009

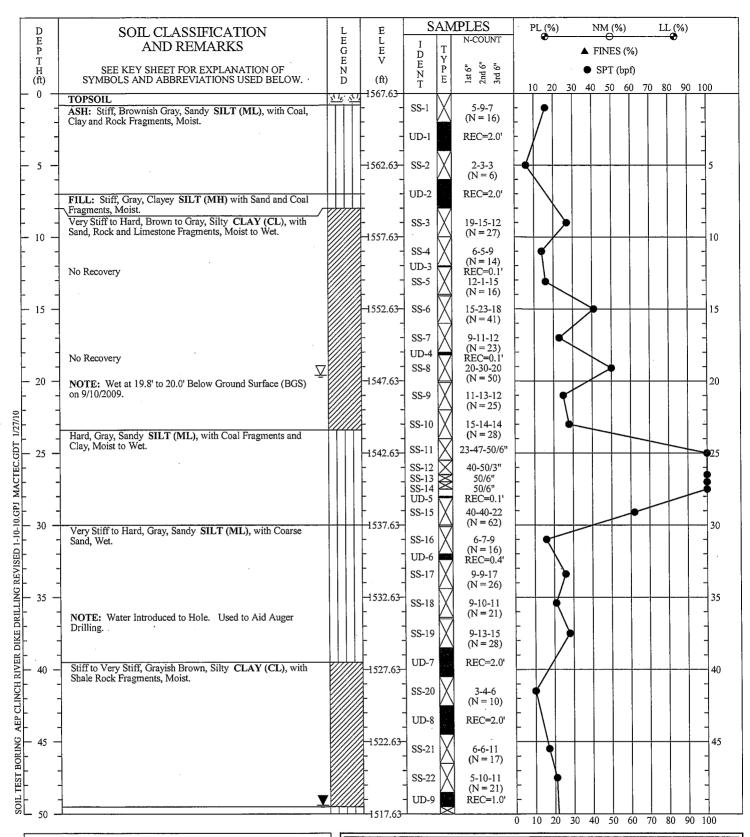
PROJECT NO.: 3050-09-0131

PAGE 2 OF 2



MACT	EC E	ngin	eering and Consulting, Inc.	BORING NO. PROJECT LOCATION PROJECT NO. LOGGED BY	B-0908 AEP Clinch River I Carbo, Virginia 3050-09-0131 Jon McDaniel	Dike Drilli	HEET 1 OF 2 ng 708- BRyan Rasnak
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION		WELL CONSTRUCTION DETAIL	 	ELEVATION FEET
- - - 5-		7 F. 7	TOPSOIL ASH: Stiff, Brownish Gray, Sandy SILT (ML), with Coal, Clay and Rock Fragments, Moist.		Bentonite (0' - 5')	,	- - -1565.00 - -
- - 10- - -			FILL: Stiff, Gray, Clayey SILT (MH) with Sand and Coal Fragments, Moist. Very Stiff to Hard, Brown to Gray, Silty CLAY (CL), with Sand, Rock and Limestone Fragments, Moist to Wet. No Recovery	7			- -1560.00 - - - - - - -1555.00
15 — - - -			No Recovery				- - - - -1550.00
20-			NOTE: Wet at 19.8' to 20.0' Below Ground Surface (BGS) on 9/10/2009.				- - - -1545.00
25 – 25 – 			Hard, Gray, Sandy SILT (ML), with Coal Fragments and Clay, Moist to Wet.				- - - - -1540.00
30-	- - - - - -		Very Stiff to Hard, Gray, Sandy SILT (ML), with Coarse Sand, Wet.				- - - -1535.00
35-	-		NOTE: Water Introduced to Hole. Used to Aid Auger Drilling.		Sand (5' - 69')		- - - -1530.00
40-	- - - -		Stiff to Very Stiff, Grayish Brown, Silty CLAY (CL), with Shale Rock Fragments, Moist.				- - - -1525.00
45-	- - - - - -						- - - 1520.00 -
DRILLI DRILLI DRILLI	ING M	ETHO			521467.007 10402599.492		

MACT	EC E	ingir	eering and Consulting, Inc.	BORING NO. PROJECT LOCATION PROJECT NO. LOGGED BY	B-0908 SHEET 2 OF AEP Clinch River Dike Drilling Carbo, Virginia 3050-09-0131 Jon McDaniel CHECKED BRyan Ras		
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION		WELL CONSTRUCTION DETAIL	ON	
55— 55— 60— 65— 70—			Firm, Yellowish Brown, Silty SAND (ML), with Clay and Shale Fragments, Moist. Yellowish Brown, Silty CLAY (CL), with Weathered Rock Fragments, Moist. Very Stiff to Hard, Grayish Brown to Orange-Brown, Silty CLAY (CL), with Highly Weathered Shale Fragments and Organics, Moist. Organics, Moist. NOTE: Used Split Spoon to Sample Due to Material in Bottom of Hole. Stiff, Dark Gray, Sandy SILT (ML), Mois to Wet. Firm, Dark Gray, Silty SAND (SM), with Shale Fragments, Wet. Very Dense, Whitish Gray, Coarse to Fine Grained. Silty SAND (SM), with Rock Fragments, Wet. Coring Terminated at 84.4' Below Ground Surface (BGS) on 9/10/2009. Moderately Hard, Light Gray to Gray, Moderately Weathered SHALE. Auger Refusal at 84.6' Below Ground Surface (BGS) on 9/10/2009. Boring Terminated at 89.5' Below Ground Surface (BGS) on 9/10/2009. Boring Terminated at 89.5' Below Ground Surface (BGS) on 9/10/2009. Boring Terminated at 89.5' Below Ground Surface (BGS) on 9/10/2009.	d	Bentonite Sand (74'		- -1515.00 - - -1510.00 - - -1505.00 - - -1500.00 - - - -1495.00 - - - -1485.00 - - - -1485.00 - - - -1480.00



DRILLER: Tri-State Drilling
EQUIPMENT: CME 75 Truck Rig
METHOD: 3.25" HSA
NORTHING: 3521467.007
EASTING: 10402599.492

LOGGED BY: Jon McDaniel CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

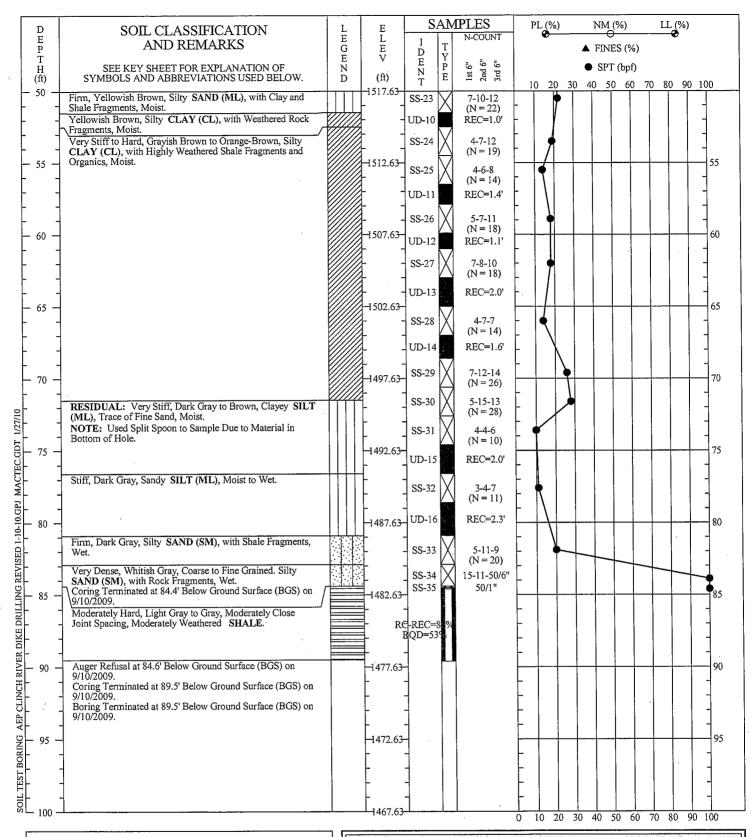
BORING NO.: B-0908

PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia **DRILLED:** September 11, 2009

PROJECT NO.: 3050-09-0131 PAGE 1 OF 2





DRILLER: Tri-State Drilling
EQUIPMENT: CME 75 Truck Rig
METHOD: 3.25" HSA
NORTHING: 3521467.007
EASTING: 10402599.492
LOGGED BY: Jon McDaniel

CHECKED BY: Ryan Rasnake PDR

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

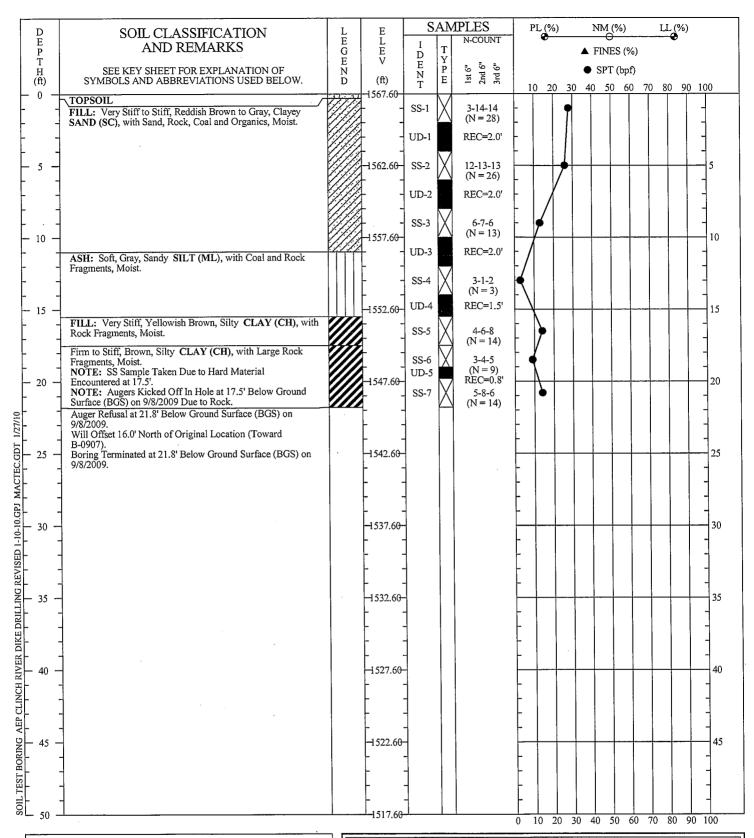
BORING NO.: B-0908

PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia **DRILLED:** September 11, 2009

PROJECT NO.: 3050-09-0131 **PAGE** 2 **OF** 2





DRILLER: Tri-State Drilling
EQUIPMENT: CME 75 Truck Rig
METHOD: 3.25" HSA

NORTHING.: 3521467.007 EASTING: 10402599.492

LOGGED BY: Jon McDaniel

CHECKED BY: Ryan Rasnake **FDR**

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

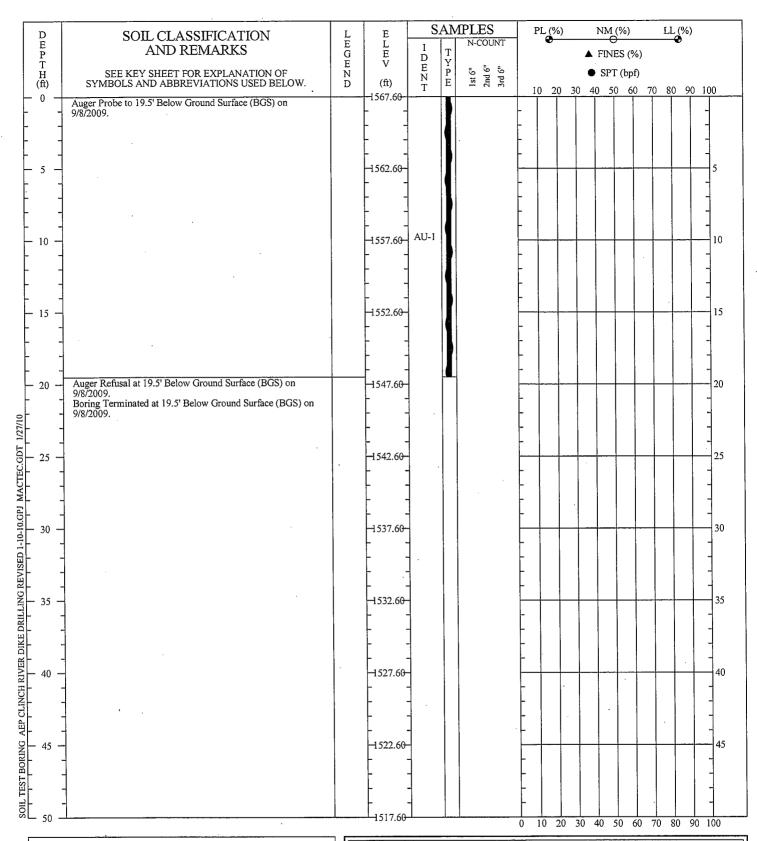
BORING NO.: B-0908A

PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia
DRILLED: September 8, 2009

PROJECT NO.: 3050-09-0131 **PAGE** 1 **OF** 1





DRILLER: Tri-State Drilling EQUIPMENT: CME 75 Truck Rig METHOD: 3.25" HSA 3521467.007 NORTHING.: EASTING: 10402599.492 Jon McDaniel LOGGED BY:

CHECKED BY: Ryan Rasnake RDR

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-0908B

PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia September 8, 2009 DRILLED:

3050-09-0131 PAGE 1 OF 1 PROJECT NO.:





MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

MW-0910

SHEET 1 OF 2

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

Carbo, Virginia

PROJECT NO.: 3050-09-0133

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake

			LOGGED	BY: Nick Smit		asnak
		₫			WELL CONSTRUCTION	
EPTH	Water	STRATA	DECODIDATION		_ DETAIL	
	Level	IR	DESCRIPTION		7	-
EET		S				ELEVA (ft.)
bgs)				VIIXVIIXVIIX	V//XV//A	(,
			∖TOPSOIL , Rootmat.	/\\\\\\	2-INCH DIAMETER	
7	}		ASH: Very Stiff to Stiff, Strong Brown, Silty CLAY (CL), with		WELL 6-INCH DIAMETER	Γ
٦			Limestone Fragments and Organics, Moist.		BOREHOLE	_
1						-
٦			Soft, Reddish Yellow, Silty CLAY (CL), with Rock			-
5-	1		Fragments, Moist to Wet.			158
-			Stiff to Very Stiff, Reddish Yellow, Silty CLAY (CL), with			-
-			Rock Fragments and Organics, Moist to Wet.			-
-						-
-						-
10-	ł					- 158
-	-					-
4		<i>\////</i>	4			F
, 4	1	<i>\////</i>	NOTE: Difficult Drilling.		X//X//	-
_	1		<u> </u>	<u> </u>		 -
15-		k k k	Very Dense, Dark Gray, Silty SAND (SM), with Organics,			-157
,,,	1	: : :	Moist to Wet.			- 's'
]			X		L
						L
		[: : :	•			
	1				<i>\$(/)\$</i> (/)	7.5-
20-	1		Firm to Dense, Dark Gray, Silty SAND (SM), Wet.			<u>- 157</u>
_					<i>\(\)\\\\\</i>	_
-	1					_
_	1	14:40	·	Y//>X//	\(\frac{1}{2}\)\(\frac{1}{2}\)\(\frac{1}{2}\)	-
_	1					<u>-</u>
25 —	1					-156
_	1	1:1:1:				_
_	1 —					-
-	Ī				K//X	-
-	1		·			-
30 -	-		Very Loose, Dark Gray, Silty SAND (SM), Wet.	- K//X//		156
-	1		:			-
-	┨.		Firm to Dense, Dark Gray, Silty SAND (SM), with Thin	-X// X//		-
-	-		Calcite Layering at 39.0', Wet.			-
-	-	1:11:	. Salata Layoting at 60.0 , 110t.			-
35-	4		·			—15
	4					-
_	4			· K //XX//	Cement Grout (0' - 73.2')	
_						_
_						L
40-	1					—15
]		Loose to Firm, Dark Gray, Silty SAND (SM), with Calcite Layering and Organics, Wet.	K//X//	<i>\(\/\)</i> \(\)	L '
		111	Layering and Organics, Wet.		(X())X()	L
_	╛	MI	<u>:</u>	Y//>X//	*//>*//	L
_		1.1.1			 	L
4-	1		;			Ĺ 45
45-	7 ·	144				− 15
•	1					Γ
•	1	134			K//X4/)	
•	1	出出	.]			-
•	1				<i>\(\)</i>	-
	1	11111		W\\\\\\\		
RILLI	NG C	ONTR	ACTOR Tri-State Drilling REMARKS:			
			- II			
RILLII	NG N	ETHC	DD 3.25" HSA, NQ Coring			
			0157			

DRILLING EQUIPMENT

CME 550X

DATE DRILLED

9/29/2009



MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

MW-0910

SHEET 2 OF 2

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

Carbo, Virginia

PROJECT NO.:

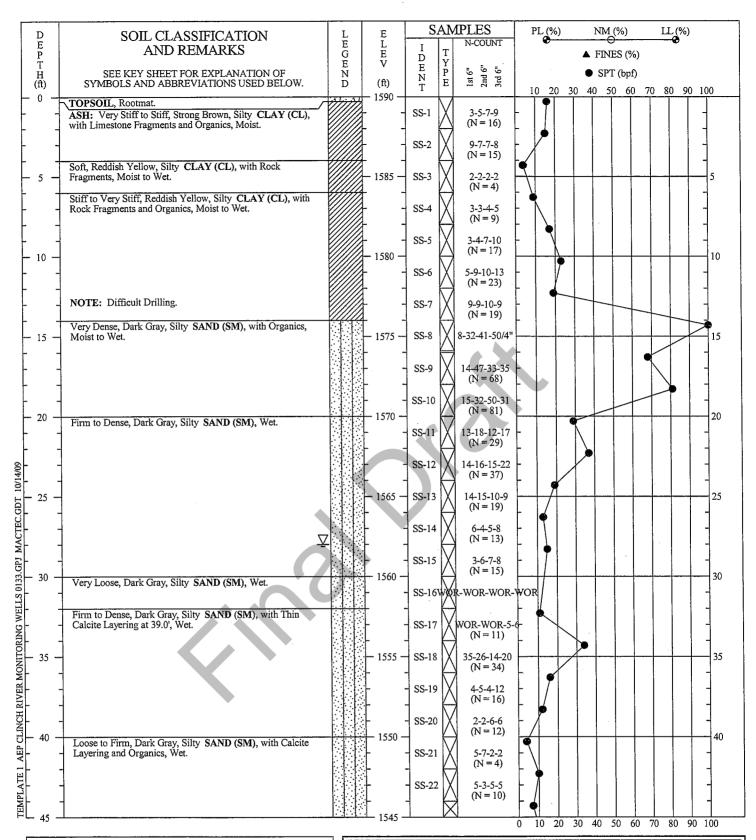
3050-09-0133

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake

DEPTH	Water	STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL	
FEET (bgs)	Level	STF			ELEVATION (ft.)
_			Loose to Firm, Dark Gray, Silty SAND (SM), with Calcite Layering and Organics, Wet.		_
_			Firm, Yellowish Brown, Silty CLAY (CL), with Rock Fragments and Black Organics, Moist.		_
55-					- 1535 -
, - 			Stiff to Very Stiff, Yellowish Brown, Silty CLAY (CL), with Rock Fragments and Black Organics, Moist.		-
60 -					- 1530
- -					_
65 -					_ 1525
			·		-
70-			Firm, Dark Gray, Clayey SILT (ML), with Black Organics, Moist.		- - -1520
75-		METTIN	Very Soft, Dark Gray, Clayey SILT (ML), with Black Organics, Moist. Very Hard, Dark Gray, Highly Weathered SHALE (HWR),		-
75-		13 ////	Moist. Soft, Dark Gray, Close Joint Spacing, Slightly Weathered	Top of Bentonite Seal at 73.2'	- - -1515
-			SHALE, 15 Degree Bedding.		-
	-			Top of Filter Pack at 78.1 Top of Screen at 80.1' (20	<u>, </u>
80~			NOTE: Slickensides at 81.1' and 83.6'.	of Screen)	- - - -
	-				-
80	-		NOTE: Slickensides at 85.0' NOTE: Had to Pull Casing, Rock Not Advancing to Inner Barrel, Very Little Recovery.		1505 - -
90-			NOTE: Slickensides at 89.2'.	Sand (78.1' - 101.65')	_ 1500
			·		-
95-	-				- 1495
	- - -				- - -
			Auger Refusal at 73.7' Below Ground Surface (BGS) on 9/30/2009.	Bottom of Screen at	
			Coring Terminated at 98.8' Below Ground Surface (BGS) on 9/30/2009.	100.1' Bottom of Well Cap at 100.65'	
			Boring Terminated at 98.8' Below Ground Surface (BGS) on 9/30/2009.	Bottom of Borehole at 101.65'	
90-					



Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA .:

REMARKS:

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0910

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

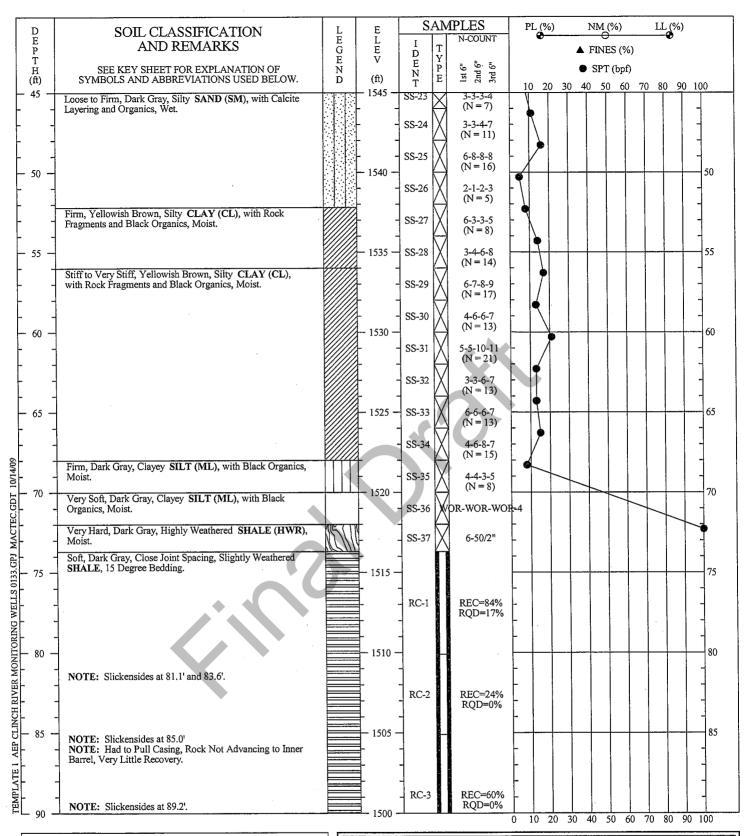
DRILLED:

September 29, 2009

3050-09-0133 PROJECT NO.:

PAGE 1 OF 3





Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA .:

REMARKS:

LOGGED BY: Nick Smith CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0910

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

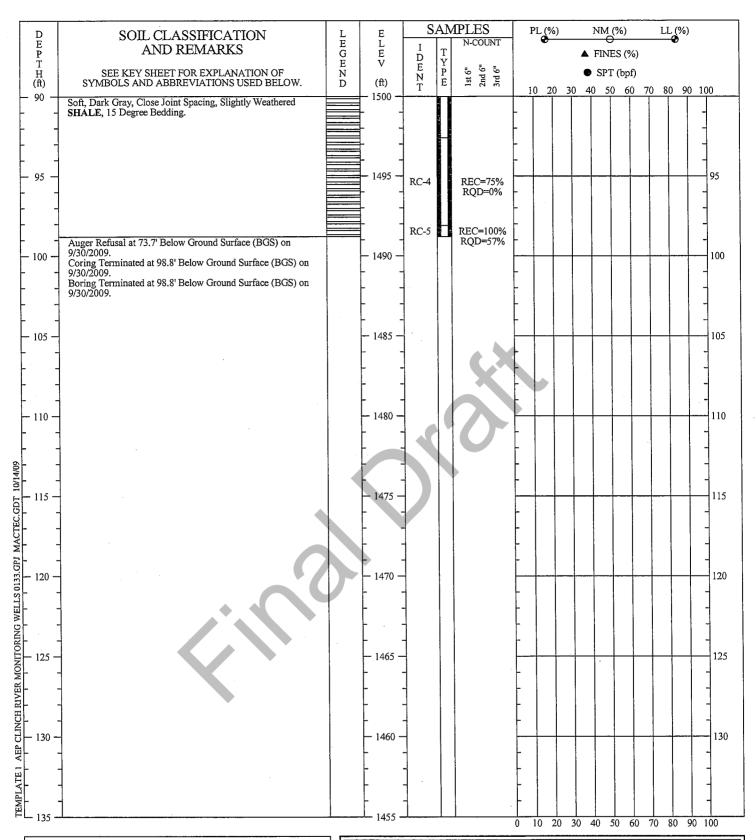
DRILLED:

September 29, 2009

3050-09-0133 PROJECT NO.:

PAGE 2 OF 3





Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA.:

REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0910

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

September 29, 2009

PROJECT NO.: 3050-09-0133 PAGE 3 OF 3





MACTEC Engineering and Consulting, Inc.

22010 Commerce Drive Abingdon, VA

Telephone: 276-676-0426

9/25/2009

DATE DRILLED

Fax: 276-676-0761

BORING NO .:

MW-0911

SHEET 1 OF 1

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

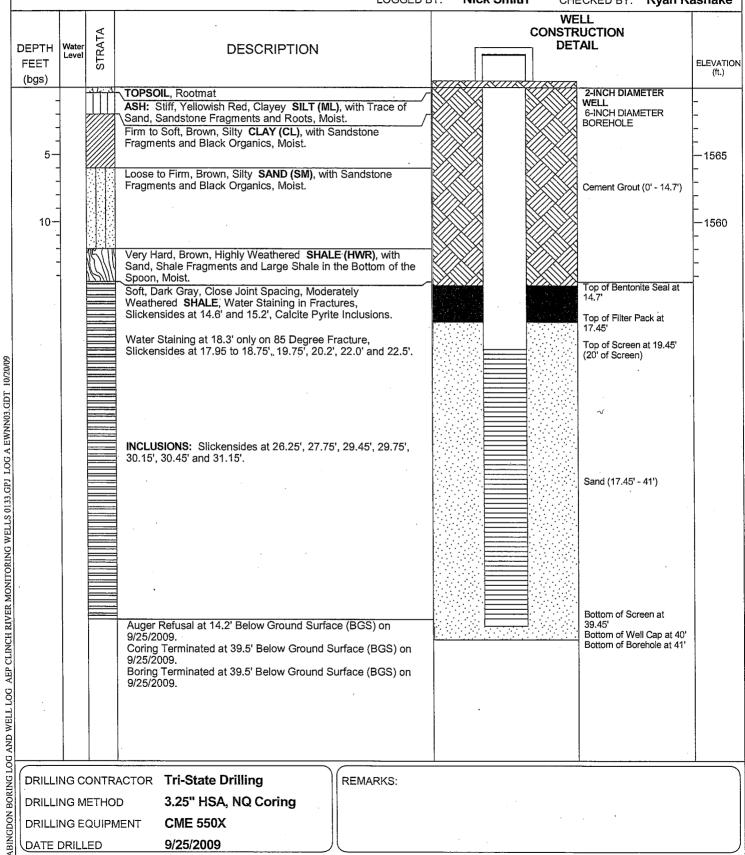
Carbo, Virginia 3050-09-0133

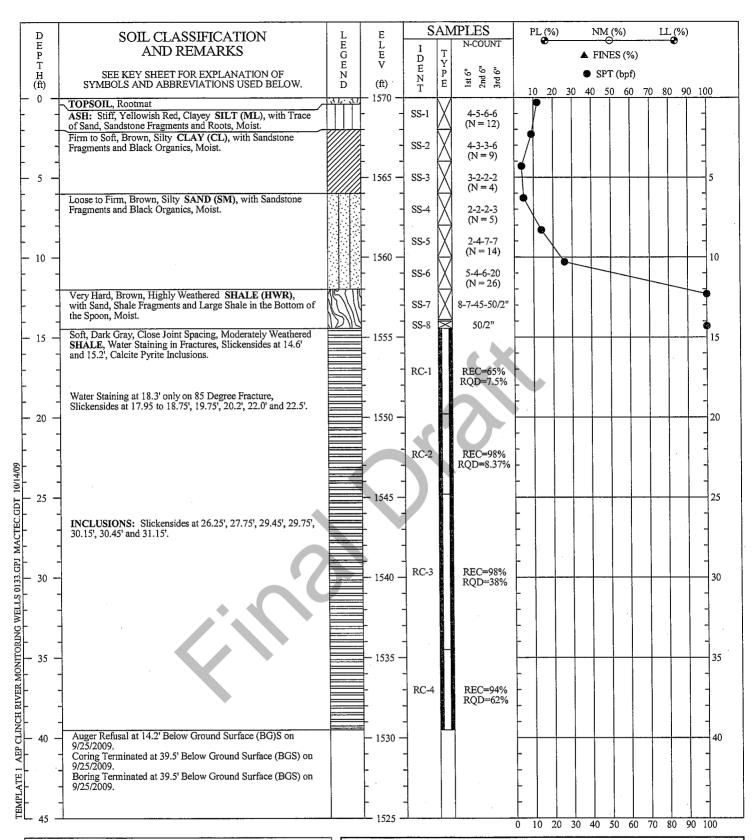
PROJECT NO.: LOGGED BY:

Nick Smith

CHECKED BY:

Rvan Rasnake





Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA .:

REMARKS:

LOGGED BY: Nick Smith CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL

SOIL TEST BORING RECORD

BORING NO.: MW-0911

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

September 25, 2009

PROJECT NO.: 3050-09-0133 PAGE 1 OF 1





MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

MW-0912

SHEET 1 OF 2

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

Carbo, Virginia

PROJECT NO.: LOGGED BY:

3050-09-0133 **Nick Smith**

CHECKED BY: Ryan Rasnake

		TA		WELL CONSTRUCTION DETAIL					
DEPTH FEET (bgs)	Water Level	STRATA	DESCRIPTION	DETAIL	ELEVATIO (ft.)				
•			ASH: Stiff to Very Stiff, Yellowish Red, Clayey SILT (ML), with Trace of Sand, with Shale, Limestone Fragments and Organics, Dry to Moist. Very Stiff, Coal Fragments.	2-INCH DIAMETER WELL 6-INCH DIAMETER BOREHOLE	-				
5-			Stiff, No Roots.		- 1555				
			Firm, Yellowish Red, Clayey SILT (ML), Moist.		-				
10-			Stiff to Very Stiff, Reddish Brown, Clayey SILT (ML), with Organics, Moist.		- 1550				
			Firm, Reddish Brown, Clayey SILT (ML), Moist.		- -				
15-	-		Stiff to Very Stiff, Red Brown, Clayey SILT (ML), Moist.		- 1545 - -				
20-			Very Stiff, Yellowish Brown, Clayey SILT (ML), with Shale Fragments, Dry to Moist.		- - - 1540 - -				
25-	1 - - - -		Firm, Dark Gray, Silty SAND (SM), with Organics, Moist to Wet.		- - -1535 - -				
30-	- - - -		Very Loose to Loose. Dark Gray, Silty SAND (SM), with Rock Fragments, Wet.	Cement Grout (0' - 57.	- - - 1530				
	<u>-</u>		Firm, Dark Gray, Silty SAND (SM) , with Rock Fragments and Organics, Wet.		- - -				
35-	-				1525 -				
40-			NOTE: Difficult Drilling. NOTE: Fill Coming Up in Augers so Center Bit Not Going Down, Will Start Using Roller Bit and Flushing.		- -1520 -				
45.	-		RESIDUAL: Firm, Grayish Brown, Silty SAND (SM), Fine to Medium Graded, with Sandstone and Calcite Fragments, Wet. Firm, Grayish Brown, Sandy GRAVEL (GP), Fine to		- - - 1515				
401	-	000	Medium Sand, Wet. Very Loose, Dark Gray, Silty SAND (SM), with Rock Fragments and White Thin Calcite Layerts, Wet.		-				

DRILLING METHOD

3.25" HSA, NQ Coring

DRILLING EQUIPMENT

CME 550X

DATE DRILLED

9/21/2009



MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone: 276-676-0426 Fax: 276-676-0761

BORING NO.:

MW-0912

SHEET 2 OF 2

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

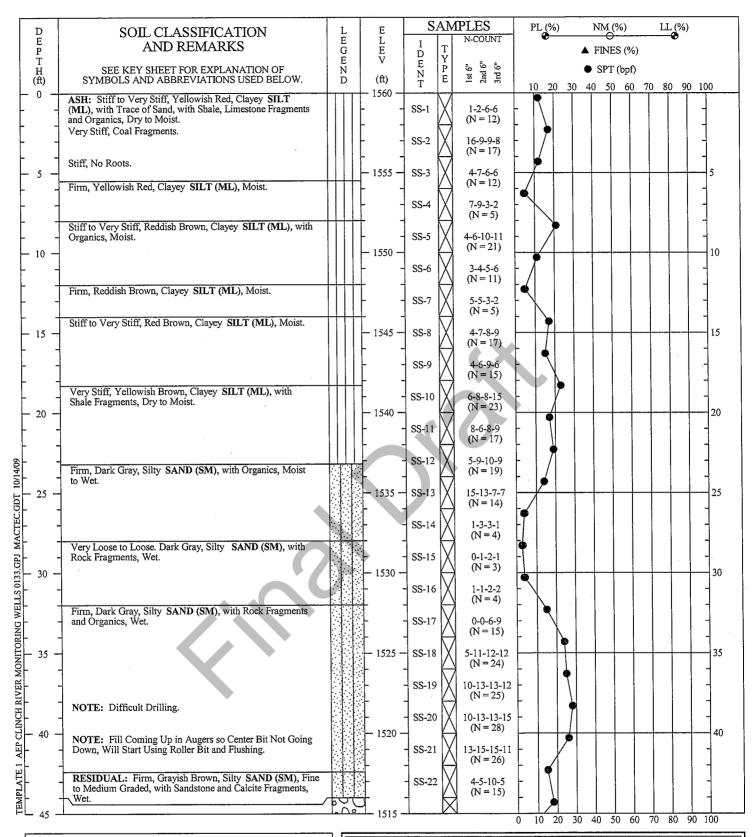
Carbo, Virginia 3050-09-0133

PROJECT NO.: LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake

	DEPTH FEET	Water Level		DESCRIPTION	WELL CONSTRUCTION DETAIL	ELEVATION (ft.)
-	(bgs)			Very Loose, Dark Gray, Silty SAND (SM), with Rock Fragments and White Thin Calcite Layerts, Wet.		
	-			Very Hard, Strong Brown, Silty CLAY (CL) , Fine Grained Sand, with Sandstone Fragments, Moist to Wet.		-
	55— -			Very Hard, Dark Gray, Highly Weathered SANDSTONE		—1505 -
	-		: : : : 	(HWR), with Some Strong Brown Silty, Wet. Hard, Medium Dark Gray, Moderately Close Joint Spacing,	Top of Bentoni 57.8'	e Seal at
	60] ′		Moderately Weathered SANDSTONE, 65 Degree Bedding, 60 to 65 Fractures. INCLUSIONS: Water Staining in Fractures on Rock, Fine	Top of Filter Pa	-
	-	-		Grained. Soft, Dark Gray, Close Joint Spacing, Moderately to Severely Weathered SHALE, Water Staining in Fractures,	Top of Screen of Screen)	at 62.1' (20'
	65—			60 to 75 Degree Bedding, 80 Degree Fracturing. Soft, Dark Gray, Close Joint Spacing, Moderately to		- 1495
	-		× × × × × × × × × × × × × × × ×	Severely Weathering SHALE, Water Staining in Fractures, 760 to 65 Degree Bedding, 80 Degree Fracturing. (INCLUSIONS: Slickensides at 61.0', 62.66', No Water		-
. 60/	70-	- -	× × × × × × × × × × × × × × × × × × ×	Staining. INCLUSIONS: Slickensides at 64.97', 66.08'. Moderately Hard, Dark Gray, Moderately Close Joint		- 1490
OT 10/20	-		× × × × × × × × × × × × × × × × × × ×	Spacing, Moderately Weathered SILTSTONE , 60 Degree Bedding.	Sand (60' - 83.	65')
NN03.GI	75-		× × × × × × × × × × × × × × × × × × ×	INCLUSIONS: Pyrite Flakes in Fracture, Slicken Sides at 70.92', 71.62'.		- 1485
OG A EW			× × × × × × × × × × × × × × ×			- - -
GPJ LC	80-	-	× × × × × × × × × × × × × × × × × × ×			- 1480
40NITORING WELLS 0133.GPJ LOG A EWNN03.GDT 10/20/09			X X X X X X X X X X X X X X X X X X X		Bottom of Scre Bottom of Wel	
UNG WE	·		X X X	Augering Terminated at 52.8' Below Ground Surface (BGS) on 9/21/2009.	82.65' Bottom of Bore 83.65'	· ,
ONITOR	•			Coring Terminated at 74.97' Below Ground Surface (BGS) on 9/21/2009. Boring Terminated at 74.97' Below Ground Surface (BGS) on		
RIVER M				9/21/2009.		
LINCH						
G AEP C						
ELL LO				·		
ABINGDON BORING LOG AND WELL LOG AEP CLINCH RIVER IN						
ING TOC						
ON BOR						
ABINGD						



Tri-State Drilling

EQUIPMENT: METHOD:

CME 550X

3.25" HSA, NQ Coring

HOLE DIA.:

REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0912

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

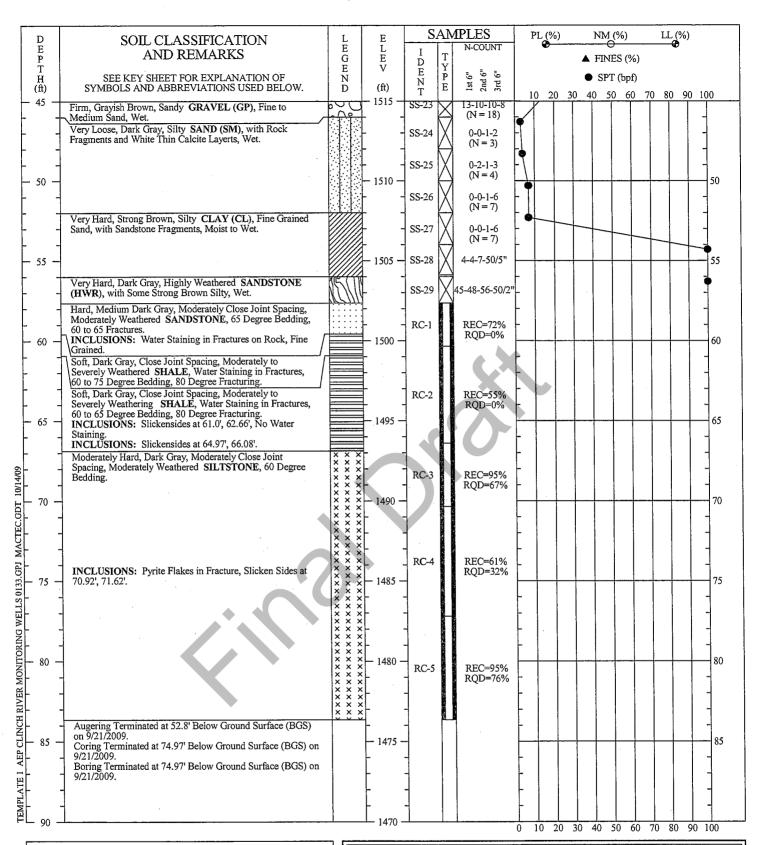
DRILLED:

September 21, 2009

PROJECT NO.: 3050-09-0133

PAGE 1 OF 2





Tri-State Drilling CME 550X

EQUIPMENT: METHOD:

3.25" HSA, NQ Coring

HOLE DIA.:

REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0912

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

September 21, 2009

PROJECT NO.: 3050-09-0133

PAGE 2 OF 2





MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive

Abingdon, VA

Telephone: 276-676-0426

Fax: 276-676-0761

BORING NO.:

MW-0913D

SHEET 1 OF 1

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

Carbo, Virginia

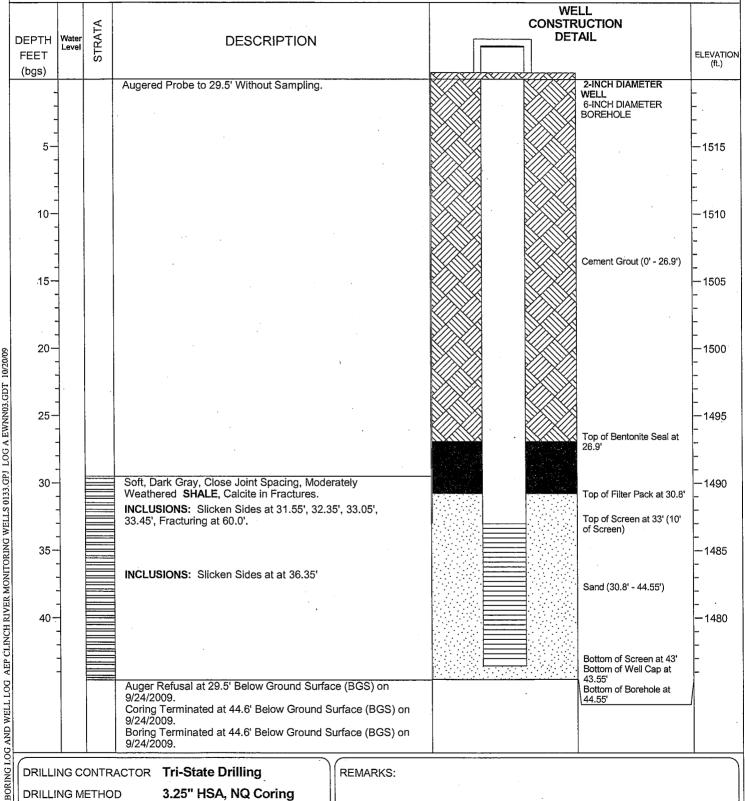
PROJECT NO.:

3050-09-0133

LOGGED BY:

Nick Smith

Rvan Rasnake CHECKED BY:



DRILLING CONTRACTOR Tri-State Drilling

DRILLING METHOD

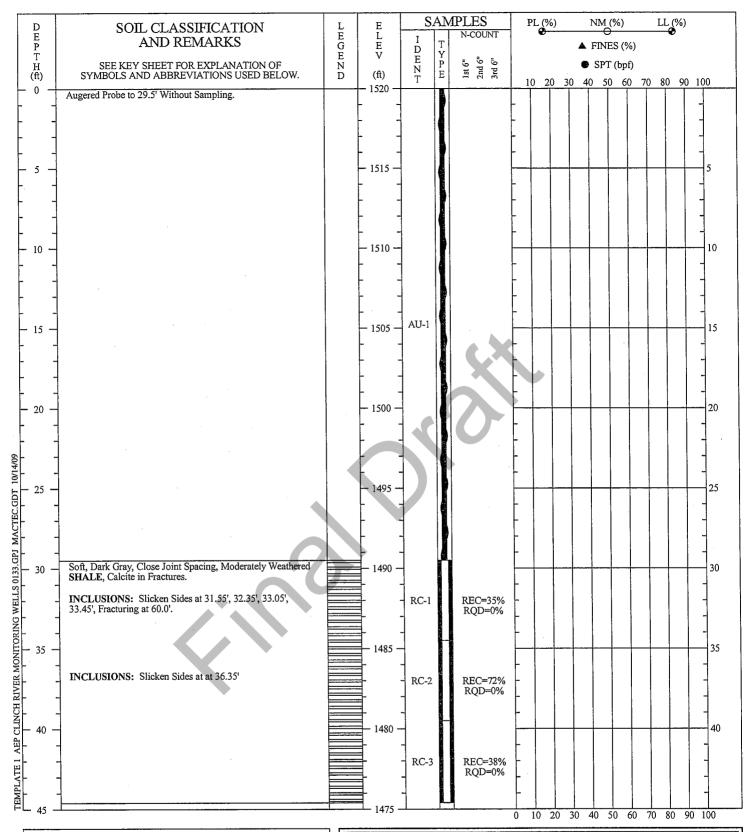
3.25" HSA, NQ Coring

DRILLING EQUIPMENT

CME 550X

DATE DRILLED

9/24/2009



Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA.:

REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0913D

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

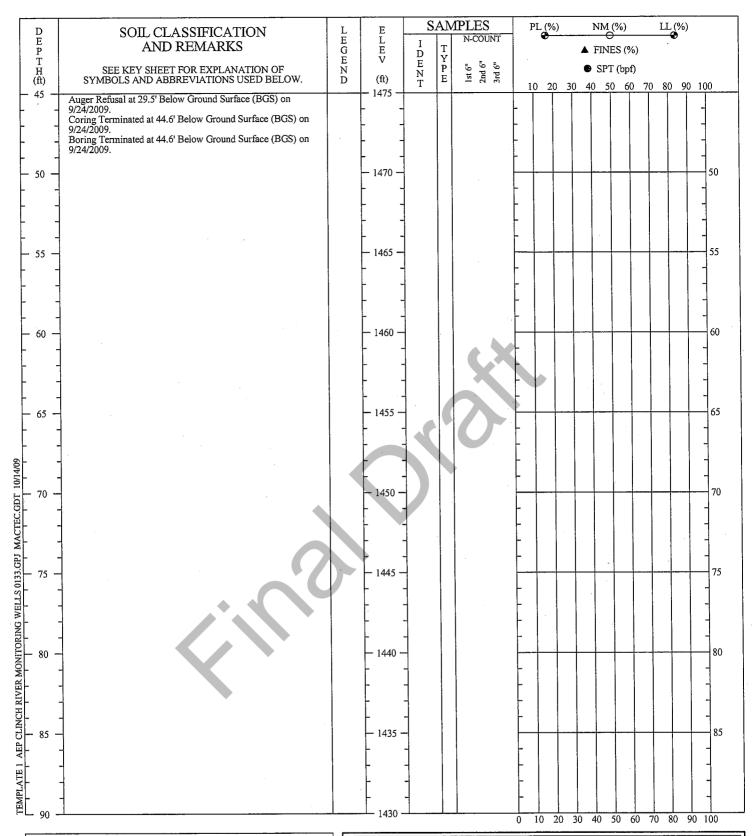
DRILLED:

September 24, 2009

PROJECT NO.: 3050-09-0133

PAGE 1 OF 2





Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA .: REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:

MW-0913D

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

September 24, 2009

PROJECT NO.: 3050-09-0133 PAGE 2 OF 2





MACTEC Engineering and Consulting, Inc. 22010 Commerce Drive Abingdon, VA Telephone 276-676-0426

Fax: 276-676-0761

MW-0915 BORING NO .:

SHEET 1 OF 1

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

Carbo, Virginia

PROJECT NO.: 3050-09-0133 LOGGED BY:

Nick Smith

CHECKED BY:

Ryan Rasnake

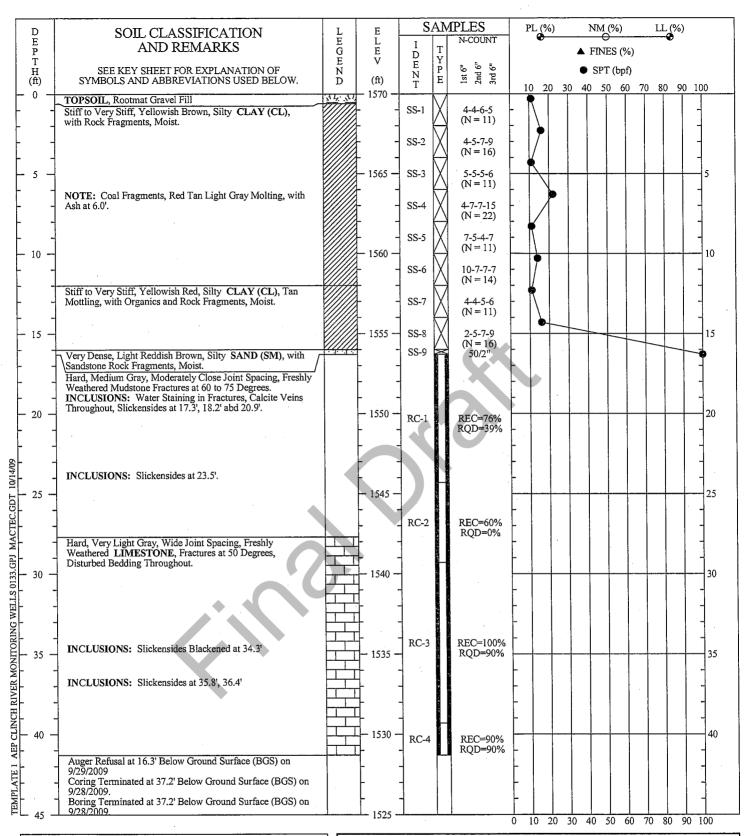
J-, ,,,	Water Level	STRATA	DESCRIPTION				
FEET (bgs)		S.					ELEVATIO (ft.)
(bgs)		'd 1 ₂ . 'd	TOPSOIL, Rootmat Gravel Fill			2-INCH DIAMETER	
1			Stiff to Very Stiff, Yellowish Brown, Silty CLAY (CL), with			WELL 6-INCH DIAMETER	_
]			Rock Fragments, Moist.			BOREHOLE	-
5							—1565
			NOTE: Ocal Francisco Ded Tay Make Ocas Makes and the				000
_			NOTE: Coal Fragments, Red Tan Light Gray Molting, with Ash at 6.0'.			Cement Grout (0' - 14.3')	_
-			7.611 dt 6.67.			Toman crack (c) no)	-
_							-
10							- 1560
-							-
` -			Stiff to Very Stiff, Yellowish Red, Silty CLAY (CL), Tan				-
			Mottling, with Organics and Rock Fragments, Moist.			Top of Bentonite Seal at	
15—	}			787778	72///2	14.3'	- 1555
15							- 1333
_			Very Dense, Light Reddish Brown, Silty SAND (SM), with Sandstone Rock Fragments, Moist.			Top of Filter Pack at 17.1'	_
_			Hard, Medium Gray, Moderately Close Joint Spacing, Freshly			Top of this is don't at this	-
-	-		Weathered Mudstone Fractures at 60 to 75 Degrees.				-
20 —	ł		INCLUSIONS: Water Staining in Fractures, Calcite Veins			Top of Screen at 20.6' (20'	-1550
-	1		Throughout, Slickensides at 17.3', 18.2' abd 20.9'.			of Screen)	-
_	i						
_			INCLUSIONS: Slickensides at 23.5'.				-
25-]		INCLUSIONS. SICKETSIDES at 25.5.			, ,	- -1545
25 -							- 1343
_							-
-	-		Hard, Very Light Gray, Wide Joint Spacing, Freshly	-		•	-
	1		Weathered LIMESTONE, Fractures at 50 Degrees,			Sand (17.1' - 42')	-
30 —	1	ДI.	Disturbed Bedding Throughout.			June (17.17 42)	1540
-	1						F
		Ц.					
	1						L
35-	4	H	INCLUSIONS: Slickensides Blackened at 34.3'				1535
-	-	\Box					-
-	1		INCLUSIONS: Slickensides at 35.8', 36.4'			1	-
-	1					İ	-
- 40	1	口				•	- -
40 –			, '			Bottom of Screen at 40.6'	- 1530
			Auger Refusal at 16.3' Below Ground Surface (BGS) on			Bottom of Well Cap at 41.15'	Г
		ŀ	9/29/2009			Bottom of Borehole at 42'	1
			Coring Terminated at 37.2' Below Ground Surface (BGS) on 9/28/2009.				
			Boring Terminated at 37.2' Below Ground Surface (BGS) on				
			9/28/2009.	1			
			<u> </u>				
יי ווים	NC C	ONTO	ACTOR Tri-State Drilling		* .		
			ACTOR Tri-State Drilling REMARKS:				
DRILLI	NG M	ETHO	D 3.25" HSA, NQ Coring				

DATE DRILLED

DRILLING EQUIPMENT

CME 550X

9/29/2009



Tri-State Drilling

EQUIPMENT:

CME 550X

METHOD:

3.25" HSA, NQ Coring

HOLE DIA .: REMARKS:

LOGGED BY: Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER.
INTERFACES BEWEEN STRATA ARE APPROXIMATE.
TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: MW-0915

PROJECT:

AEP Clinch River Monitoring Wells

LOCATION:

DRILLED:

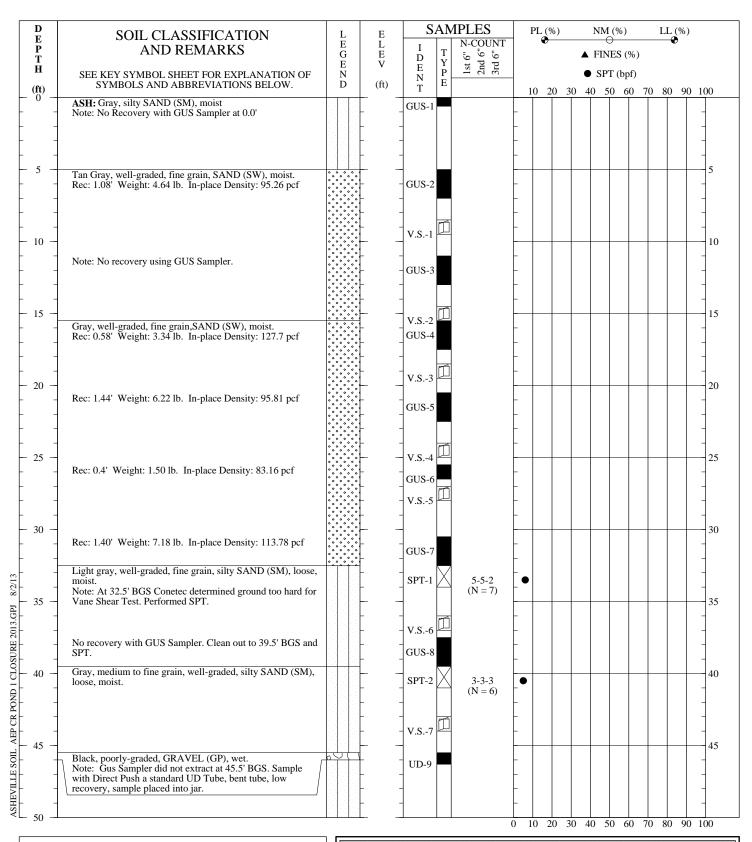
September 29, 2009

PROJECT NO.: 3050-09-0133 PAGE 1 OF 1



wood.

Appendix A3
Historical Borings



HOLE DIA.: 4.5" REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

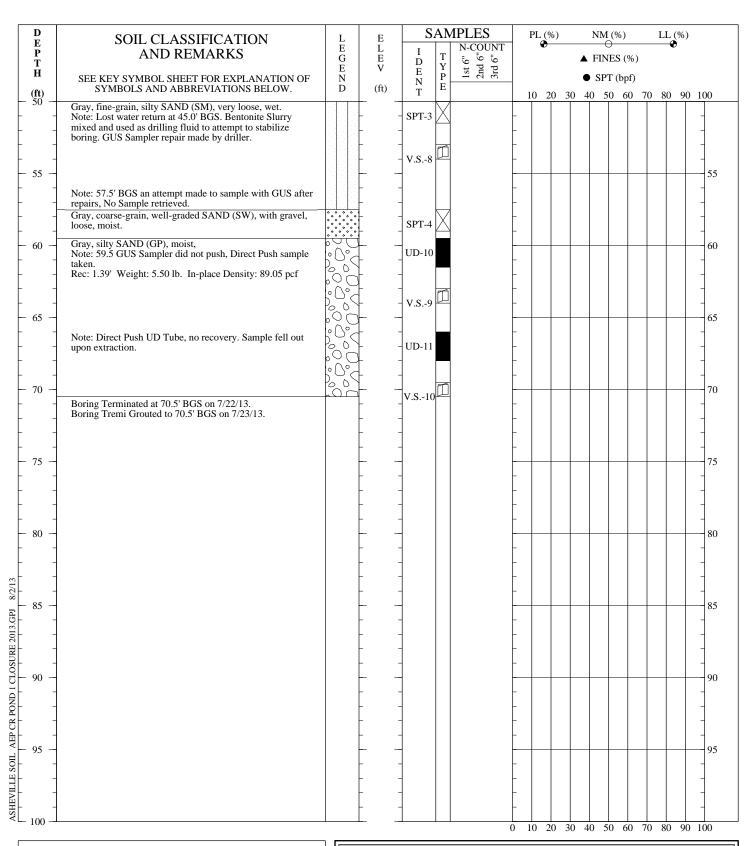
Boring: 13B-1 **Date Drilled:** 7/22/2013

Project: AEP Clinch River Pond #1 Closure Drilling

Project No.: 3050-13-0220

Prepared By: Checked By: PAGE 1 OF 2

amec



HOLE DIA .: 4.5" REMARKS:

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TEST BORING RECORD

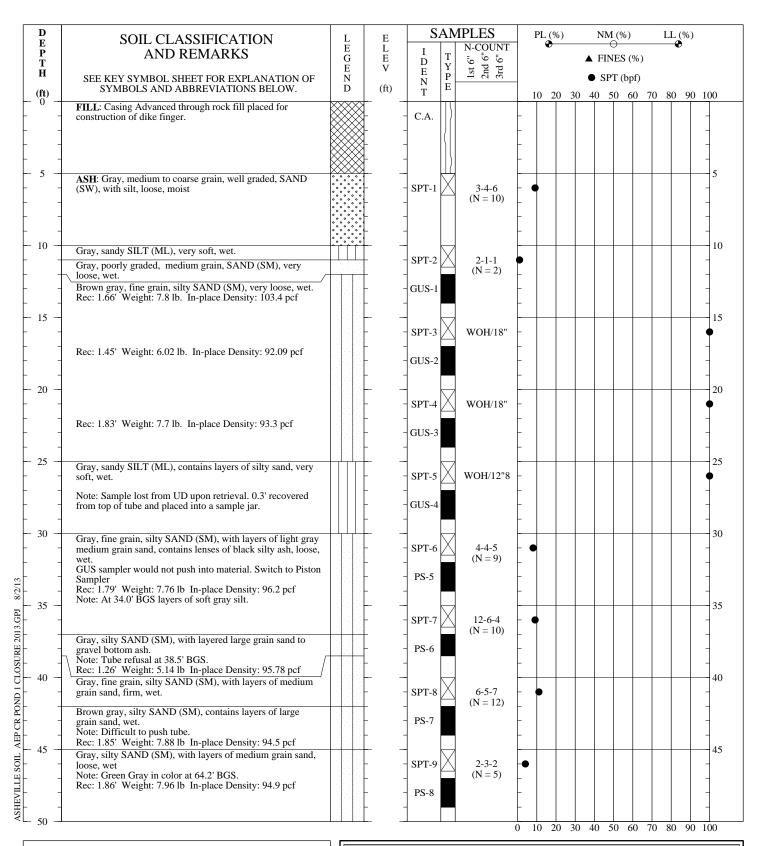
Boring: 13B-1 7/22/2013 **Date Drilled:**

AEP Clinch River Pond #1 Closure Drilling **Project:**

3050-13-0220 **Project No.:**

Prepared By: Checked By: PAGE 2 OF 2





HOLE DIA.: 4.5" REMARKS:

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TEST BORING RECORD

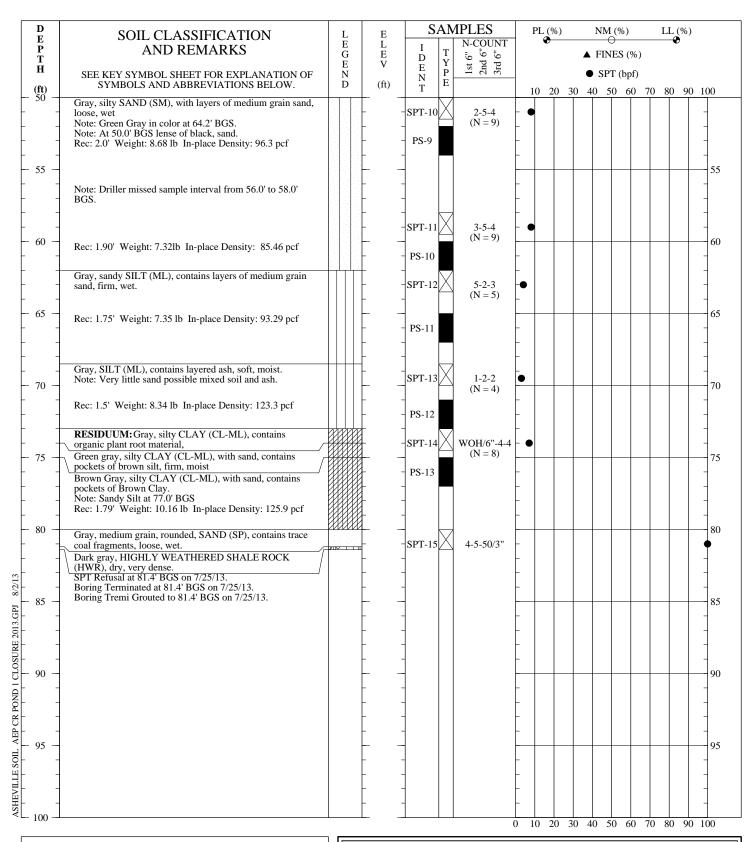
Boring: 13B-2 **Date Drilled:** 7/25/2013

Project: AEP Clinch River Pond #1 Closure Drilling

Project No.: 3050-13-0220

Prepared By: Checked By: PAGE 1 OF 2





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TEST BORING RECORD

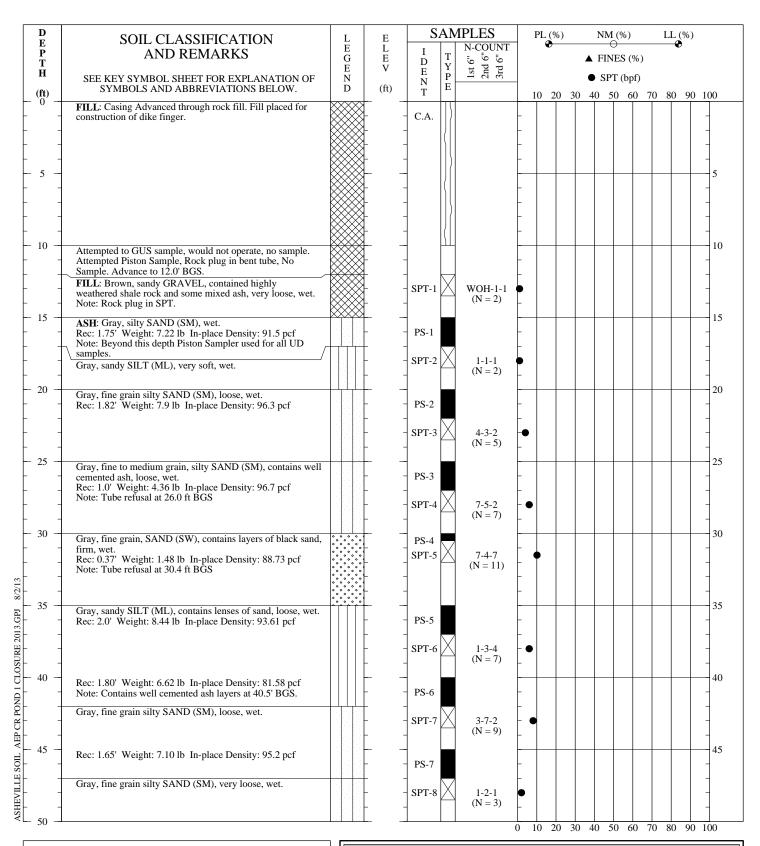
Boring: 13B-2 **Date Drilled:** 7/25/2013

Project: AEP Clinch River Pond #1 Closure Drilling

Project No.: 3050-13-0220

Prepared By: Checked By: PAGE 2 OF 2

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TEST BORING RECORD

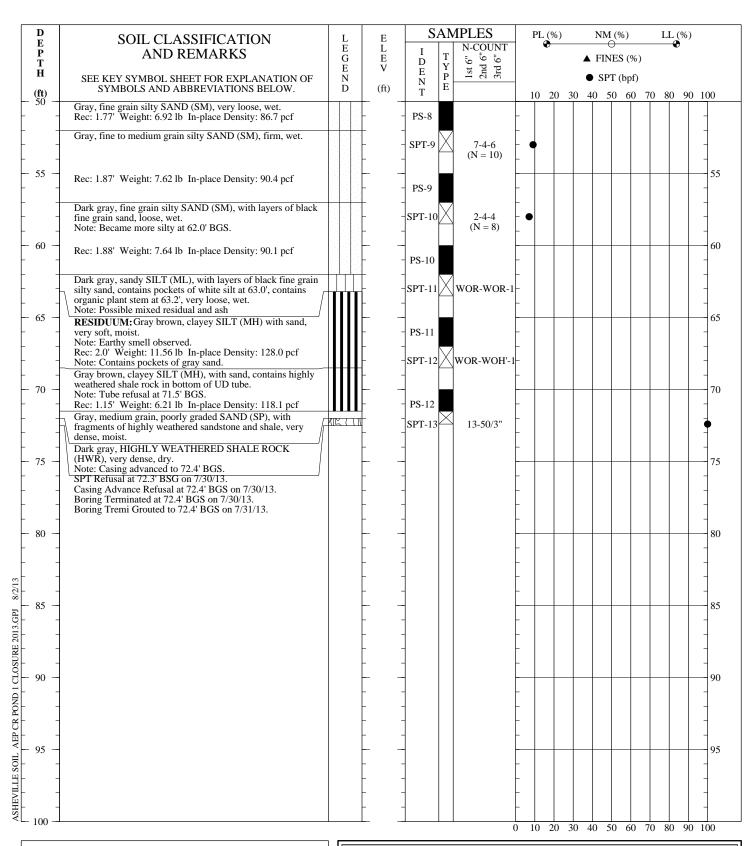
Boring: 13B-3 **Date Drilled:** 7/30/2013

Project: AEP Clinch River Pond #1 Closure Drilling

Project No.: 3050-13-0220

Prepared By: Checked By: PAGE 1 OF 2





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TEST BORING RECORD

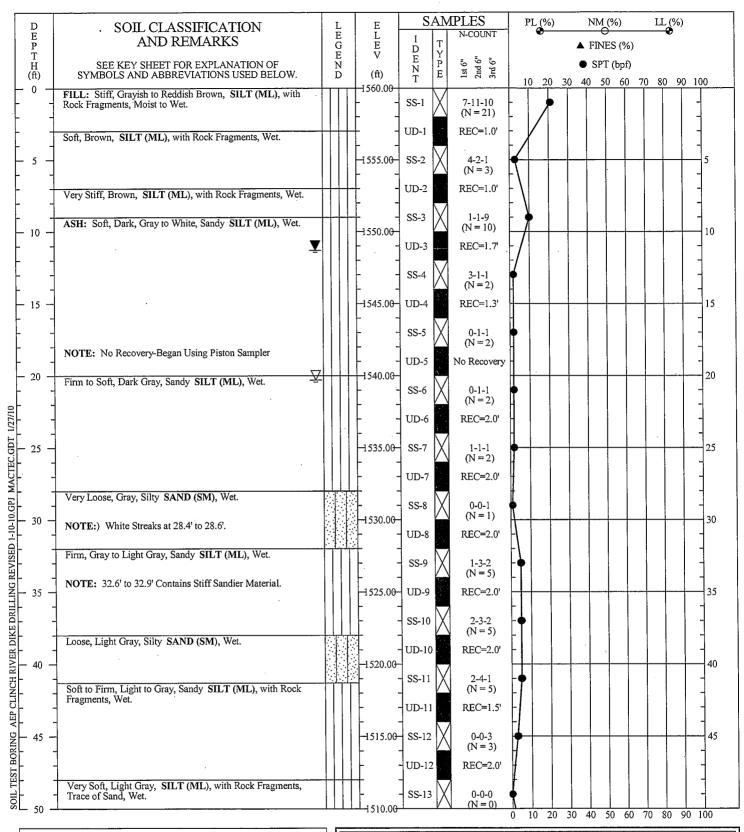
Boring: 13B-3 **Date Drilled:** 7/30/2013

Project: AEP Clinch River Pond #1 Closure Drilling

Project No.: 3050-13-0220

Prepared By: Checked By: PAGE 2 OF 2





Tri-State Drilling

EQUIPMENT: METHOD:

CME 75 Truck Rig

NORTHING .:

3.25" HSA 3522219.29

EASTING:

10403292.98

LOGGED BY:

Jon McDaniel

CHECKED BY: Ryan Rasnake PDR

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SOIL TEST BORING RECORD

BORING NO.: B-0903

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

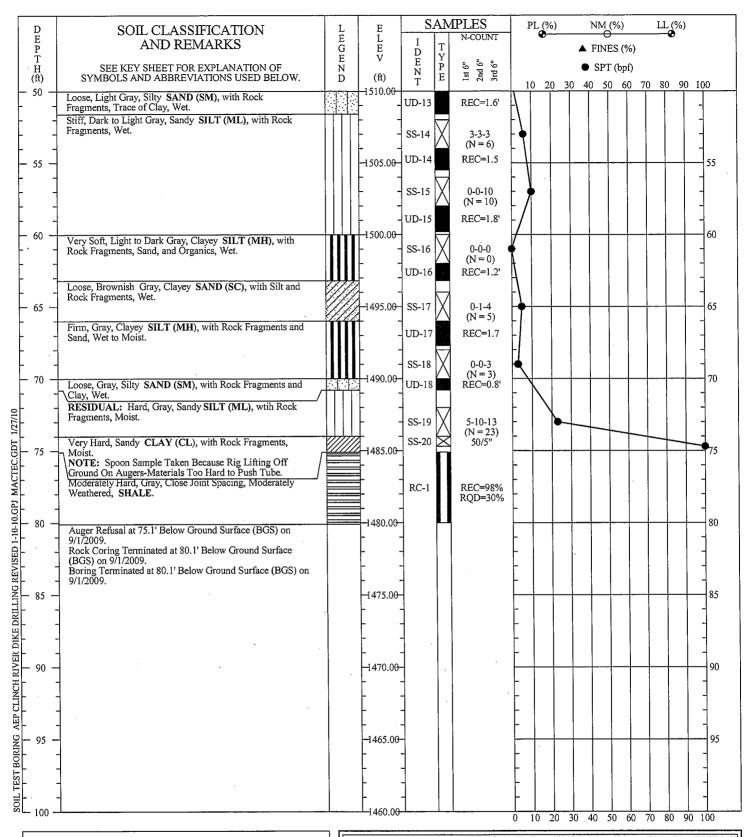
DRILLED:

August 31, 2009

PROJECT NO.: 3050-09-0131

PAGE 1 OF 2





DRILLER: Tri-State Drilling EQUIPMENT: CME 75 Truck R

CME 75 Truck Rig 3.25" HSA

METHOD: NORTHING.: EASTING:

3522219.29 10403292.98 Jon McDaniel

LOGGED BY: Jos CHECKED BY: Ry

CHECKED BY: Ryan Rasnake ZDZ

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

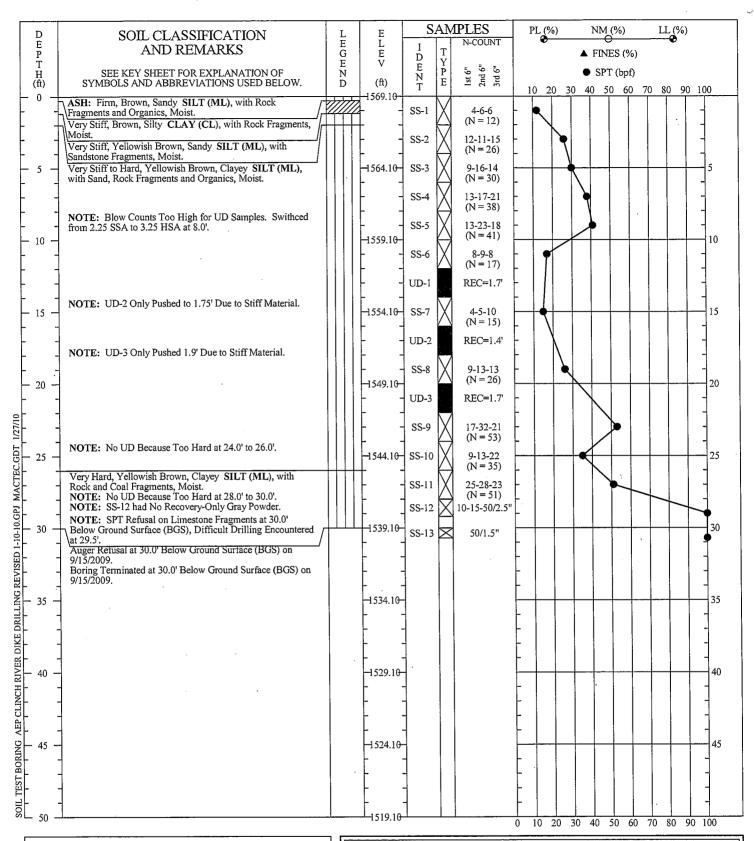
BORING NO.: B-0903

PROJECT: AEP Clinch River Dike Drilling

LOCATION: Carbo, Virginia **DRILLED:** August 31, 2009

PROJECT NO.: 3050-09-0131 PAGE 2 OF 2





Tri-State Drilling

EQUIPMENT:

CME 550X Truck Rig

METHOD:

2.25" SSA 0.0' to 6.0" 3.25" HSA 6.0' to 30.0'

NORTHING .: EASTING:

3522130.379

10403332.818

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:

B-0905

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

DRILLED:

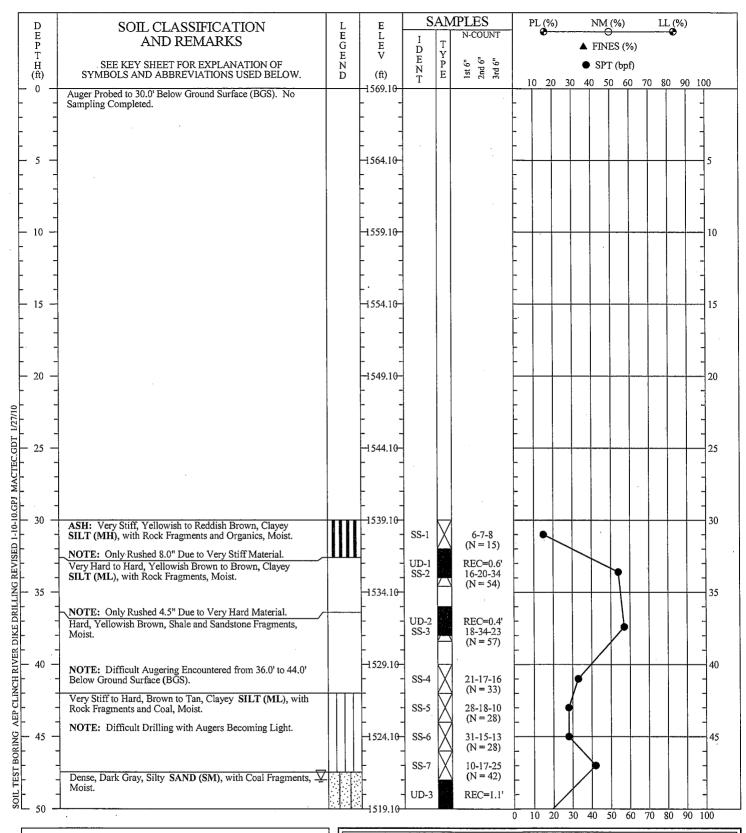
September 14, 2009

PROJECT NO.:

3050-09-0131

PAGE 1 OF 1





Tri-State Drilling

EQUIPMENT:

CME 550X Truck Rig

METHOD:

2.25" SSA 0.0' to 8.0' 3.25" HSA 6.0' to 80.0'

NORTHING.:

3522130.379

EASTING:

10403332.818

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake ZDR

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-0905A

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

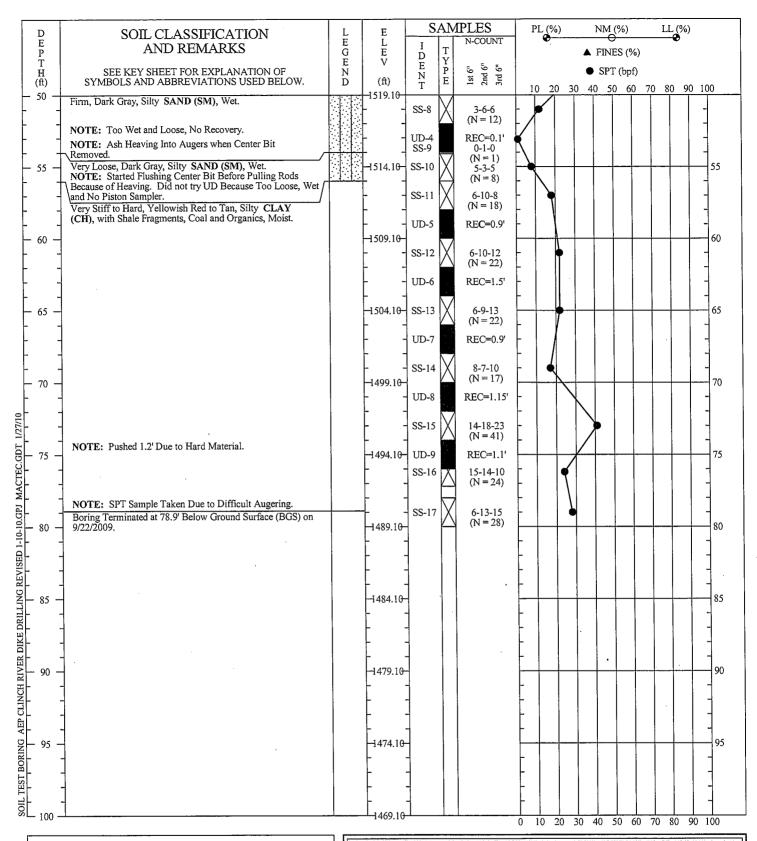
DRILLED:

September 22, 2009

PROJECT NO.: 3050-09-0131

PAGE 1 OF 2





Tri-State Drilling

EQUIPMENT: METHOD:

CME 550X Truck Rig

NORTHING .:

2.25" SSA 0.0' to 8.0' 3.25" HSA 6.0' to 80.0'

3522130.379

EASTING:

10403332.818

LOGGED BY:

Nick Smith

CHECKED BY: Ryan Rasnake **ZDZ**

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-0905A

PROJECT:

AEP Clinch River Dike Drilling

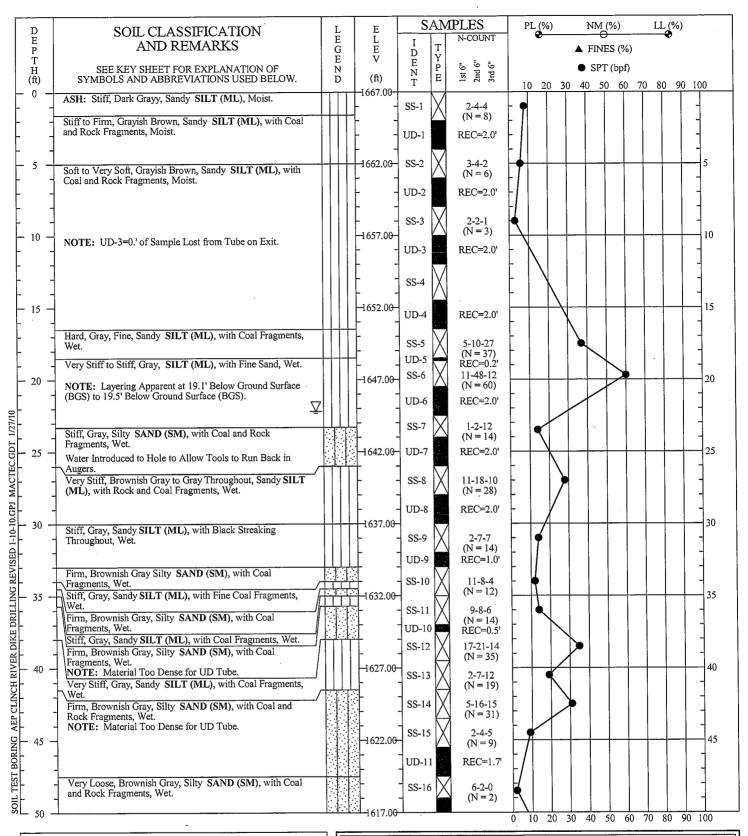
LOCATION: DRILLED:

Carbo, Virginia September 22, 2009

PROJECT NO.: 3050-09-0131

PAGE 2 OF 2





Tri-State Drilling

EQUIPMENT: METHOD:

CME 75 Truck Rig

NORTHING .:

3.25" HSA 3521561.16

EASTING:

10402579.31

LOGGED BY:

CHECKED BY: Ryan Rasnake RDR

Jon McDaniel

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE TRANSITIONS BETWEEN STRATA MAY BE GRADUAL

SOIL TEST BORING RECORD

BORING NO.: B-0907

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

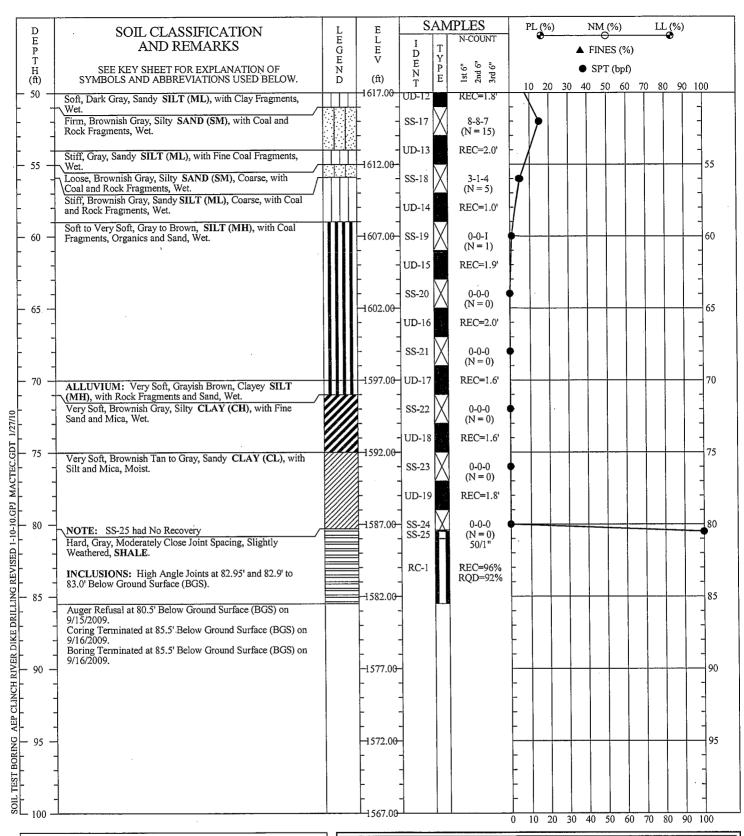
DRILLED:

September 15, 2009

PROJECT NO.: 3050-09-0131

PAGE 1 OF 2





Tri-State Drilling

EQUIPMENT: METHOD:

CME 75 Truck Rig

NORTHING .:

3.25" HSA

EASTING:

3521561.16

LOGGED BY:

10402579.31

Jon McDaniel

CHECKED BY: Ryan Rasnake ZDR

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SOIL TEST BORING RECORD

BORING NO.: B-0907

PROJECT:

AEP Clinch River Dike Drilling

LOCATION:

Carbo, Virginia

DRILLED:

September 15, 2009

3050-09-0131 PROJECT NO.:

PAGE 2 OF 2



wood.

Appendix B 2017 Monitoring Well Installation Report



2017 Monitoring Well Installation Report Clinch River Pond 1

American Electric Power Service Corporation Clinch River Plant, Cleveland, Russell County, Virginia Project # 3050170345

Prepared for:

American Electric Power Service Corporation

1 Riverside Plaza, Columbus, Ohio 43215

28 March 2019



Wood Environment & Infrastructure Solutions, Inc. 1070 West Main Street Suite 5 Abingdon, Virginia 24210 USA T: 276-676-0426 www.woodplc.com

28 March 2019

Mr. David Miller Director, Land Environment & Remediation Services American Electric Power Service Corporation 1 Riverside Plaza Columbus, OH 43215 Email: damiller@aep.com

Re: 2017 Monitoring Well Installation Report Clinch River Pond 1

Dear Mr. Miller:

Wood Environment & Infrastructure, Inc. (Wood) is pleased to provide American Electric Power (AEP) with the 2017 Monitoring Well Installation Report prepared for Pond 1 at the Clinch River Plant.

We very much appreciate working with AEP on this project. If you require additional information about this report, please feel free to contact Jason Monk or Jon McDaniel at (276) 676-0426.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.

Jason C. Monk, P.E.

Project Manager

Jon McDaniel, P.E. Branch Manager

Attachments

CC:

Daniel Mains, AEP Karen Gilmer, AEP



2017 Monitoring Well Installation Report Clinch River Pond 1

American Electric Power Service Corporation Clinch River Plant, Cleveland, Russell County, Virginia Project # 3050170345

Prepared for:

American Electric Power Service Corporation 1 Riverside Plaza, Columbus, Ohio 43215

Prepared by:

Wood Environment & Infrastructure Solutions, Inc. 1070 West Main Street Suite 5 Abingdon, Virginia 24210 USA T: 276-676-0426

28 March 2019

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1.0 Introduction

Wood Environment & Infrastructure Solutions, Inc. (Wood) was retained by American Electric Power Service Corporation (AEP) to perform QA/QC Services for Installation of Monitoring Wells at the coal combustion residual (CCR) unit Pond 1, located at the Clinch River Plant in Cleveland, Virginia. The work was performed in accordance with contract release No. 9549870038x215, Owners work order No. 41138212-08. This report documents field activities observed by Wood, including drilling, subsurface sample collection, and monitoring well installation activities at the perimeter of Pond 1 as part of the inplace closure of Pond 1.

Pond 1 is located approximately northeast of the power generating unit and north of the intersection of Route 616 and Route 665. Pond 1 is considered a side-hill impoundment built on an existing hillside. The main dike was constructed by engineered earthen embankments approximately 65 feet (ft.) high on the west, south, and east sides.

The monitoring wells installed in summer-fall 2017 at Pond 1 were replacement wells, designed to take the place of existing monitoring wells at Pond 1 that had to be removed as part of pond closure. The new wells make up the permanent post-closure monitoring well network for the Pond 1 CCR unit.

Groundwater well locations were drilled into bedrock and sampled to evaluate geologic conditions, and groundwater well depths were selected for installation of single screened interval monitoring wells at 12 locations. Seven wells were located downgradient and five wells were located upgradient of Pond 1.

Monitoring well locations are shown on the map in **Figure 1**. Drilling, well construction, and well development activities related to the new monitoring wells installed in 2017 are documented in the sections below.

2.0 Field Activities

2.1 Schedule

Wood, along with a drilling crew from AEP Dolan Civil Department, began well installation activities on 6 June 2017. A summary of key dates related to specific activities is provided below.

- Installation of monitoring wells MW-1601 through MW-1611 was performed from 6 June to 8
 September 2017. Installation activities included drilling and sampling of soils and bedrock at
 monitoring well locations, construction of monitoring wells, well development, and dedicated
 pump installation.
- Installation of a seventh downgradient monitoring well, MW-1612, was performed from 14 to 27 November 2017, to meet permit requirements for minimal distance of 500 feet between downgradient wells. Installation activities included drilling and sampling of soils and bedrock, monitoring well construction, well development, and dedicated pump installation.
- 3. Abandonment of existing piezometers and monitoring wells was completed from 8 to 15 September 2017 by tremie grouting in place to full depth.
- 4. Locations, ground surface elevations, and top of casing elevations were provided by AEP subcontract surveyor, D.R. Price Engineering and Land Surveying, Inc.
- Well development of installed wells MW-1601 through MW-1611 was conducted between 21
 June and 8 September 2017 by the drilling crew. Wood personnel observed well development
 activities.

WOOD



- 6. Initial well development of well MW-1612 was completed on 19 November 2018 by Wood personnel.
- 7. Dedicated pumps were installed in wells MW-1601 through MW-1611 from 31 August through 6 September 2017 by the AEP drill crew.
- 8. The dedicated pump for MW-1612 was installed on 27 November 2017 by Wood personnel.
- 9. Final low flow development of installed wells MW-1601 through MW-1611 was conducted between 31 August 2017 and 7 September 2017 by AEP drill crew.
- 10. Final low flow development for MW-1612 was completed on 27 November 2017 by Wood personnel.

2.2 Staking, Surveying, and Utility Clearance

- 1. All boring and monitoring well locations were located in the field by visual reference and taping and measuring from known site features prior to drilling by Wood personnel.
- 2. Prior to drilling activities, AEP located underground utilities near the new boring and monitoring well locations. Wood coordinated with onsite AEP personnel and drillers to make sure drilling locations were sufficiently removed from the located utilities to avoid damage.
- 3. All boring and monitoring well locations were surveyed both horizontally (northing and easting) and vertically (elevation) after installation, by AEP subcontract surveyor, D.R. Price Engineering and Land Surveying, Inc. Wood received survey information for MW-1701 through MW-1711 on 7 September 2017 and MW-1712 on 6 December 2017.
- 4. Coordinates were provided in the North American Datum of 1983 (NAD83), State Plane Coordinate System (SPCS) Virginia South and elevations were provided in the North American Vertical Datum of 1988 (NAVD88).
- 5. Top of PVC casing and top of concrete elevations were provided by the surveyor for all monitoring well locations after well installation. Ground surface elevation at the time of drilling was estimated by subtracting 3.5 inches (0.292 feet) from the surveyed pad elevation.

2.3 Drilling and Soil Sampling

- 1. At each well location, one monitoring well was installed below the top of rock, in the first encountered apparent water-bearing zone.
- 2. Drilling through unconsolidated overburden was performed by a rotary drill rig equipped with hollow-stem augers with an inside diameter of 4.25 inches and an outside diameter of 7.625 inches.
- 3. Continuous standard penetration testing (SPT) and sampling was performed from ground surface to refusal at all monitoring well locations. Blow counts were recorded and used to develop N values for each sampled interval.
- 4. At refusal, NQ size diamond bit rock coring was advanced into bedrock material with water used as drilling fluid. Water was provided by AEP from the Advanced Waste Plant Discharge (VPDES Permit Outfall 003). Rock core samples were collected, placed into core boxes, logged and photographed prior to transport to on-site storage facility. A geologic field boring log was recorded for each monitoring well location by Wood personnel.

WOOD



- 5. At each location, photos and the geologic field boring log recorded during the sampling of bedrock were used by Wood in consultation with AEP, to determine the depths of the screened interval for each monitoring well.
- 6. Air rotary drilling methods were used to drill into the bedrock formation each monitoring well. A pneumatic downhole hammer, 6.5 inch outside diameter, was utilized to advance through bedrock to the desired monitoring well depth. An industrial diesel-powered air compressor, with in-line oil filters was utilized by the drill crew to power the down hole hammer.
- 7. Boring logs including lithologic descriptions, blow counts, N values, and field observations are included as **Attachment A**.
- 8. All recovered samples were retained by AEP at the Clinch River Plant.

2.4 Monitoring Well Construction

- 1. Final well construction details are summarized in **Table 1**.
- 2. A bentonite pellet seal, consisting of 3/8-inch Pel-Plug TR30 time release coated bentonite pellets, was placed below the bottom of the sand filter pack to fill the bottom of the over drill and seal the lower limits of the sandpacked interval. A minimum of 0.5 feet bentonite seal was placed and hydrated.
- 3. Monitoring wells were constructed of new 2-inch flush threaded schedule 40 polyvinyl chloride (PVC) well casing and new 2-inch threaded schedule 40 PVC 0.010-inch factory slotted well screen.
- 4. A sand filter pack, consisting of quartz silica sand Global No. 5, was placed in the annular space extending from a minimum of 6 inches below the bottom of the well to a minimum of 2 feet above the top of the screen.
- 5. A bentonite pellet seal, consisting of 3/8-inch Pel-Plug TR30 time release coated bentonite pellets, was placed in the annular space above the filter pack and extended to a minimum of 2 feet above the filter pack. The bentonite pellets were hydrated as they were installed.
- 6. Bentonite grout, consisting of Baroid Quick Grout, was placed in the annular space from the bentonite seal to within 2 feet of ground surface using a tremie pipe to fill from the bottom up.
- 7. A lockable aluminum protective casing, extending 2.5 to 3 feet above ground surface, was set in a concrete pad measuring 2 feet by 2 feet in area and 4 inches in thickness. The annulus of the protector casing, around the internal PVC casing, was filled with well pack sand. The concrete pad was constructed to slope away from the protective casing.
- 8. Monitoring Well Construction Logs including construction details, materials details, construction depth, and survey elevations are included as **Attachment B**.

2.5 Well Development

- Well development of installed monitoring wells began on 6 June 2017 at MW-1607 and continued as wells were completed and time allowed. Well development was completed on 8 September 2017, except for MW-1612, which was developed on 19 and 27 November 2017
- 2. Well development was conducted by pumping using a Geotech Environmental Equipment, Inc., portable bladder pump, with skip bonded polyethylene tubing and PTFE coated stainless steel cable. Compressed air was used to power the pumps. During pumping, each well was gently

wood



- surged by moving the pump up and down the screened interval to mobilize fine-grained sediment and facilitate its removal.
- Development at each well included a period of initial development until water began to clear, and then final development. Water quality parameters (discussed in **Section 2.8**) were monitored using a YSI Pro DSS Multiparameter Water Quality Meter, with turbidity probe in the final period of development, until stable readings were achieved.
- 4. During development, depth to water and flow rate measurements were also collected.
- 5. Pumping rates during well development ranged from 0.3 to 1 gallon per minute (gpm).

2.6 Water Level Gauging

- 1. Water level readings were collected periodically during drilling activities and during well development, using an electronic water level indicator, by measuring depth to water from the top of the inside of the 2-inch PVC well casing.
- 2. A full round of water level measurements was collected at completion of well development for monitoring wells MW-1601 through MW-1611 on 7 September 2017 and have continued to be taken by AEP prior to each sampling event.
- 3. All water level readings were converted to elevations relative to NAVD88 using the surveyed top of casing elevations.
- 4. A summary of measured depths to water and water level elevations is provided in **Table 2**. The data in **Table 2** include water level data collected shortly after well completion, and at the start of each of the eight sampling events conducted in the monitoring well network after installation, between October 2017 and December 2018.

2.7 Water Quality Parameters

- 1. Water quality field parameters were collected during well development using a YSI MPS (Multi-Probe System) with turbidity meter.
- 2. Water quality parameters monitored included pH, specific conductance (SC), Temperature, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity.
- 3. Water quality parameters were monitored in the final period of well development once water began to clear.
- 4. In the case of MW-1611, the deepest well, there was insufficient yield during development to test water quality parameters.
- 5. In most cases, the turbidity of the water after development was brought below 10 Nephelometric Turbidity Units (NTU). The exceptions were MW-1601, which had a final turbidity of 65 NTU, and MW-1608, which had a final turbidity of 22 NTU.
- 6. A summary of stabilized water quality parameters is provided in **Table 3**.

2.8 Dedicated Pump Installation

1. Geosmart Dedicated Bladder Pump Sampling Systems. manufactured by Geotech Environmental Equipment, Inc., were installed in the first 11 new monitoring wells on 31 August 2017 and 1 September 2017. The same system was installed in MW-1612 on 27 November 2017.

wood



- 2. Each Geosmart Dedicated Bladder Pump Sampling System consists of a stainless steel Geotech Bladder Pump, 1.66 inch in diameter by 36 inches in length, equipped with polytetrafluoroethylene (PTFE; commonly known as Teflon®) bladders, 1/4- by 3/8-inch (outside diameter), skip bonded polyethylene tubing and PTFE coated stainless steel cable. All tubing and cables are connected through a slip fit cap that fits over the 2 inch well casing.
- 3. Each Geosmart System was assembled by the manufacturer and installed by AEP drill crew (MW-1601 through MW-1611) or Wood personnel (MW-1612) so the pump intake is at a depth corresponding to the lower portion of the well screen.

3.0 Summary and Findings

Figure 1 is a map showing the locations of the monitoring wells as installed. Full boring and well construction logs are provided in the **Attachments**. **Table 1** is a summary of well construction details. **Table 2** summarizes historical water level measurements collected at the new monitoring wells between October 2017 and December 2018. **Table 3** summarizes field water quality parameters measured at the completion of development for each well.

Downgradient borings were advanced from 58.7 feet to 79.4 feet below ground surface (bgs) while upgradient wells were advanced from 104.6 feet to 250.0 feet (bgs).

Downgradient overburden material was found to be generally in accordance with historical information available for the site. Generally, downgradient borings drilled at near toe of the pond embankment encountered fill soils consisting of sandy clay, sandy silt, and silty sand. A layer of fine sand with trace organics and silty sand with trace organics was typically found overlying highly weathered bedrock.

Upgradient wells MW-1601 and MW-1602 encountered limited soils of less than one foot deep. Boring MW-1611 encountered clay and silty sand. Borings MW-1608 and MW-1609 encountered clayey gravel, gravely clay and clay soils.

The bedrock geology information obtained during drilling and installation of the new monitoring wells has been compared to background information (published data for the area, as well as site documents provided for review by AEP). Boring records show that Chattanooga shale was encountered at four downgradient wells (MW-1603, MW-1604, MW-1605 and MW-1612) and three upgradient wells (MW-1601, MW-1602, and MW-1608) located across the eastern portion of the site. Rome formation limestone was encountered at two downgradient wells (MW-1607, and MW-1608) and one upgradient well (MW-1609), on the west portion of the site. Borings drilled to intersect the fault downgradient (MW-1610) and upgradient (MW-1609) of Pond 1 encountered Rome limestone overlying Chattanooga shale. Geologic formations encountered are in general accordance with published geological information available for the site.

At each well location one bedrock monitoring well was installed. Screened intervals for each well were selected based on lithology described from the field boring logs and rock core photos. A summary of screened interval depths and elevations is provided in **Table 1**. All of the wells were constructed with 10 feet of screen. At the downgradient locations, well screens were placed generally between elevations of approximately 1455 ft and 1480 ft. At the upgradient well locations, depths of screens varied: the screens in MW-1601, MW-1602 and MW-1608 were placed at similar elevations to the downgradient wells, between approximately 1460 and 1500 ft. The screen for MW-1609 was placed at a shallower elevation (between elevations 1581 and 1591 ft), about 110 to 125 feet higher than the downgradient wells, and the screen for MW-1611 was placed deeper (between elevations 1430 and 1440 ft), about 30 to 40 feet lower than the downgradient wells.

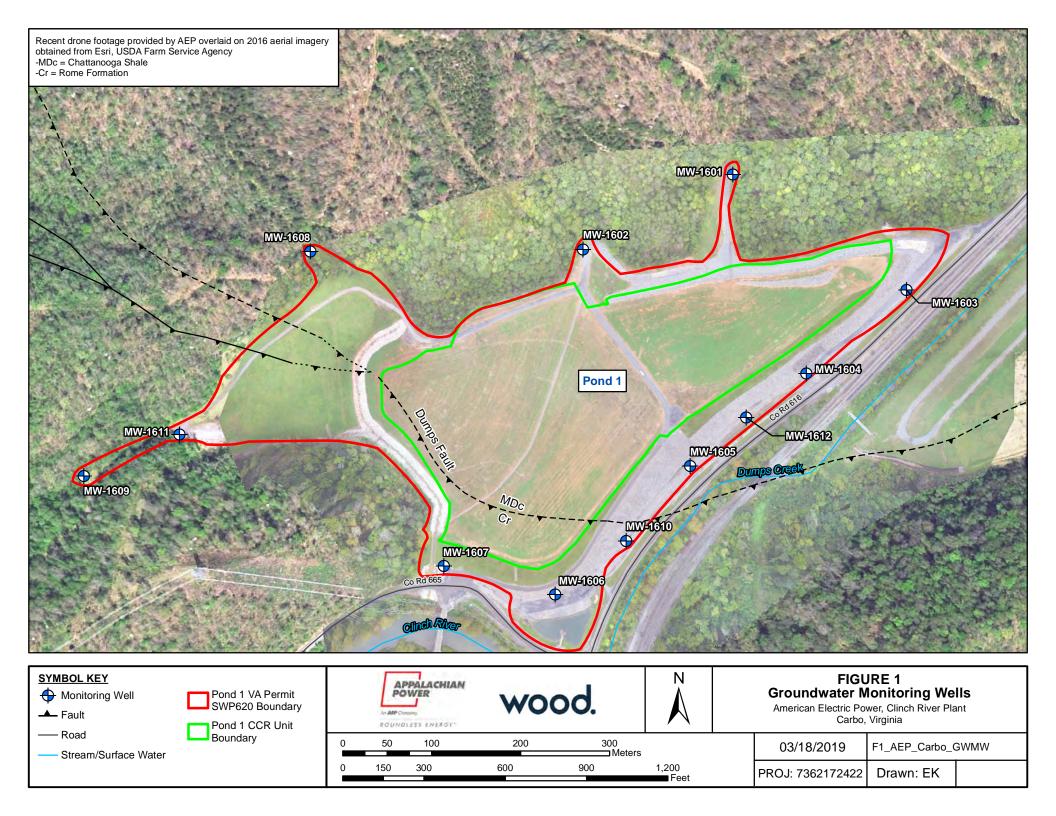
wood



Field water quality data collected during well development are summarized in Table 3. Groundwater temperature ranged from 12.4° C in MW-1609 to 15.9° C in MW-1605. The pH was variable, ranging from 5.95 standard units (S.U.) in MW-1603 to 9.19 S.U. in MW-1608. Specific Conductance (SC) ranged from $406 \mu S/cm$ in MW-1610 to 2306 $\mu S/cm$ in MW-1601. Turbidity ranged from 0.9 NTU in MW-1607 to 65 NTU MW-1601. The high turbidity in MW-1601 was due to very slow recharge rate. MW-1611 did not recover enough for reading of parameters during development period.

wood.

Figure



wood.

Tables

Table 1
Well Construction Details, Pond 1
AEP Clinch River Plant, Cleveland, Russell County, Virginia

							Ground		Well/ Screen		
Monitoring	Location		Geographic	Geographic	тос	Pad	Surface	Stick-Up	Internal	Well/	Screen
Well	Relative to	Date	Coordinate	Coordinate	Elevation	Elevation	Elevation	TOC-GS	Diameter	Screen	Slot Size
ID	Pond 1	Completed	Northing	Easting	(ft NAVD88)	(ft NAVD88)	(ft NAVD88)	(ft)	(in)	Material	(in)
MW-1601	Upgradient	7/10/2017	3522899.391	10403325.694	1577.540	1574.700	1574.41	3.13	2.0	PVC	0.010
MW-1602	Upgradient	6/29/2017	3522623.377	10402772.846	1586.593	1584.377	1584.09	2.51	2.0	PVC	0.010
MW-1603	Downgradient	6/26/2017	3522471.570	10403966.842	1517.666	1515.645	1515.35	2.31	2.0	PVC	0.010
MW-1604	Downgradient	6/23/2017	3522164.155	10403597.550	1519.650	1517.439	1517.15	2.50	2.0	PVC	0.010
MW-1605	Downgradient	6/14/2017	3521823.742	10403168.699	1518.623	1516.291	1516.00	2.62	2.0	PVC	0.010
MW-1606	Downgradient	6/13/2017	3521349.913	10402669.892	1522.909	1520.755	1520.46	2.45	2.0	PVC	0.010
MW-1607	Downgradient	6/14/2017	3521454.885	10402260.058	1530.014	1527.718	1527.43	2.59	2.0	PVC	0.010
MW-1608	Upgradient	7/13/2017	3522614.871	10401766.947	1611.237	1608.817	1608.53	2.71	2.0	PVC	0.010
MW-1609	Upgradient	7/31/2017	3521785.791	10400932.001	1728.971	1725.604	1725.31	3.66	2.0	PVC	0.010
MW-1610	Downgradient	8/15/2017	3521548.022	10402932.881	1520.121	1517.883	1517.59	2.53	2.0	PVC	0.010
MW-1611	Upgradient	8/9/2017	3521939.758	10401284.965	1656.619	1654.147	1653.86	2.76	2.0	PVC	0.010
MW-1612	Downgradient	11/18/2017	3522002.383	10402324.731	1520.996	1518.398	1518.10	2.90	2.0	PVC	0.010

TOC = top of PVC casing

GS = ground surface

ft = foot or feet

in = inch of inches

ft bgs = feet below ground surface

ft btoc = feet below top of PVC casing

ft NAVD88 = feet above North American Vertical Datum of 1988

TOC and pad elevations surveyed by D.R. Price Engineering and Land Surveying, Inc. received on 7 September 2017 (MW-1701 thought MW-1711) and 6 December 2017 (MW-1712)

Ground surface elevations estimated as 3.5 inches below top of pad

Depth to bottom of well (ft btoc) based on length of pipe in finished wel

Geographic coordinates in State Plane Coordinate System (SPCS) Virginia South

Table 1
Well Construction Details, Pond 1
AEP Clinch River Plant, Cleveland, Russell County, Virginia

Monitoring Well	Location Relative to	Date	Geographic Coordinate	Geographic Coordinate	Nominal Length of Screen	Depth to Top of Bedrock	Depth to Bottom of NQ Rock Core	Depth to Bottom of 6-in Boring	Depth to Top of Screen	Depth to Bottom of Screen	Depth to Bottom of Well
ID	Pond 1	Completed	Northing	Easting	(ft)	(ft bgs)	(ft bgs)	(ft bgs)	(ft bgs)	(ft bgs)	(ft bgs)
MW-1601	Upgradient	7/10/2017	3522899.391	10403325.694	10	0.7	124.0	102.2	90.3	100.0	100.5
MW-1602	Upgradient	6/29/2017	3522623.377	10402772.846	10	0.9	104.6	95.8	82.4	92.1	92.6
MW-1603	Downgradient	6/26/2017	3522471.570	10403966.842	10	24.0	87.6	55.7	36.3	46.0	46.5
MW-1604	Downgradient	6/23/2017	3522164.155	10403597.550	10	31.8	64.5	57.0	45.3	55.0	55.5
MW-1605	Downgradient	6/14/2017	3521823.742	10403168.699	10	30.0	64.6	49.9	37.2	46.9	47.4
MW-1606	Downgradient	6/13/2017	3521349.913	10402669.892	10	34.1	74.3	55.7	40.6	50.3	50.8
MW-1607	Downgradient	6/14/2017	3521454.885	10402260.058	10	39.1	79.6	59.0	47.8	57.5	58.0
MW-1608	Upgradient	7/13/2017	3522614.871	10401766.947	10	14.5	165.0	150.0	137.3	147.0	147.5
MW-1609	Upgradient	7/31/2017	3521785.791	10400932.001	10	4.5	250.0	147.0	134.3	144.0	144.5
MW-1610	Downgradient	8/15/2017	3521548.022	10402932.881	10	29.3	58.7	52.5	39.3	49.0	49.5
MW-1611	Upgradient	8/9/2017	3521939.758	10401284.965	10	26.0	243.5	227.3	214.0	223.7	224.2
MW-1612	Downgradient	11/18/2017	3522002.383	10402324.731	10	33.5	64.6	63.5	51.6	61.6	62.0

TOC = top of PVC casing

GS = ground surface

ft = foot or feet

in = inch of inches

ft bgs = feet below ground surface

ft btoc = feet below top of PVC casing

ft NAVD88 = feet above North American Vertical Datum of 1988

TOC and pad elevations surveyed by D.R. Price Engineering and Land Surveying, Iı

Ground surface elevations estimated as 3.5 inches below top of pad

Depth to bottom of well (ft btoc) based on length of pipe in finished wel

Geographic coordinates in State Plane Coordinate System (SPCS) Virginia South

Table 1
Well Construction Details, Pond 1
AEP Clinch River Plant, Cleveland, Russell County, Virginia

Monitoring	Location		Geographic	Geographic	Top of Screen	Bottom of Screen	Bottom of Well	Bottom of 6-in Boring	Bottom of NQ Rock Core	Top of Bedrock
Well	Relative to	Date	Coordinate	Coordinate	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation
ID	Pond 1	Completed	Northing	Easting	(ft NAVD88)	(ft NAVD88)	(ft NAVD88)	(ft NAVD88)	(ft NAVD88)	(ft NAVD88)
MW-1601	Upgradient	7/10/2017	3522899.391	10403325.694	1484.1	1474.4	1474.5	1472.2	1450.4	1573.7
MW-1602	Upgradient	6/29/2017	3522623.377	10402772.846	1501.7	1492.0	1491.5	1488.3	1479.5	1583.2
MW-1603	Downgradient	6/26/2017	3522471.570	10403966.842	1479.1	1469.4	1468.6	1459.7	1427.8	1491.4
MW-1604	Downgradient	6/23/2017	3522164.155	10403597.550	1471.8	1462.1	1461.7	1460.1	1452.6	1485.3
MW-1605	Downgradient	6/14/2017	3521823.742	10403168.699	1478.8	1469.1	1468.6	1466.1	1451.4	1486.0
MW-1606	Downgradient	6/13/2017	3521349.913	10402669.892	1479.9	1470.2	1469.6	1464.8	1446.2	1486.4
MW-1607	Downgradient	6/14/2017	3521454.885	10402260.058	1479.6	1469.9	1469.5	1468.4	1447.8	1488.3
MW-1608	Upgradient	7/13/2017	3522614.871	10401766.947	1471.2	1461.5	1461.2	1458.5	1443.5	1594.0
MW-1609	Upgradient	7/31/2017	3521785.791	10400932.001	1591.0	1581.3	1582.0	1578.3	1475.3	1720.8
MW-1610	Downgradient	8/15/2017	3521548.022	10402932.881	1478.3	1468.6	1468.1	1465.1	1458.9	1488.3
MW-1611	Upgradient	8/9/2017	3521939.758	10401284.965	1439.9	1430.2	1429.9	1426.6	1410.4	1627.9
MW-1612	Downgradient	11/18/2017	3522002.383	10402324.731	1466.5	1456.5	1456.5	1454.6	1453.5	1484.6

TOC = top of PVC casing

GS = ground surface

ft = foot or feet

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ft NAVD88 = feet above North American Vertical Datum of 1988

TOC and pad elevations surveyed by D.R. Price Engineering and Land Surveying, Iı

Ground surface elevations estimated as 3.5 inches below top of pad

Depth to bottom of well (ft btoc) based on length of pipe in finished wel

Geographic coordinates in State Plane Coordinate System (SPCS) Virginia South

Table 2
Water Level Elevation Summary, Pond 1
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Top of	Final	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8
Monitoring Well	Riser	9/1/17 to 9/7/17	10/16/2017	12/11/2017	2/13/2018	4/9/2018	6/7/2018	8/21/2018	10/15/2018	12/11/2018
	(ft NAVD88)				Depth	to Water (ft b	toc)			
MW-1601	1577.540	66.6	75.68	67.23	62.81	60.39	57.06	54.23	52.44	52.17
MW-1602	1586.593	28.69	31.71	31.15	22.07	27.05	27.86	27.52	27.14	27.13
MW-1603	1517.666	6.58	7.93	8.01	6.72	7.35	7.40	7.12	7.27	7.48
MW-1604	1519.650	11.23	12.28	12.03	10.88	11.38	11.32	11.14	11.14	11.38
MW-1605	1518.623	15.9	8.56	12.39	10.93	12.38	12.27	12.08	12.11	12.30
MW-1606	1522.909	30.44	30.62	30.55	26.20	28.39	28.73	29.58	29.01	29.13
MW-1607	1530.014	20.12	25.28	25.54	0.55	11.54	17.30	22.09	11.24	15.15
MW-1608	1611.237	20.2	20.77	20.95	19.83	17.97	17.96	19.18	19.95	18.36
MW-1609	1728.971	70.94	73.35	73.89	62.76	63.32	68.29	72.25	70.45	65.45
MW-1610	1520.121	16.61	16.24	16.12	14.18	15.46	15.63	16.00	15.68	15.72
MW-1611	1656.619	220.2	211.17	202.24	198.83	196.72	191.63	183.65	187.04	191.63
MW-1612	1520.996	13.05 (11/27/17)	not installed	13.76	12.43	13.24	13.32	13.01	12.94	13.22
					Water Leve	l Elevation (ft	NAVD88)			
MW-1601	1577.540	1510.940	1501.86	1510.310	1514.730	1517.150	1520.480	1523.310	1525.100	1525.370
MW-1602	1586.593	1557.903	1554.883	1555.443	1564.523	1559.543	1558.733	1559.073	1559.453	1559.463
MW-1603	1517.666	1511.086	1509.736	1509.656	1510.946	1510.316	1510.266	1510.546	1510.396	1510.186
MW-1604	1519.650	1508.420	1507.37	1507.620	1508.770	1508.270	1508.330	1508.510	1508.510	1508.270
MW-1605	1518.623	1502.723	1510.063	1506.233	1507.693	1506.243	1506.353	1506.543	1506.513	1506.323
MW-1606	1522.909	1492.469	1492.289	1492.359	1496.709	1494.519	1494.179	1493.329	1493.899	1493.779
MW-1607	1530.014	1509.894	1504.734	1504.474	1529.464	1518.474	1512.714	1507.924	1518.774	1514.864
MW-1608	1611.237	1591.037	1590.467	1590.287	1591.407	1593.267	1593.277	1592.057	1591.287	1592.877
MW-1609	1728.971	1658.031	1655.621	1655.081	1666.211	1665.651	1660.681	1656.721	1658.521	1663.521
MW-1610	1520.121	1503.511	1503.881	1504.001	1505.941	1504.661	1504.491	1504.121	1504.441	1504.401
MW-1611	1656.619	1436.419	1445.449	1454.379	1457.789	1459.899	1464.989	1472.969	1469.579	1464.989
MW-1612	1520.996	1507.946	not installed	1507.236	1508.566	1507.756	1507.676	1507.986	1508.056	1507.776

All depth to water measurements in this table provided by AEP

ft = foot or feet

bgs = below ground surface

ft btoc = ft below top of PVC casing

ft NAVD88 = ft above North American Vertical Datum of 1988

Table 3
Well Development - Field Water Quality Data, Pond 1
AEP Clinch River Plant, Cleveland, Russell County, Virginia

Monitoring Well	Date	Initial Static Depth to Water (ft)	Purge Rate (mL/min)	Volume Purged (gal)	Temperature (deg. C)	Specific Conductance (μS/cm)	pH (standard units)	Dissoved Oxygen (mg/L)	Turbidity (NTU)	Oxidation Reduction Potential (mV)
MW-1601	9/7/2017	66.6	550	7	12.8	2306	9.06	0.23	65	-23605
MW-1602	9/6/2017	28.69	1000	7.5	13.4	1317	8.98	0.17	9.7	-710
MW-1603	9/1/2017	6.58	1000	18	15.8	489	5.95	7.4	7.3	-31.3
MW-1604	9/1/2017	11.23	900	5	15.4	586	6.75	0.20	7.4	-98.7
MW-1605	9/1/2017	15.9	735	4.5	15.9	1075	7.6	0.18	2.9	-150.2
MW-1606	9/7/2017	30.44	1200	30	15.4	1038	6.78	0.01	9.8	164.5
MW-1607	9/1/2017	20.12	600	5	14.7	427	7.89	0.20	0.9	-147.8
MW-1608	9/6/2017	20.2	1000	15	13.1	1116	9.19	0.07	22	-247.8
MW-1609	9/6/2017	70.94	1200	10	12.4	1128	7.41	0.14	3.7	-91.2
MW-1610	9/1/2017	16.61	600	5.25	15.7	406	7.48	0.77	1.2	-91.4
MW-1611	9/6/2017	220.2	410	1	Pump dry, not e	enough volume t	to test.			
MW-1612	11/27/2017	13.05	700	18	15.15	903	6.67	0.54	9.8	-39.2

Values shown are from measurements made after stabilization of parameters made with a YSI Pro DSS Multiparameter Water Quality Meter with trubidity probe.

ft = feet

mL/min = milliliters per minute

gal = gallons

deg. C = degrees Celsius

 μ S/cm = microSiemens per centimeter

mg/L = milligrams per liter

NTU = nephelometric turbidity units

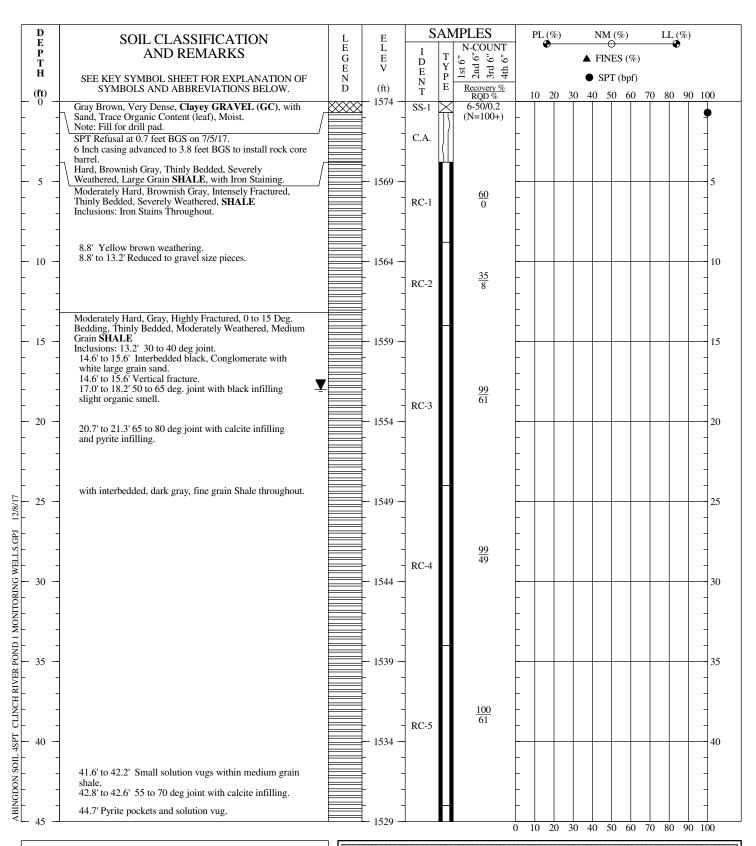
mV = milliVolts

wood.

Attachments

wood.

Attachment A Boring Logs



ELEVATION: 1,574.408 NORTHING: 3522899.391 EASTING: 10403325.694 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: JCM

REMARKS: Ground water monitoring well set from 88.3' to 101.0' on

7/8/2017 to 7/10/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1601

Date Drilled: 7/5/2017 to 7/7/2017

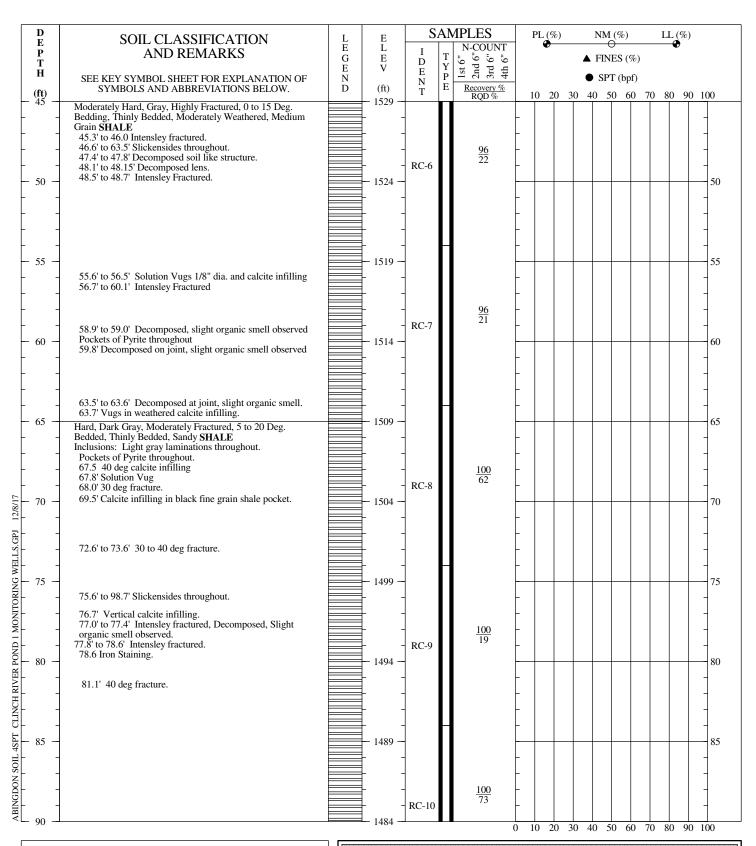
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia **PAGE** 1 **OF** 3



Amec Foster Wheeler



ELEVATION: 1,574.408

NORTHING: 3522899.391

EASTING: 10403325.694

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 88.3' to 101.0' on

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TEST BORING RECORD

Boring: MW-1601

Date Drilled: 7/5/2017 to 7/7/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

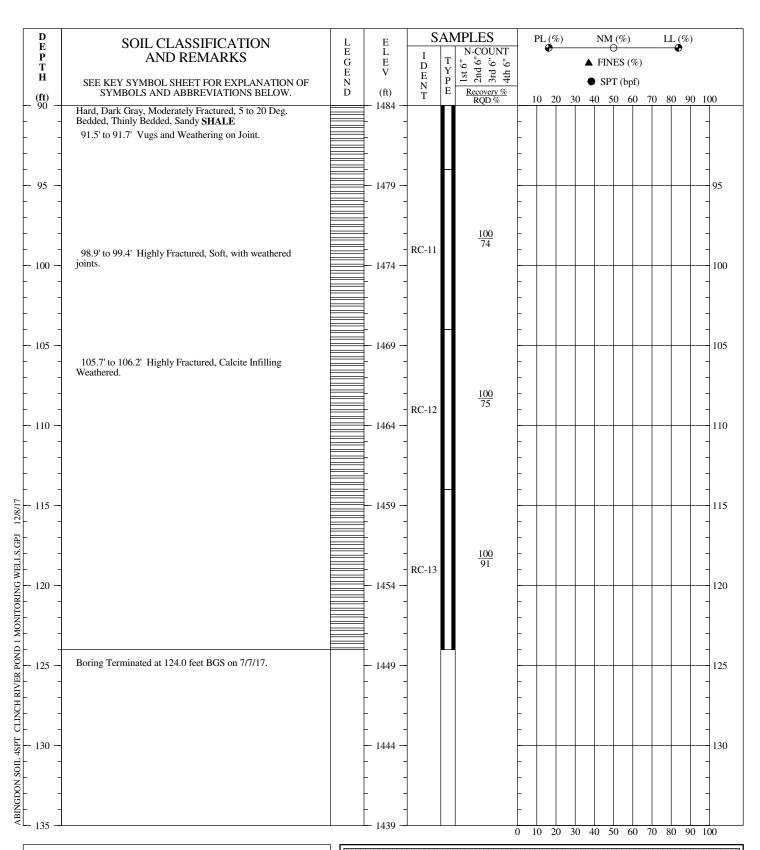
Project No.: 3050-17-0345

Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,574.408 NORTHING: 3522899.391 EASTING: 10403325.694 DRILLER: AEP - Racer EQUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: JCM

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TEST BORING RECORD

Boring: MW-1601

Date Drilled: 7/5/2017 to 7/7/2017

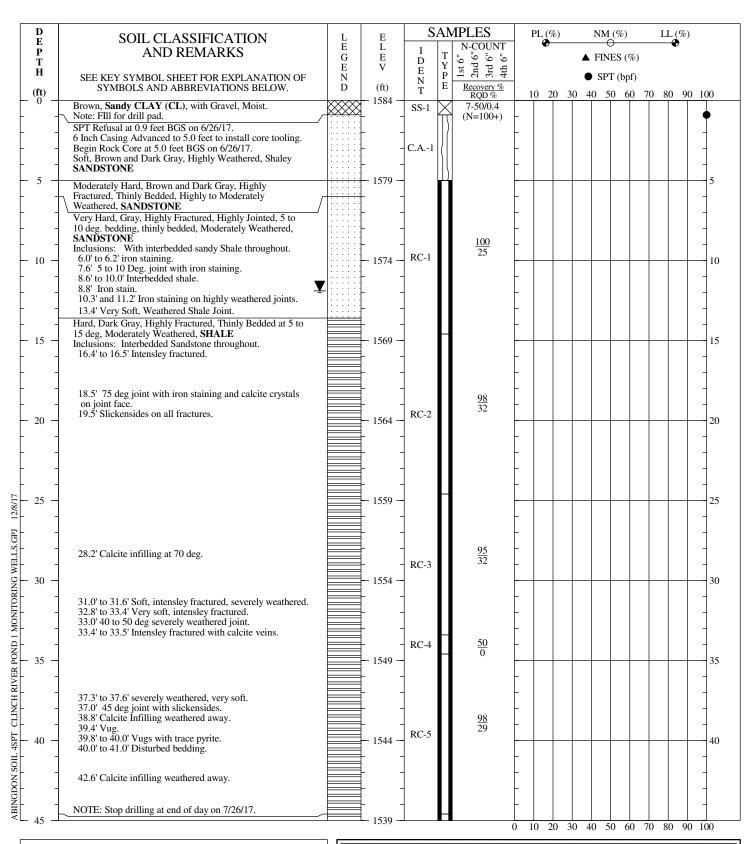
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 3 OF 3



Amec Foster Wheeler



ELEVATION: 1,584.085

NORTHING: 3522623.377

EASTING: 10402772.846

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 80.0' to 93.1' on

6/28/2017 to 6/29/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1602

Date Drilled: 6/26/2017 to 6/27/2017

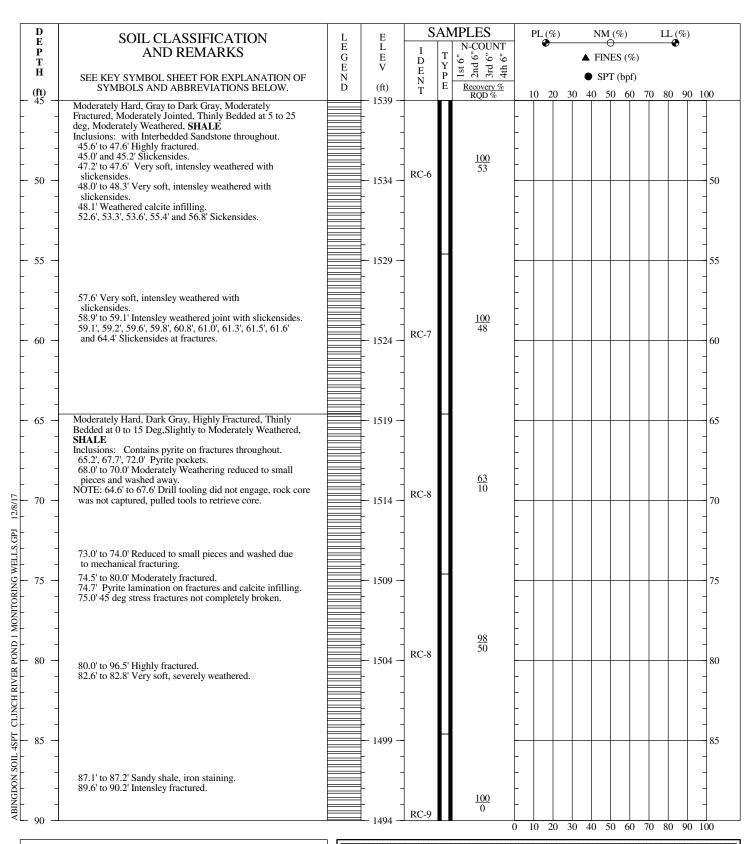
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

rirginia PAGE 1 OF 3



Amec Foster Wheeler



ELEVATION: 1,584.085 NORTHING: 3522623.377 EASTING: 10402772.846 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 80.0' to 93.1' on

6/28/2017 to 6/29/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION, SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1602

Date Drilled: 6/26/2017 to 6/27/2017

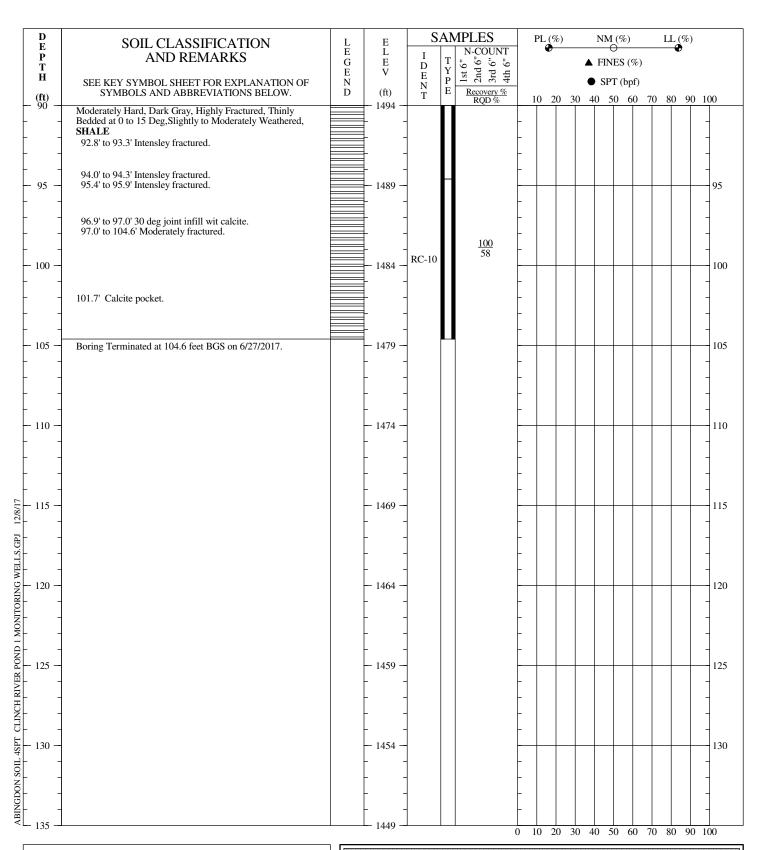
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

inia PAGE 2 OF 3



Amec Foster Wheeler



ELEVATION: 1,584.085 NORTHING: 3522623.377 EASTING: 10402772.846 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 80.0' to 93.1' on

6/28/2017 to 6/29/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION, SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1602

Date Drilled: 6/26/2017 to 6/27/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

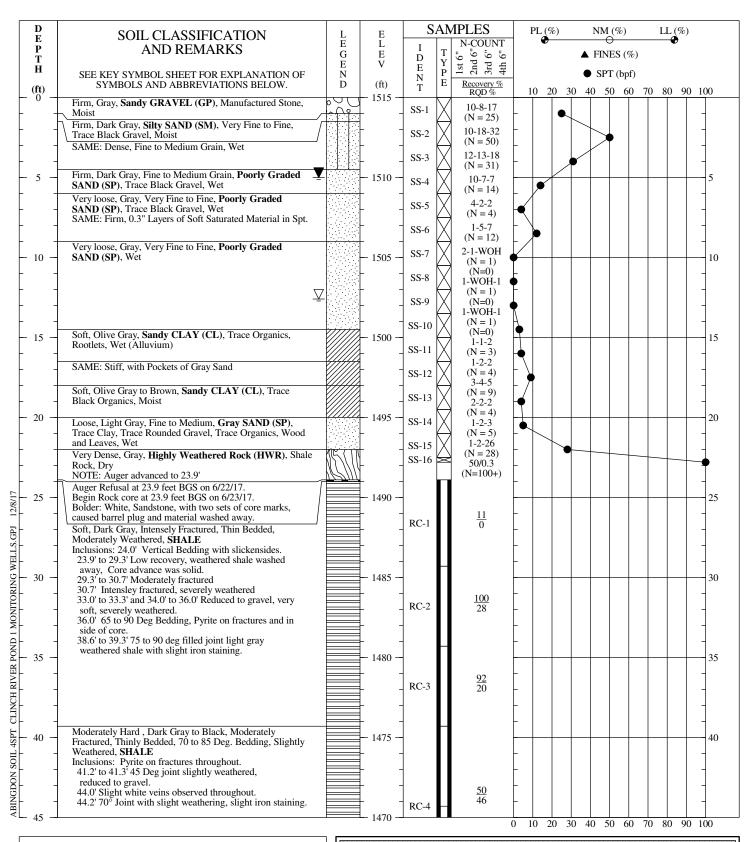
Project No.: 3050-17-0345
Project Location: Carbo, Virginia



Amec Foster Wheeler

Environment & Infrastructure, Inc. 1070 West Main Street, Suite 5 Abingdon, Virginia 24210

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ELEVATION: 1,515.353 NORTHING: 3522471.57 EASTING: 10403966.842 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: ICM

REMARKS: Ground water monitoring well set from 34.0' to 47.0' on

6/24/2017 to 6/26/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1603

Date Drilled: 6/22/2017 to 6/23/2017

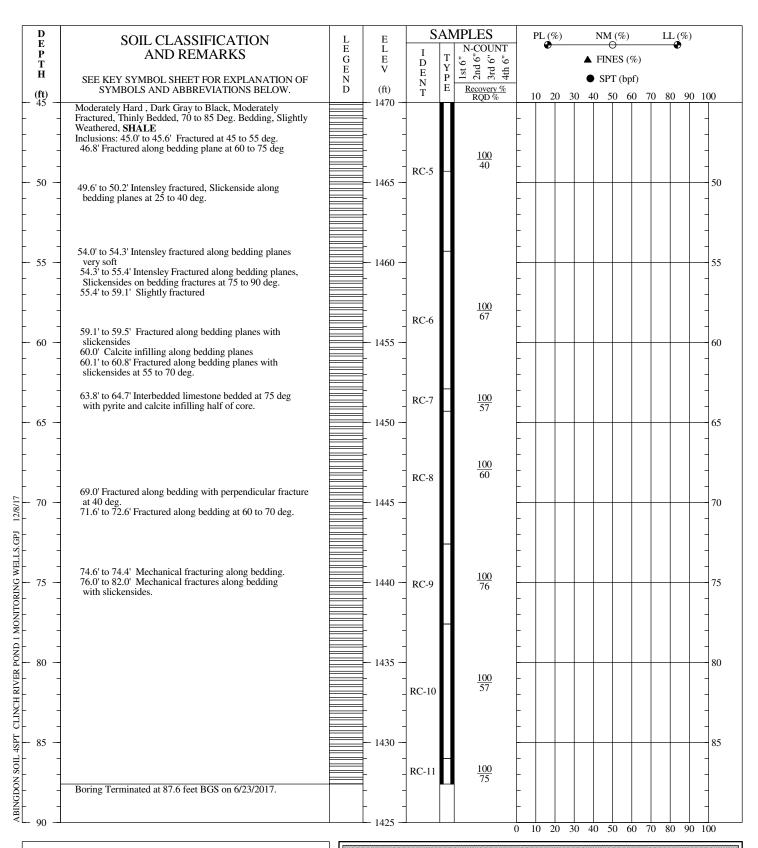
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 1 OF 2



Amec Foster Wheeler



ELEVATION: 1,515.353

NORTHING: 3522471.57

EASTING: 10403966.842

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 34.0' to 47.0' on

6/24/2017 to 6/26/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1603

Date Drilled: 6/22/2017 to 6/23/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

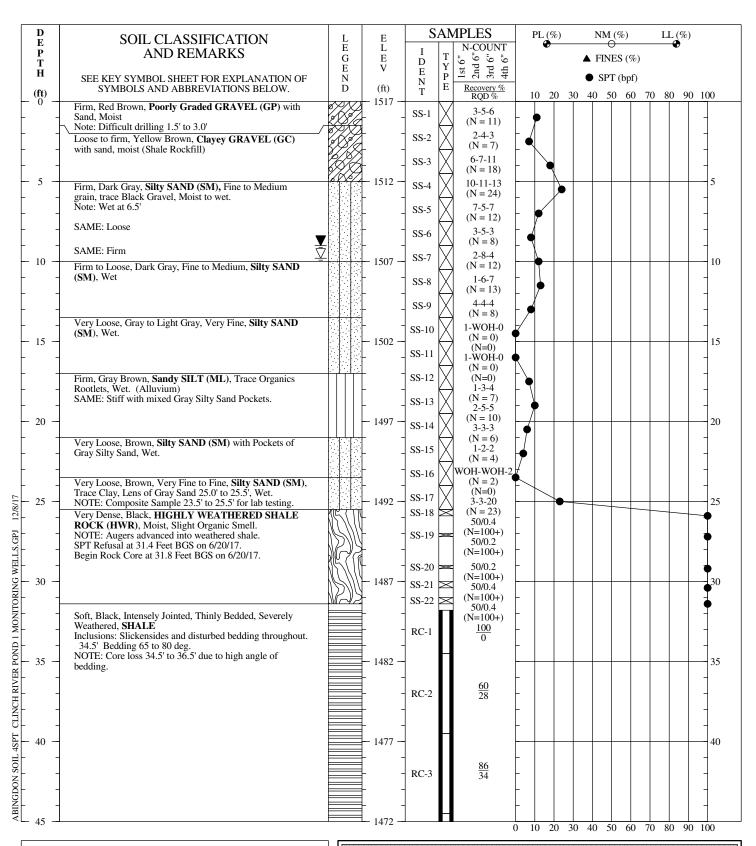
Project No.: 3050-17-0345
Project Location: Carbo, Virginia



Amec Foster Wheeler

Environment & Infrastructure, Inc. 1070 West Main Street, Suite 5 Abingdon, Virginia 24210

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ELEVATION: 1,517.147

NORTHING: 3522164.155

EASTING: 10403597.55

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 41.3' to 56.0' on

6/20/2017 to 6/21/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1604

Date Drilled: 6/20/2017 to 6/20/2017

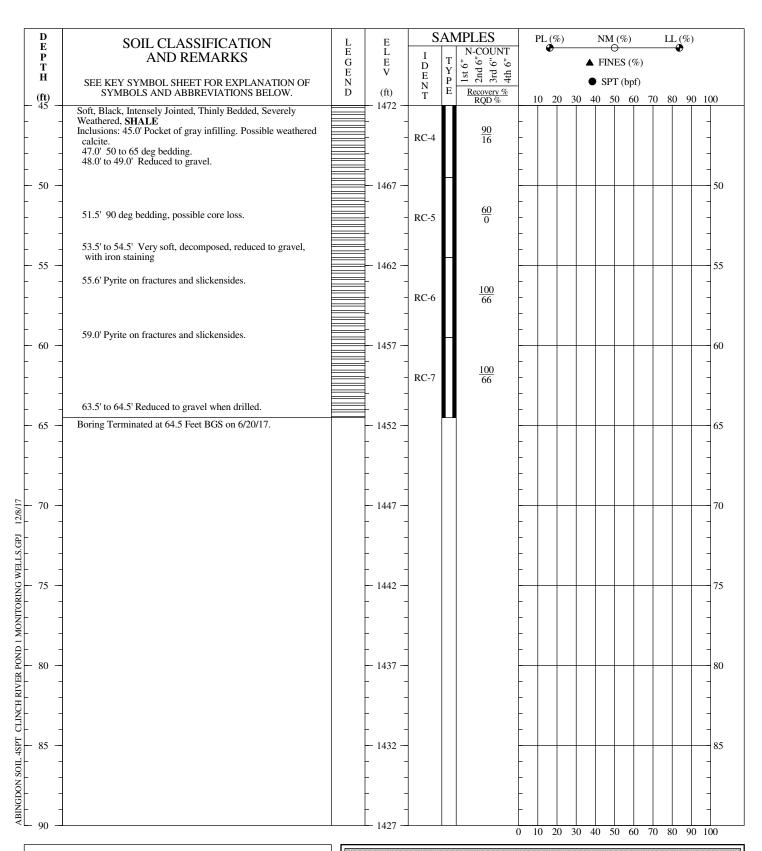
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,517.147 NORTHING: 3522164.155 EASTING: 10403597.55 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 41.3' to 56.0' on

6/20/2017 to 6/21/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1604

Date Drilled: 6/20/2017 to 6/20/2017

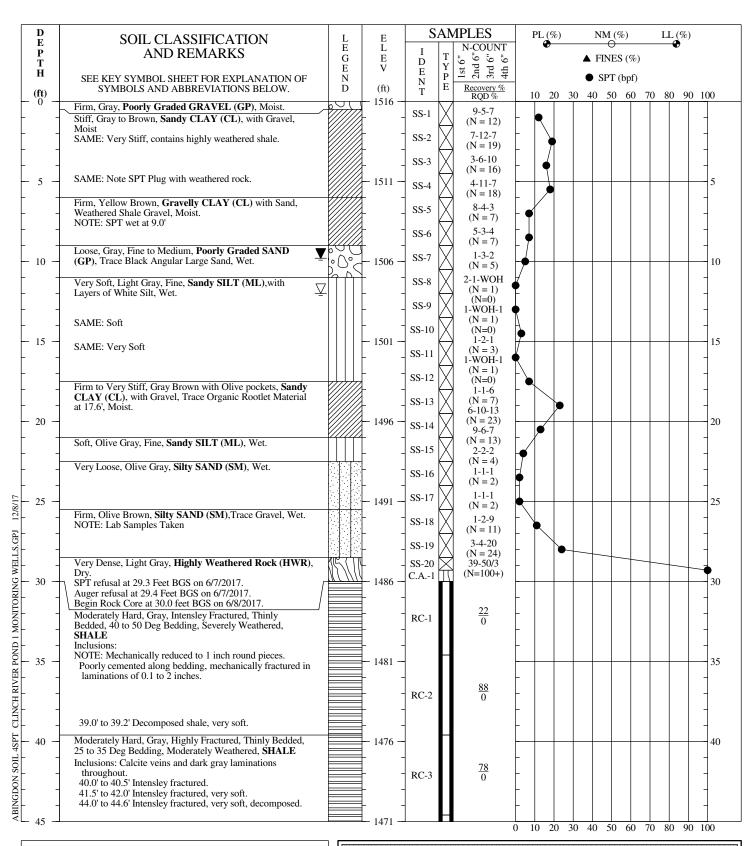
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,515.999

NORTHING: 3521823.742

EASTING: 10403168.699

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 35.0' to 47.9' on

6/13/2017 to 6/14/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1605

Date Drilled: 6/7/2017 to 6/8/2017

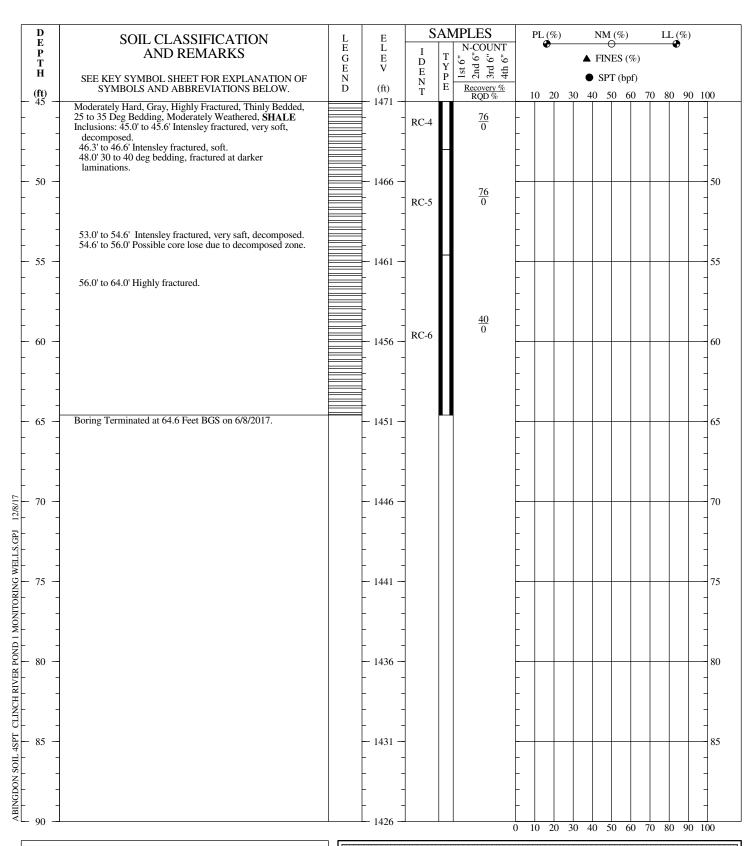
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 1 OF 2



Amec Foster Wheeler



ELEVATION: 1,515.999

NORTHING: 3521823.742

EASTING: 10403168.699

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 35.0' to 47.9' on

6/13/2017 to 6/14/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION, SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1605

Date Drilled: 6/7/2017 to 6/8/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

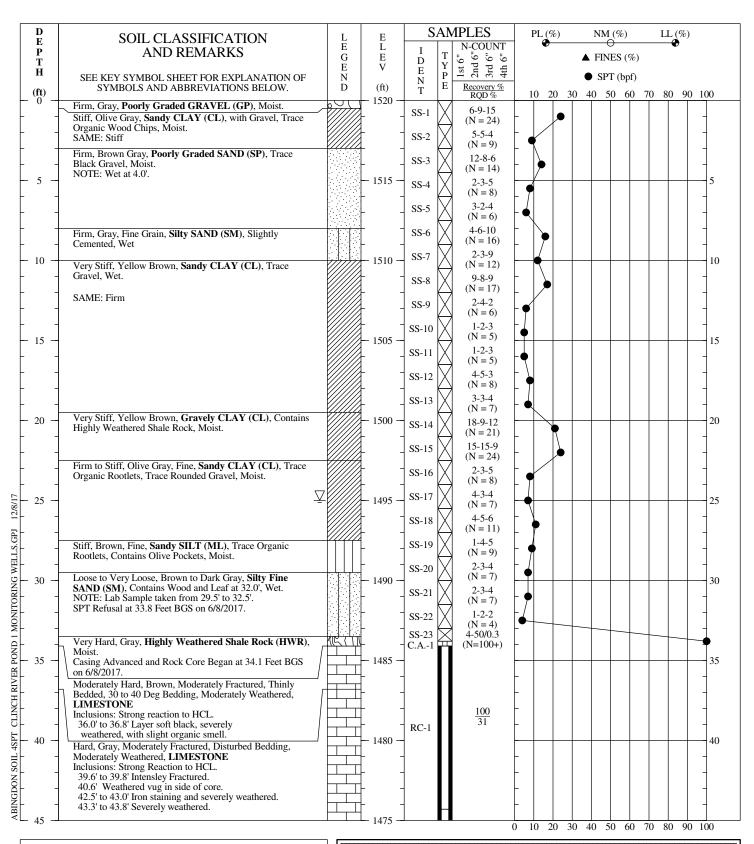
Project No.: 3050-17-0345

Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,520.463

NORTHING: 3521349.913

EASTING: 10402669.892

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 37.8' to 51.3' on

6/12/2017 to 6/13/2017. *Boring Cave Caved Dry at

50.0' on 6/10/17.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1606

Date Drilled: 6/8/2017 to 6/10/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

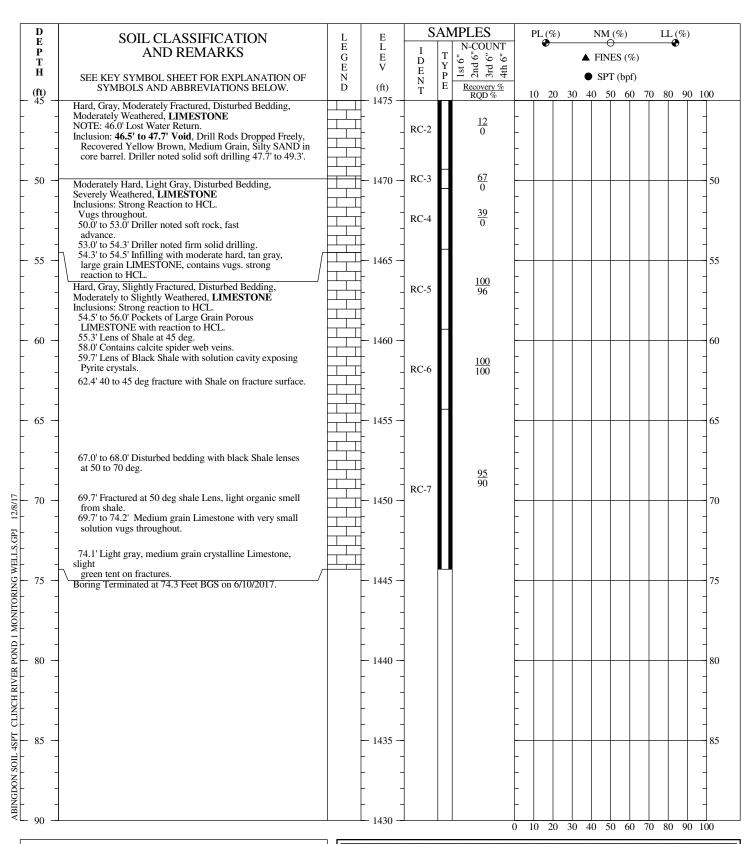
Project No.: 3050-17-0345

Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,520.463

NORTHING: 3521349.913

EASTING: 10402669.892

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 37.8' to 51.3' on

6/12/2017 to 6/13/2017. *Boring Cave Caved Dry at

50.0' on 6/10/17.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1606

Date Drilled: 6/8/2017 to 6/10/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

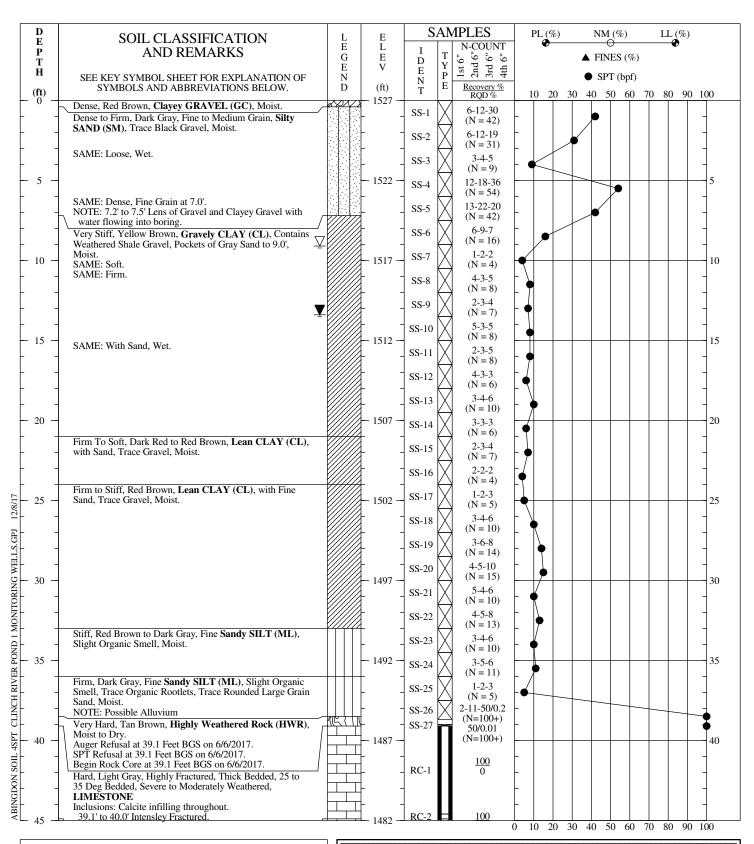
Project No.: 3050-17-0345
Project Location: Carbo, Virginia



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ELEVATION: 1,527.426

NORTHING: 3521454.885

EASTING: 10402260.058

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 45.7' to 58.5' on

6/13/2017 to 6/14/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1607

Date Drilled: 6/6/2017 to 6/7/2017

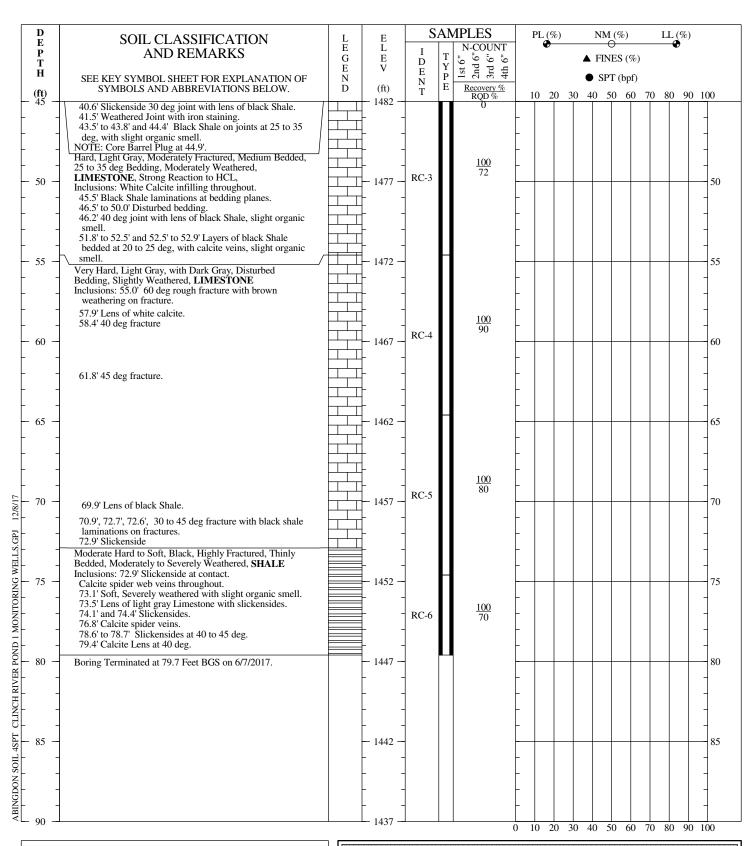
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

Virginia PAGE 1 OF 2



Amec Foster Wheeler



ELEVATION: 1,527.426 NORTHING: 3521454.885 EASTING: 10402260.058 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: REMARKS: Ground water monitoring well set from 45.7' to 58.5' on

6/13/2017 to 6/14/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1607

Date Drilled: 6/6/2017 to 6/7/2017

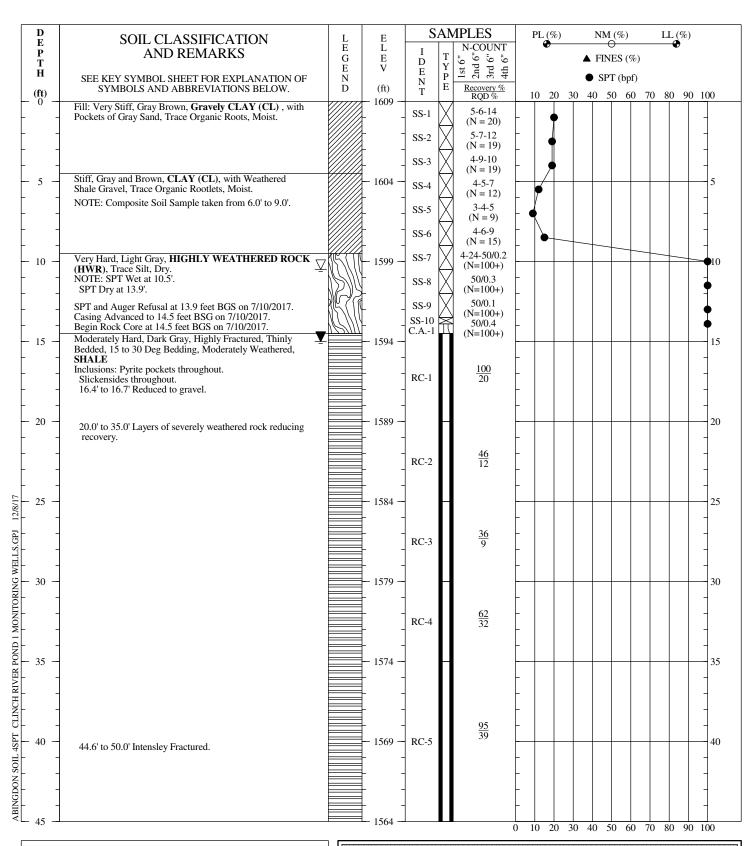
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,608.525 NORTHING: 3522614.871 EASTING: 10401766.947 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: ICM

REMARKS: Ground water monitoring well set from 133.0' to 148.0'

on 7/12/2017 to 7/13/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1608

Date Drilled: 7/10/2017 to 7/11/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

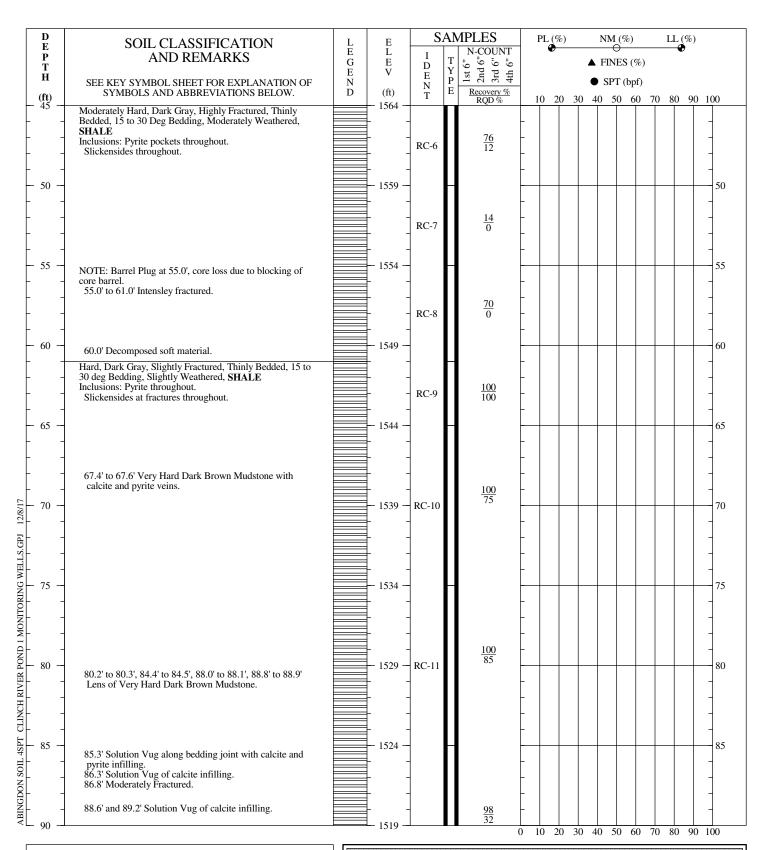
Project No.: 3050-17-0345

Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,608.525 NORTHING: 3522614.871 EASTING: 10401766.947 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 133.0' to 148.0'

on 7/12/2017 to 7/13/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1608

Date Drilled: 7/10/2017 to 7/11/2017

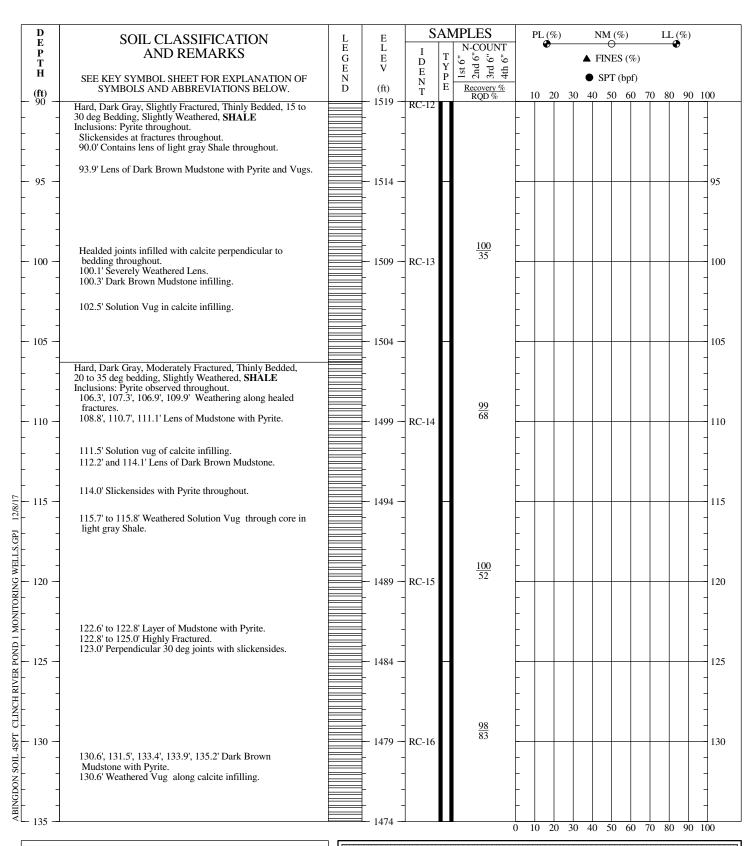
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

, Virginia PAGE 2 OF 4



Amec Foster Wheeler



ELEVATION: 1,608.525 NORTHING: 3522614.871 EASTING: 10401766.947 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 133.0' to 148.0'

on 7/12/2017 to 7/13/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1608

Date Drilled: 7/10/2017 to 7/11/2017

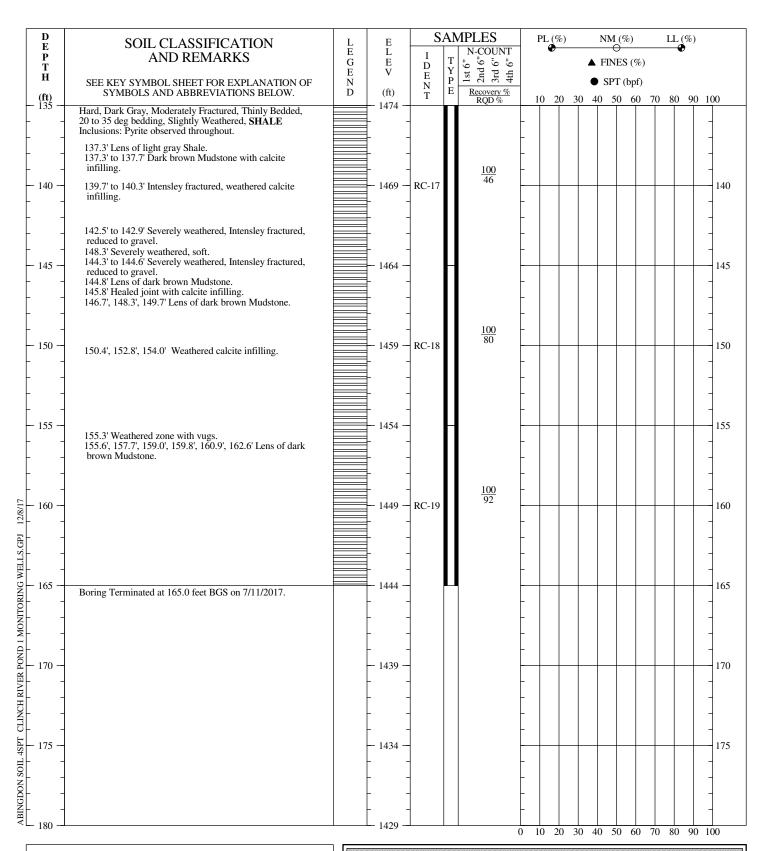
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,608.525 NORTHING: 3522614.871 EASTING: 10401766.947 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 133.0' to 148.0'

on 7/12/2017 to 7/13/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1608

Date Drilled: 7/10/2017 to 7/11/2017

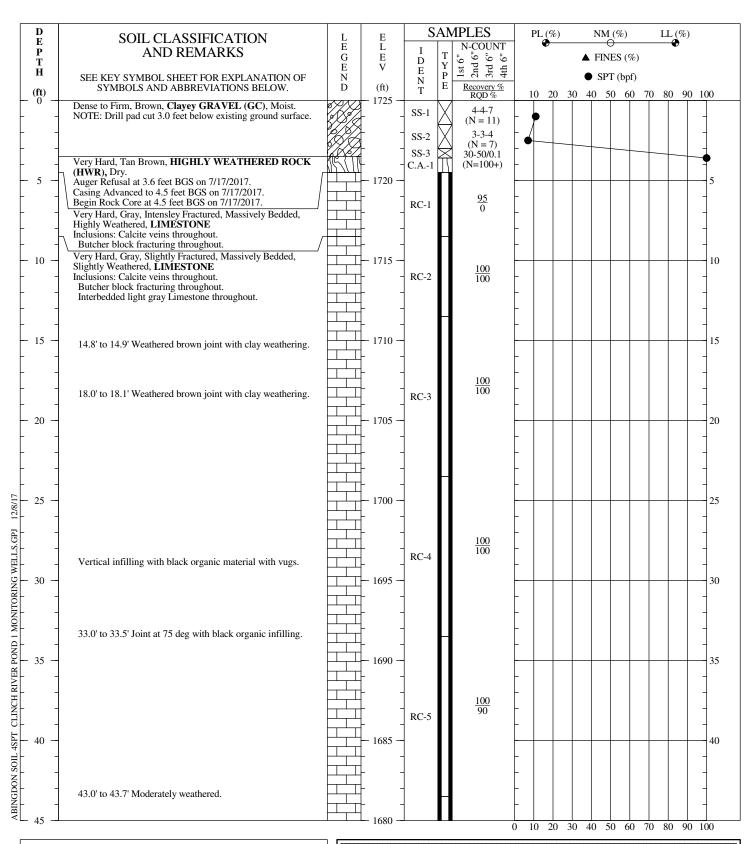
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

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Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

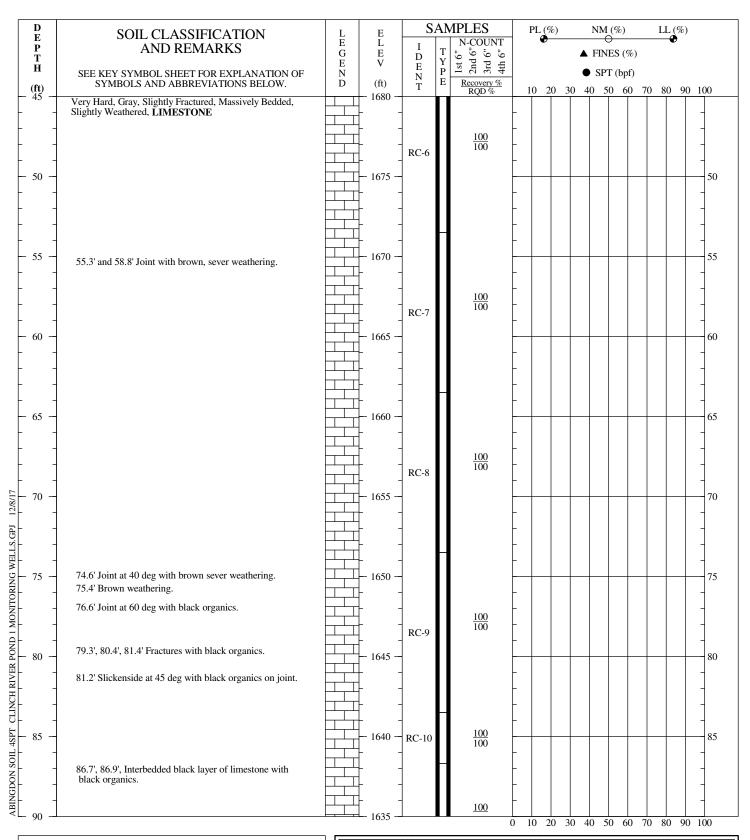
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2 LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

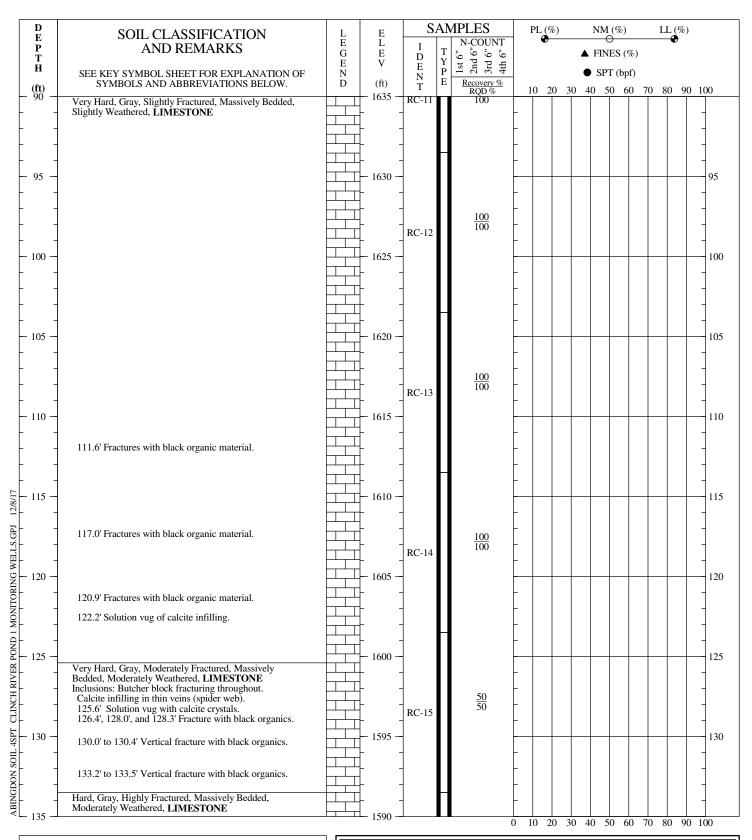
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 2 OF 6



Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

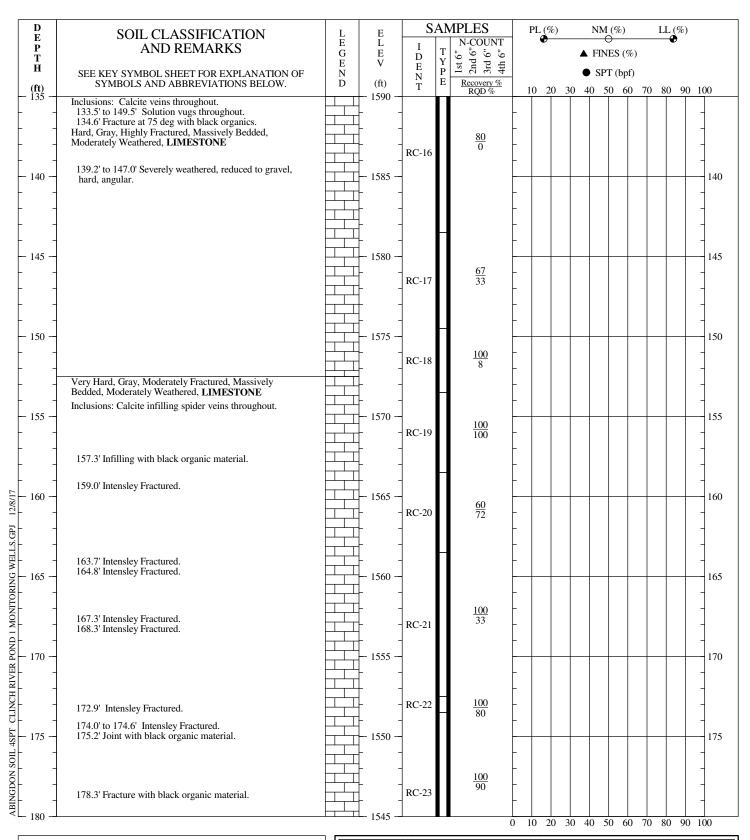
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

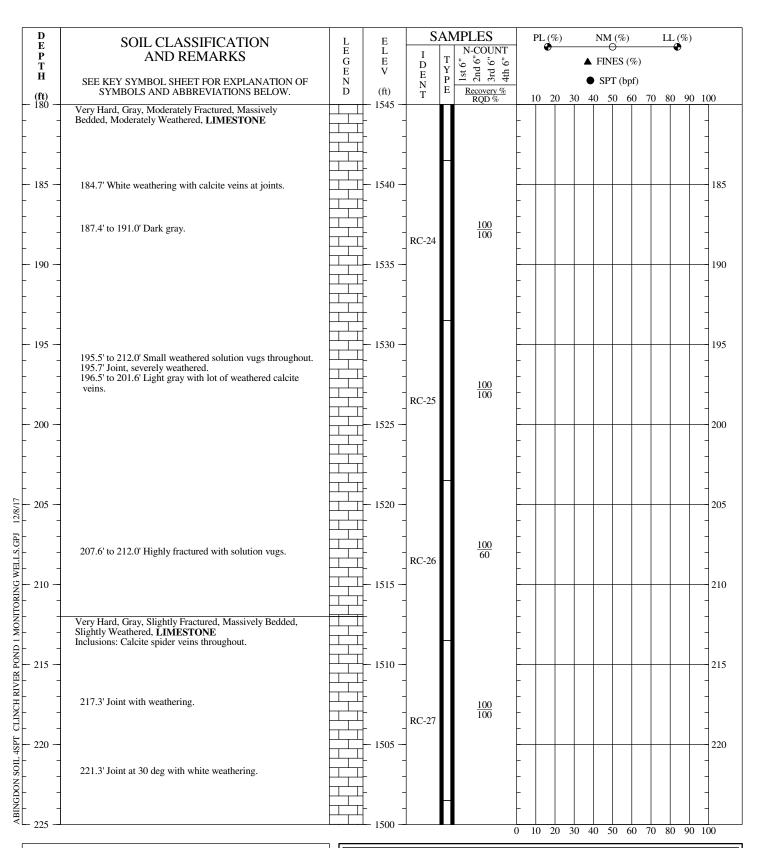
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

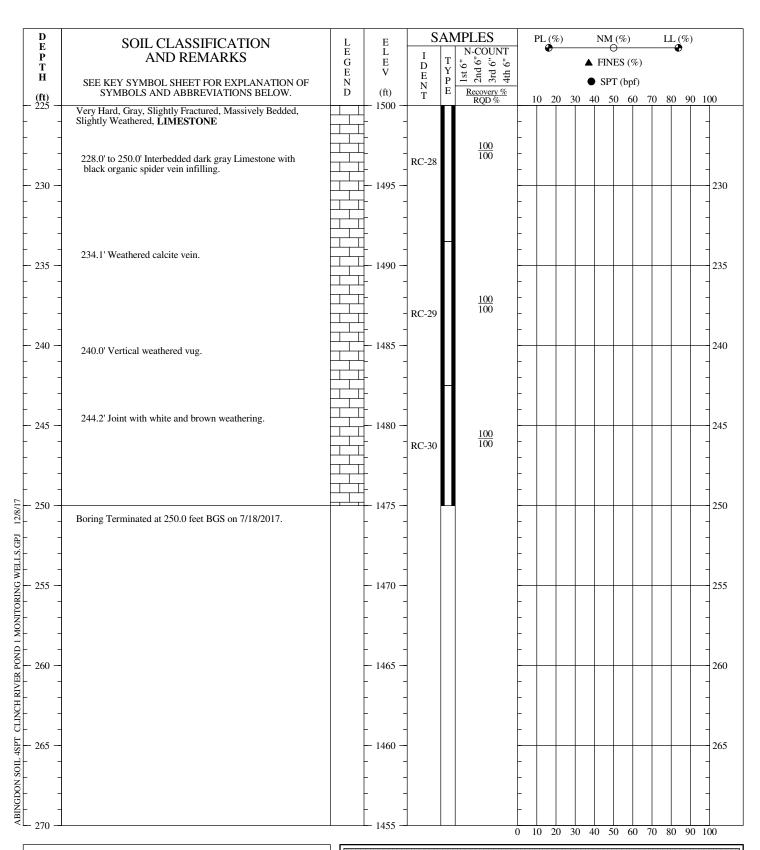
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 131.5' to 144.0' on 7/21/2017

to 7/31/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1609

Date Drilled: 7/17/2017 to 7/18/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

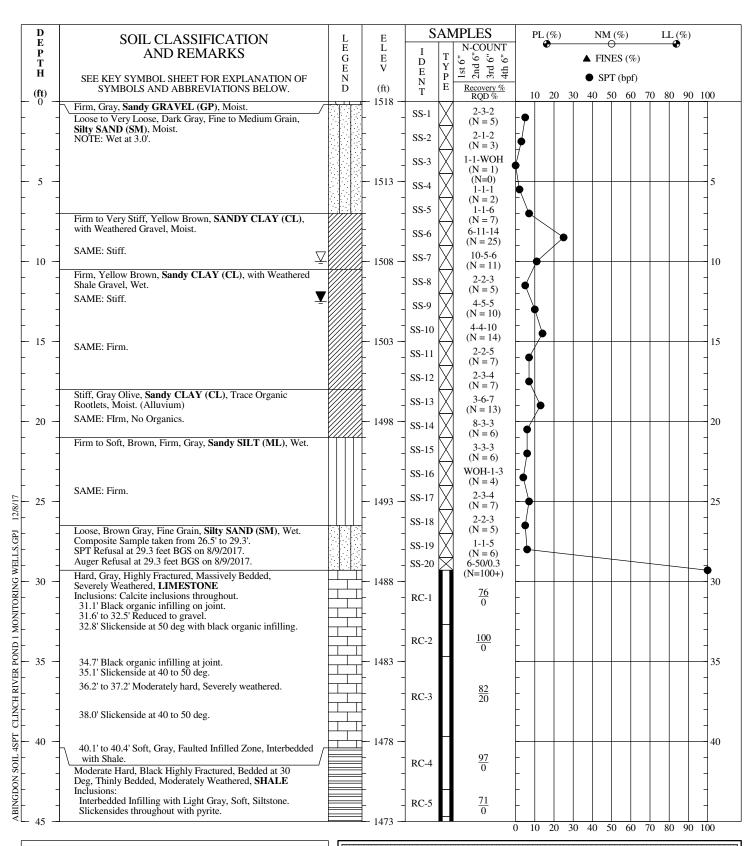
Project No.: 3050-17-0345

Project Location: Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,517.591

NORTHING: 3521548.022

EASTING: 10402932.881

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 36.3' to 50.0' on

8/10/2017 to 8/15/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1610

Date Drilled: 8/9/2017 to 8/9/2017

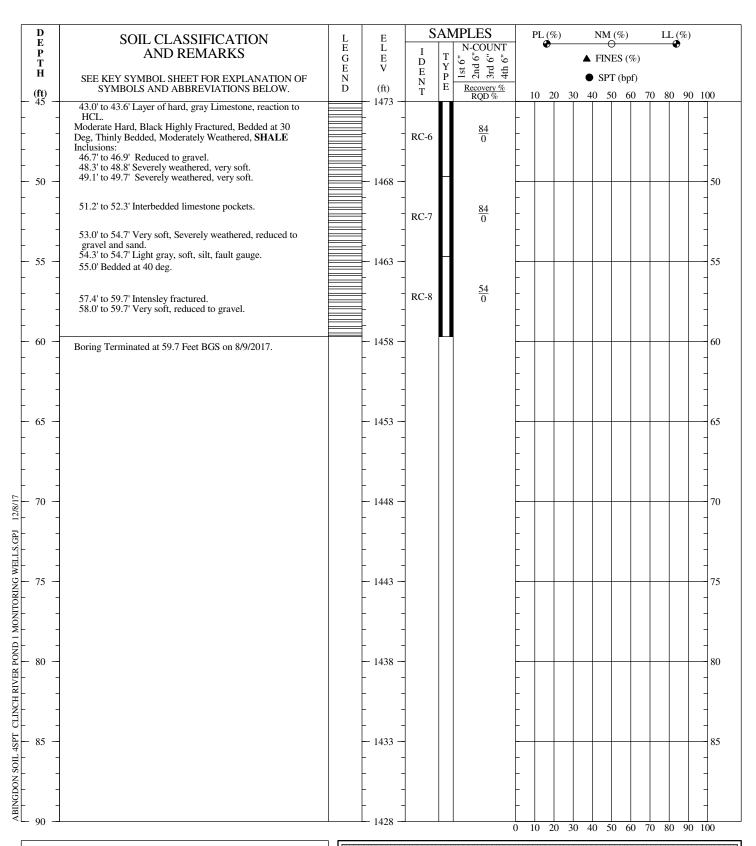
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

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Amec Foster Wheeler



ELEVATION: 1,517.591

NORTHING: 3521548.022

EASTING: 10402932.881

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM

REMARKS: Ground water monitoring well set from 36.3' to 50.0' on

8/10/2017 to 8/15/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1610

Date Drilled: 8/9/2017 to 8/9/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

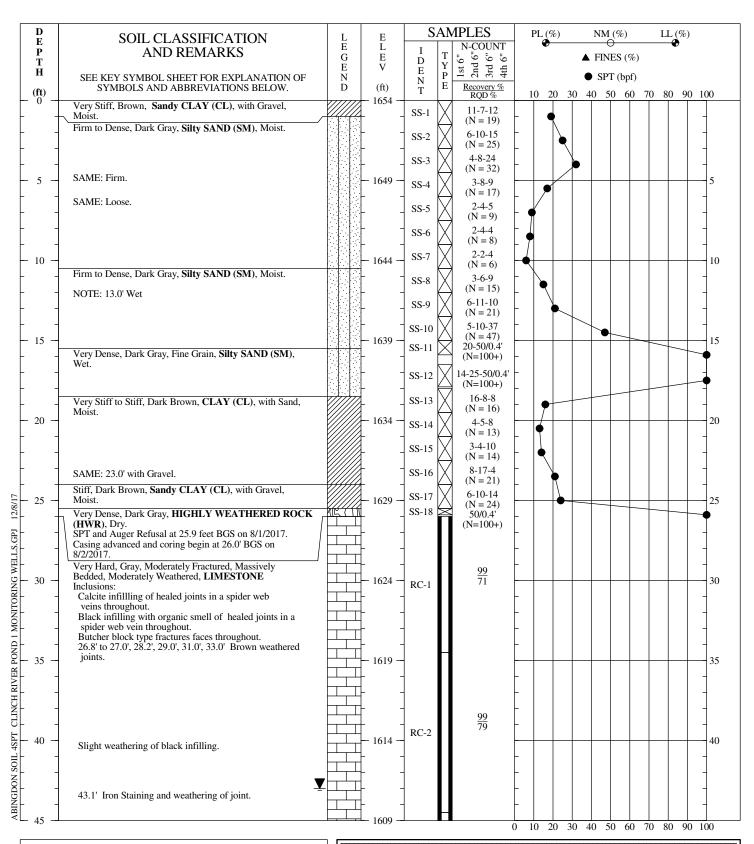
Project No.: 3050-17-0345
Project Location: Carbo, Virginia



Amec Foster Wheeler

Environment & Infrastructure, Inc. 1070 West Main Street, Suite 5 Abingdon, Virginia 24210

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ELEVATION: 1,653.855 NORTHING: 3521939.758 EASTING: 10401284.965 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: ICM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 211.3' to 224.7' on 8/8/2017 to

8/9/2017. Originally drilled as B-1612 changed to

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

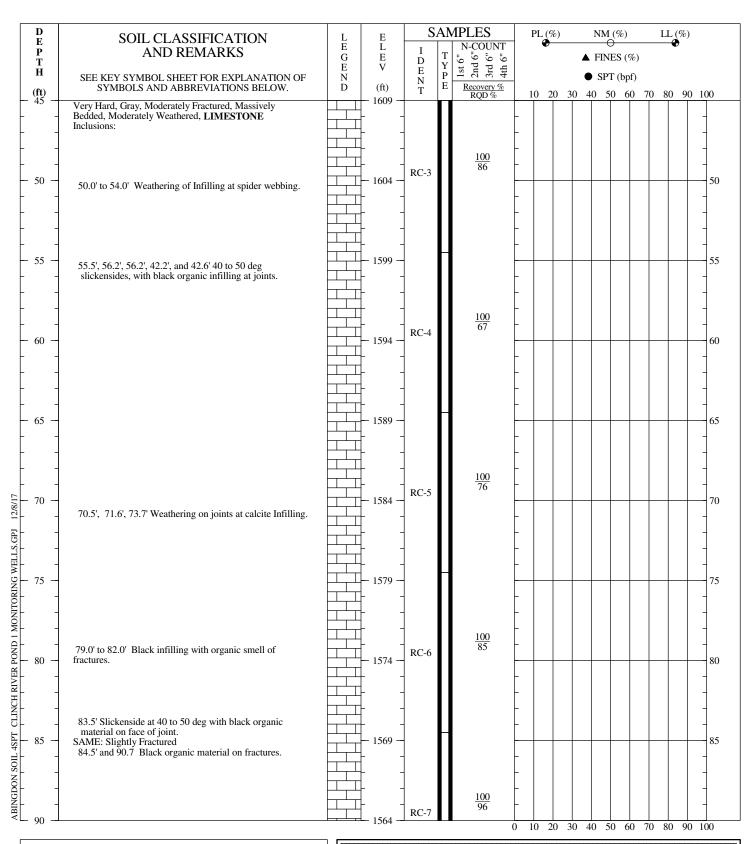
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 1 OF 6



Amec Foster Wheeler



ELEVATION: 1,653.855

NORTHING: 3521939.758

EASTING: 10401284.965

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 211.3' to 224.7' on 8/8/2017 to 8/9/2017. Originally drilled as B-1612 changed to

THIS RECORD IS A MEASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

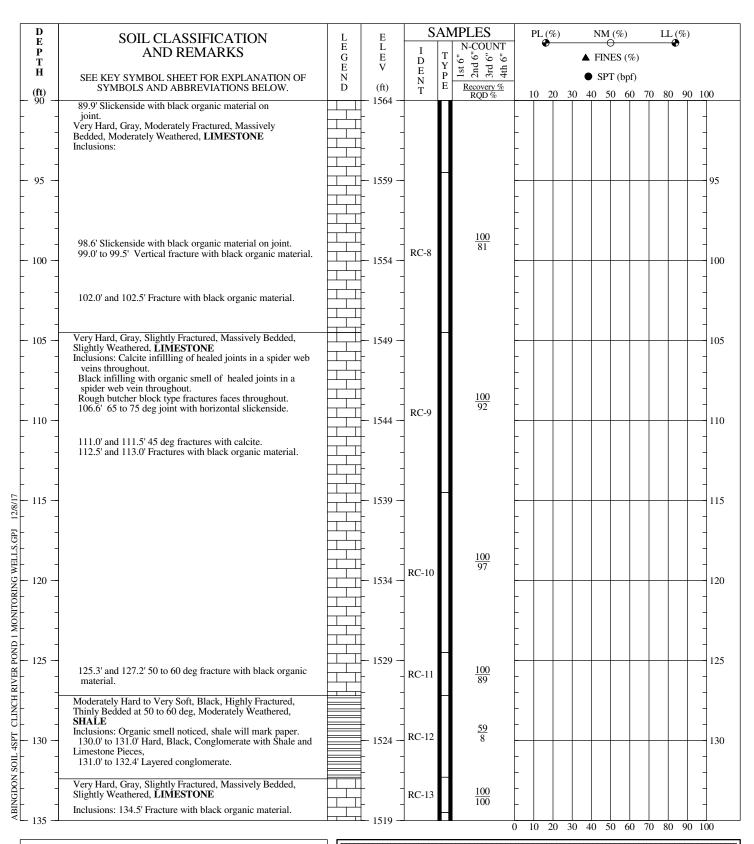
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 2 OF 6



Amec Foster Wheeler



ELEVATION: 1,653.855

NORTHING: 3521939.758

EASTING: 10401284.965

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 211.3' to 224.7' on 8/8/2017 to 8/9/2017. Originally drilled as B-1612 changed to

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TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

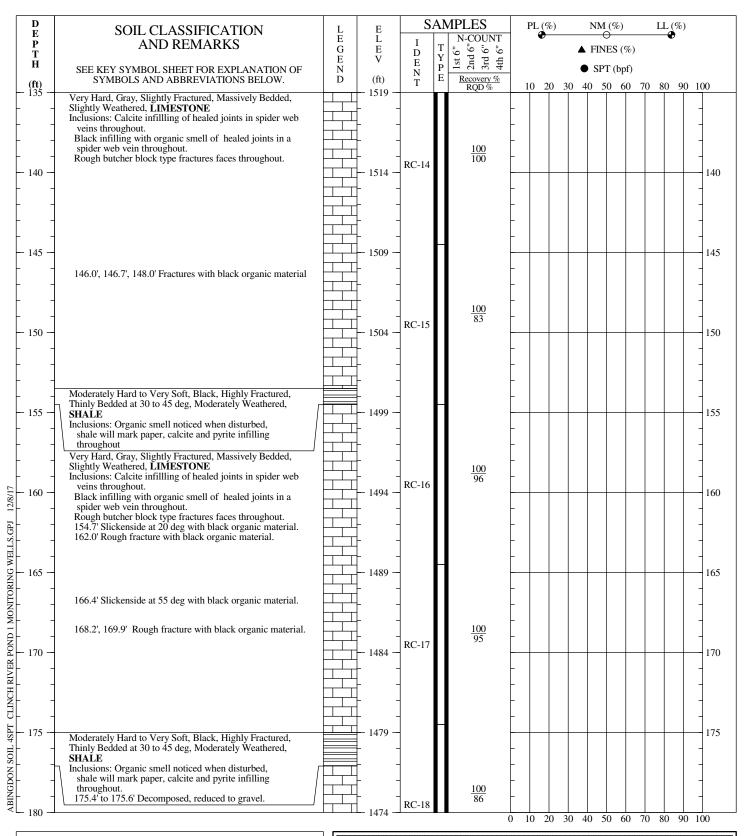
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 3 OF 6



Amec Foster Wheeler



ELEVATION: 1,653.855 NORTHING: 3521939.758 EASTING: 10401284.965 DRILLER: AEP - Racer EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

REVIEWED BY: JTM LOGGED BY: JCM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 211.3' to 224.7' on 8/8/2017 to

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TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

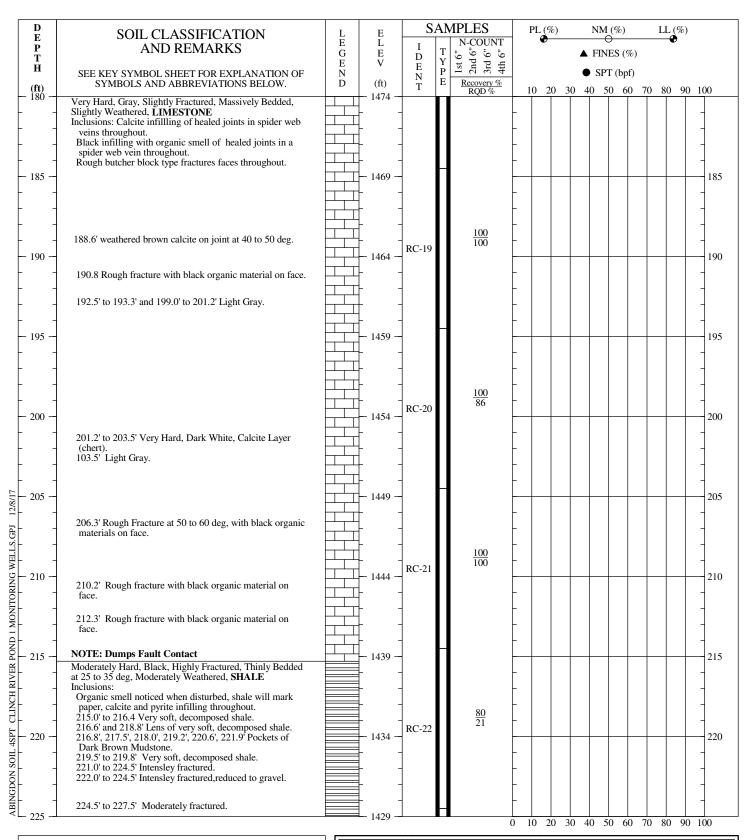
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345

Project Location: Carbo, Virginia PAGE 4 OF 6



Amec Foster Wheeler



ELEVATION: 1,653.855

NORTHING: 3521939.758

EASTING: 10401284.965

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

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TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

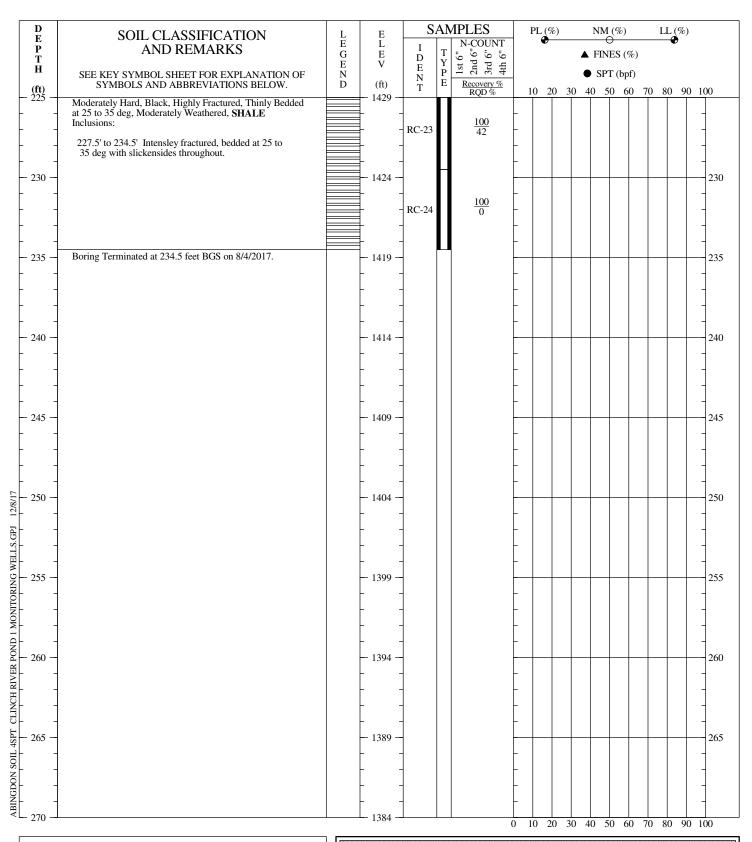
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

PAGE 5 OF 6



Amec Foster Wheeler



ELEVATION: 1,653.855

NORTHING: 3521939.758

EASTING: 10401284.965

DRILLER: AEP - Racer

EOUIPMENT: Diedrich 150

METHOD: 4.25 HSA, Casing Advance, NQ2

LOGGED BY: JCM REVIEWED BY: JTM REMARKS: Dry at top of rock before core. Ground water

monitoring well set from 211.3' to 224.7' on 8/8/2017 to

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TEST BORING RECORD

Boring: MW-1611

Date Drilled: 8/1/2017 to 8/4/2017

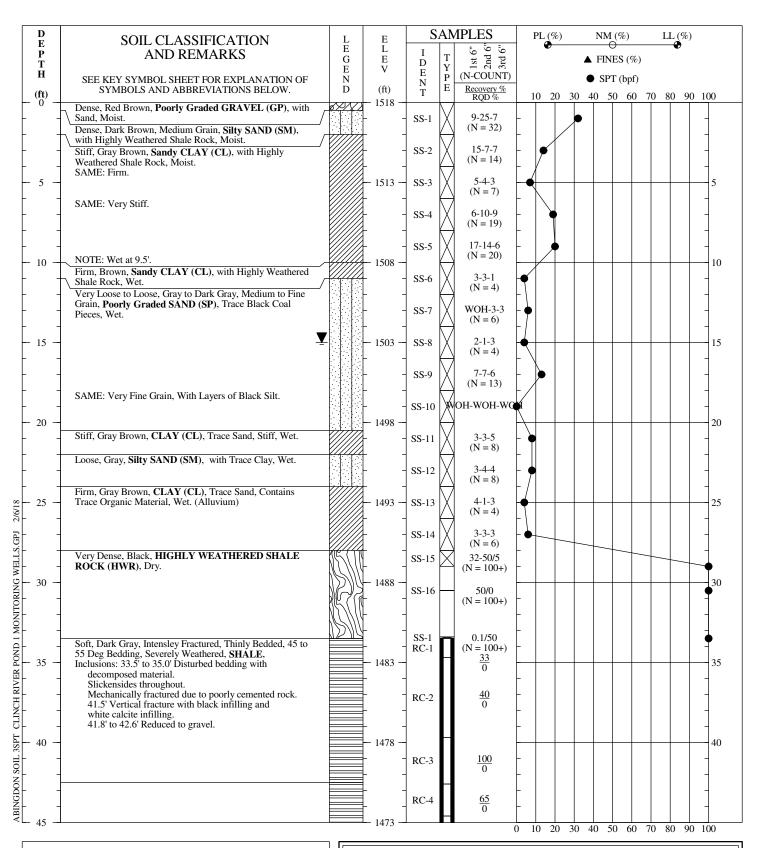
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 **Project Location:** Carbo, Virginia

PAGE 6 OF 6



Amec Foster Wheeler



ELEVATION: 1518.100 NORTHING: 3522002.383 EASTING: 10403364.496 DRILLER: TSD - A. Pelfrey **EOUIPMENT: CME 55**

METHOD: 3.75 HSA, HQ Core

REVIEWED BY: JTM LOGGED BY: JCM

REMARKS: Ground water monitoring well set from 48.6' to 62.5' on

11/17/2017 to 11/18/2017.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

TEST BORING RECORD

Boring: MW-1612

Date Drilled: 11/16/2017 to 11/17/2017

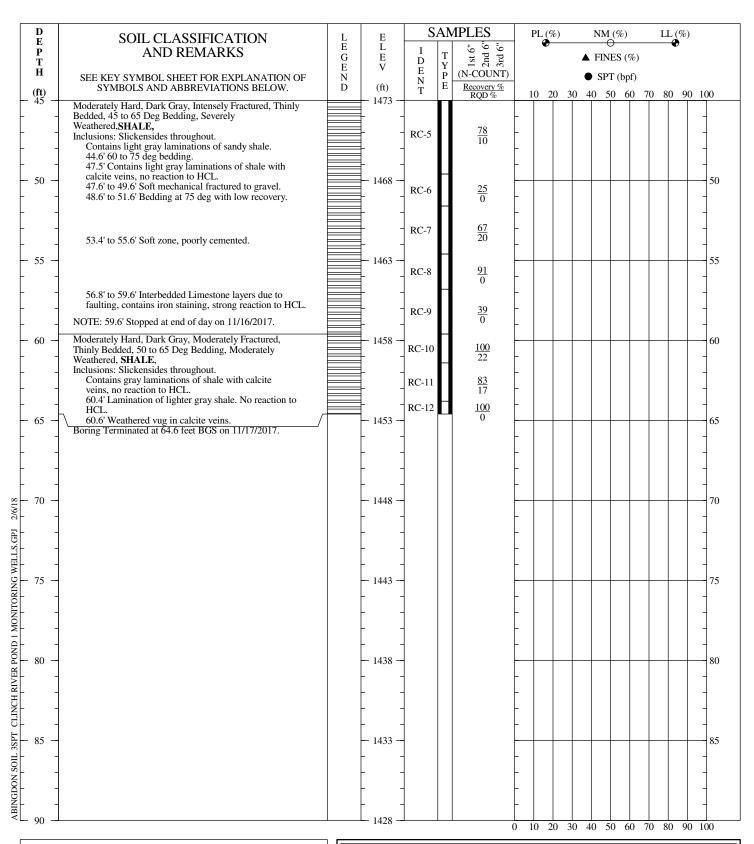
Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345 Project Location: Carbo, Virginia

PAGE 1 OF 2



Amec Foster Wheeler



ELEVATION: 1518.100

NORTHING: 3522002.383

EASTING: 10403364.496

DRILLER: TSD - A. Pelfrey

EOUIPMENT: CME 55

METHOD: 3.75 HSA, HQ Core

LOGGED BY: JCM REVIEWED BY: JTM

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TEST BORING RECORD

Boring: MW-1612

Date Drilled: 11/16/2017 to 11/17/2017

Project: AEP Clinch River Pond 1 Monitroing Wells

Project No.: 3050-17-0345
Project Location: Carbo, Virginia

PAGE 2 OF 2



Amec Foster Wheeler

Environment & Infrastructure, Inc. 1070 West Main Street, Suite 5 Abingdon, Virginia 24210

wood.

Attachment B Well Construction Logs

PROJECT NAME					and 1 Monitoring	g Wells	BORING N			1601	
PROJECT LOCA			Carbo				ELEVATIO			74.408	
Amec FW PROJ	ECT#:		3050-1	7-0345			DATE DRI		7/5/2017		/7/2017
							DATE WEI	L CONST.	7/8/2017	to 7/	10/2017
Type 🔽	Moi	nitorin	g Well		Piezo	meter		Page	1	of_	1
Date Set Start:	7/8/20	17		- 27	Surface Comp:			Grout:	Halliburton	Quick	Grout
Set By:	AEP				Pipe Size:	2 inch Flush	Threaded	Sand:	Global Ind.	#5	
Date Complete:	7/10/2	017			Screen Size:	0.010 Slot		Bentonite:	Pel-Plug	3/8"	TR.30
Datum:	Groun	d Surfa	ace								
\ <u>\</u>	/ell Infor	matio	2	_		Well D	iagram	Feet		EI	evation
Concrete Pad Ele		mation		4.700			N.T.S.	3.1	Top of Dice		
Ground Surface		i	_	4.408		ľ	V. 1.3.	J. I	Top of Rise	# 1	577,540
Depth of Bed Ro				0.7				2.0	Top of Gro	rit	
Depth of Boring -				24.0	-0.3	8		2.0	TOP OF OIO	ut	
Depth of Over Dr			_	02.2	Top of Rock	0.7	8				
Top of Sand	III O		_	8.3	NOCK						
Bottom of Sand				01.0		8	Grout	7/10/2017			
	mpleted Stickup +GS 2.5					8	8				
Completed Stick			2.5		8	8	80.0	Top of Ben	tonite		
Bentonite	0.0	to	2.0			*	8				
Grout	2.0		80.0				Bentonite				
Bentonite	80.0		88.3		Top of			88.3	Top of San	id	
Sand	88.3	to	101.0		Screen	90.3					
Bentonite	101.0	-	102.2		Bottom of		#5 0				
		•			Screen	100.0	#5 Sand				
Comp. Stickup	3.1	to	0.0		Tip of Cap	100.5		101.0	Bottom of	Sand	
Riser Pipe to GS	0.0	to	90.3				Dantonita			***********	
Screen	90.3	to	100.0	*			Bentonite	102.2	Bottom of I	Bento	nite
Pipe Cap at	100.5										
Length	, —	Each									
Cut off -2.8		1	4	-2.85				Static W	L Before 6"	1	8.00
Riser 10.0	_	9	-	95.45	Total Pipe		Static V		Completion:		2.90
-X 1 - A	0 x	1	-	10.00	103.00				Completion:		21.85
	.4 x	1	4	0.40	A				F. Salaria		
Comments:		tions in	feet at		ın sea level.						
3 5 111 (5) 132											
								Logged by:	JCM		
							(Checked by:	JTM		

PROJECT NAME: PROJECT LOCATION:					ond 1 Monitoring	g Wells	BORING N			-160	
			Carbo,				ELEVATIO			84.0	
Amec FW PROJ	ECT#:		3050-1	7-0345			DATE DRI		6/26/2017	to	6/28/2017
			-				DATE WE	LL CONST.	6/28/2017	to	6/29/2017
Type	Мо	nitorin	g Well		Piezo	meter		Page	1	of	1
Date Set Start:	6/28/2	2017			Surface Comp:			Grout:	Halliburton	Qu	ick Grout
Set By:	AEP						h Threaded		Global Ind		
Date Complete:	6/29/2	2017			Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3	/8"	TR30
Datum:	Groun	nd Surfa	ace					4 20 - 10 - 10			
100	ell Infor					Mall F	Manufaux	T. A.			Florida de la comp
Concrete Pad Ele		matio		1 277			Diagram	Feet	To store	-	Elevation
Ground Surface E		1	_	4.377 4.085		- [N.T.S.	2.51	Top of Ris	er	1586.593
Depth of Bed Roo				.90				1.00	Top of Cro		
Depth of Boring -				4.60	-45.5-		8	1.00	Top of Gro	oui	
Depth of Over Dr			-	.80	Top of Rock	0.90	*				
Top of Sand	0		-	.00	TOOK	0.90	₩ -				
Bottom of Sand				.10			Grout	6/29/2017			
Completed Sticku	ın +GS			.50			8				
2.00 <u>2.00</u>				.00			₩	70.00	Top of Ber	aton	ito
Bentonite	0.00	to	1.00			ì	*		Top or bei	itori	ile.
Grout	1.00		70.00				Bentonite				
Bentonite	70.00		80.00	-	Ton of		4-17-00-1	80.00	Top of Sar	nd	
Sand	80.00		93.10		Top of Screen	82.40					
Bentonite	93.10	-	95.80		Bottom of						
	-		-		Screen	92.10	#5 Sand				
Comp. Stickup	2.51	to	0.00		Tip of Cap	92.60	- -	93.10	Bottom of	San	d
Riser Pipe to GS	0.00		82.40				D. L. L.				
Screen	82.40	to	92.10				Bentonite	95.80	Bottom of	Ben	tonite
Pipe Cap at	92.60										***************************************
Length		Each									
Cut off -0.7	0 x	1	=	-0.70				Static W	L Before 6'		11.90
Riser 10.0	5 x	8	3 =	85,40	Total Pipe		Static \	NL prior to 0			84.00
Screen 10.0		1	=	10.00	95.10			tatic WL at 0			28.15
Cap 0.4		1	=	0.40		10.0			200 100 0 20000		
Comments:											
							_			_	
								Logged by:	JCM	_	
								Logged by.	JOIN		
							,	Shocked by	ITM		

PROJECT NAME:				and 1 Monitoring	g Wells	BORING N			-160		
PROJECT LOCATION: Carbo,					ELEVATIO			15.3			
Amec FW PROJE	ECT #:		3050-17	7-0345			DATE DRI		6/22/2017	_	6/23/2017
							DATE WEI	LL CONST.	6/24/2017	to	6/26/2017
Type 🗸	Mo	nitorin	g Well		Piezo	meter		Page	1	of.	1
Date Set Start:	6/24/2	017			Surface Comp:			Grout:	Halliburton	Qu	ick Grout
Set By:	AEP				Pipe Size:	2 inch Flush	h Threaded	Sand:	Global Ind	. #5	
Date Complete:	6/26/2	017		-	Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3	/8" -	ΓR30
Datum:	Groun	d Surfa	ace								
W	ell Infor	mation	1			Well D	Diagram	Feet			Elevation
Concrete Pad Ele				5.645			V.T.S.	2.31	Top of Ris		1517.666
Ground Surface E		1		5.353		Ė	T				
Depth of Bed Roo	k		24	.00				2.00	Top of Gro	out	
Depth of Boring -			87	.60	Top of		8				
Depth of Over Dri	ill 6"		50	.10	Rock	24.00	8				
Top of Sand			34	.00			Grout	6/26/2017			
Bottom of Sand			47	.00		8	Giout	0/20/2017			
ompleted Stickup +GS 2.50			50				07.40	T (D		4.2	
Doutouito	0.00		2.00			*	8	27.40	Top of Ber	iton	ite
Bentonite Grout	2.00	1. 1. 1. 1.	27.40				Bentonite				
Bentonite	27.40		34.00		1 100		Bornonino	34.00	Top of Sar	ha	
Sand	34.00		47.00	_	Top of Screen		34.00	100 01 341			
Bentonite	47.00		50.10	_		36.30	9				
Dentonite	47.00		50.10		Bottom of Screen	46.00	#5 Sand				
Comp. Stickup	2.31	to	0.00		Tip of Cap	46.50	3	47.00	Bottom of	Sar	id
Riser Pipe to GS	0.00		36.30				Destante				
Screen	36.30		46.00				Bentonite	50.10	Bottom of	Ber	tonite
Pipe Cap at	46.50						-				
Length	1	Each									
Cut off1.5	0 x		=	-1.50				Static W	L Before 6'		12.60
Riser 10.0		4	=	40.20	Total Pipe		Static \	NL prior to	Completion	: 1	5.00
Screen 10.0		1	=	10.00	49.10			A STATE OF THE STA	Completion		3.30
Cap 0.4	0 x	1	=	0.40							
Comments:											
							Logged by:JCM				
							Checked by: JTM				
							,				

PROJECT NAME:				ond 1 Monitoring	g Wells	BORING N			-1604		
PROJECT LOCA			Carbo,				ELEVATIO			17.147	
Amec FW PROJ	ECT#:		3050-1	7-0345			DATE DRI		6/20/2017		
			-				DATE WEI	LL CONST.	6/21/2017	to 6/23/2017	
Type 🔽	Мо	nitorin	g Well		☐ Piezo	meter		Page	1	of1	
Date Set Start:	6/21/2	017			Surface Comp:			Grout:	Halliburton	Quick Grout	
Set By:	AEP				Pipe Size:	2 inch Flush	h Threaded	Sand:	Global Ind.	. #5	
Date Complete:	6/23/2				Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3	/8" TR.30	
Datum:	Groun	d Surfa	ace								
v	/ell Infor	mation	n			Well D)iagram	Feet		Elevation	
Concrete Pad Ele				7.439			N.T.S.	2.50	Top of Rise		
Ground Surface		1		7.147							
Depth of Bed Ro	ck		31	.80				2.00	Top of Gro	out	
Depth of Boring -	NQ.		64	1.50	Top of	8	8			***************************************	
Depth of Over Dr	rill 6"		57	.00	Rock	31.80	8				
Top of Sand			41	.30			Grout	6/23/2017			
Bottom of Sand			56	5.00			Giodi	0/23/2011			
Completed Stick	ompleted Stickup +GS 2.50			.50				04.00	T(D	1. 30	
Bentonite	0.00	to	2.00			8	8	34.00	Top of Ber	tonite	
Grout	2.00	5 / 6	34.00				Bentonite				
Bentonite	34.00		42.30		Top of			42.30	Top of Sar	nd	
Sand	42.30	to	56.00		Screen	45.30	45.30				
Bentonite	56.00	to	57.00		Bottom of		#5 Sand				
					Screen	55.00	#3 Sallu				
Comp. Stickup	2.50	to	0.00		Tip of Cap	55.50		56.00	Bottom of	Sand	
Riser Pipe to GS	0.00	to	45.30			1	Bentonite				
Screen	45.30	to	55.00				Domonico	57.00	Bottom of	Bentonite	
Pipe Cap at	55.50										
Length	1	Each									
Cut off2.6	85 x	1	=	-2.65				Static W	L Before 6"	9.00	
Riser 10.0)5 x	5	<u> </u>	50.25	Total Pipe		Static V	VL prior to	Completion:	30.00	
Screen 10.0	00 x	1	=	10.00	58.00		St	atic WL at	Completion:	8.00	
Cap0.4	10 x	1	=	0.40							
Comments:											
								Logged by:	JCM		
							. (Checked by	: JTM		

PROJECT NAME: Clinch River PROJECT LOCATION: Carbo, VA				and 1 Monitoring	BORING N			-16			
							ELEVATIO			15.9	
Amec FW PRO	JECT#:		3050-1	7-0345			DATE DRI		6/7/2017	to	6/7/2017
							DATE WEI	LL CONST.	6/13/2017	to	6/14/2017
Type 🗵	Мо	nitorin	g Well		☐ Piezo	meter		Page	1	of	_ 1
Date Set Start:	6/13/2	2017			Surface Comp:			Grout:	Halliburton	Qu	ick Grout
Set By:	AEP				Pipe Size:	2 inch Flush	Threaded	Sand:	Global Ind	. #5	
Date Complete:	6/14/2	2017			Screen Size:	0.010 Slot		Bentonite:	Pel-Plug	3/8	8" TR.30
Datum:	Grour	nd Surfa	ace					- Frederick			
C v	V-11 16.					W. W.	fam. ou	Foots			
	Vell Info	rmatior		0.004			iagram	Feet	T		Elevation
Concrete Pad El Ground Surface			_	6.291		L.	N.T.S.	2.6	Top of Ris	er	1518.623
		1	_	5.999				4.0	T		
Depth of Bed Ro			-	30.0		8	8	1.0	Top of Gro	out	
Depth of Boring			-	64.6	Top of	20.0	8				
Depth of Over D	rill 6"			19.9	Rock	30.0	8				
Top of Sand				35.2		8	Grout	6/14/2017			
Bottom of Sand			_	17.9		8	8				
Completed Stick	completed Stickup +GS 2.5			2.5				29.3	Top of Ber	nton	ite
Bentonite	0.0	to	1.0					***************************************			
Grout	1.0	to	29.3				Bentonite				
Bentonite	29.3	to	35.2		Top of			35.2	Top of Sar	nd	
Sand	35.2	to	47.9		Screen	37.2					
Bentonite	47.9		49.9		Bottom of		#5 0				
					Screen	46.9	#5 Sand				
Comp. Stickup	2.6	to	0.0		Tip of Cap	47.4		47.9	Bottom of	San	id
Riser Pipe to GS	0.0	to	37,2				Pontonito				
Screen	37.2	to	46.9			Į.	Bentonite	49.9	Bottom of	Ben	itonite
Pipe Cap at	47.4									*******	
Lengt	h	Each									
),5 x	1	=	-0.50				Static W	L Before 6'	0	9.10
Riser 10.		4	=	40.12	Total Pipe		Static \	WL prior to	Completion		12.15
and the second second	10 x	1	8	10.00	50.02]		tatic WL at	57 -47 -74-64		13.05
).4 x	1		0.40		1		Salarina da	23.01.0007		
Comments:	-	_	1,000	800							
Comments.	-										
										_	
										_	
								Logged by	JCM		
								Shacked by	ITM		

PROJECT NAME: PROJECT LOCATION:			Clinch	River P	ond 1 Monitorin	g Wells	BORING N	10:	B	-160	06	
				Carbo				ELEVATIO			20.4	
Amec FW	PROJE	CT #:		3050-1	17-0345			DATE DRI		6/8/2017	to	6/10/2017
				_				DATE WE	LL CONST.	6/12/2017	to	6/13/2017
Type	V	Mor	nitorin	ng Well		Piezo	ometer		Page	1	of	1
Date Set S	Start:	6/12/2	017			Surface Comp	t		Grout:	Halliburton	Qu	ick Grout
Set By:		AEP					: 2 inch Flus	h Threaded	-	Global Ind		
Date Com	plete:	6/13/2	017			Screen Size			Bentonite:			3" TR.30
Datum:		Groun		ace						1,40,1,14	9 51	
	10/-	II lada				1	- M-ILE	Name and	(Frank)			FISCORIATE
Canarata		II Infor	matio		00.755	1		Diagram	Feet	Tan of Dia		Elevation
Concrete Ground St				_	20.755		- É	N.T.S.	2.4	Top of Ris	er	1522.909
				-	34.1	- 10	-		2.0	Ton of Cro		
Depth of E					74.3		8	8	2.0	Top of Gro	out	
Depth of C					55.7			8				
Top of Sa		O			37.8	-						
Bottom of				_	51.1	-		Grout	6/13/2017			
0.70	completed Stickup +GS 2.5						8					
Z.5					2.0	40.5		8	30.0	Top of Ber	aton	ito
Bentonite		0.0	to	2.0		Top of Rock	34.1	8		TOP OF DE	ilon	
Grout		2.0	to	30.0		- TOOK		Bentonite				
Bentonite		30.0	to	37.8		Toward		27,13/1/11	37.8	Top of Sar	ho	
Sand		37.8	to	51.3		Top of Screen	40.6	<u> </u>		op or oar		
Bentonite		51.3	Y 7500	55.7								
Dornormo						Bottom of Screen	50.3	#5 Sand				
Comp. Sti	ckup	2.4	to	0.0		Tip of Cap			51.3	Bottom of	San	d
Riser Pipe	1.00	0.0	to	40.6				Destable			*******	***************************************
Screen		40.6	to	50.3				Bentonite	55.7	Bottom of	Ben	tonite
Pipe Cap	at	50.8										
	Length		Each	i.								
Cut off	-2.2	×		=	-2.20				Static W	L Before 6		N/A
Riser	10.03			4 =	45.12	Total Pipe		Static	WL prior to	Completion	1	31.70
Screen	10			=	10.00				tatic WL at			27.95
Сар	0.4			1 =	0.40							
Comment	s:	Void fr	om 46	5.5' to 4		sand encounte	ered in 6" cut	tings.				
							2 8.27 38 8 2 2 7 2 7					
									Logged by	JCM		
									Chacked by	ITM		

PROJECT NAME: PROJECT LOCATION:				ond 1 Monitoring	Wells	BORING N			-160		
			Carbo			-	ELEVATIO			27.42	
Amec FW PROJ	ECT#:		3050-1	7-0345			DATE DRI		6/6/2017		6/7/2017
							DATE WE	LL CONST.	6/13/2017	to	6/14/2017
Type	Mo	nitorin	g Well		☐ Piezo	meter		Page	1	of_	1
Date Set Start:	6/13/2	017			Surface Comp:			Grout:	Halliburton	Quic	k Grout
Set By:	AEP				Pipe Size:	2 inch Flus	h Threaded	Sand:	Global Ind.	#5	
Date Complete:	6/14/2	017			Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3/	/8" TF	₹.30
Datum:	Groun	d Surfa	ice			-					
ı w	/ell Infor	mation	1		l.	Well	Diagram	Feet			levation
Concrete Pad Ele		mation		7.718	l,		N.T.S.	2.59	Top of Rise		1530.014
Ground Surface I				7.426		F	1	2,03	TOP OF TUS		1000.014
Depth of Bed Roo				9.10				1.00	Top of Gro	ut	
Depth of Boring -				9.60	•	8	8			<u> </u>	
Depth of Over Dr				9.00		8	8				
Top of Sand				5.70							
Bottom of Sand				3.00	•		Grout	6/14/2017			
Completed Sticks	in +GS			.55			₩				
0011,p.0133 01311					Top of			38.70	Top of Ber	ntonit	e
Bentonite	0.0	to	1.00		Rock	39.10	•				
Grout	1.0		38.70				Bentonite				
Bentonite	38.7		45.70		Top of			45.70	Top of Sar	nd	
Sand	45.7		58.50		Screen	47.80	8				
Bentonite	58.5		62.50		Bottom of		=				
		4 27	-		Screen	57.5	#5 Sand				
Comp. Stickup	2.59	to	0.00		Tip of Cap	58.0		58.50	Bottom of	Sand	-
Riser Pipe to GS			47.80				Destanita	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Screen	47.80		57.50				Bentonite	62.50	Bottom of	Bento	onite
Pipe Cap at	58.00					-					
Length		Each									
	0 x	0) =	0.00							
Riser 10.0		- 5	=	50.15				Static W	L Before 6'		13.40
Maria Cara Cara Cara Cara Cara Cara Cara	0 x	1	-	10.00	Total Pipe		Static	WL prior to	Completion	Ī	N/A
	.4 x	-		0.40			S	static WL at	Completion	_	50.40
Comments:						7				-	
Commonts.											
								attention	10.		
								Logged by			
								Checked by	MTI.		

- Company of the comp					and 1 Monitoring	g Wells	BORING N			608			
Amec FW				Carbo				DATE DRI			3.525		
Amec FW	PROJE	C1 #:		3050-	17-0345				LL CONST.	the state of the s	o 7/11/2017 o 7/13/2017		
				-				DAIL WE	LL CONOT.	1112/2017	0 1113/2011		
Type	V	Mon	itoring	Well		Piezo	meter		Page	(of 1		
Date Set	Start:	7/12/20	17			Surface Comp:			Grout:	Halliburton C	Quick Grout		
Set By:		AEP				Pipe Size:	2 inch Flus	sh Threaded	Sand:	Global Ind. #	‡5		
Date Com	plete:	7/13/20	17			Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3/8	" TR.30		
Datum:		Ground	Surfac	ce									
	Wa	ell Inforr	nation	0			Well.	Diagram	Feet		Elevation		
Concrete			nation		08.817		Well	N.T.S.	2.71	Top of Riser			
Ground S					08.525			Π	2.11	TOP OF TRIBE	1011.207		
Depth of I				_	4.50				2.00	Top of Grou			
Depth of I					65.00	400		×	2.00	Top of Olou			
Depth of					50.00	Top of Rock	14.50	₩					
Top of Sa		O		_	33.00	IXOOX	14.00	₩					
Bottom of				_	48.00			Grout	7/13/2017				
Complete	357 (13)	+GS			2.50			₩					
Complete					2.00			₿	124.00	Top of Bento	onite		
Bentonite	6	0.0	to	2.0				·					
Grout		2.0	to	124.0				Bentonite	7/12/2017				
Bentonite		124.0	to	134.4		Top of			134.40	Top of Sand			
Sand		134.4	to	148.0		Screen	137.30		134.40 Top or Sand				
Bentonite		148.0	to	150.0		Bottom of							
						Screen	147.0	#5 Sand					
Comp. St	ickup	2.71	to	0.00		Tip of Cap			148.00	Bottom of S	and		
Riser Pipe	e to GS	0.00	to	137.3	30	***************************************		Pontonito					
Screen		137.3	to	147.0	00			Bentonite	150.00	Bottom of B	entonite		
Pipe Cap	at	147.5											
	Length		Each										
Cut off	-1.1	×	1	=	-1.10								
Riser	10.05	×	14	=	140.70				Static W	/L Before 6"	15.20		
Screen	10	-	1	=	10.00	Total Pipe		Static \	WL prior to	Completion:	15.00		
Сар	0.4		1	-	0.40	150.00				Completion:	17.70		
Comment											-		
-													
										- 1.5			
									Logged by	:JCM			
									Observation to the	ITAA			

PROJECT NAME: Clinch Riv				River Pond 1 Monitoring Wells VA				IO:		-160		
Amec FW PROJ				17-0345				DATE DRI		7/17/2017	25.3	7/20/2017
Amec FW FROS	ECI#.		3030-	17-0343					LL CONST.		to	7/31/2017
					L.J.	. T.	-			112112011		710 II ZOTT
Type 🗵	Mon	itoring	Well			Piezom	eter		Page	1	of	1
Date Set Start:	7/21/20	17			Surface (Comp:_			Grout:	Halliburtor	Qu	ick Grout
Set By:	AEP				Pipe	Size: 2	inch Flus	h Threaded	Sand:	Global Ind	. #5	
Date Complete:	7/31/20	17			Screen	Size: (0.010 Slot		Bentonite:	Pel-Plug 3	/8" 7	TR.30
Datum:	Ground	Surfa	ce			-			ALC: A STORY			
v	Vell Inform	mation			1		Well F	Diagram	Feet			Elevation
Concrete Pad Ele		nation		25.604	1			N.T.S.	3.37	Top of Ris		1728.971
Ground Surface I			_	25.312	-		Ť	1.0.		100 011(18	Ç!	1720.371
Depth of Bed Roo			-	4.5'		-			2.00	Top of Gro	out	
Depth of Boring -				250'	To	n of				TOP OF OIL		
Depth of Over Dr			_	147'		op of ock	4.5	8				
Top of Sand				30.1				₩	245.02.0			
Bottom of Sand				44.5	-			Grout	7/31/2017			
Completed Sticku	up +GS			2.50				8				
				20			8	120.00	Top of Ber	nton	ite	
Bentonite	0.0	to	2.0				1					***********************
Grout	2.0	to	120.0	i i			- 1	Bentonite				
Bentonite	120.0	to	131.5	i	To	p of			131.50	Top of Sai	nd	
Sand	131.5	to	145.0			reen	134.30				,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Bentonite	145.0	to	147.0		Bott	tom of		#5 Sand				
						reen	144.0	#3 Sailu				
Comp. Stickup	3.37	to	0.00		Tip o	of Cap	144.5		145.00	Bottom of	San	d
Riser Pipe to GS	0.00	to	134.3	0				Bentonite				
Screen	134.3	to	144.0	10				Bontonia	147.00	Bottom of	Ben	tonite
Pipe Cap at	144.5											
Length	r	Each										
Cut off4.	1 x	1	= 1	-4.10								
Riser10.0	5 x	14	1 =	140.70					Static W	L Before 6		68.70
Screen 1	0 x	1	<u></u>	10.00	Tota	l Pipe		Static \	WL prior to	Completion	:	N/A
Cap0.	4 x	1	=	0.40	14	7.00		S	tatic WL at 0	Completion	1	N/A
Comments:				100	1				444	MANY		
									Logged by:	GRA/JC	M	
									Shookad him	ITA A		



					ond 1 Me	onitoring	Wells	BORING			-16		
				Carbo					ELEVAT			17.5	
Amec FW	/ PROJE	CT #:		3050-1	7-0345				DATE D		8/9/2017	to	8/9/2017
				_					DATE W	ELL CONST.	8/10/2017	to	8/15/2017
Туре	~	Mon	itoring	Well			Piezo	meter		Page	1	of	1
Date Set	Start:	8/10/20	17			Surface	Comp:			Grout	Halliburtor	ı Qu	ick Grout
Set By:		AEP Ra	acer			Pip	e Size:	2 inch Flus	h Threaded	d Sand	Global Ind	. #5	
Date Com	plete:	8/15/20	17			Scree	en Size:	0.010 Slot		Bentonite	Pel- Plug	3/8"	TR30
Datum:		Ground	Surfac	ce				4					
	We	ell Inform	nation	r -		1		Well [Diagram	Feet		Ele	evation
Concrete					7.883	-			N.T.S.	2.53	Top of Ris		1520.121
Ground S					7.591	3							
Depth of I	Bed Rock			- 2	29.3					2.00	Top of Gro	out	
Depth of I				_	8.7	т т	op of			***************************************			***************************************
Depth of					52.5		Rock	29.30	*				
Top of Sa	ind			3	36.5	-			Grout				
Bottom of	Sand				50.0				Grout				
Complete	Completed Stickup +GS 2.50							29.10	Top of Be	nton	ite		
Bentonite		0.0	to	2.0					~				
Grout		2.0	to	29.1					Bentoni	te			
Bentonite		29.1	to	36.3			op of			36.30	Top of Sa	nd	
Sand		36.3	to	50.0			creen	39.30					
Bentonite		50.0	to	52.5		Bo	ttom of		= #5 Con				
							creen	49.0	#5 San	a			
Comp. St	ickup	2.53	to	0.00		Tip	of Cap	49.5		50.00	Bottom of	San	d
Riser Pipe	e to GS	0.00	to	39.30			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Bentoni	to			
Screen		39.3	to	49.00	r				Demon	52.50	Bottom of	Ber	tonite
Pipe Cap	at	49.5											
	Length		Each										
Cut off	-3.6	×	1	=	-3.60)				Static V	VL Before 6	"	12.5
Riser	10.05	×	4	=	45.20	Tot	al Pipe	3	Stati	c WL prior to	Completion	i.	49.00
Screen	10	x	4	=	10.00		52.00			Static WL at	Completion	it.	N/A
Сар	0.4	x	1	=	0.40)							
Comment	ts:												
										Logged by	: JCM		
										Checked by	TIM		



PROJECT NAME: PROJECT LOCATION:					ond 1 Monitoring	Wells	-	ORING N			-161	
Amec FW PROJ	0.00			o, VA			-	EVATIO			53.8	
Amec FW PROJ	EU1 #.		3050-	17-0345			_	TE DRIL	L CONST.	8/1/2017	to	8/4/2017
			_				- 07	ALC VVEL	L CONST.	0/0/2017	(O	0/9/2017
Type 🗸	Mon	itoring	Well		☐ Piezo	meter			Page	1	of_	1
Date Set Start:	8/8/201	7			Surface Comp:				Grout:	Halliburtor	Qui	ck Grout
Set By:	AEP R	acer			Pipe Size:	2 inch Flu	sh Th	readed	Sand:	Global Ind	. #5	
Date Complete:	8/9/201	7			Screen Size:	0.010 Slot	t		Bentonite:	Pel- Plug	3/8"	TR30
Datum:	Ground	Surfa	ce									
v	Vell Infor	mation	1		ĺ	Well	Diagr	am	Feet		Ele	vation
Concrete Pad Ele				54.147		11.00	N.T.S		2.76	Top of Ris		1656.619
Ground Surface B				53.855			П	×		up or rus		1000.010
Depth of Bed Roo			_	26.0					37.00	Top of Gro	out	
Depth of Boring -			-	243.5	. Top of		8					
Depth of Over Dr			_	227.3	Rock	26.00						
Top of Sand				211.3			1881					
Bottom of Sand				224.7			▩	Grout				
Completed Sticku	ıp +GS			2.50			▩					
2							▩		200.00	Top of Be	ntoni	te
Bentonite	0.0	to	37.0									
Grout	37.0	to	200.0)			В	entonite				
Bentonite	200.0	to	211.3		. Top of		VI.		211.30	Top of Sa	nd	
Sand	211.3	to	224.	7	Screen 214.00							
Bentonite	224.7	to	227.3	3	. Bottom of		目 "	C 0				
					Screen	223.7	·目 #	5 Sand				
Comp. Stickup	2.76	to	0.00		Tip of Cap	224.2			224.70	Bottom of	San	d
Riser Pipe to GS	0.00	to	214.0	00			D D	entonite				
Screen	214.0	to	223.	70				entonite	227.30	Bottom of	Ben	tonite
Pipe Cap at	224.2				50							
Length		Each										
Cut off -4.3	6 x	1	=	-4.36					Static W	L Before 6	"	43.0
Riser 10.0		22	=	220.66	Total Pipe			Static V	VL prior to			96.9
Add Ton The Control	0 x	- 1	=	10.00					atic WL at			N/A
	4 x	-1	=	0.40								
Comments:		return	-		drilling. Driller n	oted that a	it abou	at 60.0 w	as fracture	where loss	OCCI	urred.
Large amount of					- 3. ve = 3136 = 1							
MW-1611.	9. 4 42 42				2.0.01.00.11.00.00.00	02,002		ge.,				
				-								
			_									_
									Logged by:	JCM		
								0	herked hy	ITM		



PROJECT NAME	:		ond 1 Monitoring	Wells	BORING N			V-16	
PROJECT LOCA		Carbo, VA			ELEVATIO			18.10	
Amec FW PROJE	CT #:	3050-17-0345			DATE DRII		11/16/2017		11/17/2017
					DATE WEL	L CONST.:	11/17/2017	to	11/18/2017
Type	Monitorin	g Well	Piezo	meter		Page	1	of_	1
Date Set Start:	11/17/2017		Surface Comp:			Grout:	Wyo-ben El	-1Υ / <u></u>	Cement
Set By:	AEP		Pipe Size:	2 inch Flush	Threaded	Sand:	DSI Well Gr	avel	#5
Date Complete:	11/18/2017		Screen Size:	0.010 Slot		Bentonite:	Pel-Plug 3/8	3" TR	:30
Datum:	Ground Surfa	ace							
\ W	ell Informatio	,		Well Di	iogram	Feet			Elevation
Concrete Pad Ele		1518.391			ıagram I.T.S.	2.61	Top of Dicco		
Ground Surface E		1518.100			1.1.3. T	2.01	Top of Rise		1520.996
		-				2.00	Top of Crou	.4	
Depth of Begins		33.50				2.00	Top of Grou	.L	
Depth of Boring -		64.60	Top of	00.50					
Depth of Over Dril	16"	63.50	Rock	33.50					
Top of Sand		48.60			Grout	11/18/2017	•		
Bottom of Sand	00	62.50							
Completed Stickup +GS 2.50						41.00	Top of Bent	onite	ı
Bentonite	0.00 to	2.00			**				
Grout	2.00 to	41.00			Bentonite				
Bentonite	41.00 to	48.60	Top of			48.60	Top of Sand	t	
Sand	48.60 to	62.50	Screen	51.60					
Bentonite	62.50 to	63.50	Bottom of		#E Cod				
			Screen	61.60	#5 Sand				
Comp. Stickup	2.50 to	0.00	Tip of Cap	62.00		62.50	Bottom of S	and	
Riser Pipe to GS	<u>0.00</u> to	51.60			Bentonite				
Screen	51.60 to	61.60			Domonico	63.50	Bottom of B	ento	nite
Pipe Cap at	62.00								
Length	Each								
Cut off5.90	<u>)</u> x <u>1</u>	= -5.90				Static V	VL Before 6"	_	N/A
Riser10.00	O x 6	= 60.00	Total Pipe	-	Static	WL prior to	Completion:	_	40.00
Screen10.00	<u> </u>	= 10.00	64.50		S	Static WL at	Completion:	_	14.25
Cap 0.40) x <u>1</u>	= 0.40							
Comments:	6" PVC casin	g set to top of ro	ock and grouted	in place. Dri	iller noted du	ring 6" over	drilling "Alot	more	e water
in air retrun from a	about 55.0 feet	to 60.0 feet".							
						Logged by:	JCM		
					C	hecked by:	JTM		

wood.

Appendix C Potentiometric Data Tables and Charts

wood.

Appendix C1 Pond 1 CCR Wells (2017)

Figure C1
Groundwater Hydrographs, Pond 1 CCR Wells
AEP Clinch River Plant, Cleveland, Russell County, Virginia

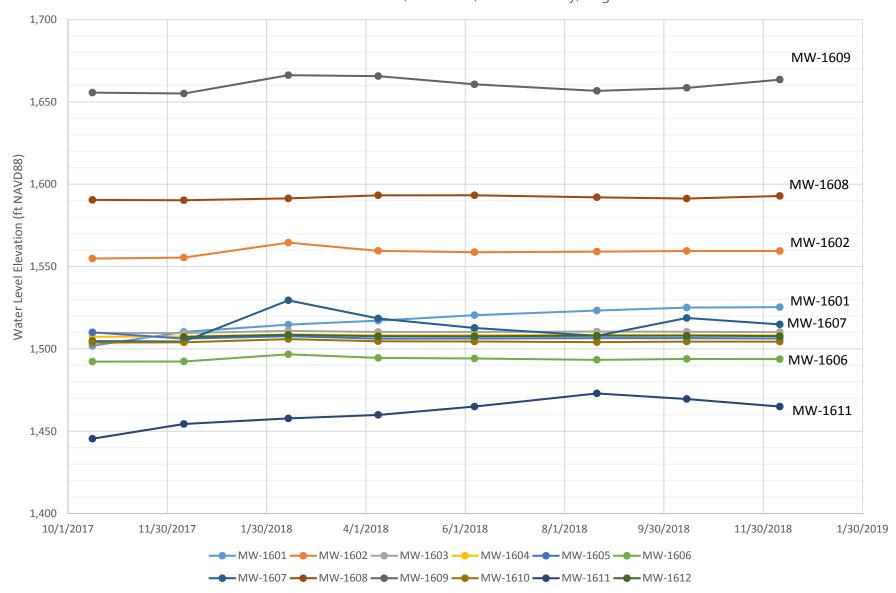


Table C1
Water Level Elevation Summary, Pond 1 CCR Wells
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Top of	Final	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8
Monitoring	Riser	9/1/17 to	10/16/2017	12/11/2017	2/13/2018	4/9/2018	6/7/2018	8/21/2018	10/15/2018	12/11/2018
Well	(ft NAVD88)	9/7/17	10/10/2017	12/11/2017	2/13/2018	4/3/2018	0///2018	8/21/2018	10/13/2018	12/11/2018
	(IT NAVD88)				Depth	to Water (ft b	toc)			
MW-1601	1577.540	66.6	75.68	67.23	62.81	60.39	57.06	54.23	52.44	52.17
MW-1602	1586.593	28.69	31.71	31.15	22.07	27.05	27.86	27.52	27.14	27.13
MW-1603	1517.666	6.58	7.93	8.01	6.72	7.35	7.40	7.12	7.27	7.48
MW-1604	1519.650	11.23	12.28	12.03	10.88	11.38	11.32	11.14	11.14	11.38
MW-1605	1518.623	15.9	8.56	12.39	10.93	12.38	12.27	12.08	12.11	12.30
MW-1606	1522.909	30.44	30.62	30.55	26.20	28.39	28.73	29.58	29.01	29.13
MW-1607	1530.014	20.12	25.28	25.54	0.55	11.54	17.30	22.09	11.24	15.15
MW-1608	1611.237	20.2	20.77	20.95	19.83	17.97	17.96	19.18	19.95	18.36
MW-1609	1728.971	70.94	73.35	73.89	62.76	63.32	68.29	72.25	70.45	65.45
MW-1610	1520.121	16.61	16.24	16.12	14.18	15.46	15.63	16.00	15.68	15.72
MW-1611	1656.619	220.2	211.17	202.24	198.83	196.72	191.63	183.65	187.04	191.63
MW-1612	1520.996	13.05 (11/27/17)	not installed	13.76	12.43	13.24	13.32	13.01	12.94	13.22
					Water Leve	l Elevation (ft	NAVD88)			
MW-1601	1577.540	1510.940	1501.86	1510.310	1514.730	1517.150	1520.480	1523.310	1525.100	1525.370
MW-1602	1586.593	1557.903	1554.883	1555.443	1564.523	1559.543	1558.733	1559.073	1559.453	1559.463
MW-1603	1517.666	1511.086	1509.736	1509.656	1510.946	1510.316	1510.266	1510.546	1510.396	1510.186
MW-1604	1519.650	1508.420	1507.37	1507.620	1508.770	1508.270	1508.330	1508.510	1508.510	1508.270
MW-1605	1518.623	1502.723	1510.063	1506.233	1507.693	1506.243	1506.353	1506.543	1506.513	1506.323
MW-1606	1522.909	1492.469	1492.289	1492.359	1496.709	1494.519	1494.179	1493.329	1493.899	1493.779
MW-1607	1530.014	1509.894	1504.734	1504.474	1529.464	1518.474	1512.714	1507.924	1518.774	1514.864
MW-1608	1611.237	1591.037	1590.467	1590.287	1591.407	1593.267	1593.277	1592.057	1591.287	1592.877
MW-1609	1728.971	1658.031	1655.621	1655.081	1666.211	1665.651	1660.681	1656.721	1658.521	1663.521
MW-1610	1520.121	1503.511	1503.881	1504.001	1505.941	1504.661	1504.491	1504.121	1504.441	1504.401
MW-1611	1656.619	1436.419	1445.449	1454.379	1457.789	1459.899	1464.989	1472.969	1469.579	1464.989
MW-1612	1520.996	1507.946	not installed	1507.236	1508.566	1507.756	1507.676	1507.986	1508.056	1507.776

Notes:

All depth to water measurements in this table provided by AEP

ft = foot or feet

bgs = below ground surface

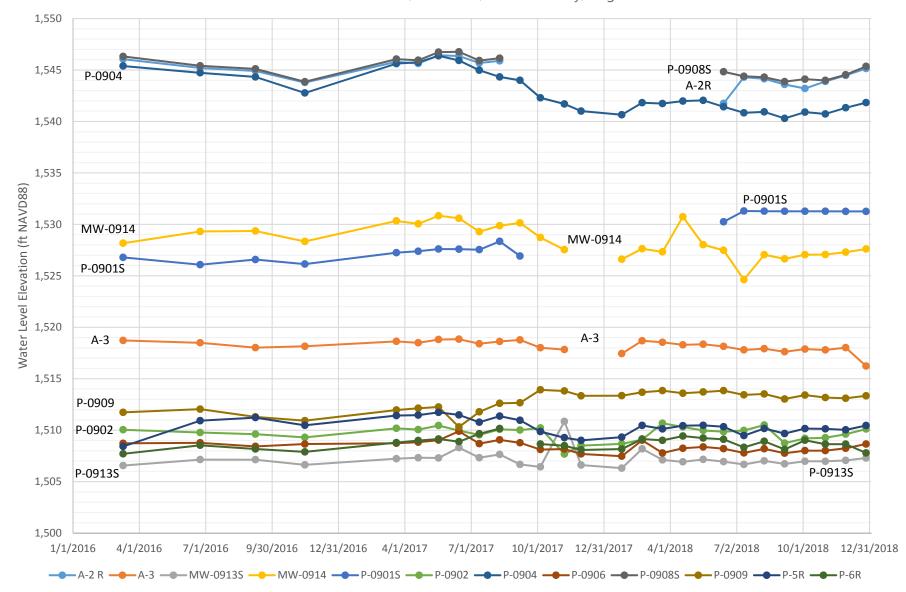
ft btoc = ft below top of PVC casing

ft NAVD88 = ft above North American Vertical Datum of 1988

wood.

Appendix C2 Historical Piezometers and Wells

Figure C2 Groundwater Hydrographs, Pond 1 Wells and Piezometers AEP Clinch River Plant, Cleveland, Russell County, Virginia



Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Туре	10/9/1985	12/10/1985	1/26/1986	3/10/1986	6/24/1986	7/30/1986	9/23/1986	1/21/1987	2/26/1987	3/20/1987	4/30/1987	6/23/1987	8/11/1987	9/16/1987	10/30/1987	1/30/1988
Existing Wells an	d Piezometers																
A-2 R	Piezometer	1547.7	1549.2	1552.0	1552.8	1551.2	1548.2	1549.1	1552.9	1552.4	1552.6	1552.7	1550.2	1547.1	1548.0	1547.8	1553.3
A-3	Piezometer	1519.0	1519.0	1525.0	1526.0	1522.8	1519.7	1519.9	1525.9	1525.6	1525.9	1526.6	1526.8	1519.1	1518.5	1517.8	1527.3
P-0901S	Piezometer				-												
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer																
P-0909	Piezometer																
MW-0913S	Monitoring Well																
MW-0914	Monitoring Well																
P-5R	Piezometer																
P-6R	Piezometer																
P-5																	
P-6																	
Ponds and Drains																	
Pond 1A	Pond																
Pond 1B	Pond																
Toe Drain	Drain				-			-									
112-421344-11																	
Historical Wells a		45405		4550.0		45500	45405	15150	4==00	45505	45500	45500			4=40.0	4544.0	
A-1	Piezometer	1543.7	1545.4	1552.6	1552.4	1550.0	1546.7	1547.8	1556.3	1553.5	1552.2	1552.2	1550.5	1545.4	1543.0	1541.0	1554.7
A-5	Piezometer	1544.7	1545.5	1549.2	1549.5	1548.9	1547.3	1548.0	1550.4	1550.3	1550.6	1550.2	1550.4	1546.6	1544.7	1543.3	1549.9
A-6 A-7 R	Piezometer	1542.0	1542.4 1531.2	1546.1	1545.2	1543.5	1543.5 1532.2	1544.1 1532.7	1546.5	1545.6 1539.6	1545.8	1545.7	1544.3	1541.9 1530.7	1540.7 1527.7	1540.3 1527.6	1545.6 1539.0
B-1	Piezometer	1531.9		1539.2	1537.4	1534.2			1539.6		1539.2	1539.3	1536.6		1527.7		
	Piezometer																
B-2 R B-3 R	Piezometer Piezometer				-												
B-3 R	Piezometer																
B-5 R	Piezometer																
B-6	Piezometer																
P-1					-			-									
P-1R	Piezometer																
P-2																	
P-2R	Piezometer			-	-			-					-				
P-3																	
P-3R	Piezometer				-			-									
P-4																	
P-4R	Piezometer				-			-									
P-7	Piezometer																
P-8	Piezometer																
P-0901D	Piezometer																
P-0908D	Piezometer																
MW-0910	Monitoring Well																
MW-0911	Monitoring Well																
MW-0912	Monitoring Well																
MW-0913D	Monitoring Well							-									
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well							-									

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well				.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				= 10011000								
or Well ID	Туре	3/25/1988	7/22/1988	1/30/1989	4/20/1989	8/29/1989	1/15/1990	4/5/1990	5/23/1990	6/29/1990	7/16/1990	7/17/1990	8/21/1990	8/23/1990	8/24/1990	8/28/1990	8/29/1990
Existing Wells and	d Piezometers																
A-2 R	Piezometer	1553.0	1552.1	1551.5	1548.3	1549.7	1547.9	1543.2	1543.2	1547.2		1546.2	1546.2	1546.2	1546.2	1546.2	1546.2
A-3	Piezometer	1528.6	1525.6	1525.4	1521.1	1521.6	1518.8	1518.8	1518.8	1518.6		1518.4	1518.4	1518.8	1518.8	1518.6	1518.8
P-0901S	Piezometer																
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer																
P-0909	Piezometer																
MW-0913S	Monitoring Well																
MW-0914	Monitoring Well																
P-5R	Piezometer																
P-6R	Piezometer																
P-5													1500.7	1504.2	1504.3	1504.0	1503.8
P-6							-		-					1509.6	1509.8	1509.4	1509.3
D																	
Ponds and Drains																	
Pond 1A	Pond																
Pond 1B	Pond																
Toe Drain	Drain																
Historical Wells a	nd Piezometers																
A-1	Piezometer	1553.1	1553.4	1553.2	1548.7	1543.3	1545.6	1544.8	1544.2	1542.9		1542.8	1542.8	1542.7	1542.7	1542.7	1542.7
A-5	Piezometer	1550.2	1550.0	1549.7	1549.7	1549.6	1546.0	1546.1	1544.7	1544.7		1543.6	1543.6	1544.4	1544.4	1544.6	1544.4
A-6	Piezometer	1545.4	1545.4	1545.1	1544.6	1544.1	1542.1	1541.4	1541.4	1541.4		1540.6	1540.6	1540.4	1540.4	1540.4	1540.4
A-7 R	Piezometer	1539.2	1537.1	1536.8	1538.5	1539.2	1531.8	1532.1	1530.8	1530.7		1527.4	1527.4	1528.6	1528.6	1528.2	1528.6
B-1	Piezometer										1546.5	1546.0	1544.6	1546.2	1546.8	1546.6	1546.5
B-2 R	Piezometer										1542.0	1542.0	1541.5	1546.2	1543.7	1543.5	1544.3
B-3 R	Piezometer																
B-4 R	Piezometer						-	-	-		1521.0	1520.9	1520.7	1524.1	1526.5	1526.5	1526.5
B-5 R	Piezometer						-	-	-								
B-6	Piezometer						-	-			1517.5	1515.7	1515.4	1516.6	1517.1	1517.0	1517.5
P-1																1513.2	1513.1
P-1R	Piezometer																
P-2							-	-	-				1511.5	1512.0	1512.0	1511.8	1511.9
P-2R	Piezometer																
P-3				-			1	-	1					1516.2	1516.2	1516.2	1516.1
P-3R	Piezometer						-		-								
P-4							-		-				1505.6	1505.9	1506.0	1507.0	1506.1
P-4R	Piezometer																
P-7	Piezometer																
P-8	Piezometer																
P-0901D	Piezometer																
P-0908D	Piezometer																
MW-0910	Monitoring Well																
MW-0911	Monitoring Well																
MW-0912	Monitoring Well						-		-								
MW-0913D	Monitoring Well																
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well																

Notes:



Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer or Well ID	Well Type	8/31/1990	9/4/1990	9/5/1990	9/6/1990	9/7/1990	9/12/1990	9/19/1990	9/27/1990	1/16/1991	5/6/1991	5/7/1991	5/8/1991	5/9/1991	5/10/1991	5/13/1991	5/15/1991
Existing Wells an	d Piezometers																-
A-2 R	Piezometer	1549.0	1548.7	1548.2	1548.3	1548.3	1547.2	1546.7	1546.2		1550.6	1550.3	1550.2	1549.3	1550.2	1550.5	1551.7
A-3	Piezometer	1519.8					1518.2	1518.2	1517.8	1516.3	1519.2	1518.8	1518.7	1519.1	1519.4	1518.9	1519.7
P-0901S	Piezometer						1010.2										
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer																
P-0909	Piezometer																
MW-0913S	Monitoring Well																
MW-09133	Monitoring Well																
P-5R	Piezometer															-	
P-6R	Piezometer						-									-	
P-5		1503.1	1503.0	1502.4	1502.4	1502.4	1502.7	1503.6	1502.6	1504.1	1503.7	1503.5	1502.9	1502.9	1503.6	1504.3	1505.0
P-6		1508.6	1503.0	1502.4	1502.4	1502.4	1502.7	1508.8	1502.8	1504.1	1503.7	1503.5	1502.9	1502.9	1509.0	1504.3	1509.5
F-0		1306.0	1306.0	1306.3	1306.3	1306.3	1309.2	1300.0	1307.0	1509.7	1509.5	1506.9	1306.9	1309.0	1309.0	1309.3	1309.3
Ponds and Drains	<u> </u>																
Pond 1A	Pond																
Pond 1B	Pond																
Toe Drain	Drain																
Historical Wells a																	
A-1	Piezometer	1547.6	1548.2	1551.8	1542.8	1542.8	1542.8	1545.4	1542.8		1554.6	1553.6	1553.7	1553.6	1553.8	1556.6	1558.0
A-5	Piezometer	1543.8				1543.7	1544.5	1544.2	1543.6	1540.7	1540.6	1540.6	1540.2	1540.3	1540.5	1541.5	1540.9
A-6	Piezometer	1545.4	1541.1	1542.1	1541.6	1541.6	1541.1	1538.9	1539.3		1551.0	1550.9	1550.9	1550.8	1550.8	1553.1	1554.1
A-7 R	Piezometer	1528.9				1529.4	1528.9	1529.0	1528.9		1529.2						
B-1	Piezometer	1546.5	1546.5	1546.5	1545.3	1545.1	1545.6	1549.5	1545.1		1555.4	1554.7	1554.8	1555.3	1555.9	1559.4	1560.3
B-2 R	Piezometer	1542.6	1544.6	1542.8	1542.5	1542.5	1542.3	1542.8	1542.6		1528.6	1528.1	1528.4	1528.2	1528.2	1530.2	1530.0
B-3 R	Piezometer																
B-4 R	Piezometer		1526.0	1525.9	1526.0	1526.0	1526.0	1526.2	1525.2		1529.4	1528.7	1528.3	1528.7	1529.1	1529.1	1529.7
B-5 R	Piezometer																
B-6	Piezometer	1516.4		1515.9	1516.5	1516.1	1516.0	1516.6	1517.5		1519.2	1518.9	1519.0	1518.5	1518.7	1519.7	1519.5
P-1		1514.3	1512.4	1511.7	1512.4	1512.4	1512.3	1515.2	1512.3	1517.8	1515.6	1515.9	1515.5	1515.4	1516.0	1515.5	1515.9
P-1R	Piezometer															-	
P-2		1511.1	1511.0	1511.2	1511.0	1511.4	1511.1	1511.1	1511.0	1511.3	1511.7	1511.8	1511.1	1512.1	1513.2	1512.1	1515.1
P-2R	Piezometer																
P-3		1516.1	1515.8	1515.5	1515.5	1515.5	1515.1	1514.9	1515.0	1514.9	1515.1	1514.8	1515.0	1515.0	1515.1	1515.0	
P-3R	Piezometer																
P-4		1505.4	1503.9	1505.1	1505.1	1505.2	1505.6	1505.0	1505.8	1505.5	1505.3	1504.5	1504.4	1505.0	1505.1	1505.2	1506.6
P-4R	Piezometer																
P-7	Piezometer																
P-8	Piezometer																
P-0901D	Piezometer																
P-0908D	Piezometer																
MW-0910	Monitoring Well																
MW-0911	Monitoring Well																
MW-0912	Monitoring Well																
MW-0913D	Monitoring Well																
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well																

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Туре	5/16/1991	5/17/1991	5/21/1991	5/24/1991	5/26/1991	5/29/1991	5/30/1991	6/3/1991	6/4/1991	6/5/1991	6/6/1991	6/7/1991	6/10/1991	6/13/1991	6/14/1991	6/17/1991
Existing Wells and	d Piezometers																
A-2 R	Piezometer	1551.7	1551.7	1552.1	1551.8	1552.5	1552.2	1552.3	1552.1	1552.7	1552.7	1552.3	1552.3	1552.2	1552.4	1552.2	1552.1
A-3	Piezometer	1519.9	1520.3	1521.1	1521.1	1521.0	1521.4	1521.3	1521.1	1521.7	1522.1	1521.6	1521.5	1521.8	1521.6	1522.3	1522.2
P-0901S	Piezometer																
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer																
P-0909	Piezometer																
MW-0913S	Monitoring Well																
MW-0914	Monitoring Well																
P-5R	Piezometer																
P-6R	Piezometer																
P-5		1505.1	1504.9	1505.7	1505.6	1505.6	1505.8	1505.9	1505.7	1505.8	1505.8	1505.6	1504.9	1505.5	1505.1	1505.3	1505.7
P-6		1509.7	1509.7	1510.5	1510.3	1510.5	1510.2	1510.2	1510.5	1510.0	1510.4	1510.0	1510.1	1509.9	1510.1	1510.1	1510.2
Ponds and Drains	David																
Pond 1A	Pond																
Pond 1B Toe Drain	Pond Drain																
Toe Drain	Drain															-	-
Historical Wells ar	nd Piezometers																
A-1	Piezometer	1558.6	1563.2	1560.0	1560.4	1560.8	1560.7	1560.4	1560.0	1560.4	1561.1	1560.2	1560.3	1560.0	15161.1	1560.9	1561.5
A-5	Piezometer	1540.5	1540.9	1541.3	1541.7	1542.7	1542.0	1542.1	1541.3	1542.9	1543.4	1542.7	1542.7	1542.8	1543.6	1543.6	1544.0
A-6	Piezometer	1554.7	1554.9	1556.9	1557.0	1556.7	1557.1	1556.8	1556.9	1558.1	1558.1	1557.4	1557.4	1557.3	1557.8	1557.8	1557.6
A-7 R	Piezometer																
B-1	Piezometer	1560.6	1561.0	1561.8	1561.2	1561.6	1564.4	1561.6	1561.8	1561.7	1562.1	1562.0	1561.5	1561.9	1561.9	1561.5	1561.5
B-2 R	Piezometer	1531.0	1531.2	1531.9	1532.1	1533.7	1530.5	1533.2	1531.9	1533.6	1534.7	1533.6	1533.4	1532.3	1533.2	1533.4	1533.8
B-3 R	Piezometer																
B-4 R	Piezometer	1529.4	1529.6	1530.1	1530.8	1531.5	1531.1	1534.2	1530.1	1532.0	1532.3	1531.3	1531.6	1531.6	1531.8	1531.7	1531.8
B-5 R	Piezometer																
B-6	Piezometer	1520.6	1520.6	1521.2	1521.3	1521.8	1522.0	1521.8	1521.2	1522.0	1522.4	1521.6	1521.6	1521.5	1521.3	1521.5	1522.0
P-1		1516.1	1516.2	1519.8	1519.3	1518.2	1517.8	1517.3	1519.8	1516.7	1516.5	1516.2	1515.9	1515.4	1515.6	1515.6	1515.5
P-1R	Piezometer																
P-2		1515.2	1512.2	1512.4	1512.7	1512.8	1512.8	1513.2	1512.4	1513.4	1513.5	1513.5	1513.3	1513.2	1513.4	1513.5	1513.5
P-2R	Piezometer																
P-3																	
P-3R	Piezometer																
P-4		1506.6	1505.2	1505.6	1505.5	1505.6	1505.4	1505.6	1505.6	1505.5	1505.4	1505.3	1505.3	1505.6	1505.5	1505.6	1505.5
P-4R	Piezometer																
P-7	Piezometer																
P-8	Piezometer																
P-0901D	Piezometer																
P-0908D	Piezometer																
MW-0910	Monitoring Well																
MW-0911	Monitoring Well																
MW-0912	Monitoring Well																
MW-0913D	Monitoring Well Monitoring Well																
MW-0915																	

Notes:



Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Туре	6/18/1991	6/19/1991	6/24/1991	6/26/1991	6/28/1991	7/1/1991	7/3/1991	8/8/1991	9/10/1991	9/16/1991	10/18/1991	10/19/1991	10/21/1991	10/28/1991	12/11/1991	2/19/1992
Existing Wells an	d Piezometers																
A-2 R	Piezometer	1552.0	1552.2	1551.7	1551.7	1552.4	1551.3	1552.4	1551.4	1551.5	1551.5	1550.2	1550.2	1550.2	1550.4	1551.0	1551.7
A-3	Piezometer	1521.9	1522.5	1525.9	1522.3	1522.2	1521.9	1522.0	1522.4	1522.0	1522.2	1519.6	1519.5	1519.4	1519.1	1519.5	1521.1
P-0901S	Piezometer				-												
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer																
P-0909	Piezometer																
MW-0913S	Monitoring Well																
MW-0914	Monitoring Well																
P-5R	Piezometer																
P-6R	Piezometer																
P-5	•	1505.6	1506.0	1507.0	1506.4	1506.4	1506.1	1505.8	1505.1	1506.2	1504.7				1501.3	1505.2	1505.3
P-6		1510.1	1510.6	1511.0	1510.9	1510.8	1510.8	1510.6	1510.0	1510.5	1510.0				1508.9	1509.7	1506.6
Ponds and Drains	•																
Pond 1A	Pond																
Pond 1B	Pond								-								
Toe Drain	Drain																
Historical Wells a		4504.5	4500.0	4500.0	4504.0	4504.0	4500.0	4504.0	4500.7	4500.0	4500.5	4557.0	45545	4550.5	4555.4	4555.4	4500.0
A-1	Piezometer	1561.5	1560.6	1560.9	1561.3	1561.3	1560.2	1561.3	1560.7	1560.9	1560.5	1557.6	1554.5	1556.5	1555.1	1555.1	1560.0
A-5	Piezometer	1544.0	1544.0	1544.9	1544.8	1544.5	1544.7	1544.4	1545.3	1545.9	1545.5	1552.1	1545.3	1544.9	1544.3	1543.3	1545.9
A-6 A-7 R	Piezometer Piezometer	1557.7	1557.5	1558.1	1557.4	1557.1	1556.9	1557.0	1558.1	1557.6	1557.5	1525.4	1551.8 1525.6	1551.5 1525.3	1550.6 1524.7	1551.5 	1555.9 1553.7
B-1		4504.5	4504.5	4504.5	4504.5	1561.7			4504.4		1561.1	1557.2	1525.6			1555.5	
	Piezometer	1561.5 1533.8	1561.5 1531.2	1561.5 1534.2	1561.5 1534.1		1561.6 1534.4	1561.8 1534.2	1561.4 1534.5	1561.4 1535.4			1557.2	1556.9 1550.8	1555.6 1551.4	1551.2	1560.2 1555.2
B-2 R B-3 R	Piezometer Piezometer	1533.8	1531.2	1534.2	1534.1	1534.4	1534.4	1534.2	1534.5	1535.4	1535.3	1551.3	1550.9	1550.8	1551.4	1551.2	1555.2
B-4 R	Piezometer	1531.9	1531.8	1531.6	1532.0	1531.9	1532.1	1531.9	1532.1	1532.1	1532.2	1529.7	1529.8	1529.7	1528.8	1528.4	1530.1
B-5 R	Piezometer				1332.0			1331.9			1002.2	1329.7	1329.0	1329.7		1320.4	
B-6	Piezometer	1522.0	1522.2	1521.4	1522.3	1522.4	1522.2	1522.2	1519.2	1523.0	1521.2	1516.9	1517.1	1517.3	1518.6	1519.6	1521.2
P-1		1515.5	1515.4	1518.6	1517.6	1517.5	1517.6	1517.2	1517.0	1514.8	1514.7	1310.9	1317.1	1317.3	1513.9	1520.8	1516.1
P-1R	Piezometer		1010.4	1010.0	1017.0			1017.2		1314.0							
P-2		1513.4	1513.6	1513.6	1513.7	1513.9	1513.8	1513.7	1513.8	1513.9	1513.9				1512.0	1512.0	1502.7
P-2R	Piezometer																
P-3																	+
P-3R	Piezometer																
P-4		1505.8	1505.8	1505.8	1506.1	1506.0	1506.1	1506.1	1505.9	1505.8	1505.8				1505.5	1506.4	1506.2
P-4R	Piezometer																
P-7	Piezometer																
P-8	Piezometer																
P-0901D	Piezometer																
P-0908D	Piezometer																
MW-0910	Monitoring Well								-								
MW-0911	Monitoring Well																
MW-0912	Monitoring Well							-	ı								
MW-0913D	Monitoring Well																
MW-0915	Monitoring Well								-								
MW-0915 A	Monitoring Well																

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

B:	NA/ - 11																
Piezometer or Well ID	Well Type	4/22/4002	6/47/4000	0/44/4000	12/22/1992	4/40/4002	7/20/4002	11/19/1993	4/40/4004	9/8/1994	10/15/1999	10/27/2000	40/20/2004	0/4 4/2002	10/6/2003	7/16/2004	2/9/2005
Or Well ID	туре	4/23/1992	0/11/1992	0/11/1992	12/22/1992	4/13/1333	1130/1993	11/19/1993	4/12/1994	3/0/1334	10/13/1999	10/2//2000	10/20/2001	3/14/2002	10/0/2003	7/10/2004	2/9/2003
Existing Wells and	d Piezometers																+ +
A-2 R	Piezometer	1553.2	1551.1	1549.6	1547.7	1548.3	1547.9	1544.0	1550.0	1545.5	1547.5	1547.1	1547.3	1546.8	1546.9	1547.8	1547.3
A-3	Piezometer	1520.8	1520.7	1518.1	1517.3	1520.6	1520.3	1518.8	1522.5	1519.0	1519.5	1519.5	1519.5	1519.2	1519.4	1519.9	1519.7
P-0901S	Piezometer												-				
P-0902	Piezometer																
P-0904	Piezometer																
P-0906	Piezometer																
P-0908S	Piezometer												-				
P-0909	Piezometer												1				
MW-0913S	Monitoring Well												-				
MW-0914	Monitoring Well												1				
P-5R	Piezometer												1				
P-6R	Piezometer												-				
P-5		1505.7	1503.7	1503.7	1500.9	1504.5	1504.0	1503.4	1506.6	1504.1	1512.3	1512.1	1512.1	1511.9	1508.2	1508.9	1509.5
P-6		1509.4	1509.2	1508.9	1506.3	1508.3	1509.3	1508.7	1511.0	1507.2	1509.6	1509.1	1509.2	1508.2	1507.9	1508.3	1508.4
Ponds and Drains																	ļI
Pond 1A	Pond												-				
Pond 1B	Pond																
Toe Drain	Drain												-				
Historical Wells a	nd Piezometers																
A-1	Piezometer	1560.1	1558.1	1552.1	1552.7	1557.5	1555.8	1548.3	1560.3	1551.5	1554.4	1554.2	1556.1	1553.9	1560.8	1554.4	1554.0
A-5	Piezometer	1546.6	1546.2	1543.4	1539.7	1544.9	1545.5	1542.7	1548.2	1543.9	1545.6	1546.0	1546.3	1545.2	1546.1	1546.4	1545.6
A-6	Piezometer	1556.1	1552.7	1548.1	1546.8	1554.6	1551.3	1546.9	1558.0	1549.1	1554.9	1554.0	1556.9	1552.9	1553.8	1555.9	1554.7
A-7 R	Piezometer	1524.8	1525.6	1523.4	1523.0	1528.2	1530.3	1528.0	1532.7	1529.1	1532.9	1532.8	1533.0	1531.6	1532.3	1533.2	1532.5
B-1	Piezometer	1561.3	1559.1	1552.4	1555.9	1558.2	1556.2	1548.8	1561.3	1551.7	1555.2	1554.9	1554.8	1553.6	1554.4	1555.1	1554.7
B-2 R	Piezometer	1555.6	1553.6	1548.8	1549.8	1552.6	1551.4	1546.8	1555.5	1549.1	1551.7	1551.9	1552.1	1551.3	1551.8	1552.6	1552.2
B-3 R	Piezometer				1543.0	1545.1	1544.9	1542.6	1547.6	1543.8	1545.9	1545.4	1546.3	1547.0	1545.0		
B-4 R	Piezometer	1530.7	1530.4	1529.1	1538.8	1541.5	1541.5	1540.3	1543.7	1541.0	1541.8	1541.9	1542.1	1541.5	1541.7	1542.1	1541.9
B-5 R	Piezometer				1541.9	1536.5	1536.9	1535.3	1537.6	1536.5	1538.3	1537.0	1537.1	1536.9	1536.9	1537.1	1537.0
B-6	Piezometer	1521.1	1518.5	1518.5	1513.6	1519.1	1517.9	1516.8	1521.0	1517.6	1521.0	1520.9	1521.4	1519.1	1518.4	1519.1	1519.1
P-1		1516.4	1514.7	1512.9	1512.5	1512.5	1516.7	1516.7	1516.7	101110	1514.7	1514.9	1513.1	1514.7	1515.0	1515.4	1517.5
P-1R	Piezometer																
P-2		1513.2	1512.9	1511.6	1509.7	1511.9	1513.1	1510.7	1513.2	1511.2	1514.7	1514.7	1514.6	1514.6	1515.2	1516.0	1515.9
P-2R	Piezometer												-				
P-3							1515.2				1507.9	1508.2	1508.3	1508.1	1508.5	1508.9	1507.9
P-3R	Piezometer																
P-4		1506.1	1505.7	1505.4	1502.4	1504.0	1506.0	1506.0	1506.9	1506.0	1505.0	1505.4	1505.6	1504.7	1505.4	1506.1	1506.5
P-4R	Piezometer												-				
P-7	Piezometer				1494.7	1495.5	1495.9	1495.2	1498.4	1495.7	1495.1	1494.9	1495.3	1494.9	1496.0	1497.5	1497.8
P-8	Piezometer				1492.5	1492.1	1492.4	1492.3	1496.0	1492.6	1492.0	1491.9	1492.1	1491.9	1493.3	1494.5	1495.0
P-0901D	Piezometer									-			-				
P-0908D	Piezometer												ł				
MW-0910	Monitoring Well								-								
MW-0911	Monitoring Well																
MW-0912	Monitoring Well												-				
MW-0913D	Monitoring Well																
MW-0915	Monitoring Well												-				
MW-0915 A	Monitoring Well												-				

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Туре	5/6/2005	9/29/2005	3/11/2006	4/5/2006	7/7/2006	10/6/2006	1/14/2007	4/20/2007	7/3/2007	7/13/2008	10/25/2008	4/17/2009	8/7/2009	3/15/2010	6/3/2010	11/19/2010
Existing Wells an	d Piezometers																
A-2 R	Piezometer	1548.0	1546.8	1547.1	1547.2	1547.9	1547.4	1547.1	1547.7	1547.1	1547.0	1546.7	1547.6	1547.0	1549.25	1548.24	1548.3
A-3	Piezometer	1520.2	1519.3	1519.6	1519.6	1520.05	1519.8	1519.6	1520.0	1519.5	1519.6	1519.6	1520.2	1519.2	1519.33	1519.24	1519.04
P-0901S	Piezometer														1528.34	1528.27	1527.59
P-0902	Piezometer														1509.62	1505.13	1509.7
P-0904	Piezometer														1545.55	1546.13	1546.15
P-0906	Piezometer														1509.61	1507.84	1509.49
P-0908S	Piezometer														1547.42	1547.03	1547
P-0909	Piezometer														1511.52	1514.79	1506.04
MW-0913S	Monitoring Well														1510.28	1508.42	1507.27
MW-0914	Monitoring Well														1528.48	1528.95	1528.75
P-5R	Piezometer																
P-6R	Piezometer																
P-5		1510.0	1509.2	1508.6	1508.7	1509.8	1508.8	1509.3	1509.6	1509.4	1509.6	1509.0	1509.2	1509.5	1508.06	1508.46	1511.05
P-6		1563.0	1507.3	1507.7	1508.0	1508.6	1508.0	1507.8	1508.3	1508.2	1508.3		1508.1	1508.2	1507.89	1507.53	1507.73
Ponds and Drains	•																+
Pond 1A	Pond		1567				1566.7			1566.7			1566.8				1566.6
Pond 1B	Pond		1559				1558			1558.4			1559				1558.16
Toe Drain	Drain														101.52	141	375.98
Historical Wells a																	ļ
A-1	Piezometer	1553.9	1553.2	1553.6	1554.0	1554.9	1554.3	1557.0	1554.4	1554.2	1554.1	1553.9	1554.8	1554.2	1554	1553.55	1548.3
A-5	Piezometer	1546.1	1545.0	1545.5	1545.9	1545.5	1545.5	1545.3	1545.8	1545.9	1545.7	1545.1	1546.1	1545.4	1544.57	1544.75	1543.96
A-6	Piezometer	1555.5	1553.3	1555.2	1554.8	1556.3	1554.5	1553.9	1556.8	1555.8	1555.3	1553.9	1556.1	1554.4	1553.22	1552.5	1551.79
A-7 R	Piezometer	1532.8	1532.9	1532.6	1532.7	1533.0	1532.6	1532.4	1533.4	1533.1	1533.0	1532.5	1533.2	1532.7	1532.74	1532.74	1531.49
B-1	Piezometer	1555.6	1553.9	1554.3	1554.6	1555.2	1555.1	1554.7	1555.1	1554.0	1553.9	1553.5	1554.6	1553.9	1554.81	1555.65	1552.8
B-2 R	Piezometer	1552.9	1551.4	1551.9	1552.2	1552.9	1552.4	1552.0	1552.7	1552.0	1551.9	1551.6	1552.6	1551.7	1550.43	1549.99	1551
B-3 R	Piezometer	1561.5													1542.95	1542.94	1558.99
B-4 R	Piezometer	1545.2	1536.6	1541.9	1541.9	1542.1	1541.7	1541.6	1542.1	1542.1	1541.8	1541.5	1542.0	1541.8	1541.72	1541.68	1541.22
B-5 R	Piezometer	1537.0	1536.8	1537.0	1537.1	1537.0	1537.1	1536.9	1537.1	1537.2	1537.4	1537.3	1537.6	1536.7	1536.87	1536.93	1535.78
B-6	Piezometer	1519.2	1518.4	1518.6	1519.0	1519.4	1519.0	1518.8	1519.4	1519.3	1519.5	1518.7	1518.9	1519.0	1517.82	1518.45	1548
P-1		1520.3	1515.0	1515.6	1515.9	1519.0	1516.0	1518.3	1522.3	1515.5	1515.6	1515.6	1518.9	1515.7	1516.85	1516.25	1516.01
P-1R	Piezometer																
P-2	 D':	1515.7	1515.2	1514.9	1515.0	1515.2	1515.4	1515.0	1515.1	1515.1	1515.1	1515.0	1515.2	1515.1	1515.73	1515.56	1515
P-2R	Piezometer 	 1507.6	4500.4	 1507.0	45074	1508.0	 1508.6	4507.0	 1507.5	4500.4	4500.4	4500.5	4507.0	 1508.6	 1507.07	4500.00	1508.32
P-3 P-3R	Piezometer	1507.6	1508.4	1507.0	1507.1	1508.0	1508.6	1507.6	1507.5	1508.1	1508.4	1508.5	1507.6	1508.6	1507.07	1508.33	1508.32
P-3K	Piezometei 	1506.6	1505.1	1505.2	1504.9	1505.0	1504.8	1506.8	1506.9	1504.6	1504.6	1504.4	1505.1	1505.5	1504.69	1504.69	1504.96
P-4R	Piezometer	1506.6	1505.1	1505.2	1504.9	1505.0	1504.6	1300.6	1506.9	1504.6	1504.6	1504.4	1505.1	1505.5	1504.69	1504.69	1504.96
P-7	Piezometer	1498.7	1496.2	1496.5	1496.6	1497.1	1496.9	1497.4	1498.1	1496.5	1496.3	1495.9	1497.4	1497.0	1498.5	1497.49	1501.71
P-8	Piezometer	1495.7	1496.2	1490.5	1493.9	1497.1	1495.2	1494.7	1495.4	1490.5	1490.3	1493.9	1494.9	1497.0	1497.03	1494.4	1493.83
P-0901D	Piezometer	1495.7	1490.4	1493.1	1493.9	1493.2	1493.2	1494.7	1495.4	1493.1	1493.7	1493.3	1494.9	1493.2	1525.71	1526.44	1525.29
P-0901D	Piezometer														1507.92	1506.39	1505.29
MW-0910	Monitoring Well														1570.74	1570.34	1568.93
MW-0910	Monitoring Well														1560.99	1563.47	1564.09
MW-0912	Monitoring Well														1547.71	1547.5	1546.74
MW-0913D	Monitoring Well														1506.69	1507.03	1506.78
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well														1538.44	1536.61	1530.78

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Type	2/15/2011	6/8/2011	8/26/2011	10/21/2011	2/3/2012	4/27/2012	5/8/2012	7/25/2012	9/6/2012	11/9/2012	3/11/2013	6/11/2013	9/5/2013	12/5/2013	3/21/2014	6/2/2014
	.,,,,,		0.0.00					0,0,2012	.,,_,	0,0,0							
Existing Wells and																	
A-2 R	Piezometer	1546.84	1548.24	1548.24	1546.52	1547.14	1546.67	1546.67	1546.75	1546.73	1546.83	1547.24	1546.98	1548.31	1547.21	1547.53	1546.54
A-3	Piezometer	1519.04	1518.39	1518.23	1519.22	1519.09	1519.44	1519.44	1519.08	1519.06	1519.05	1519.38	1519.33	1519.33	1519.12	1519.44	1519.02
P-0901S	Piezometer	1527.59	1527.17	1526.25	1527.07	1529.47	1527.73	1527.73	1527.44	1527.25	1527.38	1526.34	1528.04	1527.49	1528.01	1526.37	1526.5
P-0902	Piezometer	1509.7	1508.41	1508.5	1509.52	1509.87	1509.75	1509.75	1509.52	1509.63	1509.84	1509.76	1509.88	1509.88	1509.76	1508.93	1509.67
P-0904	Piezometer	1546.15	1546.24	1545.08	1545.7	1546.57	1556.75	1556.75	1546.39	1546.8	1546.7	1546.86	1547.01	1547.03	1546.79	1546.97	1547
P-0906	Piezometer	1509.49	1508.03	1507.92	1509.07	1509.28	1509.8	1509.8	1508.96	1509.03	1509.29	1509.75	1509.93	1509.57	1509.41	1509.45	1509.16
P-0908S	Piezometer	1547	1546.03	1545.93	1547.01	1547.29	1547.2	1517.2	1547.09	1546.95	1547.19	1547.59	1547.38	1547.67	1547.51	1547.66	1546.89
P-0909	Piezometer	1506.04	1507.3	1504.75	1506.11	1511.64	1511.6	1511.16	1507.77	1505.79	1511.73	1508.28	1506.3	1507.08	1511.82	1511.76	1511.64
MW-0913S	Monitoring Well	1507.27	1505.92	1505.17	1506.97	1507.07	1507.36	1507.36	1506.81	1506.86	1507.15	1506.64	1507.26	1506.69	1507.4	1507.05	1506.94
MW-0914	Monitoring Well	1528.75	1526.04	1526.99	1527.97	1528.24	1528.73	1528.73	1528.66	1528.6	1528.57	1528.75	1529.25	1528.9	1528.94	1529.2	1529.31
P-5R	Piezometer							-									
P-6R	Piezometer				4500.04		4500.75	4500.75	4500.07			4500.05		4500.04		4500.07	4500.05
P-5		1511.05	1507.49	1507.42	1508.31	1508.38	1508.75	1508.75	1508.87	1508.94	1508.78	1509.05	1509.48	1509.31	1509.09	1508.97	1508.85
P-6		1507.73	1506.54	1506.4	1507.27	1507.68	1508.25	1508.25	1507.8	1507.77	1508.5	1508.17	1508.49	1508.32	1508.03	1507.87	1507.8
Ponds and Drains																	
Pond 1A	Pond			1566.25			1566.7			1567.62	1565.57	1566.5	1566.8	1566.4	1566.58	1567.6	1566.6
Pond 1B	Pond			1557			1557.8			1558.17	1556.96	1557.4	1557.5	1558.4	1557.68	1556.5	1557
Toe Drain	Drain	250.78	582.78	526.38	437.79	714.37		413.58	274.47		376.513	404.752	413.58	375.98	563.98	413.58	263.19
100 214	210111	200.10	002.70		101110			110.00			0.00.0						
Historical Wells ar	nd Piezometers																
A-1	Piezometer	1548.3	1552.63	1552.52	1552.98	1552.2	1552.12	1552.12	1552.82	1552.66	1552.99	1552.97	1552.82	1553.26	1553.21	1553.53	
A-5	Piezometer	1543.96	1542.94	1542.9	1543.83	1544.05	1543.2	1543.2	1543.95	1543.87	1543.99	1545.48	1544.59	1544.26	1543.5	1544.82	1544.42
A-6	Piezometer	1551.79	1551.79	1550.47	1547.15	1551.74	1552.32	1552.32	1551.52	1552.57	1552.57	1553.03	1553.35	1554.34	1551.93	1553.32	1554.04
A-7 R	Piezometer	1531.49	1531.31	1530.52	1531.24	1532.02	1531.95	1531.95	1531.61	1531.94	1531.95	1532.33	1532.72	1532.89	1532.34	1532.82	1532.94
B-1	Piezometer	1552.8	1552.65	1552.72	1553.16	1553.58	1553.67	1553.67	1553.21	1552.98	1553.06	1554.96	1553.66	1553.78	1553.89	1554.26	
B-2 R	Piezometer	1562.48	1550.79	1551.31	1551.04	1562.48	1549.93	1549.49	1549.97	1549.52	1549.75	1550.36	1550.11	1550.42	1550.14	1550.51	1549.43
B-3 R	Piezometer	1558.99	1542.45	1541.41	1542.18	1542.57	1542.5	1542.5	1542.28	1542.28	1542.43	1542.74	1542.82	1542.91	1542.47	1542.83	1542.46
B-4 R	Piezometer	1541.22	1541	1539.95	1540.97	1546.32	1541.14	1541.14	1540.9	1541.13	1541.21	1541.36	1541.5	1541.63	1541.27	1541.51	1541.42
B-5 R	Piezometer	1535.78	1536.82	1535.92	1536.95	1537.17	1535.78	1535.78	1537.03	1537.05	1536.05	1537.13	1537.24	1537.24	1537.26	1535.63	1536.57
B-6	Piezometer	1548	1517.87	1517.78	1517.8	1518.1	1518.55	1518.55	1518.29	1518.21	1518.19	1518.42	1518.77	1518.77	1518.47	1518.77	1518.68
P-1		1516.01	1515.62	1519.03	1515.91	1517.12	1519.56	1519.56	1516.01	1515.83	1516.09	1522.8	1519.37	1517.81	1516.45	1518.6	
P-1R	Piezometer																
P-2		1515	1514.81	1514.79	1515.51	1515.8	1515.89	1515.89	1515.59	1515.55	1515.28	1515.81	1515.85	1515.66	1515.89	1515.99	1515.64
P-2R	Piezometer																
P-3		1508.32	1507.27	1508.13	1510.77	1507.98	1508.2	1508.2	1508.76	1509.03	1508.48	1507.85	1508.34	1509.02	1508.82	1507.82	1508.08
P-3R	Piezometer																
P-4		1504.96	1503.82	1503.65	1504.7	1505.06	1505.42	1505.42	1504.7	1504.51	1504.99	1505.55	1505.58	1505.3	1505.4	1505.4	1504.99
P-4R	Piezometer																
P-7	Piezometer	1501.71	1497.03	1496.11	1496.82	1498.41	1498.64	1498.64	1497.34	1596.86	1497.6	1497.46	1497.81	1497.7	1497.63	1497.85	1497.19
P-8	Piezometer	1493.83	1493.85	1493.01	1493.84	1495.14	1500.41	1500.47	1494.28	1494.06	1494.56	1495.42	1495.09	1494.56	1494.46	1494.67	1494.34
P-0901D	Piezometer	1525.29	1525.02	1525.39	1525.31	1525.72	1526.1	1526.1	1525.61	1525.82	1526.26	1527.75	1526.37	1526.28	1526.29	1527.85	1527.73
P-0908D	Piezometer	1505.29	1505.24	1504.36	1491.34	1506.28	1507.87	1507.87	1505	1491.83	1505.16	1506.75	1505.56	1505.18	1505.21	1505.35	1504.64
MW-0910	Monitoring Well	1568.93	1569.54	1568.68	1569.83	1570.76	1571.44	1571.44	1569.57	1568.9	1568.71	1568.71	1570.93	1570.38	1570.14	1571.1	4500.00
MW-0911 MW-0912	Monitoring Well Monitoring Well	1564.09 1546.74	1562.59 1546.56	1561.54 1545.58	1562.45 1546.23	1562.47 1547.08	1567.05 1547.71	1567.05 1547.71	1562.41 1546.63	1561.51 1547.56	1562.19 1547.29	1566.42 1547.9	1566.02	1564.84 1548.2	1563.25 1547.12	1564.34 1548.22	1562.22 1548.67
MW-0912 MW-0913D	Monitoring Well	1546.74	1546.56	1545.58	1546.23	1547.08	1547.71	1547.71	1546.63	1547.56	1547.29	1547.9	1548.19 1507.88	1548.2	1547.12	1548.22	1548.67
	Monitoring Well	1300.76	1303.46	1303.21	1500.46	1300.4	1544.73	1500.09	1300.22	1538.75	1537.46	1307.36	1539.93	1537.38	1536.69	1536.61	1307.34
MW-0915																	

Notes:



Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

Piezometer	Well																
or Well ID	Type	8/8/2014	11/11/2014	3/16/2015	7/2/2015	9/24/2015	10/19/2015	12/7/2015	3/10/2016	6/24/2016	9/8/2016	11/15/2016	3/21/2017	4/20/2017	5/18/2017	6/15/2017	7/13/2017
Existing Wells an	d Diazamatara																
A-2 R	Piezometer	1546.9	1546.74	1547.88	1546.46	1545.89	1545.39	1545.96	1546.06	1545.2	1544.91	1543.79	1545.8	1545.63	1546.44	1546.36	1545.68
A-2 R A-3	Piezometer	1519.09	1546.74	1519.83	1546.46	1545.69	1545.39	1545.96	1546.06	1518.49	1518.02	1543.79	1518.63	1545.63	1546.44	1518.84	1518.40
P-0901S	Piezometer	1519.09	1519.07	1519.63	1516.95	1527.45	1516.47	1516.49	1516.72	1516.49	1526.58	1516.15	1516.63	1516.49	1527.60	1527.59	1527.54
P-09013	Piezometer	1509.82	1509.79	1509.82	1509.81	1509.75	1509.64	1509.73	1510.04	1509.77	1509.61	1509.3	1510.18	1510.06	1510.45	1509.96	1509.54
P-0904	Piezometer	1546.93	1546.66	1546.93	1546.64	1546.63	1545.53	1546.14	1545.39	1544.73	1544.33	1542.77	1545.62	1545.76	1546.38	1545.93	1544.98
P-0904	Piezometer	1509.44	1509.37	1546.93	1509.41	1509.23	1508.76	1509.17	1508.72	1508.77	1508.42	1508.65	1508.73	1508.83	1509.03	1509.89	1508.69
P-0908S	Piezometer	1547.24	1547.17	1548.23	1546.7	1546.12	1545.78	1546.21	1546.32	1545.41	1545.11	1543.86	1546.06	1545.95	1546.74	1546.77	1545.92
P-09083	Piezometer	1511.79	1511.68	1512.39	1511.89	1511.43	1511.2	1512.06	1511.73	1512.04	1511.29	1510.92	1511.96	1512.13	1512.25	1510.31	1511.78
MW-0913S	Monitoring Well	1507.18	1507.45	1506.73	1507.4	1506.18	1505.76	1507.07	1506.56	1507.14	1507.13	1506.63	1507.23	1507.32	1507.30	1508.30	1507.32
MW-09133	Monitoring Well	1529.34	1529.22	1529.26	1529.39	1529.04	1528.5	1528.76	1528.17	1529.31	1529.36	1528.34	1530.34	1530.05	1530.84	1530.59	1529.29
P-5R	Piezometer					1323.04			1508.42	1510.92	1511.22	1510.47	1511.42	1511.46	1511.73	1511.48	1510.77
P-6R	Piezometer								1507.7	1508.53	1508.17	1507.89	1508.79	1508.99	1509.14	1508.88	1509.65
P-5		1509.29	1509.08	1508.43	1509.45	1508.95	1508.66	1509.17									
P-6		1508.09	1507.89	1508.14	1508.46	1507.82	1507.81	1508.23									
1 0		1300.03	1307.03	1300.14	1300.40	1307.02	1507.01	1300.23									
Ponds and Drains	<u> </u>																1
Pond 1A	Pond	1566.6	1567.12	1566.6	1565.88												
Pond 1B	Pond	1557	1556.35	1557						1554	1553	1551.13	1544.92		1555.3	1554.8	1554.8
Toe Drain	Drain	244.39	338.663	432.38	308.3	413.58		300.78	258.49	250.78	281.99	93.99			62.79		
												00.00					
Historical Wells a	nd Piezometers																
A-1	Piezometer																
A-5	Piezometer	1544.45	1544.33	1545.55	1544.05	1543.84	1543.1	1543.35	1543.22	1542.77	1542.63		1542.43	1543.05	1543.46	1543.65	1543.20
A-6	Piezometer	1553.68	1552.22	1553.66	1551.79	1551.58	1550.03	1550.83	1549.75	1548.83	1548.36		1550.84	1551.14	1552.29	1551.19	1549.61
A-7 R	Piezometer	1532.93	1532.38	1533.18	1532.36	1531.96	1531.49	1531.86	1531.54	1531.19	1531.12		1532.1	1532.05	1532.59	1532.29	1531.69
B-1	Piezometer																
B-2 R	Piezometer	1549.7	1549.7	1551.01	1548.96	1548.06	1547.56	1548.04	1548.23	1547.06	1546.56		1547.79	1547.69	1548.74	1548.71	1547.57
B-3 R	Piezometer	1542.68	1542.58	1543.27	1542.2	1541.94	1541.51	1541.75	1541.67	1541.21	1541.03		1541.85	1541.62	1542.23	1542.17	1541.55
B-4 R	Piezometer	1541.55	1541.22	1541.59	1541.14	1541.14	1540.48	1540.94	1540.78	1540.51	1540.4		1541.88	1540.85	1540.96	1540.92	1530.64
B-5 R	Piezometer	1536.43	1536.53	1536.56	1536.63	1536.74	1536.63	1536.57	1536.7	1536.57	1536.54		1536.74	1536.75	1535.81	1536.78	1536.83
B-6	Piezometer	1518.91	1518.72	1518.86	1518.95	1518.76	1518.16	1518.64	1517.94	1519.83	1520.01		1520.58	1520.50	1520.80	1520.45	1518.77
P-1																	
P-1R	Piezometer																
P-2		1515.44	1515.52	1516.25	1515.64	1515.19	1514.74	1514.83	1514.8	1514.3	1514.4						
P-2R	Piezometer				ı								1514.19	1514.18	1514.64		
P-3		1508.89	1508.9	1508.31	1508.48	1508.7	1508.37	1508.16	1507.46	1507.63	1508.27				-		
P-3R	Piezometer				-								1507.28	1507.10	1507.83	1508.23	1507.16
P-4		1505.21	1505.24	1505.54	1505.39	1505.99	1505.08	1505.41	1505.12	1505.27	1504.99						
P-4R	Piezometer												1505.48	1505.51	1505.58	1507.18	1505.12
P-7	Piezometer	1497.38	1497.45	1498.72	1497.51	1496.88	1496.79	1498.09	1497.63	1497.06	1496.43		1497.31	1498.27	1499.02		
P-8	Piezometer	1494.71	1494.47	1495.41	1494.38	1495.72	1493.35	1495.09	1494.33	1494.59	1493.39		1494.44	1495.55	1495.59		
P-0901D	Piezometer	1526.6	1526.27	1526.96	1526.25	1526.3	1525.52	1525.57	1524.99	1526.58	1526.23		1526.97	1526.51	1526.61	1526.34	1524.97
P-0908D	Piezometer	1504.89	1504.75	1505.94	1504.61	1503.83	1503.6	1505.25	1504.51	1504.31	1503.35		1504.65	1505.35	1505.61	1502.62	1502.37
MW-0910	Monitoring Well																
MW-0911	Monitoring Well	1562.53	1563.23	1564.67	1562.46	1561.99	1561.99	1562.13	1563.46	1562.83	1561.59		1564.04	1564.92	1564.69	1563.89	1561.68
MW-0912	Monitoring Well	1548.09	1547.76	1548.25	1547.27	1547.23	1546.42	1546.95	1546.33	1545.88	1545.55		1546.56	1546.84	1547.14	1546.83	1548.71
MW-0913D	Monitoring Well	1507.68	1506.96	1507.58	1507.83	1507.19	1504.36	1506.24	1505.43	1506.48	1506.68		1506.68	1506.78	1506.89	1507.60	1507.00
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well																

Notes:





Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

B*	W-11																
Piezometer or Well ID	Well Type	8/10/2017	9/7/2017	10/5/2017	11/7/2017	11/30/2017	1/25/2018	2/22/2018	3/22/2018	4/19/2018	5/17/2018	6/14/2018	7/12/2018	8/9/2018	9/6/2018	10/4/2018	11/1/2018
	,,																
Existing Wells an																	
A-2 R	Piezometer	1545.89										1541.75	1544.30	1544.15	1543.60	1543.20	1543.89
A-3	Piezometer	1518.62	1518.77	1518.01	1517.83		1517.44	1518.69	1518.54	1518.29	1518.35	1518.14	1517.80	1517.92	1517.62	1517.88	1517.80
P-0901S	Piezometer	1528.35	1526.92									1530.25	1531.30	1531.28	1531.27	1531.27	1531.27
P-0902	Piezometer	1510.08	1510.01	1510.21	1507.68	1508.50	1508.67	1509.08	1510.67	1510.31	1509.97	1509.85	1509.97	1510.50	1508.74	1509.20	1509.26
P-0904	Piezometer	1544.33	1544.00	1542.30	1541.70	1541.01	1540.65	1541.82	1541.74	1541.98	1542.05	1541.43	1540.84	1540.93	1540.30	1540.91	1540.73
P-0906	Piezometer	1509.06	1508.77	1508.12	1508.16	1507.69	1507.47	1509.02	1507.78	1508.24	1508.37	1508.20	1507.79	1508.19	1507.76	1508.01	1508.01
P-0908S	Piezometer	1546.15										1544.83	1544.39	1544.30	1543.87	1544.11	1543.99
P-0909	Piezometer	1512.61	1512.66	1513.92	1513.81	1513.34	1513.35	1513.68	1513.84	1513.59	1513.71	1513.84	1513.43	1513.52	1513.03	1513.41	1513.17
MW-0913S	Monitoring Well	1507.64	1506.67	1506.43	1510.85	1506.61	1506.31	1508.18	1507.11	1506.92	1507.16	1506.94	1506.67	1507.02	1506.72	1506.98	1506.97
MW-0914	Monitoring Well	1529.87	1530.14	1528.72	1527.54		1526.61	1527.63	1527.33	1530.74	1528.02	1527.48	1524.63	1527.05	1526.65	1527.05	1527.07
P-5R	Piezometer	1511.36	1510.96	1509.86	1509.27	1509.01	1509.32	1510.46	1510.12	1510.43	1510.47	1510.33	1509.47	1510.16	1509.67	1510.15	1510.13
P-6R	Piezometer	1510.16		1508.65	1508.49	1508.08	1508.16	1509.14	1509.01	1509.43	1509.23	1509.11	1508.33	1508.92	1508.13	1509.02	1508.64
P-5																	
P-6																	
Ponds and Drains	1																
Pond 1A	Pond				-												
Pond 1B	Pond	1554.8															
Toe Drain	Drain				125												
100 Brain	Didiii				120												
Historical Wells a	nd Piezometers																
A-1	Piezometer																
A-5	Piezometer				-												
A-6	Piezometer																
A-7 R	Piezometer																
B-1	Piezometer																
B-2 R	Piezometer																
B-3 R	Piezometer																
B-4 R	Piezometer																
B-5 R	Piezometer																
B-6	Piezometer																
P-1																	
P-1R	Piezometer																
P-2																	
P-2R	Piezometer																
P-3																	
P-3R	Piezometer	1507.40															
P-4																	
P-4R	Piezometer	1504.68															
P-7	Piezometer				-												
P-8	Piezometer				-										-		
P-0901D	Piezometer				-										-		
P-0908D	Piezometer																
MW-0910	Monitoring Well																
MW-0911	Monitoring Well																
MW-0912	Monitoring Well																
MW-0913D	Monitoring Well	1507.16															
MW-0915	Monitoring Well																
MW-0915 A	Monitoring Well																

Notes:



Water Level Elevation Summary, Pond 1 Wells and Piezometers

AEP Clinch River Plant, Cleveland, Russell County, Virginia

	I	ı	
Piezometer	Well		
or Well ID	Туре	11/29/2018	12/27/2018
Frieting Walls an	d Diamonatana		
Existing Wells an		454440	454544
A-2 R	Piezometer	1544.48	1545.14
A-3	Piezometer	1518.02	1516.23
P-0901S	Piezometer	1531.26	1531.26
P-0902	Piezometer	1509.61	1510.11
P-0904	Piezometer	1541.33	1541.83
P-0906	Piezometer	1508.24	1508.65
P-0908S	Piezometer	1544.54	1545.35
P-0909	Piezometer	1513.10	1513.34
MW-0913S	Monitoring Well	1507.06	1507.29
MW-0914	Monitoring Well	1527.30	1527.60
P-5R	Piezometer	1510.03	1510.45
P-6R	Piezometer	1508.64	1507.79
P-5			
P-6			
Ponds and Drain			
Pond 1A	Pond		
Pond 1B	Pond		
Toe Drain	Drain		
	l		
Historical Wells a			
A-1	Piezometer		
A-5	Piezometer		
A-6	Piezometer		
A-7 R	Piezometer		
B-1	Piezometer		
B-2 R	Piezometer		
B-3 R	Piezometer		
B-4 R	Piezometer		
B-5 R	Piezometer		
B-6	Piezometer		
P-1			
P-1R	Piezometer		
P-2			
P-2R	Piezometer		
P-3			
P-3R	Piezometer		
P-4			
P-4R	Piezometer		
P-7	Piezometer		
P-8	Piezometer		
P-0901D	Piezometer		
P-0908D	Piezometer		
MW-0910	Monitoring Well		
MW-0911	Monitoring Well		
MW-0912	Monitoring Well		
MW-0913D	Monitoring Well		
MW-0915	Monitoring Well		
MW-0915 A	Monitoring Well		

Notes:

wood.

Appendix C3 Vibrating Wire Piezometers

Figure C3
Groundwater Hydrographs, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

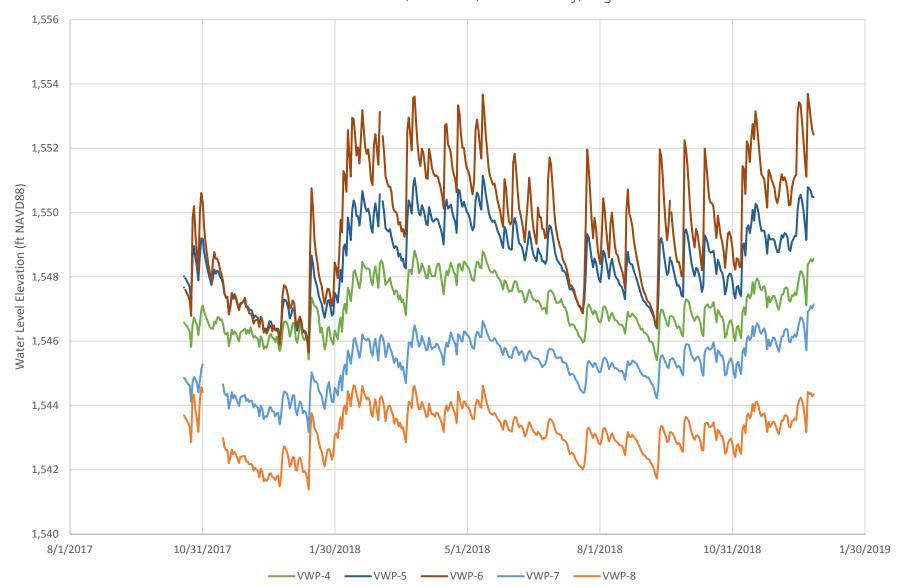




Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
8/29/2017	1543.35	1536.67	1490.26									
8/30/2017	1543.05	1536.26	1490.09									
8/31/2017	1542.16	1535.27	1489.80									
9/1/2017	1541.14	1534.33	1489.56									
9/2/2017	1539.80	1533.47	1489.39									
9/3/2017	1538.72	1532.77	1489.18									
9/4/2017	1537.33	1532.05	1489.00									
9/5/2017	1535.93	1531.39	1488.82									
9/6/2017	1534.53	1530.76	1488.67									
9/7/2017	1533.17	1530.19	1488.52									
9/8/2017	1531.81	1529.69	1488.39									
9/9/2017	1528.75	1529.33	1488.26									
9/10/2017	1526.52	1528.96	1488.13									
9/11/2017	1524.88	1528.59	1488.03									
9/12/2017	1522.68	1528.17	1487.92									
9/13/2017	1520.72	1527.77	1487.84									
9/14/2017	1518.97	1527.40	1487.77									
9/15/2017	1517.45	1527.05	1487.70									
9/16/2017	1515.56	1526.71	1487.64									
9/17/2017	1514.36	1526.38	1487.59									
9/18/2017	1513.30	1526.06	1487.53									
9/19/2017	1512.28	1525.82	1487.48									
9/20/2017	1511.33	1525.57	1487.43									
9/21/2017	1510.48	1525.37	1487.39									
9/22/2017	1509.65	1525.17	1487.34									
9/23/2017	1508.88	1524.90	1487.30									
9/24/2017	1508.20	1524.78	1487.26									
9/25/2017	1507.61	1524.61	1487.22									
9/26/2017	1507.02	1524.41	1487.18									
9/27/2017	1506.45	1524.22	1487.15									
9/28/2017	1505.93	1523.99	1487.11									
9/29/2017	1505.48	1523.74	1487.09									
9/30/2017	1505.40	1523.51	1487.05									
10/1/2017	1503.06	1523.29	1487.02									
10/1/2017	1504.76	1523.29	1487.02									
10/2/2017	1504.46	1523.07	1486.97									
10/3/2017												
	1504.07	1522.66	1486.94									
10/5/2017	1503.88	1522.46	1486.92									
10/6/2017	1503.69	1522.37	1486.89									
10/7/2017	1503.51	1522.16	1486.87									
10/8/2017	1503.33	1521.95	1486.85	-								
10/9/2017	1503.15	1521.80	1486.83	-								
10/10/2017	1502.99	1521.68	1486.81									
10/11/2017	1502.83	1521.58	1486.79									
10/12/2017	1502.68	1521.47	1486.78									



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
10/11/0017	4500.40	4504.00	4.400.70									
10/14/2017	1502.48	1521.30	1486.76									
10/15/2017	1502.38	1521.18	1486.75									
10/16/2017	1502.30	1521.05	1486.74									
10/17/2017	1502.22	1520.92	1486.71									
10/18/2017	1502.15	1520.79	1486.70									
10/10/2017				1546.91	1548.40	1548.12						
10/10/2017							1545.34	1544.3				
10/18/2017				1546.57	1548.02	1547.67						
10/18/2017				1546.57	1548.02	1547.67						
10/18/2017				1546.57	1548.02	1547.67						
10/18/2017							1544.85	1543.6				
10/18/2017							1544.85	1543.6				
10/18/2017							1544.85	1543.6				
10/19/2017	1502.10	1520.67	1486.69	1546.53	1547.96	1547.59	1544.81	1543.6				
10/20/2017	1502.07	1520.53	1486.68	1546.47	1547.87	1547.50	1544.72	1543.5				
10/21/2017	1502.05	1519.95	1486.67	1546.40	1547.79	1547.40	1544.66	1543.4				
10/22/2017	1502.04	1519.69	1486.66	1546.29	1547.68	1547.27	1544.61	1543.3				
10/23/2017	1502.04	1519.46	1486.66	1545.82	1547.23	1546.79	1544.12	1542.8				
10/24/2017	1502.04	1519.30	1486.65	1546.53	1548.62	1549.82	1544.72	1544.3				
10/25/2017	1502.05	1518.99	1486.64	1546.73	1548.96	1550.19	1544.89	1544.3				
10/26/2017	1502.05	1518.72	1486.63	1546.62	1548.57	1549.30	1544.81	1543.8				
10/27/2017	1502.07	1518.46	1486.62	1546.51	1548.30	1548.77	1544.72	1543.5				
10/28/2017	1502.08	1518.60	1486.60	1546.19	1547.89	1548.18	1544.41	1543.1				
10/29/2017	1502.10	1518.31	1486.59	1546.57	1548.67	1550.00	1544.76	1544.1				
10/30/2017	1502.11	1518.00	1486.57	1546.96	1549.19	1550.61	1545.12	1544.5				
10/31/2017	1502.14	1517.75	1486.54	1547.11	1549.18	1550.30	1545.28	1544.4				
11/1/2017	1502.17	1517.52	1486.53	1546.91	1548.77	1549.50						
11/2/2017	1502.21	1517.30	1486.51	1546.79	1548.52	1549.03						
11/3/2017	1502.25	1517.09	1486.50	1546.67	1548.30	1548.67						
11/4/2017	1502.29	1516.91	1486.48	1546.54	1548.10	1548.35						
11/5/2017	1502.32	1516.90	1486.47	1546.43	1547.92	1548.09						
11/6/2017	1502.37	1516.69	1486.46	1546.39	1547.75	1547.87						
11/7/2017	1502.46	1516.47	1486.45	1546.38	1547.98	1548.47						
11/8/2017	1502.49	1516.29	1486.43	1546.61	1548.22	1548.77						
11/9/2017	1502.53	1516.16	1486.42	1546.55	1548.10	1548.56						
11/10/2017	1502.57	1516.04	1486.41	1546.73	1548.19	1548.56						
11/11/2017	1502.62	1515.92	1486.39	1546.75	1548.15	1548.44						
11/12/2017	1502.68	1515.80	1486.38	1546.66	1547.99	1548.20						
11/13/2017	1502.75	1515.66	1486.38	1546.68	1547.93	1548.07						
11/14/2017	1502.82	1515.53	1486.37	1546.53	1547.77	1547.85	1544.65	1542.9				
11/15/2017	1502.89	1515.38	1486.37	1546.26	1547.46	1547.49	1544.37	1542.7				
11/16/2017	1502.97	1514.70	1486.36	1546.21	1547.36	1547.35	1544.32	1542.6				
11/17/2017	1503.05	1514.42	1486.36	1546.26	1547.38	1547.34	1544.36	1542.6				
11/18/2017	1503.03	1514.28	1486.35	1545.84	1546.93	1546.83	1543.91	1542.2				
11/19/2017	1503.12	1514.21	1486.35	1546.05	1547.10	1547.03	1544.13	1542.3				
11/20/2017	1503.23	1514.21	1486.34	1546.35	1547.10	1547.03	1544.41	1542.6				

Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
11/21/2017	1503.48	1514.06	1486.34	1546.21	1547.32	1547.38	1544.23	1542.49				
11/22/2017	1503.60	1513.95	1486.34	1546.30	1547.39	1547.46	1544.32	1542.55				
11/23/2017	1503.71	1513.84	1486.34	1546.23	1547.30	1547.35	1544.23	1542.47				
11/24/2017	1503.83	1513.72	1486.34	1546.11	1547.13	1547.17	1544.11	1542.34				
11/25/2017	1503.94	1513.60	1486.33	1545.99	1546.97	1546.98	1543.98	1542.21				
11/26/2017	1504.06	1513.68	1486.33	1546.27	1547.18	1547.17	1544.25	1542.41				
11/27/2017	1504.18	1513.58	1486.32	1546.31	1547.19	1547.17	1544.27	1542.41				
11/28/2017	1504.30	1513.47	1486.33	1546.34	1547.23	1547.25	1544.31	1542.42				
11/29/2017	1504.43	1513.37	1486.33	1546.39	1547.24	1547.35	1544.32	1542.42				
11/30/2017	1504.55	1513.37	1486.34	1546.22	1547.06	1547.10	1544.14	1542.26				
12/1/2017	1504.68	1513.23	1486.34	1546.35	1547.08	1547.03	1544.19	1542.26				
12/2/2017	1504.83	1513.12	1486.34	1546.25	1546.98	1546.87	1544.11	1542.17				
12/3/2017	1505.06	1514.07	1486.35	1546.42	1546.98	1546.85	1544.15	1542.19				
12/4/2017	1505.24	1514.87	1486.34	1546.24	1546.93	1546.78	1544.13	1542.10				
12/5/2017	1505.43	1514.90	1486.35	1546.11	1546.72	1546.54	1543.94	1541.9°				
12/6/2017	1505.60	1514.69	1486.36	1546.16	1546.80	1546.64	1544.03	1542.0				
12/7/2017	1505.76	1514.48	1486.36	1546.10	1546.76	1546.66	1543.97	1542.0				
12/8/2017	1505.92	1514.28	1486.37	1546.07	1546.72	1546.67	1543.92	1541.9				
12/9/2017	1506.08	1513.53	1486.38	1545.83	1546.48	1546.44	1543.67	1541.7				
12/10/2017	1506.25	1513.48	1486.38	1546.15	1546.76	1546.74	1543.99	1542.0				
12/11/2017	1506.42	1513.41	1486.39	1546.05	1546.65	1546.62	1543.89	1541.9				
12/12/2017	1506.61	1513.32	1486.40	1545.76	1546.33	1546.27	1543.57	1541.6				
12/13/2017	1506.85	1513.29	1486.41	1545.84	1546.39	1546.34	1543.67	1541.7				
12/14/2017	1506.97	1513.18	1486.42	1545.79	1546.33	1546.24	1543.64	1541.6				
12/15/2017	1507.12	1513.04	1486.43	1545.95	1546.44	1546.33	1543.74	1541.7				
12/16/2017	1507.29	1512.89	1486.43	1546.16	1546.62	1546.50	1543.95	1541.8				
12/17/2017	1507.45	1512.76	1486.44	1546.23	1546.61	1546.45	1543.94	1541.8				
12/18/2017	1507.61	1512.65	1486.45	1546.09	1546.47	1546.31	1543.83	1541.7				
12/19/2017	1507.78	1512.50	1486.47	1546.09	1546.48	1546.48	1543.81	1541.7				
12/20/2017	1507.95	1512.34	1486.48	1545.97	1546.34	1546.34	1543.65	1541.6				
12/21/2017	1508.12	1512.22	1486.50	1546.14	1546.39	1546.34	1543.76	1541.7				
12/22/2017	1508.29	1512.09	1486.50	1545.94	1546.39	1546.29	1543.77	1541.8				
12/23/2017	1508.50	1511.97	1486.51	1545.69	1546.04	1545.89	1543.42	1541.4				
12/24/2017	1508.84	1511.85	1486.53	1545.82	1546.40	1546.43	1543.68	1541.7				
12/25/2017	1509.16	1511.67	1486.54	1546.33	1547.02	1547.42	1544.19	1542.4				
12/26/2017	1509.50	1511.56	1486.56	1546.60	1547.29	1547.74	1544.43	1542.7				
12/27/2017	1509.82	1511.45	1486.56	1546.61	1547.28	1547.70	1544.42	1542.6				
12/28/2017	1510.15	1511.35	1486.58	1546.58	1547.20	1547.58	1544.37	1542.5				
12/29/2017	1510.46	1511.24	1486.59	1546.43	1547.02	1547.35	1544.19	1542.3				
12/30/2017	1510.79	1511.13	1486.61	1546.14	1546.71	1547.01	1543.91	1542.1				
12/31/2017	1511.12	1511.04	1486.62	1546.29	1546.82	1547.08	1544.06	1542.1				
1/1/2018	1511.45	1510.95	1486.64	1546.56	1547.02	1547.26	1544.31	1542.3				
1/2/2018	1511.79	1510.89	1486.65	1546.55	1547.00	1547.19	1544.31	1542.3				
1/3/2018	1512.11	1510.80	1486.66	1546.11	1546.52	1546.65	1543.84	1542.0				
1/4/2018	1512.44	1510.73	1486.68	1545.95	1546.33	1546.42	1543.70	1541.9				
1/5/2018	1512.77	1510.58	1486.69	1546.18	1546.54	1546.66	1543.96	1542.3				



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
1/6/2018	1513.09	1510.50	1486.71	1546.61	1546.70	1546.77	1544.13	1542.38				
1/7/2018	1513.42	1510.44	1486.73	1546.39	1546.61	1546.62	1544.05	1542.25				
1/8/2018	1513.74	1510.38	1486.74	1546.10	1546.29	1546.27	1543.76	1541.93				
1/9/2018	1514.05	1510.33	1486.76	1546.04	1546.33	1546.29	1543.83	1541.96				
1/10/2018	1514.36	1510.29	1486.78	1546.12	1546.27	1546.21	1543.77	1541.9				
1/11/2018	1514.68	1510.86	1486.80	1545.99	1546.11	1546.03	1543.62	1541.7				
1/12/2018	1514.98	1510.88	1486.83	1545.43	1545.71	1545.66	1543.17	1541.3				
1/13/2018	1515.27	1510.81	1486.84	1546.53	1547.41	1548.86	1544.39	1543.0				
1/14/2018	1515.63	1509.72	1486.86	1547.36	1548.66	1550.75	1545.03	1543.7				
1/15/2018	1515.98	1509.68	1486.88	1547.22	1548.41	1550.13	1544.89	1543.6				
1/16/2018	1516.34	1509.66	1486.89	1547.10	1548.00	1549.17	1544.74	1543.3				
1/17/2018	1516.71	1509.63	1486.91	1547.07	1547.82	1548.72	1544.75	1543.2				
1/18/2018	1517.07	1509.62	1486.93	1546.99	1547.67	1548.44	1544.68	1543.1				
1/19/2018	1517.45	1509.61	1486.95	1546.74	1547.40	1548.07	1544.45	1542.8				
1/20/2018	1517.86	1509.56	1486.96	1546.27	1547.27	1547.86	1544.37	1542.6				
1/21/2018	1518.26	1509.53	1486.98	1546.42	1547.16	1547.71	1544.30	1542.5				
1/22/2018	1518.65	1509.50	1487.01	1546.11	1546.92	1547.39	1544.06	1542.3				
1/23/2018	1519.00	1509.46	1487.03	1545.74	1546.73	1547.16	1543.89	1542.1				
1/24/2018	1519.39	1509.45	1487.05	1545.93	1546.98	1547.40	1544.20	1542.3				
1/25/2018	1519.79	1509.43	1487.07	1546.39	1547.24	1547.63	1544.57	1542.6				
1/26/2018	1520.19	1509.44	1487.09	1546.44	1547.28	1547.61	1544.73	1542.6				
1/27/2018	1520.58	1509.42	1487.11	1546.13	1547.06	1547.38	1544.36	1542.5				
1/28/2018	1520.97	1509.44	1487.14	1545.99	1546.80	1547.09	1544.12	1542.3				
1/29/2018	1521.36	1509.45	1487.15	1545.90	1546.86	1547.35	1544.10	1542.4				
1/30/2018	1521.75	1509.56	1487.17	1546.33	1547.50	1548.44	1544.55	1543.0				
1/31/2018	1522.17	1509.60	1487.20	1546.22	1547.41	1548.27	1544.47	1543.1				
2/1/2018	1522.55	1509.42	1487.22	1546.06	1547.20	1547.95	1544.31	1542.9				
2/2/2018	1522.96	1509.43	1487.24	1546.50	1547.65	1548.66	1544.74	1543.3				
2/3/2018	1523.40	1509.44	1487.26	1546.73	1548.21	1549.77	1544.92	1543.6				
2/4/2018	1523.77	1509.47	1487.27	1546.29	1547.84	1549.38	1544.47	1543.2				
2/5/2018	1524.11	1509.61	1487.31	1547.00	1548.91	1551.29	1545.13	1543.8				
2/6/2018	1524.48	1510.31	1487.32	1547.16	1549.01	1551.16	1545.27	1543.9				
2/7/2018	1524.83	1510.07	1487.34	1546.87	1548.66	1550.65	1544.97	1543.7				
2/8/2018	1525.17	1509.98	1487.37	1547.66	1549.84	1552.56	1545.71	1544.4				
2/9/2018	1525.52	1509.99	1487.39	1547.52	1549.54	1551.78	1545.56	1544.2				
2/10/2018	1525.85	1510.14	1487.41	1547.25	1549.14	1551.12	1545.30	1543.9				
2/11/2018	1526.15	1510.13	1487.43	1547.63	1550.05	1552.95	1545.61	1544.4				
2/12/2018	1526.42	1510.12	1487.46	1548.15	1550.37	1552.91	1546.04	1544.6				
2/13/2018	1526.88	1510.20	1487.48	1548.20	1550.25	1552.41	1546.10	1544.5				
2/14/2018	1524.07	1510.23	1487.51	1547.99	1549.90	1551.78	1545.90	1544.3				
2/15/2018	1521.57	1510.25	1487.53	1547.82	1549.89	1552.02	1545.69	1544.1				
2/16/2018	1520.71	1510.14	1487.56	1547.64	1549.60	1551.53	1545.49	1543.9				
2/17/2018	1520.71	1510.14	1487.58	1547.93	1550.04	1552.33	1545.74	1544.1				
2/18/2018	1520.45	1508.51	1487.61	1548.46	1550.66	1553.18	1546.21	1544.6				
2/19/2018	1520.43	1507.36	1487.63	1548.37	1550.42	1552.57	1546.10	1544.4				
2/20/2018	1520.83	1506.99	1487.66	1548.29	1550.42	1552.03	1546.06	1544.3				



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

				Elevation (ft NAVD88)			
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8
2/21/2018	1521.09	1506.61	1487.68	1548.25	1550.04	1551.82	1546.02	1544.19
2/22/2018	1521.31	1506.81	1487.71	1548.26	1550.12	1551.96	1546.08	1544.25
2/23/2018	1521.67	1506.89	1487.73	1548.21	1549.92	1551.55	1545.99	1544.15
2/24/2018	1522.03	1506.98	1487.76	1547.87	1549.52	1551.00	1545.65	1543.77
2/25/2018	1522.40	1506.94	1487.79	1547.74	1549.37	1550.85	1545.55	1543.65
2/26/2018	1522.86	1506.97	1487.82	1548.12	1550.02	1552.11	1545.88	1543.99
2/27/2018	1523.37	1507.02	1487.85	1548.32	1550.29	1552.44	1546.07	1544.19
2/28/2018	1523.91	1507.07	1487.87	1548.01	1549.96	1552.00	1545.74	1543.86
3/1/2018	1524.47	1507.13	1487.90	1547.66	1549.57	1551.49	1545.40	1543.54
3/2/2018	1524.94	1507.20	1487.93	1548.39	1550.56	1553.13	1546.08	1544.20
3/3/2018	1525.39	1507.24	1487.96	1548.51			1546.20	1544.28
3/4/2018	1525.54	1507.29	1487.98	1548.42	1550.35	1552.37	1546.11	1544.19
3/5/2018	1524.02	1507.28	1488.01	1548.11	1550.00	1551.84	1545.94	1543.95
3/6/2018	1523.97	1507.30	1488.03	1547.75	1549.51	1551.13	1545.50	1543.51
3/7/2018	1524.17	1507.07	1488.06	1547.83	1549.45	1550.95	1545.68	1543.83
3/8/2018	1524.47	1507.06	1488.09	1547.87	1549.41	1550.81	1545.94	1543.98
3/9/2018	1525.57	1507.06	1488.13	1547.96	1549.48	1550.81	1545.79	1543.99
3/10/2018	1526.63	1507.10	1488.15	1547.73	1549.24	1550.65	1545.68	1543.82
3/11/2018	1527.40	1507.12	1488.18	1547.62	1549.05	1550.19	1545.50	1543.73
3/12/2018	1528.02	1507.14	1488.21	1547.45	1548.89	1550.04	1545.33	1543.44
3/13/2018	1528.55	1507.24	1488.25	1547.58	1548.95	1550.02	1545.46	1543.59
3/14/2018	1529.00	1507.30	1488.28	1547.55	1548.90	1549.94	1545.43	1543.57
3/15/2018	1528.84	1507.32	1488.31	1547.29	1548.63	1549.63	1545.19	1543.35
3/16/2018	1528.92	1507.33	1488.34	1547.42	1548.72	1549.70	1545.33	1543.46
3/17/2018	1529.35	1507.32	1488.37	1547.21	1548.50	1549.41	1545.12	1543.28
3/18/2018	1529.49	1507.27	1488.40	1547.29	1548.55	1549.49	1545.21	1543.32
3/19/2018	1528.21	1507.28	1488.43	1547.09	1548.31	1549.25	1544.93	1543.09
3/20/2018	1528.89	1507.30	1488.47	1546.81	1548.26	1549.55	1544.70	1542.85
3/21/2018	1529.98	1507.27	1488.51	1547.60	1549.79	1552.56	1545.39	1543.65
3/22/2018	1530.81	1507.27	1488.53	1548.21	1550.37	1552.95	1545.95	1544.11
3/23/2018	1531.94	1507.27	1488.57	1548.22	1550.22	1552.42	1545.96	1544.07
3/24/2018	1533.17	1507.27	1488.61	1548.08	1549.97	1551.93	1545.82	1543.92
3/25/2018	1533.86	1507.34	1488.64	1548.51	1550.81	1553.55	1546.25	1544.55
3/26/2018	1535.03	1507.38	1488.68	1548.81	1551.07	1553.61	1546.49	1544.60
3/27/2018	1537.73	1507.40	1488.71	1548.64	1550.75	1552.84	1546.32	1544.39
3/28/2018	1538.44	1507.37	1488.75	1548.49	1550.29	1552.15	1546.05	1544.09
3/29/2018	1539.11	1507.37	1488.79	1548.49	1549.97	1552.15	1545.83	1543.88
3/30/2018		1507.33		1548.11				
	1539.78		1488.83		1549.91	1551.45	1545.92	1543.90
3/31/2018	1540.57	1507.34 1507.36	1488.87	1548.41	1550.23 1550.11	1551.98	1546.16	1544.11
4/1/2018	1540.98		1488.91	1548.29		1551.86	1546.02	1543.99
4/2/2018	1541.42	1507.34	1488.94	1548.15	1549.91	1551.50	1545.89	1543.85
4/3/2018	1541.93	1507.36	1488.98	1547.96	1549.64	1551.07	1545.71	1543.64
4/4/2018	1542.18	1507.35	1489.02	1547.96	1549.61	1551.05	1545.74	1543.65
4/5/2018	1542.87	1507.47	1489.07	1548.34	1550.17	1551.98	1546.11	1544.06
4/6/2018	1543.04	1507.48	1489.10	1548.12	1549.97	1551.73	1545.87	1543.85
4/7/2018	1542.87	1507.51	1489.15	1548.01	1549.76	1551.38	1545.75	1543.72



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
4/8/2018	1543.61	1507.55	1489.19	1548.03	1549.72	1551.22	1545.81	1543.73				
4/9/2018	1544.10	1507.58	1489.23	1548.01	1549.77	1551.13	1545.82	1543.65				
4/10/2018	1537.92	1507.79	1489.28	1548.28	1549.81	1551.16	1545.93	1543.78				
4/11/2018	1539.33	1508.06	1489.32	1548.41	1549.78	1551.10	1545.90	1543.76				
4/12/2018	1540.69	1508.28	1489.37	1548.40	1549.63	1550.94	1545.77	1543.64				
4/13/2018	1541.17	1508.50	1489.41	1548.08	1549.49	1550.76	1545.66	1543.5				
4/14/2018	1541.56	1508.68	1489.46	1547.75	1549.31	1550.51	1545.53	1543.4				
4/15/2018	1541.68	1508.87	1489.51	1547.46	1549.01	1550.12	1545.26	1543.1				
4/16/2018	1541.81	1509.07	1489.55	1547.94	1550.16	1552.72	1545.75	1543.8				
4/17/2018	1542.00	1509.23	1489.60	1548.18	1550.40	1552.75	1545.95	1544.0				
4/18/2018	1542.28	1509.40	1489.65	1548.05	1550.12	1552.13	1545.83	1543.8				
4/19/2018	1542.67	1509.60	1489.70	1548.25	1550.17	1552.01	1546.04	1543.9				
4/20/2018	1543.31	1509.79	1489.74	1548.43	1550.24	1551.84	1546.26	1544.1				
4/21/2018	1543.61	1509.94	1489.79	1548.29	1550.00	1551.40	1546.14	1543.9				
4/22/2018	1543.81	1510.08	1489.84	1548.14	1549.83	1551.18	1546.01	1543.8				
4/23/2018	1544.02	1510.26	1489.90	1548.06	1549.71	1551.03	1545.92	1543.7				
4/24/2018	1544.02	1510.53	1489.95	1547.74	1549.37	1550.63	1545.58	1543.4				
4/25/2018	1543.98	1510.57	1490.01	1548.38	1550.71	1553.33	1546.21	1544.4				
4/26/2018	1543.94	1510.74	1490.07	1548.41	1550.69	1553.06	1546.17	1544.2				
4/27/2018	1544.06	1510.95	1490.13	1548.26	1550.37	1552.42	1546.02	1544.0				
4/28/2018	1544.20	1511.22	1490.19	1548.19	1550.18	1552.01	1545.99	1543.9				
4/29/2018	1544.54	1511.27	1490.27	1548.48	1550.33	1552.00	1546.30	1544.1				
4/30/2018	1544.88	1511.47	1490.33	1548.43	1550.18	1551.62	1546.29	1544.0				
5/1/2018	1545.04	1511.70	1490.41	1548.34	1550.02	1551.37	1546.19	1543.9				
5/2/2018	1545.36	1512.02	1490.48	1548.30	1549.96	1551.29	1546.17	1543.9				
5/3/2018	1545.68	1511.95	1490.55	1548.19	1549.83	1551.12	1546.08	1543.8				
5/4/2018	1546.36	1512.13	1490.61	1548.00	1549.60	1550.81	1545.90	1543.6				
5/5/2018	1546.19	1512.26	1490.67	1547.88	1549.45	1550.57	1545.79	1543.5				
5/6/2018	1546.18	1512.41	1490.72	1547.88	1549.56	1550.98	1545.76	1543.5				
5/7/2018	1546.21	1512.59	1490.78	1548.30	1550.38	1552.57	1546.13	1544.0				
5/8/2018	1546.38	1512.81	1490.83	1548.46	1550.62	1552.89	1546.29	1544.1				
5/9/2018	1546.57	1512.88	1490.87	1548.45	1550.52	1552.56	1546.27	1544.1				
5/10/2018	1546.54	1513.06	1490.92	1548.29	1550.25	1552.07	1546.13	1543.9				
5/11/2018	1546.50	1513.26	1490.97	1548.27	1550.09	1551.68	1546.12	1543.9				
5/12/2018	1546.71	1512.93	1491.01	1548.79	1551.14	1553.67	1546.62	1544.6				
5/13/2018	1546.90	1513.07	1491.04	1548.72	1550.93	1553.11	1546.52	1544.4				
5/14/2018	1547.19	1513.22	1491.08	1548.56	1550.58	1552.43	1546.38	1544.2				
5/15/2018	1547.25	1513.37	1491.12	1548.42	1550.32	1551.94	1546.25	1544.0				
5/16/2018	1547.56	1513.53	1491.17	1548.29	1550.03	1551.38	1546.14	1543.8				
5/17/2018	1546.13	1513.73	1491.21	1548.18	1549.85	1551.13	1546.04	1543.7				
5/18/2018	1546.13	1513.75	1491.25	1548.14	1549.77	1551.01	1546.04	1543.7				
5/19/2018	1546.92	1513.83	1491.23	1548.13	1549.77	1550.87	1546.01	1543.7				
5/20/2018	1546.92	1514.09	1491.34	1548.20	1549.71	1550.90	1546.02	1543.7				
5/21/2018	1548.03	1514.52	1491.39	1548.14	1549.63	1550.68 1550.40	1546.03 1545.93	1543.7				
5/22/2018	1548.69 1548.93	1514.80 1514.88	1491.43 1491.48	1548.01 1547.96	1549.45 1549.34	1550.40	1545.93	1543.6 1543.5				



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

		Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8					
5/24/2018	1549.32	1514.64	1491.53	1547.91	1549.24	1550.04	1545.84	1543.49					
5/25/2018	1549.69	1514.86	1491.58	1547.75	1549.04	1549.75	1545.68	1543.34					
5/26/2018	1549.22	1515.11	1491.62	1547.61	1548.90	1549.56	1545.57	1543.24					
5/27/2018	1548.99	1515.50	1491.67	1547.89	1549.55	1551.04	1545.79	1543.54					
5/28/2018	1549.15	1515.82	1491.72	1547.83	1549.42	1550.76	1545.75	1543.5					
5/29/2018	1549.28	1515.23	1491.77	1547.67	1549.13	1550.16	1545.62	1543.30					
5/30/2018	1549.48	1515.43	1491.81	1547.53	1548.90	1549.74	1545.50	1543.2					
5/31/2018	1549.64	1515.65	1491.86	1547.57	1548.85	1549.63	1545.52	1543.2					
6/1/2018	1549.72	1515.80	1491.91	1547.55	1548.85	1549.70	1545.48	1543.1					
6/2/2018	1549.76	1515.97	1491.96	1547.73	1549.60	1551.56	1545.70	1543.5					
6/3/2018	1549.82	1516.05	1492.01	1547.86	1549.83	1551.83	1545.79	1543.6					
6/4/2018	1550.19	1516.33	1492.07	1547.85	1549.65	1551.29	1545.82	1543.6					
6/5/2018	1550.27	1516.42	1492.11	1547.68	1549.32	1550.67	1545.69	1543.4					
6/6/2018	1550.42	1516.64	1492.17	1547.53	1549.05	1550.14	1545.57	1543.3					
6/7/2018	1550.59	1516.91	1492.22	1547.56	1549.01	1549.93	1545.67	1543.3					
6/8/2018	1550.96	1516.94	1492.28	1547.55	1548.93	1549.71	1545.69	1543.3					
6/9/2018	1550.47	1517.17	1492.34	1547.42	1548.74	1549.42	1545.57	1543.2					
6/10/2018	1550.80	1517.43	1492.39	1547.20	1548.51	1549.08	1545.38	1543.0					
6/11/2018	1550.96	1517.55	1492.44	1547.27	1548.77	1549.78	1545.42	1543.1					
6/12/2018	1551.04	1518.06	1492.49	1547.44	1549.06	1550.38	1545.60	1543.3					
6/13/2018	1551.23	1517.89	1492.55	1547.59	1549.41	1551.08	1545.70	1543.4					
6/14/2018	1551.45	1518.12	1492.59	1547.51	1549.18	1550.54	1545.64	1543.4					
6/15/2018	1551.75	1517.97	1492.64	1547.37	1548.87	1549.88	1545.54	1543.2					
6/16/2018	1551.89	1518.24	1492.69	1547.29	1548.68	1549.48	1545.48	1543.1					
6/17/2018	1552.07	1518.34	1492.75	1547.28	1548.59	1549.25	1545.49	1543.1					
6/18/2018	1552.21	1518.39	1492.81	1547.22	1548.49	1549.02	1545.44	1543.0					
6/19/2018	1552.45	1518.57	1492.86	1547.27	1548.88	1550.15	1545.45	1543.1					
6/20/2018	1552.43	1518.56	1492.92	1547.20	1548.75	1549.86	1545.38	1543.1					
6/21/2018	1552.75	1518.76	1492.97	1547.10	1548.67	1549.85	1545.30	1543.0					
6/22/2018	1552.45	1518.84	1493.03	1546.98	1548.48	1549.49	1545.19	1542.9					
6/23/2018	1552.78	1519.02	1493.07	1547.02	1548.49	1549.48	1545.25	1542.9					
6/24/2018	1552.73	1519.21	1493.13	1547.04	1548.40	1549.20	1545.29	1542.9					
6/25/2018	1552.94	1519.42	1493.19	1546.85	1548.50	1549.25	1545.41	1543.0					
6/26/2018	1552.94	1519.54	1493.24	1547.50	1549.30	1551.03	1545.70	1543.4					
6/27/2018	1552.97	1519.46	1493.29	1547.57	1549.60	1551.71	1545.76	1543.5					
6/28/2018	1553.09	1519.60	1493.35	1547.57	1549.54	1551.49	1545.74	1543.5					
6/29/2018	1553.35	1519.92	1493.41	1547.52	1549.30	1550.86	1545.74	1543.5					
6/30/2018	1553.48	1520.16	1493.46	1547.43	1549.01	1550.21	1545.67	1543.4					
7/1/2018	1553.54	1520.24	1493.52	1547.27	1548.72	1549.69	1545.54	1543.2					
7/2/2018	1553.73	1520.33	1493.58	1547.19	1548.54	1549.34	1545.47	1543.1					
7/3/2018	1553.89	1520.44	1493.63	1547.20	1548.47	1549.15	1545.49	1543.1					
7/4/2018	1553.97	1520.57	1493.69	1547.21	1548.40	1548.98	1545.49	1543.1					
7/5/2018	1554.09	1520.61	1493.75	1547.30	1548.35	1548.83	1545.50	1543.0					
7/6/2018	1554.17	1520.88	1493.80	1547.15	1548.19	1548.55	1545.34	1542.9					
7/7/2018	1554.21	1521.38	1493.86	1547.16	1548.18	1548.45	1545.34	1542.9					
7/8/2018	1554.31	1521.83	1493.92	1547.04	1548.13	1548.37	1545.33	1542.9					



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

		Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8					
7/9/2018	1554.42	1521.81	1493.97	1546.88	1547.99	1548.22	1545.26	1542.82					
7/10/2018	1554.43	1522.32	1494.03	1546.62	1547.77	1547.96	1545.06	1542.63					
7/11/2018	1554.57	1522.54	1494.08	1546.48	1547.61	1547.71	1544.94	1542.49					
7/12/2018	1554.75	1522.61	1494.14	1546.52	1547.63	1547.74	1544.98	1542.53					
7/13/2018	1554.83	1522.71	1494.21	1546.52	1547.57	1547.66	1544.98	1542.51					
7/14/2018	1554.96	1522.48	1494.27	1546.49	1547.50	1547.57	1544.92	1542.44					
7/15/2018	1555.09	1523.31	1494.33	1546.37	1547.34	1547.37	1544.81	1542.3					
7/16/2018	1555.39	1523.98	1494.40	1546.34	1547.25	1547.26	1544.75	1542.2					
7/17/2018	1555.25	1525.01	1494.47	1546.18	1547.12	1547.10	1544.65	1542.1					
7/18/2018	1555.46	1525.40	1494.54	1546.12	1547.08	1547.05	1544.51	1542.1					
7/19/2018	1555.43	1525.61	1494.61	1546.05	1547.02	1546.94	1544.46	1542.0					
7/20/2018	1555.58	1526.12	1494.67	1545.96	1546.95	1546.86	1544.40	1542.0					
7/21/2018	1555.67	1526.21	1494.74	1546.01	1547.25	1547.77	1544.40	1542.1					
7/22/2018	1555.46	1526.52	1494.80	1546.35	1548.12	1549.76	1544.67	1542.5					
7/23/2018	1555.30	1526.86	1492.41	1547.04	1549.32	1551.96	1545.25	1543.2					
7/24/2018	1555.54	1526.65	1492.47	1547.15	1549.23	1551.40	1545.38	1543.3					
7/25/2018	1555.91	1527.07	1492.53	1547.05	1548.91	1550.59	1545.33	1543.2					
7/26/2018	1556.07	1528.09	1492.59	1546.93	1548.56	1549.77	1545.26	1543.0					
7/27/2018	1556.48	1528.90	1492.66	1546.83	1548.30	1549.20	1545.19	1542.9					
7/28/2018	1556.81	1529.34	1492.73	1546.95	1548.57	1549.83	1545.32	1543.1					
7/29/2018	1557.06	1530.00	1492.79	1546.91	1548.45	1549.52	1545.28	1543.0					
7/30/2018	1557.32	1530.71	1492.86	1546.74	1548.16	1548.98	1545.14	1542.9					
7/31/2018	1557.32	1530.99	1492.93	1546.61	1547.94	1548.61	1545.04	1542.8					
8/1/2018	1557.72	1531.31	1493.01	1546.58	1547.84	1548.40	1545.04	1542.7					
8/2/2018	1558.10	1530.86	1493.08	1546.74	1548.22	1549.32	1545.19	1542.9					
8/3/2018	1558.19	1531.44	1493.15	1547.05	1548.81	1550.44	1545.43	1543.2					
8/4/2018	1558.35	1531.67	1493.22	1547.08	1548.73	1550.08	1545.49	1543.3					
8/5/2018	1558.50	1532.63	1493.29	1547.00	1548.48	1549.49	1545.44	1543.2					
8/6/2018	1558.73	1534.53	1493.35	1546.84	1548.22	1549.01	1545.31	1543.0					
8/7/2018	1558.01	1536.71	1493.42	1546.63	1547.94	1548.60	1545.13	1542.8					
8/8/2018	1558.16	1539.39	1493.49	1546.78	1548.36	1549.66	1545.24	1543.0					
8/9/2018	1557.36	1541.87	1493.55	1546.88	1548.55	1549.99	1545.32	1543.1					
8/10/2018	1557.86	1543.91	1493.62	1546.78	1548.32	1549.47	1545.24	1543.0					
8/11/2018	1558.11	1545.74	1493.68	1546.66	1548.08	1548.99	1545.15	1542.9					
8/12/2018	1558.46	1548.11	1493.75	1546.64	1547.97	1548.73	1545.15	1542.8					
8/13/2018	1558.71	1549.47	1493.82	1546.60	1547.92	1548.67	1545.13	1542.8					
8/14/2018	1558.98	1539.78	1493.89	1546.52	1547.79	1548.46	1545.06	1542.7					
8/15/2018	1558.87	1543.03	1493.96	1546.51	1547.72	1548.31	1545.07	1542.7					
8/16/2018	1558.87	1546.55	1494.04	1546.51	1547.67	1548.18	1545.08	1542.7					
8/17/2018	1559.16	1550.44	1494.12	1546.41	1547.51	1547.96	1544.98	1542.6					
8/18/2018	1559.25	1553.78	1494.20	1546.24	1547.30	1547.65	1544.80	1542.4					
8/19/2018	1559.33	1555.08	1494.27	1546.59	1548.30	1550.08	1545.11	1542.8					
8/20/2018	1559.11	1557.19	1494.33	1546.91	1548.78	1550.72	1545.37	1543.1					
8/21/2018	1559.29	1556.27	1494.40	1546.76	1548.45	1549.96	1545.25	1543.0					
8/22/2018	1559.40	1557.26	1494.46	1546.77	1548.40	1549.81	1545.28	1543.0					
8/23/2018	1552.08	1556.04	1494.53	1546.86	1548.38	1549.58	1545.40	1543.0					



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

				Elevation (ft NAVD88)			
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8
8/24/2018	1553.55	1557.11	1494.60	1546.80	1548.20	1549.16	1545.37	1543.02
8/25/2018	1553.10	1558.43	1494.68	1546.74	1548.06	1548.86	1545.33	1542.96
8/26/2018	1552.58	1559.05	1494.75	1546.69	1547.94	1548.64	1545.30	1542.91
8/27/2018	1552.57	1561.52	1494.83	1546.56	1547.77	1548.39	1545.19	1542.81
8/28/2018	1552.70	1563.05	1494.92	1546.47	1547.63	1548.17	1545.12	1542.72
8/29/2018	1552.87	1557.37	1494.99	1546.35	1547.46	1547.91	1545.01	1542.60
8/30/2018	1553.23	1559.64	1495.06	1546.39	1547.33	1547.69	1544.95	1542.5
8/31/2018	1553.77	1562.07	1495.13	1546.27	1547.24	1547.53	1544.91	1542.4
9/1/2018	1554.27	1561.69	1495.20	1546.26	1547.20	1547.45	1544.92	1542.4
9/2/2018	1554.51	1562.44	1495.28	1546.20	1547.12	1547.30	1544.87	1542.3
9/3/2018	1554.98	1564.67	1495.36	1546.15	1547.08	1547.22	1544.88	1542.3
9/4/2018	1555.45	1562.12	1495.43	1545.99	1547.04	1547.19	1544.80	1542.3
9/5/2018	1555.86	1563.73	1495.51	1545.98	1546.93	1547.05	1544.71	1542.2
9/6/2018	1556.46	1565.96	1495.58	1545.94	1546.84	1546.93	1544.64	1542.1
9/7/2018	1556.86	1566.57	1495.65	1545.77	1546.70	1546.75	1544.52	1542.0
9/8/2018	1557.04	1565.75	1495.72	1545.55	1546.50	1546.52	1544.33	1541.8
9/9/2018	1557.42	1566.21	1495.80	1545.41	1546.40	1546.44	1544.23	1541.7
9/10/2018	1557.54	1566.47	1495.87	1545.83	1547.32	1548.60	1544.57	1542.2
9/11/2018	1557.64	1564.45	1495.94	1546.78	1549.04	1551.96	1545.39	1543.2
9/12/2018	1557.80	1564.32	1496.00	1546.98	1549.20	1551.74	1545.54	1543.3
9/13/2018	1558.21	1565.48	1496.06	1546.97	1549.01	1551.15	1545.55	1543.3
9/14/2018	1558.70	1566.02	1496.12	1546.81	1548.63	1550.30	1545.43	1543.1
9/15/2018	1558.86	1567.21	1496.18	1546.67	1548.32	1549.64	1545.33	1543.0
9/16/2018	1559.19	1568.25	1496.24	1546.52	1548.06	1549.14	1545.21	1542.8
9/17/2018	1559.26	1568.56	1496.31	1546.47	1548.15	1549.58	1545.16	1542.8
9/18/2018	1559.71	1569.48	1496.38	1546.77	1548.61	1550.37	1545.42	1543.1
9/19/2018	1560.20	1569.39	1496.44					
9/19/2018	1560.42	1569.67	1496.46					
9/19/2018	1560.42	1569.67	1496.46					
9/19/2018	1560.43	1569.68	1496.46					
9/19/2018	1560.43	1569.68	1496.46					
9/19/2018	1560.44	1569.73	1496.46					
9/19/2018	1560.44	1569.73	1496.46	1546.78	1548.50	1550.01	1545.45	1543.1
9/20/2018	1560.81	1570.49	1496.50	1546.76	1548.30	1549.48	1545.47	1543.1
9/21/2018	1561.56	1570.49	1496.57	1546.66	1548.09	1549.46	1545.39	1543.0
9/22/2018	1561.49	1571.07	1496.64	1546.53	1547.89	1548.72	1545.39	1543.0
							1545.26	
9/23/2018	1561.62	1571.79	1496.70	1546.41	1547.72	1548.46		1542.7
9/24/2018	1562.14	1572.41	1496.77	1546.46	1547.74	1548.47	1545.23	1542.8
9/25/2018	1562.76	1572.70	1496.84	1546.41	1547.64	1548.30	1545.19	1542.7
9/26/2018	1563.03	1572.48	1496.91	1546.23	1547.42	1548.02	1545.02	1542.6
9/27/2018	1563.30	1572.99	1496.97	1546.15	1547.38	1548.01	1544.94	1542.5
9/28/2018	1563.44	1573.23	1497.03	1547.08	1549.34	1552.25	1545.73	1543.5
9/29/2018	1563.38	1570.43	1497.09	1547.29	1549.47	1551.97	1545.90	1543.6
9/30/2018	1563.72	1571.90	1497.15	1547.28	1549.31	1551.46	1545.90	1543.5
10/1/2018	1563.97	1572.84	1497.22	1547.22	1549.06	1550.81	1545.88	1543.5
10/2/2018	1563.32	1573.32	1497.28	1547.02	1548.69	1550.08	1545.71	1543.3



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

	Elevation (ft NAVD88)											
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8				
10/3/2018	1564.04	1573.13	1497.35	1546.84	1548.39	1549.55	1545.55	1543.14				
10/4/2018	1564.17	1574.46	1497.42	1546.72	1548.19	1549.19	1545.46	1543.02				
10/5/2018	1564.40	1572.45	1497.49	1546.63	1548.03	1548.92	1545.39	1542.93				
10/6/2018	1564.74	1571.58	1497.55	1546.74	1548.27	1549.49	1545.48	1543.05				
10/7/2018	1564.73	1572.13	1497.62	1546.77	1548.24	1549.33	1545.52	1543.07				
10/8/2018	1565.13	1572.77	1497.69	1546.70	1548.07	1548.98	1545.48	1543.01				
10/9/2018	1565.32	1573.91	1497.76	1546.56	1547.87	1548.67	1545.34	1542.88				
10/10/2018	1565.36	1571.87	1497.82	1546.26	1547.53	1548.20	1545.05	1542.61				
10/11/2018	1565.34	1572.92	1497.90	1546.16	1547.71	1549.03	1544.92	1542.60				
10/12/2018	1565.46	1573.95	1497.96	1547.03	1549.29	1551.98	1545.66	1543.43				
10/13/2018	1565.44	1574.45	1498.02	1547.12	1549.20	1551.50	1545.76	1543.46				
10/14/2018	1566.20	1575.46	1498.09	1547.14	1549.05	1550.97	1545.81	1543.45				
10/15/2018	1566.20	1576.76	1498.14	1547.05	1548.81	1550.46	1545.74	1543.33				
10/16/2018	1566.58	1572.78	1498.21	1547.04	1548.75	1550.31	1545.75	1543.33				
10/17/2018	1566.65	1573.97	1498.27	1547.09	1548.77	1550.29	1545.81	1543.37				
10/18/2018	1567.17	1575.69	1498.34	1547.22	1548.81	1550.17	1545.96	1543.48				
10/19/2018	1567.35	1577.40	1498.41	1546.94	1548.48	1549.67	1545.70	1543.23				
10/20/2018	1567.00	1578.25	1498.48	1546.58	1548.09	1549.21	1545.34	1542.92				
10/21/2018	1567.29	1579.43	1498.55	1546.96	1548.53	1549.90	1545.71	1543.24				
10/22/2018	1567.72	1579.05	1498.62	1546.90	1548.40	1549.60	1545.66	1543.19				
10/23/2018	1567.74	1579.54	1498.69	1546.76	1548.20	1549.26	1545.55	1543.06				
10/24/2018	1568.08	1580.30	1498.77	1546.76	1548.13	1549.09	1545.56	1543.05				
10/25/2018	1568.07	1577.41	1498.84	1546.57	1547.91	1548.80	1545.38	1542.88				
10/26/2018	1567.87	1575.61	1498.91	1546.11	1547.46	1548.28	1544.93	1542.50				
10/27/2018	1566.91	1575.72	1498.98	1546.19	1547.67	1548.87	1544.98	1542.56				
10/28/2018	1567.24	1576.64	1499.06	1546.47	1548.01	1549.35	1545.27	1542.82				
10/29/2018	1567.45	1577.15	1499.13	1546.60	1548.09	1549.39	1545.39	1542.92				
10/30/2018	1567.71	1577.57	1499.20	1546.65	1548.08	1549.24	1545.47	1542.97				
10/31/2018	1567.97	1577.82	1499.26	1546.50	1547.88	1548.91	1545.34	1542.83				
11/1/2018	1568.00	1578.56	1499.32	1546.14	1547.50	1548.43	1544.98	1542.51				
11/2/2018	1567.77	1578.55	1499.39	1546.01	1547.33	1548.22	1544.86	1542.40				
11/3/2018	1568.06	1578.95	1499.47	1546.43	1547.68	1548.57	1545.29	1542.75				
11/4/2018	1568.09	1579.39	1499.54	1546.48	1547.71	1548.55	1545.36	1542.79				
11/5/2018	1565.98	1579.93	1499.61	1546.25	1547.49	1548.30	1545.14	1542.60				
11/6/2018	1566.18	1580.57	1499.68	1546.10	1547.40	1548.35	1544.98	1542.50				
11/7/2018	1566.60	1575.20	1499.76	1546.90	1548.94	1551.44	1545.64	1543.26				
11/8/2018	1568.37	1578.24	1499.83	1547.05	1549.04	1551.35	1545.78	1543.38				
11/9/2018	1569.08	1578.83	1499.90	1546.81	1548.66	1550.58	1545.76	1543.14				
	1569.00			1547.36								
11/10/2018		1579.25 1579.47	1499.98 1500.06	1547.46	1549.52 1549.60	1552.21 1552.08	1546.07	1543.67 1543.74				
11/11/2018	1569.10	1579.47	1500.06			1552.08	1546.15					
11/12/2018	1569.62			1547.33	1549.36		1546.03	1543.60				
11/13/2018	1569.62	1579.95	1500.22	1547.43	1549.62	1552.25	1546.10	1543.70				
11/14/2018	1570.15	1578.35	1500.30	1547.83	1550.08	1552.76	1546.47	1544.05				
11/15/2018	1569.94 1569.70	1578.50 1578.50	1500.38 1500.46	1547.48 1547.84	1549.75 1550.27	1552.28 1553.15	1546.16 1546.43	1543.82 1544.09				
11/16/2018												



Table C3
Water Level Elevation Summary, Pond 1 Vibrating Wire Piezometers
AEP Clinch River Plant, Cleveland, Russell County, Virginia

				Elevation (ft NAVD88)			
Date	VWP-1	VWP-2	VWP-3	VWP-4	VWP-5	VWP-6	VWP-7	VWP-8
11/10/0010	4570.70	4==0.00	4500.00	454505	4540.05	1==0.10	4540.40	4.7.40.00
11/18/2018	1570.73	1578.96	1500.62	1547.87	1549.97	1552.19	1546.49	1543.98
11/19/2018	1570.89	1579.60	1500.70	1547.66	1549.66	1551.67	1546.29	1543.76
11/20/2018	1570.79	1579.71	1500.78	1547.59	1549.43	1551.19	1546.23	1543.66
11/21/2018	1571.43	1580.31	1500.85	1547.67	1549.44	1551.12	1546.33	1543.72
11/22/2018	1571.69	1580.86	1500.94	1547.71	1549.42	1551.02	1546.40	1543.75
11/23/2018	1571.82	1581.21	1501.02	1547.53	1549.17	1550.61	1546.23	1543.58
11/24/2018	1571.58	1581.48	1501.10	1547.05	1548.72	1550.15	1545.74	1543.17
11/25/2018	1571.63	1581.77	1501.18	1547.39	1549.31	1551.32	1546.05	1543.49
11/26/2018	1570.83	1582.40	1501.26	1547.20	1549.16	1551.21	1545.85	1543.33
11/27/2018	1566.87	1581.28	1501.33	1547.31	1549.16	1551.01	1545.97	1543.41
11/28/2018	1565.39	1581.33	1501.41	1547.41	1549.18	1550.91	1546.10	1543.49
11/29/2018	1564.69	1581.57	1501.48	1547.40	1549.13	1550.77	1546.10	1543.48
11/30/2018	1563.95	1581.12	1501.56	1547.27	1548.92	1550.43	1545.97	1543.34
12/1/2018	1563.49	1581.43	1501.64	1547.07	1548.77	1550.29	1545.80	1543.20
12/2/2018	1562.92	1581.83	1501.72	1546.98	1548.77	1550.50	1545.68	1543.11
12/3/2018	1562.83	1581.08	1501.81	1547.21	1549.05	1550.93	1545.90	1543.32
12/4/2018	1562.88	1581.99	1501.89	1547.45	1549.29	1551.19	1546.14	1543.53
12/5/2018	1562.79	1582.20	1501.97	1547.45	1549.22	1551.00	1546.15	1543.53
12/6/2018	1562.89	1582.68	1502.05	1547.63	1549.36	1551.09	1546.34	1543.68
12/7/2018	1562.82	1582.86	1502.13	1547.67	1549.33	1550.96	1546.38	1543.70
12/8/2018	1562.76	1581.08	1502.22	1547.64	1549.22	1550.70	1546.35	1543.66
12/9/2018	1562.75	1581.61	1502.30	1547.27	1548.85	1550.22	1545.99	1543.34
12/10/2018	1562.66	1581.99	1502.38	1547.23	1548.81	1550.25	1545.96	1543.32
12/11/2018	1562.71	1582.69	1502.47	1547.42	1549.09	1550.76	1546.14	1543.51
12/12/2018	1562.62	1582.68	1502.55	1547.40	1549.17	1550.99	1546.12	1543.53
12/13/2018	1562.58	1582.56	1502.63	1547.51	1549.27	1551.11	1546.21	1543.60
12/14/2018	1562.66	1583.03	1502.72	1547.43	1549.27	1551.18	1546.14	1543.55
12/15/2018	1562.47	1582.48	1502.80	1547.69	1550.09	1553.12	1546.33	1543.98
12/16/2018	1562.29	1583.83	1502.88	1547.99	1550.44	1553.43	1546.56	1544.16
12/17/2018	1562.63	1582.77	1502.95	1548.18	1550.55	1553.35	1546.74	1544.24
12/18/2018	1562.93	1582.45	1503.03	1548.15	1550.36	1552.81	1546.72	1544.15
12/19/2018	1563.15	1582.70	1503.12	1547.99	1550.07	1552.24	1546.57	1543.96
12/20/2018	1563.16	1583.10	1503.12	1547.62	1549.63	1551.61	1546.21	1543.61
12/21/2018	1562.91	1582.82	1503.29	1547.02	1549.05	1551.01	1545.71	1543.17
12/21/2018	1563.20	1582.14	1503.29	1548.39	1549.15	1553.69	1546.91	1544.42
	+		1503.37					
12/23/2018	1563.87	1581.80		1548.45	1550.75	1553.36	1546.96	1544.36
12/24/2018	1564.09	1581.49	1503.53	1548.55	1550.67	1552.95	1547.09	1544.39
12/25/2018	1564.34	1581.34	1503.62	1548.47	1550.49	1552.57	1547.02	1544.29
12/26/2018	1564.58	1581.87	1503.71	1548.57	1550.48	1552.42	1547.14	1544.34

Notes:

-- = not applicable or not available

ft = foot or feet

ft NAVD88 = ft above North American Vertical Datum of 1988

VWP = Vibrating Wire Piezometer

