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FGD LANDFILL-CCR REVISED GROUNDWATER MONITORING WELL NETWORK EVALUATION

Amos Plant

Winfield Road

Putnam County

Winfield, West Virginia

May 27, 2020

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ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power Service Corporation
amsl	above mean sea level
Arcadis	Arcadis U.S., Inc.
ASD	alternative source demonstration
bgs	below ground surface
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
CSM	Conceptual Site Model
FGD	flue gas desulfurization
ft	feet
LCS	Leachate Collection System
PVC	polyvinyl chloride

1 INTRODUCTION

This report was prepared by Arcadis U.S., Inc. (Arcadis) for American Electric Power Service Corporation (AEP) to assess the adequacy of the groundwater monitoring well network included in the Coal Combustion Residual (CCR) requirements, as specified in Code of Federal Regulations (CFR) 40 CFR 257.91, for the offsite flue gas desulfurization (FGD) landfill (CCR Unit) located approximately 2 miles northwest of the AEP Generating Plant (Plant) located on Winfield Road in Winfield, West Virginia (**Figure 1**). Specifically, this Groundwater Monitoring Well Network Evaluation report is intended to address the requirements of 40 CFR 257.91 excluding paragraphs (d) and (g) regarding the adequacy of the groundwater monitoring system. The CCR requirements include an evaluation of the adequacy of the groundwater monitoring well network to characterize groundwater quality up and down gradient of the CCR unit in the uppermost aquifer. The objective of this report is to present an evaluation of the adequacy of the groundwater monitoring well network in the uppermost aquifer at the offsite FGD Landfill (Site).

Two other regulated CCR units associated with the Plant were identified for review, which include the bottom ash pond (BAP) system and the fly ash pond (FAP) (**Figure 2**). The evaluations of the onsite BAP system and FAP are not included in this report and were completed under separate cover.

An initial evaluation of the FGD Landfill monitoring well network was completed in November 2015 and included a review of AEP-provided data associated with previously completed subsurface investigation activities in the vicinity of the FGD Landfill, as well as publicly available geologic and hydrogeologic data. Based on the initial evaluation, the monitoring well network included wells and piezometers that already existed at the Site. Additional analyses and understanding of the uppermost aquifer have provided information that supports re-evaluation of the previous monitoring well network that included shallow monitoring wells. To supplement the network, two additional deeper down gradient monitoring wells (MW-1801, MW-1802) screened in the uppermost aquifer were drilled and installed in August 2018. Drilling activities were performed by a West Virginia-licensed driller (AEP) with Arcadis personnel completing borehole logging and well installation oversight. These monitoring wells have been effectively added to the federal CCR Rule Groundwater Monitoring Network as of the date of this report.

The following report presents the current Conceptual Site Model (CSM) based on a combination of historic site data, regional data for the Site and surrounding vicinity, site-specific investigations completed through 2018, and permit documentation. This report also includes a description of the uppermost aquifer and the revised monitoring well network. The revised monitoring well network was determined to adequately monitor up gradient and down gradient areas of the Site in the uppermost aquifer; therefore, the report objective has been met.

2 BACKGROUND INFORMATION

The following section provides background information for the AEP Amos Generating Plant FGD landfill that was used to support the groundwater monitoring well network evaluation.

2.1 Facility Location Description

The AEP Amos Generating Plant is located in Putnam County, bounded by State Route 817 (Old U.S. Route 35) to the west and the Kanawha River to the east. The FGD Landfill is located approximately 2 miles northwest of the Plant and approximately three-quarters of a mile west of Winfield Road (WV 817) (**Figures 1** and **2**). The CCR Unit occupies approximately 258 total acres, located in an isolated area, with surrounding land use predominantly residential or undeveloped, with some agriculture (**Figure 3**).

2.2 Description of FGD Landfill CCR Unit

The following section will discuss the landfill configuration, area, volume, construction and operational history, and surface water control associated with the FGD Landfill.

2.2.1 Landfill Configuration

The landfill consists of a northern and southern valley surrounded on all sides by ridges with the northern and southern valleys separated by a topographic high point. The surface of the waste is designed to be covered with a minimum of 6-inches of soil overlying CCR, a 50-mil High Density Polyethylene (HDPE) Integrated Drainage System (IDS) geomembrane or equivalent, and covered with at least 18-inches of protective and vegetative cover soil (in the upper 6-inches of the protective cover) and vegetated with grass cover as closure construction at each landfill area is completed. Currently, final cover has been placed on the south valley cell 3 section of the landfill. General construction of the landfill final cover is further detailed in the *Design Report: Landfill Final Cover System* (GAI Consultants, Inc. [GAI] 2016).

The topography surrounding the FGD Landfill consists of steep ridges greater than 200 ft on most sides (**Figure 3**). The highest point at the Site is greater than 1,000 ft above mean sea level (amsl), while the river valley elevations range from less than 600 ft amsl (Kanawha River valley) to less than 700 ft amsl (Lick Run). The Kanawha River is located east of the FGD Landfill and ranges in elevation from approximately 565 to 583 ft amsl (United States Geological Survey [USGS] 2019).

2.2.2 Area/Volume

The total area of the Site is approximately 258 acres which includes both disposal and non-disposal use. The current permitted area for disposal is 192 acres, with a permitted waste capacity of approximately 36.7 million cubic yards (**Figure 3**).

2.2.3 Construction and Operational History

In March 2006, AEP submitted the *Class F Industrial Landfill Facility Application* (GAI 2006) to West Virginia Department of Environmental Protection. The application was approved and landfill activities began in April 2009. Subsequent permit modifications and renewals have been submitted and approved for the Site, most

recently in 2016 at the time of this report (GAI 2016). Landfill construction is planned for 9 individual sequences (i.e. cells), and the designed disposal rate is 2 million cubic yards per year. With a maximum design capacity of 36.7 million cubic yards, the landfill design life is approximately through the middle of year 2035 (GAI 2016). As of April 2019, the landfill is being filled within cells 1, 2 and 3 in the southern valley. Northern valley construction began in 2013 with installation of the groundwater interceptor drainage system, as well as the sedimentation and leachate ponds, and followed by the cell 4 bottom liner construction in 2018-2019.

During landfill construction, a liner is placed at the base of each cell. This liner is described in detail in the *Solid Waste/NPDES Permit Renewal Application* (GAI 2006). In general, the landfill liner consists of the following layers:

- Groundwater interceptor drainage system
- 12-inches of compacted or in-place clayey-silt subbase
- 24-inches of compacted clay liner (North Valley); 18-inches of compacted clay liner (South Valley)
- 30-mil polyvinyl chloride (PVC) geomembrane
- Leachate Collection System (LCS)
- 18-inches of protective cover (typically bottom ash, potentially West Virginia Department of Transportation mortar sand or gypsum)

The CCR byproducts from the three coal-fired generating units at the Plant (Unit 1 through Unit 3) are placed in the landfill. These waste products include fly ash, bottom ash, FGD (synthetic gypsum), and FGD purge stream treatment solids (limestone inert solids). Fly ash and bottom ash are trucked from the Amos Plant to the landfill active cell area. FGD is sluiced from the Amos Plant to the Chloride Purge Stream (CPS) WWTP directly adjacent to the Landfill via pipelines. FGD products are dried and caked at this facility before being trucked to the landfill for disposal. Fly ash and bottom ash are trucked directly from the Amos Plant to the landfill via a private haul road for direct disposal. The landfill was also permitted to receive CCR byproducts from the AEP Plants at Big Sandy, Clinch River, Conesville, Gavin, Glen Lyn, Mitchell, Mountaineer, Muskingum River, Sporn, Tanners Creek, and Kanawha River (GAI 2006; GAI 2016).

2.2.4 Surface Water Control

Surface water control at the CCR Unit is discussed in detail in *Class F Industrial Landfill Facility Application* (GAI 2006) and consists of surface runoff and infiltration of surface runoff. Surface runoff is managed through a series of collection channels, sediment traps, and pipe culverts that channel flow to 4 sediment collection ponds around the perimeter of the site. Leachate and surface flow in active landfill areas are directed to the leachate pond at the mouth of the southern or northern valley, respective to the active portion of the landfill containing the contact water. This is accomplished with vertical chimney drains that divert water to the LCS component of the landfill liner, which is a geo-composite drainage net consisting of a high-density polyethylene geo-net with needle-punched nonwoven geotextiles heat-bonded to its upper and lower surfaces draining to a network of perforated PVC pipes. The LCS channels leachate and surface flow in active landfilling areas to the leachate ponds (GAI 2006). Sedimentation ponds are located in the northwest, southwest, and southeast portions of the landfill. A sedimentation pond is located along the eastern side of the landfill near the divide between the north and south valleys.

2.3 Previous Investigations

Prior to submission of the *Class F Industrial Landfill Facility Application* in March 2006, GAI Consultants, Inc., in coordination with AEP, performed a site investigation to characterize the conditions at the proposed landfill facility. These investigations included drilling through soil and into rock, split barrel soil sampling and standard penetration testing, undisturbed soil sampling (Shelby tubes), continuous rock coring (where appropriate), and pump or packer testing of select rock units (GAI 2006).

Soil samples were analyzed for geotechnical parameters to assist with general site characterization and stability analyses. These parameters include grain size distribution, Atterberg limits, specific gravity, moisture content, compaction, permeability, cation exchange capacity, and X-Ray Diffraction characteristics. Additionally, soil samples were analyzed for physical properties at a proposed onsite borrow site for liner quality determination (GAI 2006).

During the site investigation, piezometers were installed in 23 of 25 soil borings advanced in the projected landfill footprint. Ten 2-inch PVC monitoring wells were also installed, generally around the perimeter of the proposed extent of fill. Groundwater samples were collected from monitoring wells in an effort to characterize background water quality.

Since 2016, background and detection groundwater monitoring has been performed in accordance with 40 CFR 257.90 through 40 CFR 257.94. This monitoring includes statistical evaluation of concentrations of Appendix III and Appendix IV parameters as defined in 40 CFR 257. Analysis of groundwater chemistry data has been successful in demonstrating alternate sources. Specifically, two alternate source demonstrations (ASDs) have been completed for observed statistically significant increases (SSIs) in Appendix III parameters (AEP 2019):

- November 2017/January 2018 monitoring events: Boron (MW-2), Chloride (MW-5), and Fluoride (MW-2 and MW-4)
- May/June 2018 monitoring events: Boron (MW-2 and MW-5), and Chloride (MW-5)

These ASDs suggested that concentration trends may be the result of Type IV (natural variability) and/or Type V (alternative source) causes. In particular, it was noted that construction activities and/or road salting may represent an anthropogenic Type V factor contributing to concentration variability in several wells at the Site. Furthermore, the ASD indicated groundwater types can be divided into two groups, with MW-2, MW-4, and MW-10 exhibiting a tight sodium-carbonate cluster, and the remaining wells (MW-1, MW-5, MW-6, MW-7R, MW-8, and MW-9) falling outside of this range (AEP 2019). Down gradient wells within the uppermost aquifer (MW-2 and MW-4) that fall within a differing groundwater type than shallow perched zone wells (MW-1 and MW-5) is evidence of separation of these two zones.

In 2018, Arcadis completed site investigation activities including high-resolution water level monitoring, hydraulic testing, and well installation. Pressure transducers were installed in seven monitoring wells (MW-1, MW-2, MW-4, MW-5, MW-8, MW-9, and MW-10) to collect continuous water level data from May through August 2018 in order to better characterize hydrogeologic conditions. Monitoring well installation was designed to augment the CCR monitoring well network at the Site with two additional down gradient wells installed in the stress relief fracture system. Boreholes were continuously logged and advanced to depths ranging from approximately 105 ft below ground surface (bgs) to 115 ft bgs at MW-1801 (south valley) and MW-1802 (north valley), respectively. After completion of the boreholes, straddle packer tests were

completed to quantify hydraulic parameters and to assist in final placement of well screen intervals. Well yield testing was completed at the new monitoring wells to further quantify aquifer parameters. A complete description of well installation field methodology is provided in **Appendix A**. Results of hydraulic testing and water level monitoring are discussed in Section 3.1.3 of this report.

2.4 Hydrogeologic Setting

The geologic setting surrounding the Site consists of ridges formed by the Pennsylvanian age Monongahela and Conemaugh Formations. The Monongahela and Conemaugh Formations consist of sandstones, shales, limestones, and coal. These rocks have been fractured in response to a decline in stress and erosion. This decline in stress expands the rock and a system of fractures form throughout the bedrock over time. This process, which is characteristic of Appalachian valleys, is called stress relief fracturing (SRF) and is more prevalent in shallow bedrock (USGS 1981, 2000). Groundwater is present at the Site within these fracture systems (secondary porosity), while groundwater within primary porosity components (i.e., pore spaces) is less significant. A generalized cross section illustrating the features of an Appalachian SRF system is provided on **Figure 4**. Fractures observed at the Site in the SRF system are nearly vertical with attitude angles ranging from 75˚ to near 90˚. These fractures occur in sets that are oriented roughly parallel and perpendicular to one another, but not necessarily to the valley walls. Borings installed in both the south valley and north valley have moderate to highly fractured bedrock at depths greater than 100 ft below ground surface (bgs). Bedrock groundwater flow generally follows surface topography and is generally downslope of the ridge towards the valley floors. The SRF is known to be regionally prevalent and is considered the regional uppermost aquifer system outside of primary unconsolidated fluvial valleys (e.g. Kanawha River Valley and Teays Valley) surrounding the Site.

Unconsolidated deposits on top of the bedrock consist primarily of weathered bedrock and residuum, with some colluvial/alluvial deposits consisting of weathered rock, sand, silt, and clay. In valley bottoms, the unconsolidated sediments can be saturated with localized areas of shallow perched groundwater at the soil-rock interface. These localized areas of shallow groundwater generally flow down-valley and have limited connection with the SRF system. This is further discussed in Section 3.1.3.4.

These features are further illustrated on three lines of cross section through the FGD Landfill. Two lines trend from southwest to northeast through the south valley (A-A') and north valley (B-B'). The other line trends from northwest to southeast through both the north and south valleys. A cross section location map is provided on **Figure 5**. Cross sections A-A', B-B', and C-C' are provided on **Figures 6A**, **6B**, and **6C**, respectively. Detailed boring logs and well construction diagrams are included in **Appendix B**.

2.4.1 Climate and Water Budget

The climate of Winfield, West Virginia is characterized as humid continental with an average rainfall of approximately 40 inches annually. The average maximum temperature is 66 degrees Fahrenheit and the average minimum temperature is 44 degrees Fahrenheit based on information from Southeast Regional Climate Center (SERCC 2017).

The results of a numerical water budget analysis performed as part of the March 2006 *Class F Industrial Landfill Facility Application* is described in detail in Appendix I of that application (GAI 2006). The primary objective of the analysis was to estimate the average annual leachate production and estimate the

maximum leachate head within the landfill liner system. Using site-specific climate, slope, and soil characteristics, it was determined that maximum average daily heads, maximum daily peak heads, and average annual leachate heads were all within acceptable ranges (GAI 2006).

2.4.2 Regional and Local Geologic Setting

2.4.2.1 Unconsolidated

The Site is located in the Appalachian Plateau physiographic province, and unconsolidated soils are limited in extent and are residual and colluvial in origin. Soils in lower topographic areas (i.e. valleys) consist of sand, silt, or clay with increasing rock fragments with depth (colluvium), and grade to weathered bedrock (residuum) with depth. Further up the ridges, soils are composed mainly of residuum. Unconsolidated material is thickest in the valley floors, and average soil thickness is approximately 11 ft (GAI 2006).

2.4.2.2 Bedrock

The primary regional bedrock units encountered are Pennsylvanian age sedimentary rocks of the Monongahela Formation and Conemaugh Formation, in descending order from youngest to oldest. The depositional environment for these formations is characterized by a gradually subsiding shallow sea with alternating marine and freshwater strata. The sedimentary package associated with the Monongahela and Conemaugh Formations consists of alternating shale and sandstone units, with occasional thin limestone and coal beds. Several coal horizons are present in the region and often serve as marker beds for unit identification. The principal marker bed in the region is the Pittsburg Coal (i.e. No. 8 Coal), which marks the transition from the Monongahela and Conemaugh Formations. However, the Pittsburg Coal is not represented in Site borings (GAI 2006). The Pittsburgh Limestone has been identified in two borings at the nearby FAP, MW-3 and 2008-26, and is used to mark the local Monongahela-Conemaugh transition. Additionally, the Little Clarksburg Coal has been identified at FAP boring B-0608 and is used to mark the base of the Connellsville sandstone deposition (Latimer, W.J., et al. 1911).

The Monongahela Formation is found capping the hills surrounding the Site. It consists of claystones and sandstones, and to a lesser extent silt shales and siltstones, which have varying degrees of thickness laterally, making correlation difficult (GAI 2006). Stratigraphy and landfill construction details are illustrated on cross sections A-A' (south valley-southwest to northeast), B-B' (north valley-southwest to northeast), and C-C' (north and south valleys-northwest to southeast) (**Figures 6A**, **6B**, and **6C**, respectively).

Interpretations regarding shallow geologic structures are based on mapping of the Pittsburg Coal. The Parkersburg Syncline and the Byrnside Anticline appears to dip to the north-northwest through the site. Bedding planes at the site have a strike to the east-northeast and dip to the north-northwest at approximately 20 ft per mile (GAI 2006).

Deeper bedrock units produce oil and gas. Six (6) active oil and gas wells are located in the vicinity of the FGD Landfill along with former wells that were located within the landfill footprint (079-00611 and 079-00722) that were closed in 2007 and 2006, respectively. The location of these wells is shown on **Figure 3**. Available information on the closure is provided in **Appendix B**.

2.4.3 Surface Water and Surface Water Groundwater Interactions

There are intermittent streams in both the northern and southern area of the Site, Lick Run, and Little Hurricane Creek (**Figure 3**). Groundwater flows following topographic relief and is generally in the direction of each of these creeks. However, sedimentation, leachate, and stormwater ponds have been constructed around the perimeter of the landfill. The design specifications of these ponds are described in detail in the Class F Industrial Landfill Facility Application (GAI 2006). Groundwater flow, as well as surface water runoff that contacts active landfill areas, is directed to the leachate ponds via the Leachate Collection System component of the landfill liner. Non-contact runoff that contacts covered landfill areas, disturbed borrow areas, or undisturbed areas is contained in the sediment collection ponds which ultimately discharge to either Little Hurricane Creek or Lick Run via principal or emergency spillways (GAI 2006).

2.4.4 Water Users

There are no active groundwater production wells at the Site or within a half-mile radius of the site, based on available information. In 2017, a water well inventory for the Amos Plant indicated no information regarding the use of wells located in the vicinity of the Site was available (Banks Environmental Data, Inc., 2017). The report identified one well registered with the United States Geological Survey within a half-mile of the Site. This well is located approximately 1,700 ft west of the FGD Landfill north valley, on the west side of Lick Run, and appears to be used for groundwater monitoring (**Appendix C**).

There is at least one confirmed private water well located within 0.5 miles of the FGD Landfill. This private well is located east of the Site at 6881 Winfield Road but is not in use because the residence is connected to public water supply.

Public water wells within 0.5 mile of the Site are unlikely. Land use is comprised of residential or undeveloped properties, with some agriculture and industry. Most, if not all, developed parcels in the vicinity of the Site are connected to Putnam Public Service District public water supply. The Putnam Public Service District source water is from the Poplar Fork Creek water shed located over 4 miles to the northwest of the Site. The water is pumped to a reservoir and subsequently treated at the water treatment plant before being distributed to public users (Putnam Public Service District 2017). Additional potable water in the area is supplied by West Virginia American Water, which operates several water systems that pull water from the Elk River, a tributary to the Kanawha River (West Virginia American Water 2015). The Lower Kanawha River is not used as a source for potable water.

3 MONITORING WELL NETWORK EVALUATION

An initial evaluation of the monitoring well network present at the Site was performed in November 2015 to determine if any of the wells were viable for continued use as part of the federal CCR Rule groundwater quality monitoring well network or retained for the purpose of water level measurement as part of a larger groundwater hydraulic monitoring well network. As part of this review, hydrogeologic conditions were evaluated to determine if the defined uppermost aquifer unit had an adequate monitoring well network. The evaluation was completed in accordance with 40 CFR 257.91 to have an established monitoring well network that effectively monitors the uppermost aquifer up gradient and down gradient of the Site. Following the initial evaluation, the network was augmented to include existing piezometers for the purpose of hydraulic monitoring. Additionally, existing wells MW-1 and MW-5 were removed from the groundwater quality monitoring well network and retained only for hydraulic monitoring. As a result, two new monitoring wells were installed in the uppermost aquifer down gradient of the FGD Landfill. Background groundwater quality is monitored at the wells that are hydraulically up gradient from the FGD Landfill. Down gradient wells are placed down gradient of the CCR unit boundary to monitor water quality.

3.1 Hydrostratigraphic Units

3.1.1 Horizontal and Vertical Position Relative to CCR Unit

The uppermost aquifer is the first encountered aquifer that is horizontally continuous across the site. The uppermost aquifer at the Site is defined by the saturated portion of the SRF system, is independent of lithologic unit, and was examined to confirm hydraulic connection from ridge to valley using multiple lines of evidence that are discussed in Section 3.2.3. Stress relief fractures occur in both the Conemaugh and Monongahela Formations. Moderate to highly fractured bedrock was observed from the bedrock surface to depths greater than 100 ft bgs at wells MW-1801 and MW-1802, immediately west of the FGD Landfill in the south and north valleys, respectively. Stress relief fractures are also present along open horizontal bedding planes. In similar stress relief fracture systems, the aquifers are generally unconfined but water levels in wells can exhibit confined behavior in valley floors if low-transmissivity sediments (i.e. clay) are present (USGS 1981). The uppermost aquifer (i.e. saturated portion of the SRF system) is horizontally continuous across the entire site.

The upper limit of the uppermost aquifer is defined by the top of the potentiometric surface in the SRF system, generally located beneath the original bedrock surface prior to landfill construction. The potentiometric surface occurs at depths as shallow as 1 ft below the soil-rock interface (beneath valley walls) to greater than 90 ft below the soil-rock interface (beneath ridgetops, e.g. MW-10). This is illustrated on cross sections A to A', B to B', and C-C' (**Figures 6A**, **6B**, and **6C**), as well as depth to water measurements summarized on **Table 1**.

There are localized areas of shallow perched groundwater at the soil-rock interface. These are limited in valley bottoms and have limited connection with the underlying SRF system. Monitoring wells MW-1 (southern valley), and MW-5 (northern valley) are screened in these shallow perched zones. These zones are not considered the uppermost aquifer as they are limited in extent and discontinuous. Within the limits of the landfill, underdrains located at various depths beneath the landfill liner prevent an intermittent,

recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevation (GAI 2006).

3.1.2 Overall Flow Conditions

Groundwater flow at the Site occurs within the SRF system (i.e. uppermost aquifer), mainly moving along hydraulically connected fractures and other secondary porosity features. Groundwater within primary porosity components (i.e., pore spaces) is less significant. Fractures in this system are hydraulically connected via open bedding planes, and groundwater flow directions generally follow topography from ridges towards the valley floor and out the northern and southern valley mouths. Local areas of shallow perched groundwater in the valley flows horizontally along the soil-rock interface. As discussed in Section 3.1.3.4, vertical flow of perched groundwater is limited. Available groundwater elevations are summarized on **Table 1** for July 2005, November 2010, and January 2019 well gauging events. Potentiometric contours from the November 2010 event, which is the most recently available data that includes groundwater elevations beneath the landfilled material (e.g. MW-3R, 0512, 0513), are depicted on **Figure 7**. Groundwater levels and flow directions from the most recent gauging events, including levels from MW-1801 and MW-1802, are consistent with historical data.

3.1.3 Hydraulic Conductivity

The following subsection describes field implementation and data analysis of hydraulic testing conducted at the FGD Landfill (e.g., borehole packer tests, well yield tests). Historical hydraulic tests are briefly described and referenced. Hydraulic conductivity estimates derived from 2018 investigations are consistent with historical estimates and discussed in more detail below.

3.1.3.1 Historical Hydraulic Testing

Packer testing was completed during piezometer and well installations in 2005 in order to estimate hydraulic properties of the fractured bedrock. Additionally, slug tests were conducted at select bedrock monitoring wells. Reported hydraulic conductivity estimates from historic packer and slug tests in the SRF are provided in **Table 2** and ranged from 10^{-3} to 10^{-6} centimeters per second (cm/sec). No hydraulic testing data is available for perched groundwater in the valley floor (GAI 2006).

3.1.3.2 Packer Testing

Packer testing was conducted during installation of wells MW-1801 and MW-1802. The intent of injection packer testing is to estimate relative bedrock permeability for various borehole depth intervals to assist with water-bearing unit identification and monitoring well installation. Upon completion of each borehole, rock cuttings were flushed from the borehole with water in preparation for packer testing. Inflatable upper and lower rubber packers were then inserted to a specified 10-ft depth interval and inflated to create a seal. A riser pipe was attached to the top of the upper packer to provide a rigid, sealed standpipe with a pressure gauge at a known distance above the ground surface. Through this riser pipe, water was injected into the packer interval while measuring the gauge injection pressure, as well as injection volumes via a totalizing flowmeter. During the packer tests, flow rates and borehole pressure were monitored at regular intervals. Test data was analyzed using the method described in the U.S. Department of the Interior Ground Water Manual (1977).

Packer tests were designed to target the SRF system. Two depth intervals were tested at MW-1801 (55 to 65 and 65 to 75 ft bgs). The estimated hydraulic conductivity from 55 to 65 ft bgs was 7.9 x 10^{-5} cm/sec, and from 65 to 75 ft bgs was 3.2 x 10^{-6} cm/sec. Four depth intervals were tested at MW-1802 (48 to 58, 65 to 75, 89 to 99, and 99 to 109 ft bgs) and flow was only observed at two of those intervals. The estimated hydraulic conductivity from 48 to 58 ft bgs was 4.0 x 10^{-6} cm/sec, and from 89 to 99 ft bgs was 3.7 x 10^{-5} cm/sec. Packer test results are summarized on **Table 2** and packer testing logs are included in **Appendix D**.

3.1.3.3 Yield Testing

Well yield testing was conducted by Arcadis from August through September 2018 at wells MW-1801 and MW-1802, both of which are installed in the uppermost aquifer. Yield tests were completed by pumping each well at variable and steady state extraction rates and measuring the water level response in each well during and after pumping (recovery). Extraction rates were maintained using a submersible pump. High-resolution water level data were collected during both pumping and recovery phases via data-logging pressure transducers installed in each test well. Representative portions of recovery data were selected for analysis and analyzed using AQTESOLV® for Windows® Version 4.50 (Duffield 2007). Hydraulic parameter values were determined using the Theis analytical solution based on the observed response for a single (partially-penetrating) well. Drawdown data was corrected for unconfined conditions using an appropriate equation (Kruseman and DeRidder 1990).

The estimated hydraulic conductivity values at MW-1801 and MW-1802 were 2.5 x 10^{-6} and 1.2 x 10^{-5} cm/sec, respectively. A summary of yield testing results is provided on **Table 2** and solution reports with individual curve matches are provided in **Appendix D**.

3.1.3.4 High Resolution Water Level Monitoring

Continuous water level data in the SRF and shallow alluvial zone was collected in May through August 2018 in order to better characterize hydrogeologic conditions at the FGD Landfill. Resulting hydrographs from this data collection is presented in **Appendix D**.

Pressure transducers were installed at seven hydraulic monitoring locations that included three SRF monitoring wells located up gradient on ridges in the north valley (MW-8, MW-9 and MW-10), two down gradient SRF monitoring wells with one in the south valley (MW-2) and north valley (MW-4), and two down gradient shallow alluvium monitoring wells with one in the south valley (MW-1) and one north valley (MW-5).

The following external hydraulic influences were observed at the FGD Landfill during the monitoring period: precipitation events, barometric pressure fluctuations, and responses to groundwater sampling. Water-levels were post-processed that included barometric compensation, shift correction, water-level elevation, and barometric correction. Barometric efficiency was estimated for each monitoring well and varied from 0.05 to 0.2 and indicates a level of confinement for the SRF. In the north valley, shallow alluvium well MW-5 did not have a barometric effect reflecting unconfined shallow water table conditions. Shallow alluvium well MW-1 did have a barometric effect with a resulting barometric efficiency of 0.2, which is likely due to shallower finer grained material in the vadose zone compare to coarser deposits observed at MW-5. Additionally, the observed water level elevations confirm a vertical sequence separating the shallow alluvium and SRF indicating a level of hydraulic separation of the two zones (e.g. MW-1, MW-2 [south valley

Figures D-2 and **D-3**] and MW-4, MW-5 [north valley **Figures D-4** and **D-5**]). Vertical separation is evident at each of these two well pairs because the water level elevations in wells screened in the shallow alluvium (i.e., MW-1 and MW-5) are approximately 15 to 30 ft higher than at adjacent wells screened in the SRF (i.e., MW-2 and MW-4).

Several of the monitoring wells responded to precipitation events resulting in water level increases including MW-2, MW-4, MW-5 as well as MW-9, to a lesser extent. Sudden declines followed by recovery in water levels due to groundwater sampling were also observed in wells MW-5, MW-8, MW-9, and MW-10. Following groundwater sampling events and an anomalous decrease at MW-1, several wells showed a more rapid recharge such as MW-5, MW-8, and MW-9 (see **Figure D-7**) while other wells took several days or weeks to return to pre-pumping levels such as MW-10 (see **Figure D-8**). The more rapid recharge response is reflective of a higher permeability of the materials at the respective locations.

3.2 Uppermost Aquifer

3.2.1 CCR Rule Definition

Per 40 CFR 257.60(a), new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (5 ft) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high conditions).

The CCR rule definitions for an aquifer and the uppermost aquifer as specified in 40 CFR 257.53 indicates an aquifer is a geologic formation capable of yielding usable quantities of groundwater to wells or springs while an uppermost aquifer is defined as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers, that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural groundwater surface to which the aquifer rises during the wet season.

3.2.1.1 Common Definitions

An aquifer is commonly defined as a geologic unit that stores and transmits water (readily or at sufficient flow rates) to supply wells and springs (USGS 2015; Fetter 2001). The uppermost aquifer is considered the first encountered aquifer nearest to the CCR unit.

3.2.2 Identified Onsite Hydrostratigraphic Unit

The identified Site hydrostratigraphic unit is the saturated portion of the SRF system, which is considered the uppermost aquifer at the Site. The SRF is known to be regionally prevalent and is considered the regional uppermost aquifer system outside of primary unconsolidated fluvial valleys. The uppermost aquifer is not known to be used locally for groundwater supply or industrial water use.

3.2.3 Hydraulic Connection – Multiple Lines of Physical Evidence Approach

A multiple lines of evidence approach was used to understand the hydraulics related to horizontal and vertical groundwater flow at the Site. The main purpose for this demonstration was to help understand the dynamics and vertical connectivity of the SRF system, both from ridges to valleys, as well as perched groundwater in valleys to deeper bedrock fractures.

At the Site, the SRF system is determined to be the uppermost aquifer based on spatial occurrence and hydraulic testing. The following lines of physical evidence support the understanding that the SRF system is connected from the ridgetops down to the valleys and the shallow perched zones are hydraulically disconnected.

The physical lines of evidence that verify SRF hydraulics are:

- SRF occurring independent of bedrock units at depths greater than 100 feet (MW-1801 and MW-1802)
- Shallow shales are fractured on ridges according to boring logs
- Hydrographs indicate vertical separation from the local areas of shallow perched groundwater and deeper groundwater within the SRF system
- ASD evaluation concluded that there is a geochemical distinction between shallow perched groundwater wells MW-1 and MW-5 relative to other wells screened in the SRF system down gradient of the FGD Landfill at MW-2 and MW-4.

Based on this information and the positive correlation of these lines of evidence with the Appalachian conceptual site model for groundwater flow (USGS 1981), the SRF system is hydraulically connected from ridges to valleys. A generalized cross section illustrating the features of an Appalachian SRF system is provided on **Figure 4**.

3.3 Review of Existing Monitoring Well Network

3.3.1 Overview

The Site was visited by Arcadis and AEP personnel on August 11, 2015 to review existing well network conditions and locations. At that time, the monitoring well network was initially determined sufficient (Arcadis 2016). Since 2016, additional analyses discussed above in this report have resulted in a refined understanding of the uppermost aquifer and provided support for removal of shallow perched zone wells MW-1 and MW-5 from the federal well network. These wells were replaced with two deeper down gradient wells screened in the uppermost aquifer (i.e., SRF). A well construction table that summarizes the location, ground surface elevation, borehole depth, installation date, and associated well construction details of the monitoring well network is included as **Table 3**. As presented in **Table 3**, wells included in the monitoring network have been designated as up gradient or down gradient. Additionally, some monitoring wells and piezometers are designated for hydraulic monitoring only. The wells that are shaded on **Table 1** and **3** and **Figure 3** were abandoned. Available closure information is provided in **Appendix B** from the West Virginia Department of Environmental Protection (WVDEP). No closure information was available for monitoring wells MW-3 and MW-3RA and piezometers 0503, 0504, 0507 and 0514. These monitoring wells and

piezometers are assumed to have been closed following WVDEP guidelines. Further details are provided in Section 4.1.

Spatially, the monitoring well network as illustrated on **Figure 8** is distributed around the entire Site and sufficiently monitors up gradient and down gradient locations as specified in 40 CFR 257.91. The well screen intervals are located in the SRF system and include both the Monongahela and Conemaugh Formations.

3.3.2 Gaps in Monitoring Network

As discussed in Section 3.3.1 of this report, gaps in the monitoring network were not identified upon initial Arcadis review in 2016. Upon additional data collection, modifications were made to the federal monitoring well network to add MW-1801 and MW-1802 as replacements for MW-1 and MW-5, respectively and as described previously in this report**.** Based on these modifications, there are no gaps in the monitoring network. The recommended monitoring well network is described in Section 4.

4 RECOMMENDED MONITORING NETWORK

The network meets specifications stated in 40 CFR 257.91. Recommended groundwater monitoring objectives utilizing existing wells are further discussed and will provide an adequate understanding of seasonal and temporal fluctuations in groundwater quality, hydraulics, and groundwater flow at the Site.

4.1 Monitoring Well Network Distribution

The groundwater quality monitoring network at the Site consists of 9 out of 11 wells as represented on **Table 3** and **Figure 8**. The remaining two wells at the Site (i.e., MW-1 and MW-5) will be gauged for the purpose of ongoing groundwater elevation data collection. Additionally, all available piezometers listed on **Table 3** along with the 9 groundwater water quality monitoring wells will be gauged.

4.1.1 Down Gradient Locations

Monitoring wells down gradient in the south valley (MW-2, MW-1801) and north valley (MW-4, MW-1802) constitute the down gradient groundwater quality monitoring locations (**Figure 8**).

4.1.2 Up Gradient Locations

Monitoring wells located along the western (MW-6), southern (MW-7R), eastern (MW-8), and northern (MW-9, MW-10) CCR boundary constitute the up gradient groundwater quality monitoring locations (**Figure 8**).

4.2 Well Construction

As discussed above in Section 3, gaps in the monitoring well network at the FGD Landfill were addressed by utilizing existing wells and by the installation of 2 monitoring wells in August 2018 (MW-1801, MW-1802). All new monitoring wells were constructed in general accordance with West Virginia Department of Environmental Protection Title 47 Series 60 Monitoring Well Design Standards dated June 21, 2011 by a state licensed driller.

Installation details and field methods are provided in **Appendix A**. Well construction data for the monitoring well network is summarized on **Table 3**. Boring logs and the monitoring well completion diagrams are provided in **Appendix B**.

5 PROFESSIONAL ENGINEER'S CERTIFICATION

I, Todd A. Minehardt, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, the proposed groundwater monitoring system will be adequate to meet the requirements of 40 CFR Part 257.91 excluding paragraphs (d) and (g), which do not apply to this groundwater monitoring well network evaluation.

TODD A. MINEHARDT

Printed Name of Registered Professional Engineer

Signature

TODD A. MINEHARDT REGISTERED 23518 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 5/27/20

23518 WV 5/27/2020

Registration No. Registration State Date

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TABLES

Table 1
Water Level Data
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Well ID	Top of Casing Elevation	7/1/2005	7/1/2005	11/22/2010	11/22/2010	12/17/2018	12/17/2018	1/24/2019	1/24/2019	2/21/2019	2/21/2019	3/13/2019	3/13/2019	4/23/2019	4/23/2019	6/10/2019	6/10/2019	7/22/2019	7/22/2019	11/4/2019	11/4/2019
		Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl	Depth to Water ft TOC	GW Elev ft amsl
Monitor Wells																					
Downgradient																					
MW-1 [a]	711.57	6.30	705.27	9.76	701.81	13.07	698.50	13.08	698.49	NM	NM	NM	NM	NM	NM	13.02	698.55	12.34	699.23	12.24	699.33
MW-2 [a]	711.41	40.40	671.01	43.06	668.35	44.03	667.38	73.74	637.67	43.82	667.59	NM	NM	NM	NM	44.13	667.28	44.06	667.35	44.47	666.94
MW-3	NA	NA	806.80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3R [a]	NA	NM	NM	NA	779.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3RA	NA	NM	NM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4 [a]	676.76	19.70	657.06	20.51	656.25	NM	NM	18.43	658.33	NM	NM	NM	NM	NM	NM	19.11	657.65	19.22	657.54	19.19	657.57
MW-5 [a]	676.84	6.60	670.24	6.34	670.50	4.85	671.99	3.58	673.26	NM	NM	NM	NM	NM	NM	5.20	671.64	5.06	671.78	5.12	671.72
MW-1801	738.32	NA	NA	NA	NA	34.48	703.84	34.42	703.90	34.70	703.62	35.23	703.09	35.33	702.99	35.60	702.72	35.47	702.85	34.99	703.33
MW-1802	712.69	NA	NA	NA	NA	52.68	660.01	52.35	660.34	53.00	659.69	55.30	657.39	53.73	658.96	53.82	658.87	54.01	658.68	53.92	658.77
Upgradient																					
MW-6 [a]	929.29	66.00	863.29	65.75	863.54	NM	NM	61.10	868.19	NM	NM	NM	NM	NM	NM	63.79	865.50	64.71	864.58	65.56	863.73
MW-7	NA	NA	906.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-7R [a]	854.63	NM	NM	72.35	782.28	NM	NM	69.90	784.73	NM	NM	NM	NM	NM	NM	70.02	784.61	70.07	784.56	70.64	783.99
MW-8 [b]	937.68	25.80	921.21	31.81	915.20	NM	NM	26.53	920.48	NM	NM	NM	NM	NM	NM	27.44	919.57	28.49	918.52	16.88	920.80
MW-9 [a]	935.39	32.90	902.49	37.89	897.50	NM	NM	27.28	908.11	NM	NM	NM	NM	NM	NM	30.63	904.76	32.35	903.04	35.45	899.94
MW-10 [a]	911.43	119.70	791.73	101.28	810.15	NM	NM	99.64	811.79	NM	NM	NM	NM	NM	NM	103.18	808.25	100.81	810.62	98.40	813.03
Piezometers																					
0501	761.33	18.65	742.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0502	761.46	NM	NM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0503	777.00	19.30	757.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0504	777.30	6.10	771.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0505	912.89	88.40	824.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0506 [a]	711.77	41.75	670.02	43.61	668.16	NM	NM	43.81	667.96	NM	NM	NM	NM	NM	NM	44.19	667.58	44.12	667.65	44.53	667.24
0507	712.49	14.60	697.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0508	980.97	139.15	841.82	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0509	826.75	22.25	804.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0510	927.69	NM	NM	NM	NM	NM	NM	45.66	882.03	NM	NM	NM	NM	NM	NM	46.41	881.28	47.48	880.21	46.60	881.09
0511	826.67	20.90	805.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0512 [a]	786.29	5.40	780.89	5.22	781.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0513 [a]	786.49	5.70	780.79	5.25	781.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0514	950.65	25.85	924.80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0515	935.49	62.85	872.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0517 [b]	937.68	51.20	896.15	52.67	894.68	NM	NM	42.09	905.26	NM	NM	NM	NM	NM	NM	41.92	905.43	42.34	905.01	31.26	906.42
0519 [a]	992.97	84.30	908.67	87.54	905.43	NM	NM	73.41	919.56	NM	NM	NM	NM	NM	NM	80.31	912.66	80.39	912.58	80.40	912.57
0520 [a]	681.38	24.47	656.91	NA	656.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0521 [a]	1006.48	56.33	950.15	58.05	948.43	NM	NM	54.10	952.38	NM	NM	NM	NM	NM	NM	56.31	950.17	56.33	950.15	56.38	950.10
0522 [a]	903.54	67.30	836.24	70.17	833.37	NM	NM	65.32	838.22	NM	NM	NM	NM	NM	NM	65.90	837.64	66.84	836.70	68.77	834.77
0523 [a]	972.30	296.90	675.40	304.13	668.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0524 [a]	699.14	5.33	693.81	5.61	693.53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0525 [a]	681.48	6.55	674.93	6.47	675.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
Shaded = well not verified or closed
Elevation in feet above mean sea level.
a = Source: AEP DWG. No. 13-30500-12-E
b = Well was re-surveyed in September 2019. Ground surface was loweredto access stockpiled soil, and subsequently well casing was removed. Top of casing elevation changed from 947.01 to 937.68 at MW-8, and 947.35 to 937.68 at 0517.
amsl = above mean sea level
bls = below land surface
Elev = elevation
ft = feet
GW = groundwater

Table 2
Summary of Hydraulic Testing Results
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Test Borehole/Well Identification	Test Date	Boring Diameter (inches)	Casing Diameter (inches)	Top of Interval/ Screen (ft-bgs)	Base of Interval/ Screen (ft-bgs)	Interval/ Screen Length (ft)	Water Level[4] (ft bgs)	Water Column (ft)	Test Pressure (psi)	Test Flow Rate (gpm)	Max Sustained Flow Rate (gpm)	T (ft^2/day)	K (ft/day)	K (cm/sec)
Borehole Packer Testing[1]														
MW-1801	8/9/2018	3.0	--	65	75	10	13.00	62.0	60	0.0	--	--	--	--
MW-1801	8/9/2018	3.0	--	65	75	10	13.00	62.0	100	0.2	--	9.1E-02	9.1E-03	3.2E-06
MW-1801	8/13/2018	3.0	--	55	65	10	17.10	47.9	60	2.6	--	2.2	0.2	7.9E-05
MW-1802	8/21/2018	3.0	--	48	58	10	35.10	22.9	60	0.1	--	0.1	1.1E-02	4.0E-06
MW-1802	8/21/2018	3.0	--	65	75	10	35.10	39.9	60	0.0	--	--	--	--
MW-1802	8/21/2018	3.0	--	65	75	10	35.10	39.9	100	0.0	--	--	--	--
MW-1802	8/21/2018	3.0	--	89	99	10	35.10	63.9	60	0.0	--	--	--	--
MW-1802	8/21/2018	3.0	--	89	99	10	35.10	63.9	100	2.0	--	1.0	0.1	3.7E-05
MW-1802	8/21/2018	3.0	--	99	109	10	35.10	73.9	60	0.0	--	--	--	--
MW-1802	8/21/2018	3.0	--	99	109	10	35.10	73.9	100	0.0	--	--	--	--
Yield Testing Recovery[2]														
MW-1801	9/12/2018	6.0	2	55	75	20	32.83	42.2	N/A	0.2	0.2	0.1	7.0E-03	2.5E-06
MW-1802	9/11/2018	6.0	2	50	70	20	51.84	18.2	N/A	0.3	0.3	0.7	3.5E-02	1.2E-05
Slug Testing[3]														
Unknown Location (high end range)	2006	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	2.8	1.0E-03
Unknown Location (low end range)	2006	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	2.8E-03	1.0E-06
											Minimum	**9.1E-02**	**2.8E-03**	**1.0E-06**
											Maximum	**2.2**	**2.8**	**1.0E-03**
											Geometric Mean	**0.4**	**3.8E-02**	**1.4E-05**

NOTES:

[1] Packer testing analysis analyzed using U.S. Department of the Interior, Bureau of Reclamation, 1977. Ground Water Manual, A Water Resources Technical Publication, pp. 258-264

[2] Recovery results only using Theis solution; correction of drawdown data applied for unconfined conditions ($s'=s-s^2/2b$; where s is drawdown and b is aquifer thickness)

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[3] Slug testing results from GAI Consultants, Inc. 2006. Class F Industrial Landfill Facility Application, John E. Amos Landfill, John E. Amos Plant, Winfield, West Virginia, GAI Project Number: C040384.40

[4] Water level and total depth taken from data from individual respective test data

N/A = not available

-- = not applicable

T = transmissivity

K = hydraulic conductivity

ft = feet

gpm = gallons per minute

psi = pounds per square inch

cm/sec = centimeters per second

bgs = below ground surface

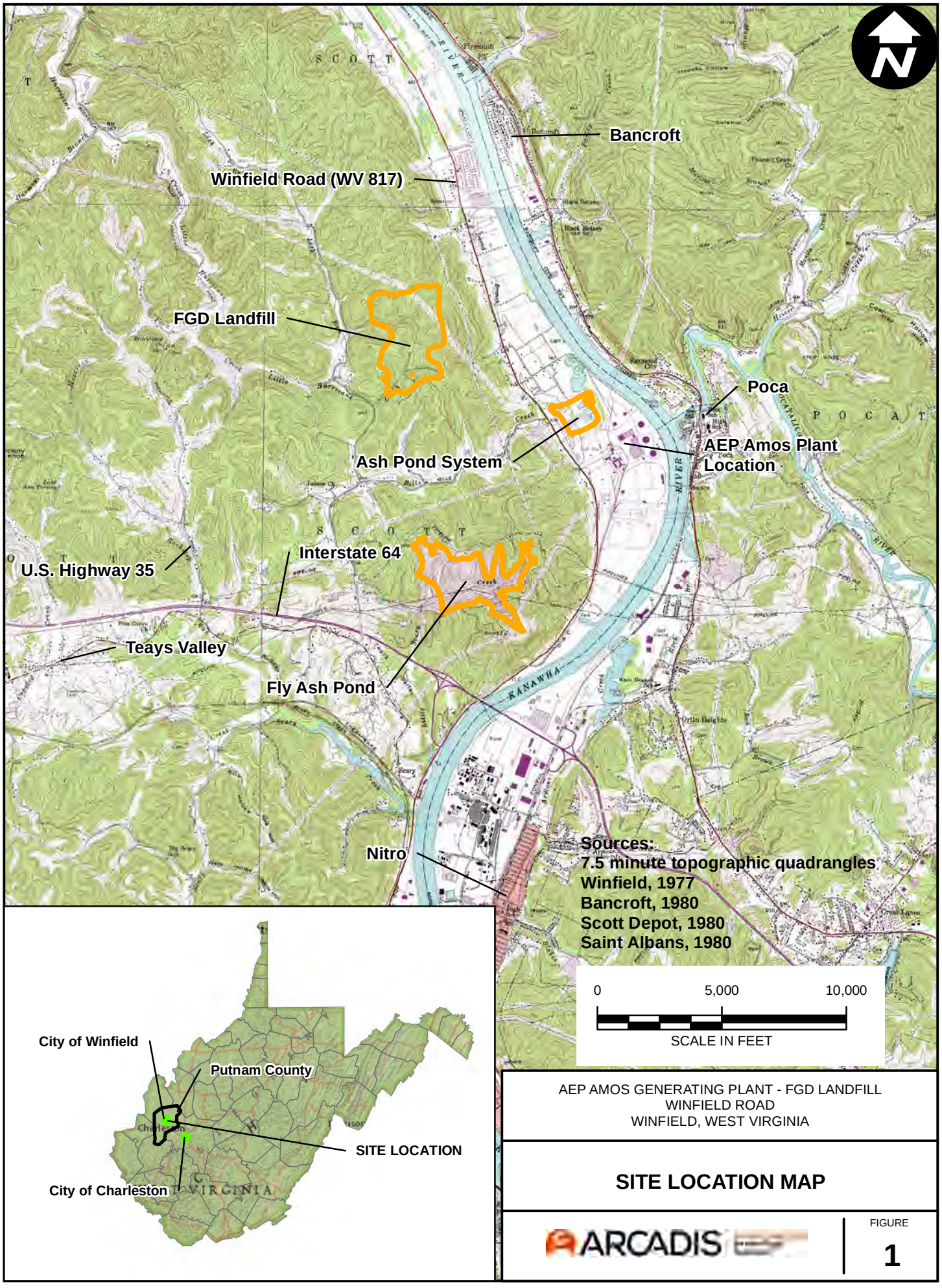
Table 3
Well Construction Details
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

ARCADIS Design & Consultancy for natural and built assets

Well ID	Hydraulic Monitoring Only	Location Description to CCR Unit	Northing [a]	Easting [a]	Ground Surface Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Borehole Depth ft bls	Date Installed	Screen Material	Well Diameter inches	Top of Filter Pack		Bottom of Filter Pack		Top of Screen		Bottom of Screen	
											Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl
Monitor Wells																		
Downgradient																		
MW-1 [b]	X	Southwest	539438.68	1722490.93	709.57	711.57	19.0	7/12/2005	screened PVC	2.00	6.00	703.57	19.00	690.57	8.00	701.57	18.00	691.57
MW-2 [b]		Southwest	539438.31	1722530.69	709.41	711.41	62.5	7/12/2005	screened PVC	2.00	37.00	672.41	62.50	646.91	42.00	667.41	62.00	647.41
MW-3 [b]		Central	541709.83	1724126.13	823.00	NA	32.5	6/27/2005	screened PVC	2.00	9.00	814.00	32.50	790.50	12.00	811.00	32.00	791.00
MW-3R [c]		Central	542088.19	1724096.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3RA [c]		Central	542150.25	1724100.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4 [b]		West	542302.52	1721626.94	674.76	676.76	78.5	7/7/2005	screened PVC	2.00	53.00	621.76	78.50	596.26	58.00	616.76	78.00	596.76
MW-5 [b]	X	West	542299.18	1721658.72	674.84	676.84	10.2	7/7/2005	screened PVC	2.00	4.00	670.84	10.20	664.64	5.00	669.84	10.00	664.84
MW-1801		Southwest	539890.17	1722991.78	735.55	738.32	105.0	8/8/2018	screened PVC	2.00	52.00	683.55	76.00	659.55	55.00	680.55	75.00	660.55
MW-1802		West	542831.10	1722351.37	709.78	712.69	114.4	8/21/2018	screened PVC	2.00	45.00	664.78	71.00	638.78	50.00	659.78	70.00	639.78
Upgradient																		
MW-6 [b]		West	540882.81	1722758.78	927.29	929.29	91.0	6/23/2005	screened PVC	2.00	55.00	872.29	78.50	848.79	58.00	869.29	78.00	849.29
MW-7 [b]		South	539657.88	1723948.19	943.15	NA	55.5	6/28/2005	screened PVC	2.00	30.00	913.15	55.50	887.65	32.00	911.15	52.00	891.15
MW-7R [c]		South	539989.31	1723429.40	NA	854.63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-8 [d]		East	542177.39	1725392.13	935.14	937.68	50.6	7/11/2005	screened PVC	2.00	20.13	915.01	50.63	884.51	30.13	905.01	50.13	885.01
MW-9 [b]		Northeast	544204.89	1724522.80	933.39	935.39	62.5	6/30/2005	screened PVC	2.00	37.00	896.39	62.50	870.89	42.00	891.39	62.00	871.39
MW-10 [b]		Northwest	544079.05	1722812.23	909.43	911.43	157.0	7/6/2005	screened PVC	2.00	85.00	824.43	157.00	752.43	133.00	776.43	153.00	756.43
Piezometers																		
0501 [b]		Central	540588.50	1723508.13	759.08	761.33	80.0	4/21/2005	Slotted PVC	0.75	35.00	724.08	53.00	706.08	40.00	719.08	50.00	709.08
0502 [b]		Central	540563.24	1723508.03	759.46	761.46	22.0	4/21/2005	Slotted PVC	0.75	7.00	752.46	22.00	737.46	11.00	748.46	21.00	738.46
0503 [b]		Central	540843.81	1723858.56	773.00	777.00	50.0	4/20/2005	Slotted PVC	0.75	34.70	738.30	50.00	723.00	39.70	733.30	49.70	723.30
0504 [b]		Central	540840.05	1723859.84	775.40	777.30	24.0	4/20/2005	Slotted PVC	0.75	8.20	767.20	24.00	751.40	13.20	762.20	23.20	752.20
0505 [b]		Central	541325.35	1723551.34	910.89	912.89	200.0	4/27/2005	Slotted PVC	0.75	10.00	900.89	140.00	770.89	117.00	793.89	137.00	773.89
0506 [b]	X	Southwest	539424.97	1722578.68	709.52	711.77	80.0	4/28/2005	Slotted PVC	0.75	20.00	689.52	70.00	639.52	58.00	651.52	68.00	641.52
0507 [b]		Southwest	539428.81	1722523.77	709.99	712.49	18.0	4/22/2005	Slotted PVC	0.75	4.00	705.99	18.00	691.99	7.00	702.99	17.00	692.99
0508 [b]		Central	541996.98	1723377.34	979.22	980.97	200.9	5/3/2005	Slotted PVC	0.75	77.00	902.22	150.00	829.22	127.00	852.22	147.00	832.22
0509 [b]		Central	541748.67	1724111.62	824.40	826.75	100.0	5/3/2005	Slotted PVC	0.75	20.00	804.40	80.00	744.40	68.00	756.40	78.00	746.40
0510 [b]	X	West	540879.83	1722795.65	925.74	927.69	250.0	5/10/2005	Slotted PVC	0.75	30.00	895.74	122.00	803.74	100.00	825.74	120.00	805.74
0511 [b]		Central	541746.94	1724116.35	824.57	826.67	26.0	5/4/2005	Slotted PVC	0.75	3.50	821.07	26.00	798.57	15.50	809.07	25.50	799.07
0512 [b]		Central	542140.89	1724101.76	784.29	786.29	110.0	5/6/2005	Slotted PVC	0.75	20.00	764.29	54.00	730.29	42.00	742.29	52.00	732.29
0513 [b]		Central	542140.89	1724101.76	784.29	786.49	19.0	5/6/2005	Slotted PVC	0.75	2.50	781.79	16.00	768.29	4.00	780.29	14.00	770.29
0514 [b]		Southeast	540555.64	1725145.94	948.40	950.65	150.0	5/12/2005	Slotted PVC	0.75	17.00	931.40	67.00	881.40	55.00	893.40	65.00	883.40
0515 [b]		South	539572.11	1723680.17	933.64	935.49	250.3	5/16/2005	Slotted PVC	0.75	20.00	913.64	82.00	851.64	70.00	863.64	80.00	853.64
0517 [d]	X	East	542182.52	1725397.24	935.14	937.68	139.6	3/19/2005	Slotted PVC	0.75	3.59	931.55	45.99	889.15	33.99	901.15	43.99	891.15
0519 [b]	X	Northeast	543732.89	1725136.52	991.07	992.97	150.5	5/19/2005	Slotted PVC	0.75	15.00	976.07	108.00	883.07	95.00	896.07	105.00	886.07
0520 [b]		West	542378.38	1721739.79	679.31	681.38	100.0	5/24/2005	Slotted PVC	0.75	34.00	645.31	96.00	583.31	84.00	595.31	94.00	585.31
0521 [b]	X	North	544199.55	1724054.58	1004.35	1006.48	70.4	5/23/2005	Slotted PVC	0.75	12.40	991.95	70.40	933.95	60.40	943.95	70.40	933.95
0522 [b]		Northwest	543873.44	1722326.41	901.64	903.54	250.5	5/26/2005	Slotted PVC	0.75	35.00	866.64	155.00	746.64	133.00	768.64	153.00	748.64
0523 [b]		West	542742.24	1722248.67	969.90	972.30	50.0	5/25/2005	Slotted PVC	0.75	24.00	945.90	50.00	919.90	38.00	931.90	48.00	921.90
0524 [b]		West	542745.10	1722251.41	696.91	699.14	18.0	5/25/2005	Slotted PVC	0.75	3.00	693.91	18.00	678.91	8.00	688.91	18.00	678.91
0525 [b]		West	542379.95	1721745.36	679.43	681.48	10.0	5/25/2005	Slotted PVC	0.75	2.00	677.43	10.00	669.43	5.00	674.43	10.00	669.43

NOTES:
Shaded = well not verified or closed
Elevation in feet above mean sea level
a = 1983 West Virginia State Planar Coordinates
b = Source: GAI Consultants. March 2006. Class F Industrial Landfill Facility Application, John E. Amos Landfill, Volume 1, Appendix K - Monitor Well Construction Diagrams.
c = Survey data and boring log not available, coordinates estimated based on AEP DWG. No. 13-30500-11-E.
d = Well was re-surveyed in September 2019. Ground surface was loweredto access stockpiled soil, and subsequently well casing was removed. Top of casing elevation changed from 947.01 to 937.68 at MW-8, and 947.35 to 937.68 at 0517.
amsl = above mean sea level
bls = Below land surface
ft = feet
NA = not applicable

FIGURES



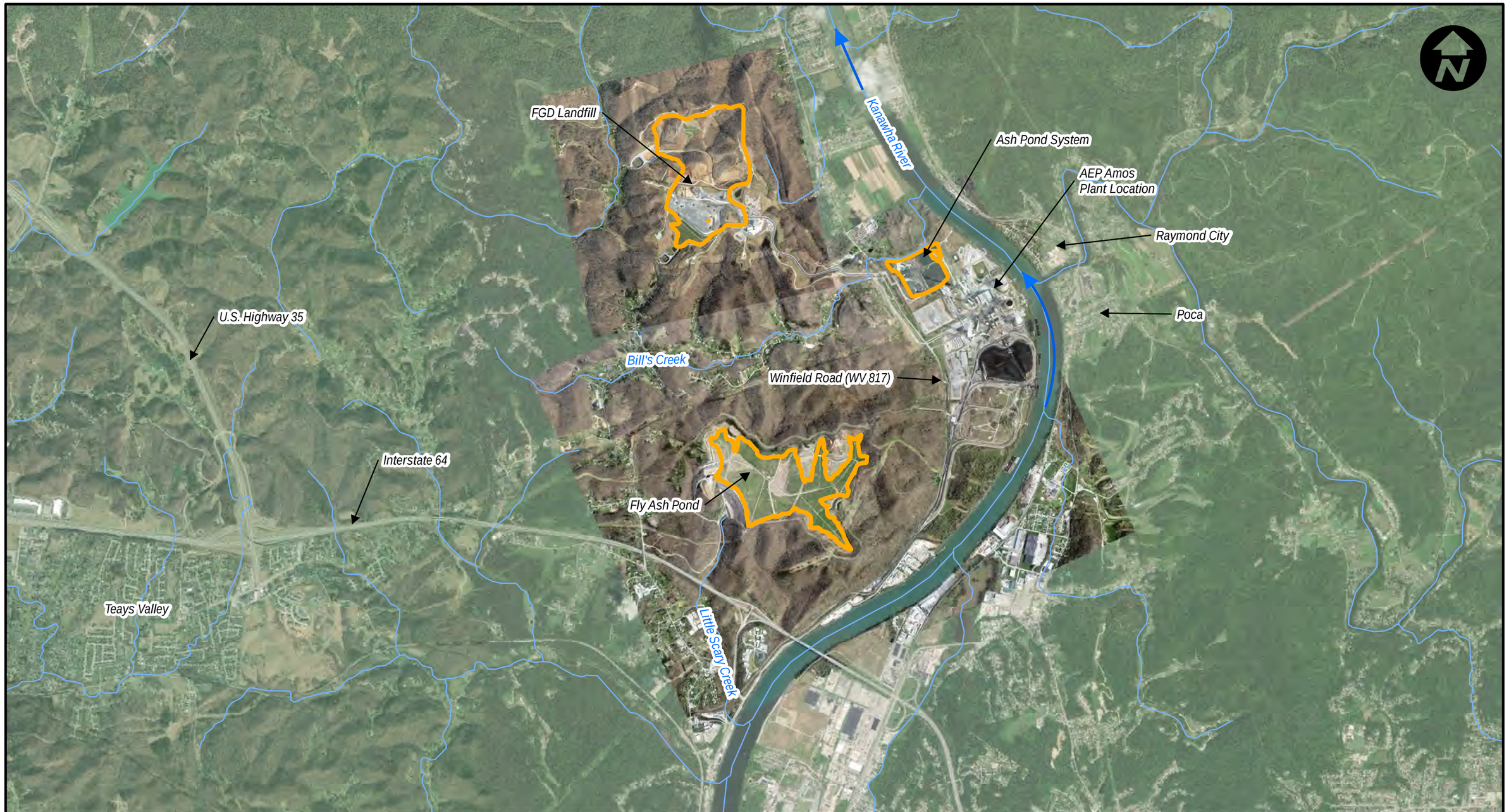
AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

SITE LOCATION MAP

ARCADIS

FIGURE
1

Document Path: Z:\GISProjects_ENV\AEP\Amos\mxd\Landfill Report\Sept2018\F1_ site map.mxd



LEGEND:

- Coal Combustion Residual (CCR) Unit
- Rivers and Streams
- Streamflow Direction

NOTES:
1. 2016 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. 2018 SITE SPECIFIC AERIAL IMAGERY OBTAINED FROM AEP.
3. WEST VIRGINIA 1983 STATE PLANAR COORDINATES

0 3,000 6,000 Feet
GRAPHIC SCALE

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

PLANT AND CCR UNIT LOCATION MAP

ARCADIS

FIGURE
2

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: akens
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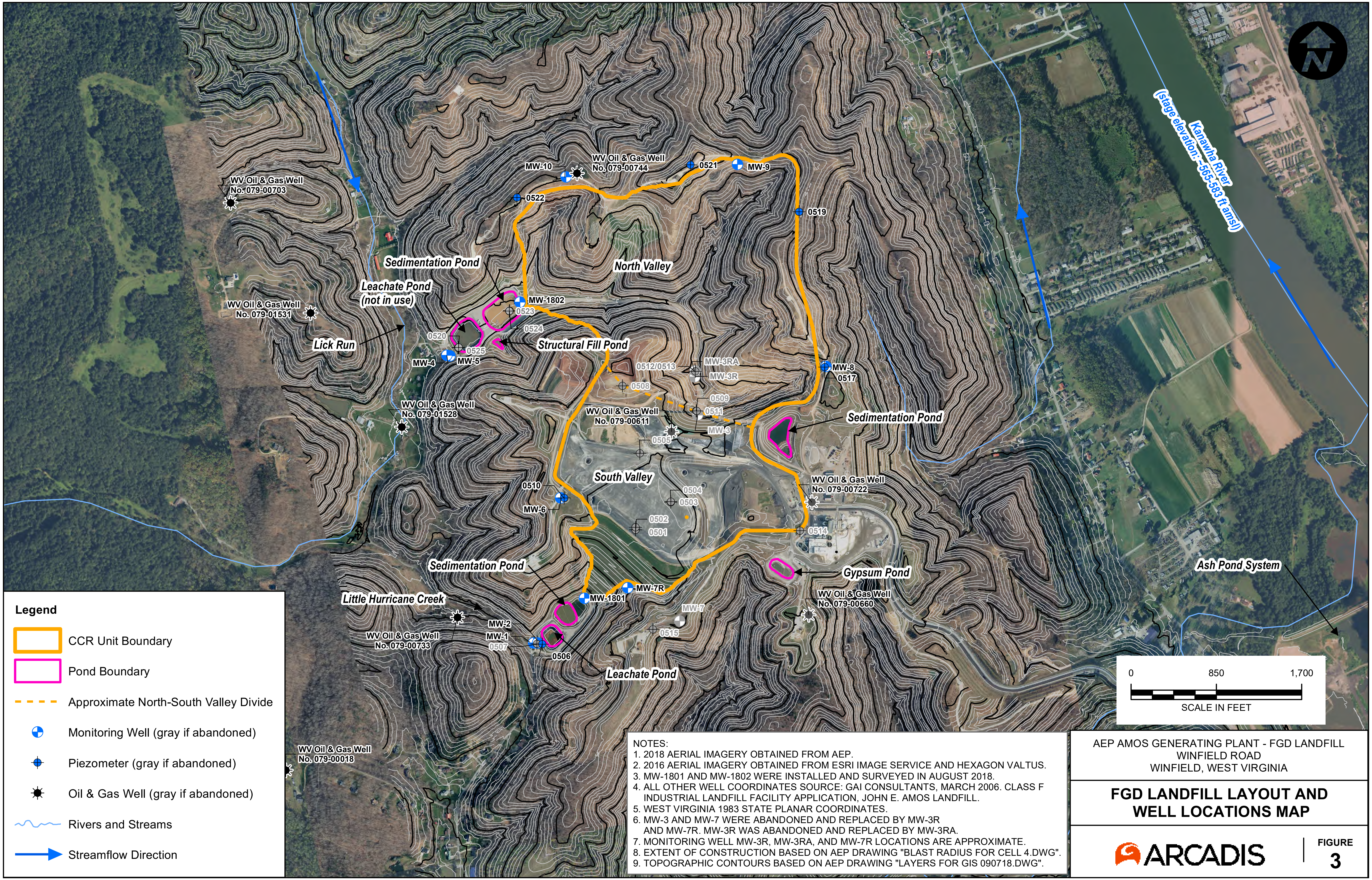

Legend

- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Rivers and Streams
- Streamflow Direction

NOTES:
1. 2018 AERIAL IMAGERY OBTAINED FROM AEP.
2. 2016 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE AND HEXAGON VALTUS.
3. MW-1801 AND MW-1802 WERE INSTALLED AND SURVEYED IN AUGUST 2018.
4. ALL OTHER WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
5. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
6. MW-3 AND MW-7 WERE ABANDONED AND REPLACED BY MW-3R AND MW-7R. MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
7. MONITORING WELL MW-3R, MW-3RA, AND MW-7R LOCATIONS ARE APPROXIMATE.
8. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
9. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

FGD LANDFILL LAYOUT AND WELL LOCATIONS MAP

ARCADIS

FIGURE
3

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: webb
OH015976.0009.00001 (Mountaineer Ash Pond)
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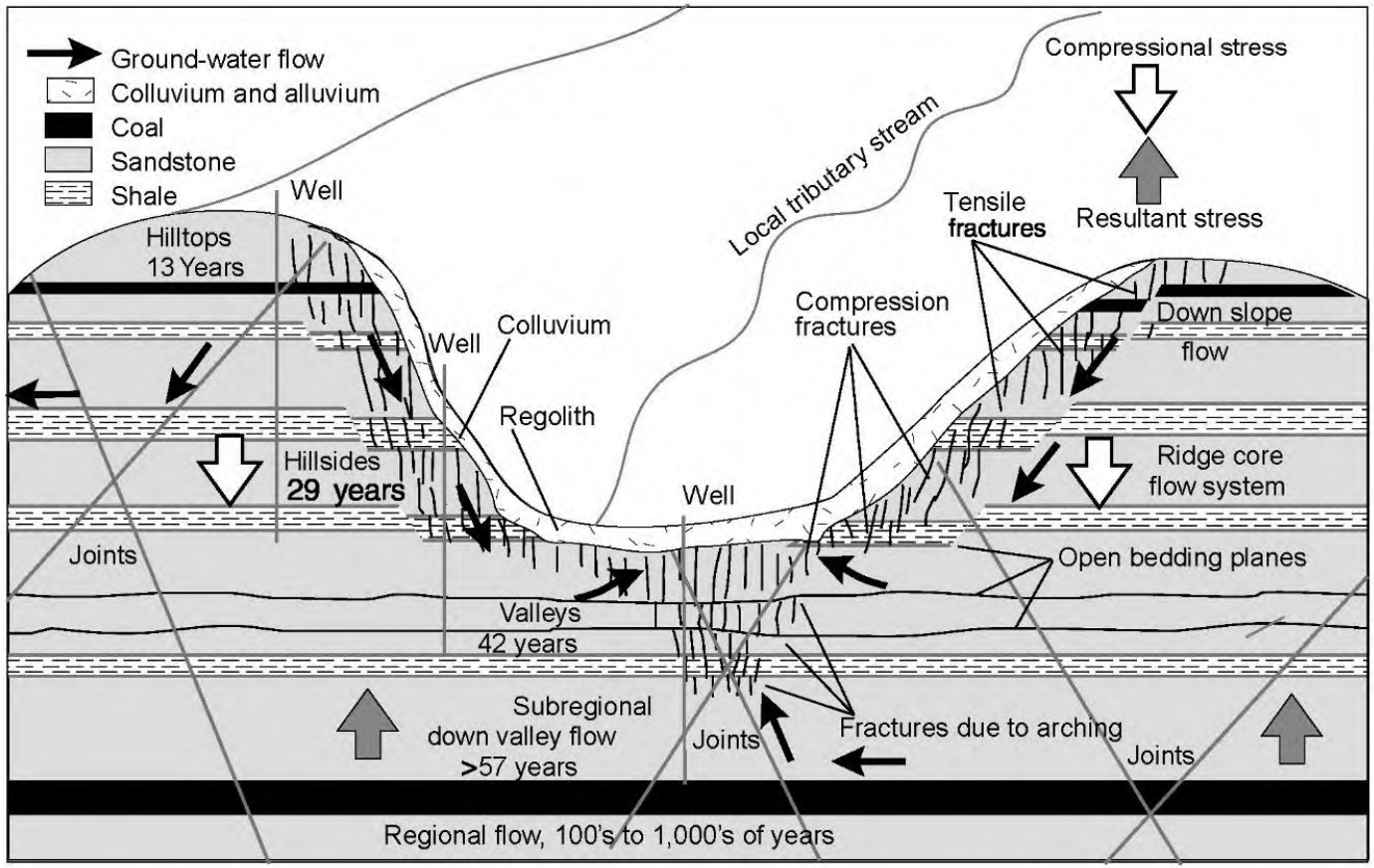


Figure 3. Revised conceptual model of ground-water flow in an Appalachian Plateaus fractured-bedrock aquifer including apparent age of ground water (Modified from Wyrick and Borchers, fig. 3.2-1, 1981 and Kozar, 1998).

References:

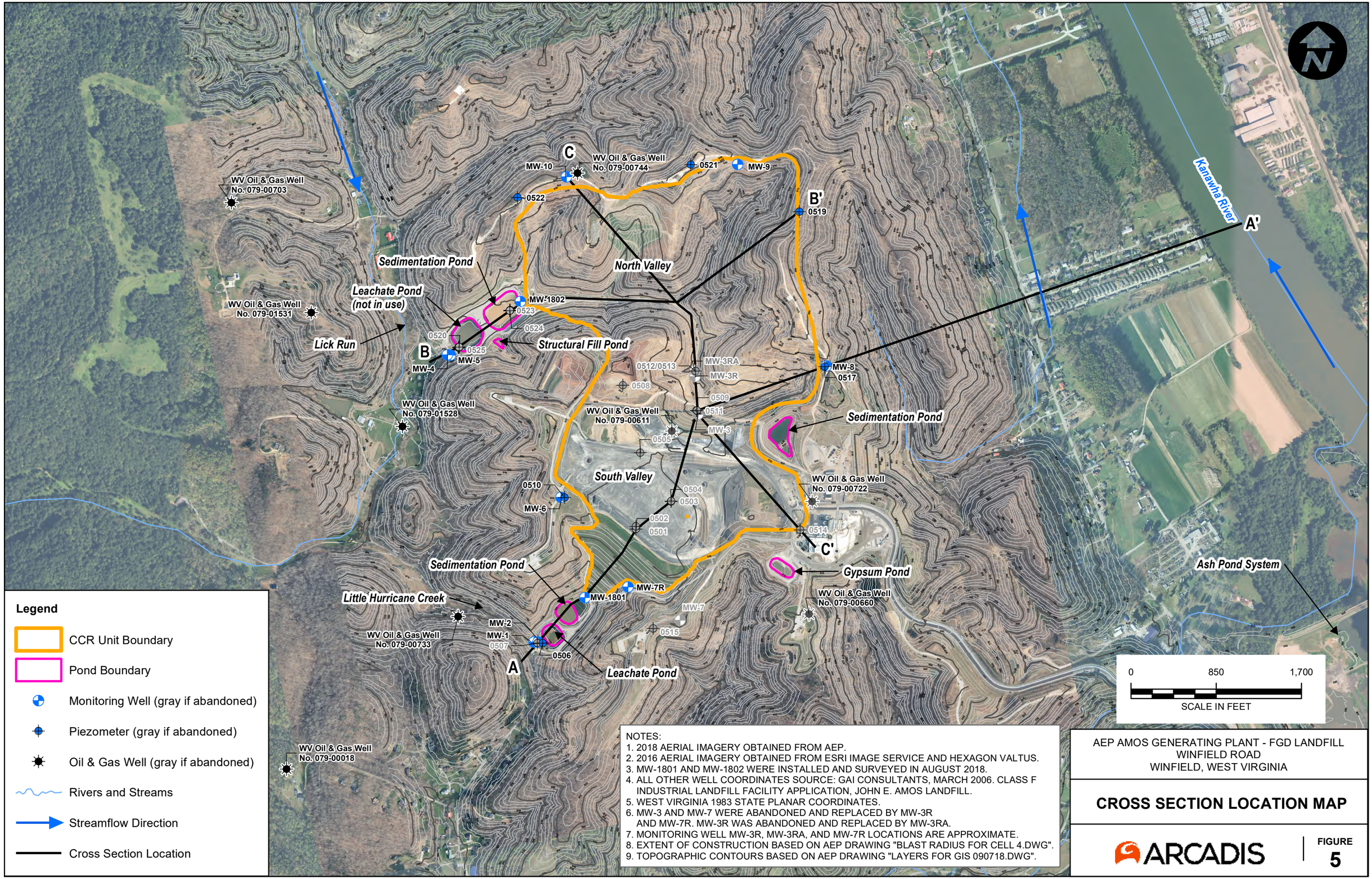
- United States Geological Survey (USGS), Wyrick, G.D. and J.W. Borchers, 1981. Hydrologic Effects of Stress-Relief Fracturing in an Appalachian Valley. Water-Supply Paper 2177.

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

STRESS RELIEF FRACTURE SYSTEM CONCEPTUAL SITE MODEL

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4



Legend

- CCR Unit Boundary
- Pond Boundary
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Rivers and Streams
- Streamflow Direction
- Cross Section Location

NOTES:
1. 2018 AERIAL IMAGERY OBTAINED FROM AEP.
2. 2016 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE AND HEXAGON VALTUS.
3. MW-1801 AND MW-1802 WERE INSTALLED AND SURVEYED IN AUGUST 2018.
4. ALL OTHER WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
5. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
6. MW-3 AND MW-7 WERE ABANDONED AND REPLACED BY MW-3R AND MW-7R. MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
7. MONITORING WELL MW-3R, MW-3RA, AND MW-7R LOCATIONS ARE APPROXIMATE.
8. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
9. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION LOCATION MAP

ARCADIS

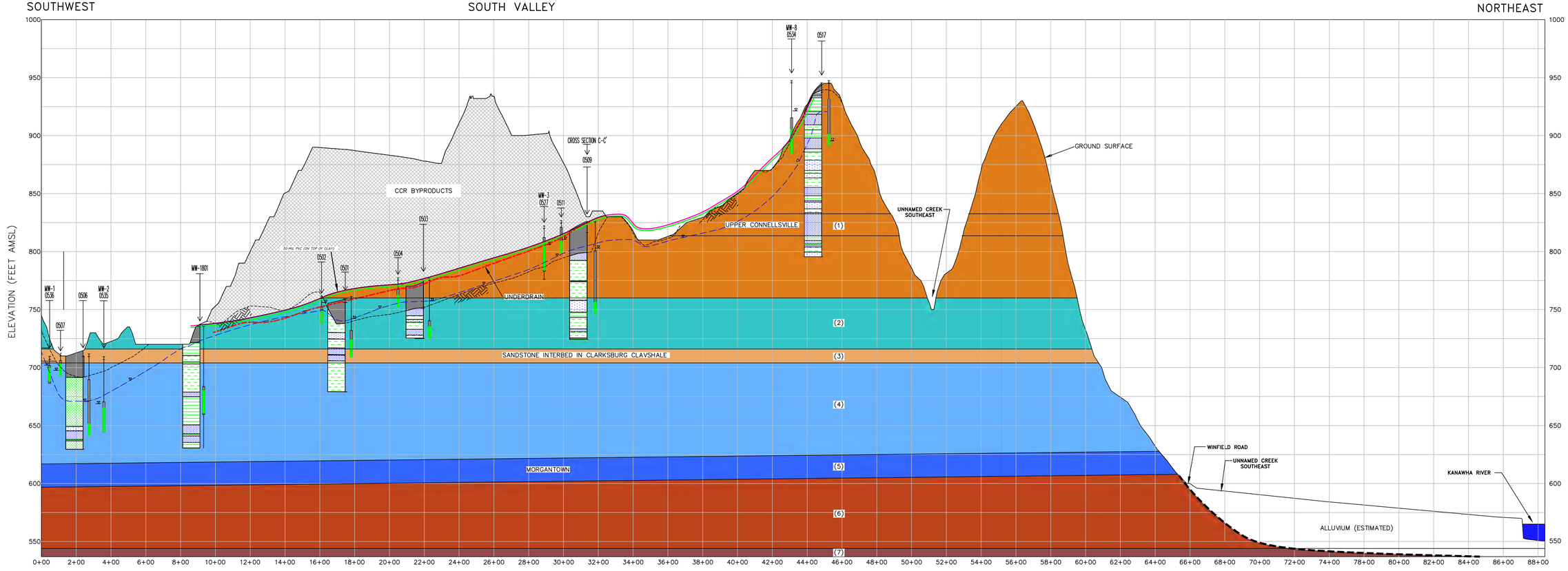
FIGURE
5

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: webb
OH015976.0009.00001 (Mountaineer Ash Pond)
Z:\GISProjects_ENV\AEP\Amos\mxd\Landfill Report\Sept2018\F5_CrossSectionTrend_aerial.mxd 5/20/2020 11:49:37 AM

A
SOUTHWEST

SOUTH VALLEY

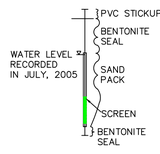
A'
NORTHEAST



LEGEND:

- SOIL AND DECOMPOSED ROCK
- CLAYSTONE
- SANDSTONE
- SHALE
- SILTSTONE
- INFERRED TOP OF ROCK
- POTENTIOMETRIC SURFACE TRACE
- MW-1 / 0536 — MONITORING WELL NUMBER / BORING NUMBER
- LINE INDICATES BORING LOCATION
- SUBBASE (AS BUILT)
- CLAY LINER (AS BUILT)
- GROUNDWATER UNDERDRAIN (AS BUILT)

PIEZOMETERS AND MONITORING WELLS



- (1) ALTERNATING SANDSTONE AND SHALE UNITS INCLUDING THE UPPER CONNELLSVILLE SANDSTONE
- (2) LOWER CONNELLSVILLE SANDSTONE WITH SILTY TO SHALEY INTERBEDS
- (3) CLARKSBURG SHALE WITH SILTSTONE AND SANDSTONE INTERBEDS
- (4) CLARKSBURG HIGHLY FRACTURED AND WEATHERED SHALE ZONE WITH SILTSTONE AND SANDSTONE INTERBEDS
- (5) MORGANTOWN SANDSTONE
- (6) BIRMINGHAM RED BEDS/SHALE WITH OCCASIONAL SANDSTONE (GRAFFTON SANDSTONE)
- (7) DEEP SANDSTONE UNITS

NOTES:
1. THE HORIZONTAL POSITION OF THE SAMPLED BORING IS CORRECT ON THE CROSS SECTIONS. THE PIEZOMETERS AND MONITORING WELLS HAVE BEEN MOVED OFF LOCATION SO THEIR INFORMATION CAN BE SEEN. THEIR VERTICAL LOCATIONS AND LENGTHS ARE CORRECT.
2. SUBGRADE ELEVATION IS BASED ON THE GAI CONSULTANTS DRAWING 2004-384-40-02-E-M004 SHEET 5 OF 25 PROVIDED BY AEP.
3. THE EXTENT AND DEPTH OF KANAWHA RIVER VALLEY ALLUVIUM ARE ESTIMATED. THERE IS NO AVAILABLE LITHOLOGY DATA BETWEEN THE FGD LANDFILL AND KANAWHA RIVER.

SOURCES:
1. POST-CONSTRUCTION UNDERDRAIN, SUBBASE, CLAY LINER AND 2018 GROUND SURFACE: GAI CONSULTANTS DRAWING 13-30500-05-A SHEET 5 OF 25 PROVIDED BY AEP.

HORIZONTAL SCALE: 1"=300'
VERTICAL SCALE: 1"=45'

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION A-A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
6A

CITY:(COLUMBUS_OHIO) DIV/GROUP:(MIDV) DB:(R. SMITH) LD:(Opt) PIC:(Opt) PM:(T. FORTNER) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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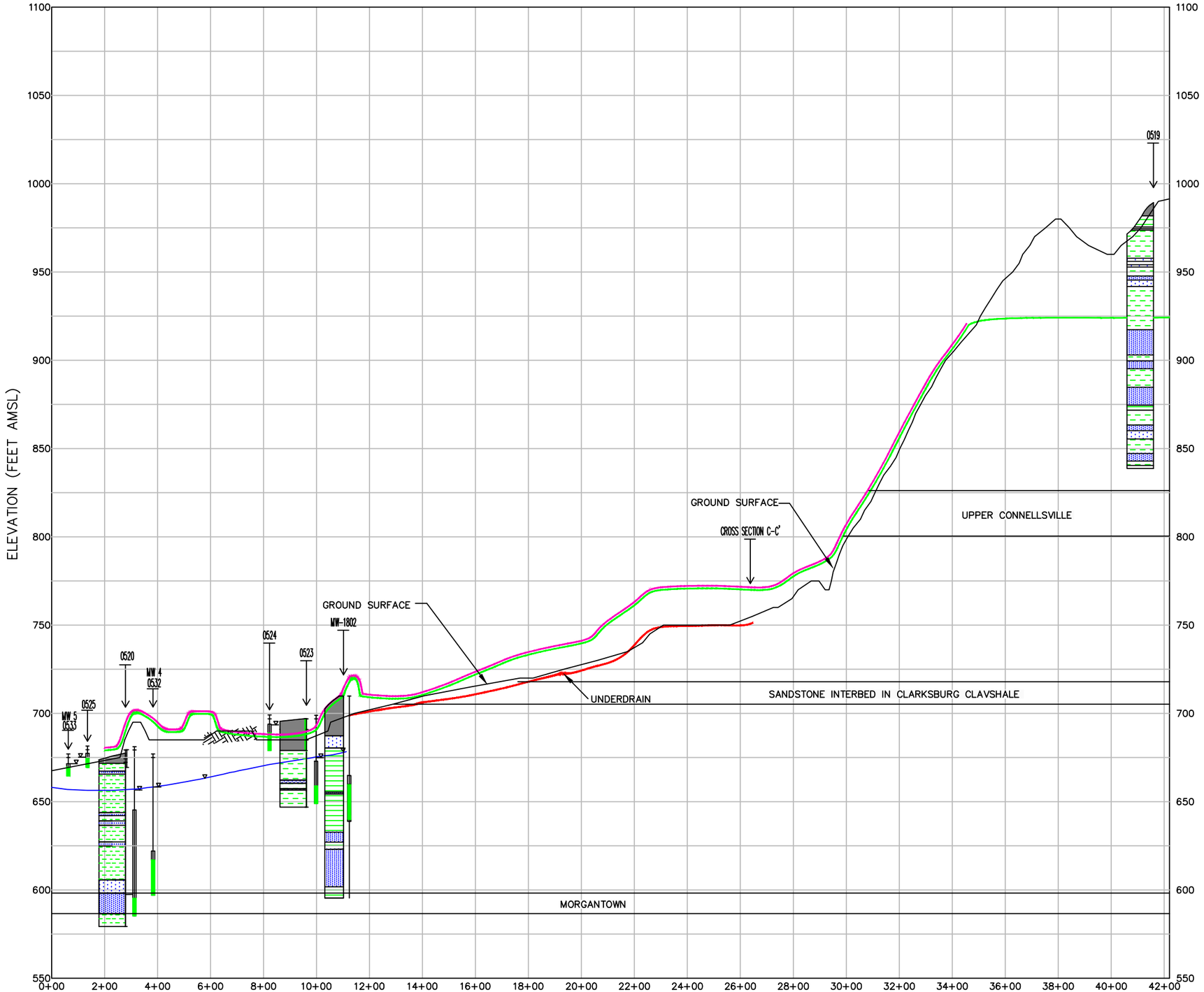
XREFS:

B
SOUTHWEST

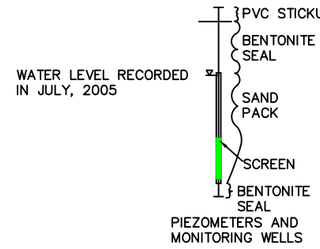
NORTH VALLEY

B'
NORTHEAST



LEGEND:

- SOIL AND DECOMPOSED ROCK
- CLAYSTONE
- SANDSTONE
- SHALE
- SILTSTONE
- INFERRED TOP OF ROCK
- SUBBASE (DESIGN)
- CLAY LINER (DESIGN)
- GROUNDWATER UNDERDRAIN (AS BUILT)
- POTENTIOMETRIC SURFACE TRACE
- MW-1 MONITORING WELL NUMBER
- 0536 BORING NUMBER
- LINE INDICATES BORING LOCATION



PIEZOMETERS AND MONITORING WELLS

HORIZONTAL SCALE: 1"=400'
VERTICAL SCALE: 1"=60'

NOTES:
THE HORIZONTAL POSITION OF THE SAMPLED BORING IS CORRECT ON THE CROSS SECTIONS. THE PIEZOMETERS AND MONITORING WELLS HAVE BEEN MOVED OFF LOCATION SO THEIR INFORMATION CAN BE SEEN. THEIR VERTICAL LOCATIONS AND LENGTHS ARE CORRECT.

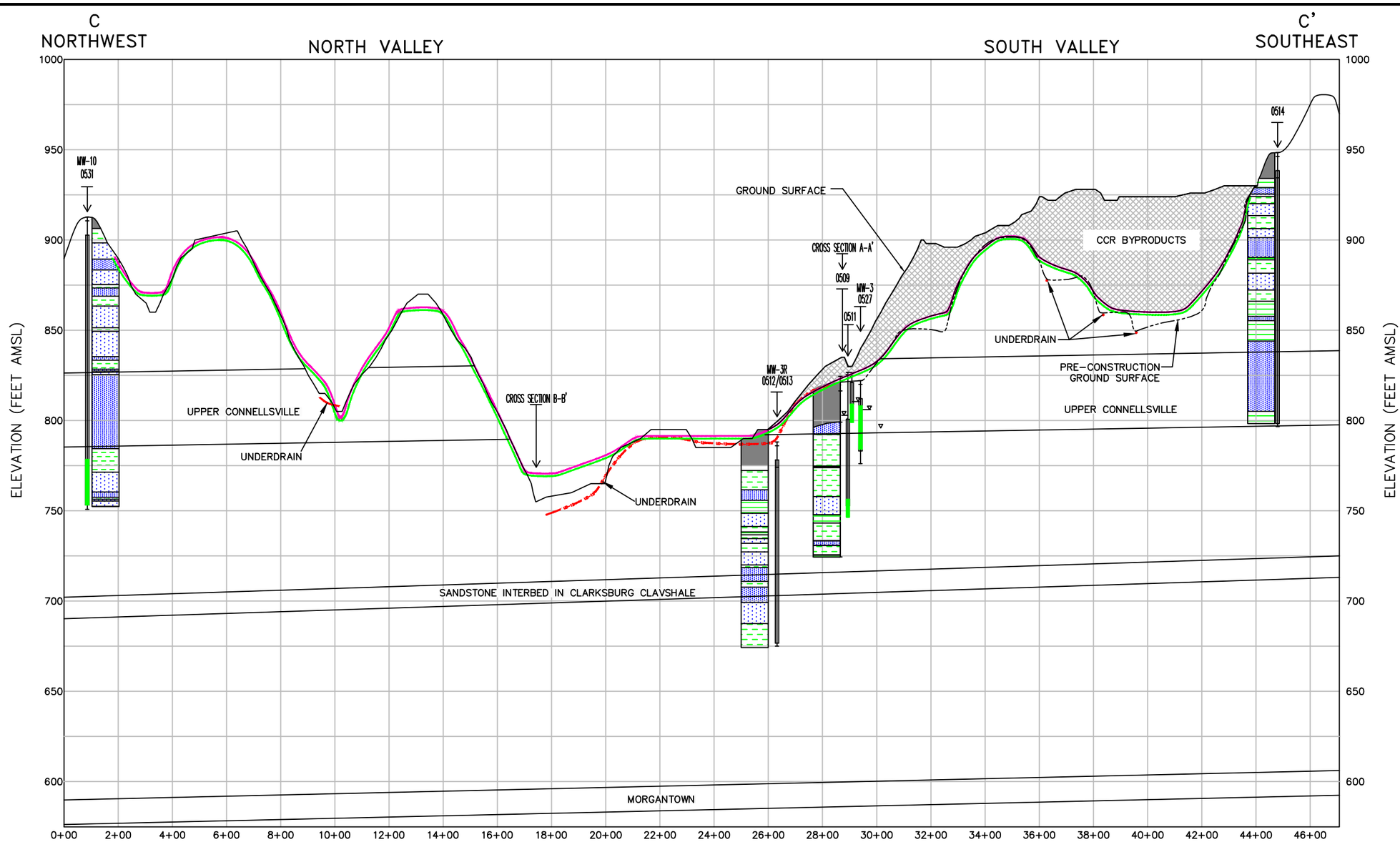
SOURCES:
1. POST–CONSTRUCTION UNDERDRAIN, SUBBASE, CLAY LINER AND 2018 GROUND SURFACE: GAI CONSULTANTS DRAWING 13–30500–05–A SHEET 5 OF 25 PROVIDED BY AEP.

AEP AMOS GENERATING PLANT -FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION B-B'

ARCADIS Design & Consultancy for natural and built assets

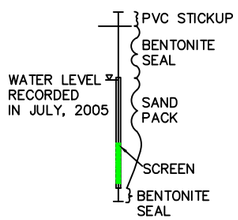
FIGURE
6B



LEGEND:

- SOIL AND DECOMPOSED ROCK
- CLAYSTONE
- SANDSTONE
- SHALE
- SILTSTONE
- INFERRED TOP OF ROCK
- POTENTIOMETRIC SURFACE TRACE
- MW-1 MONITORING WELL NUMBER
- 0536 BORING NUMBER
- LINE INDICATES BORING LOCATION
- SUBBASE (DESIGN IN NORTH VALLEY, AS BUILT IN SOUTH VALLEY)
- CLAY LINER (DESIGN IN NORTH VALLEY, AS BUILT IN SOUTH VALLEY)
- GROUNDWATER UNDERDRAIN (AS BUILT)

PIEZOMETERS AND MONITORING WELLS



NOTES:
1. THE HORIZONTAL POSITION OF THE SAMPLED BORING IS CORRECT ON THE CROSS SECTIONS. THE PIEZOMETERS AND MONITORING WELLS HAVE BEEN MOVED OFF LOCATION SO THEIR INFORMATION CAN BE SEEN. THEIR VERTICAL LOCATIONS AND LENGTHS ARE CORRECT.
2. SUBGRADE ELEVATION IS BASED ON THE GAI CONSULTANTS DRAWING 2004-384-40-02-E-M004 SHEET 5 OF 25 PROVIDED BY AEP.

SOURCES:
1. POST-CONSTRUCTION UNDERDRAIN, SUBBASE, CLAY LINER AND 2018 GROUND SURFACE: GAI CONSULTANTS DRAWING 13-30500-05-A SHEET 5 OF 25 PROVIDED BY AEP.

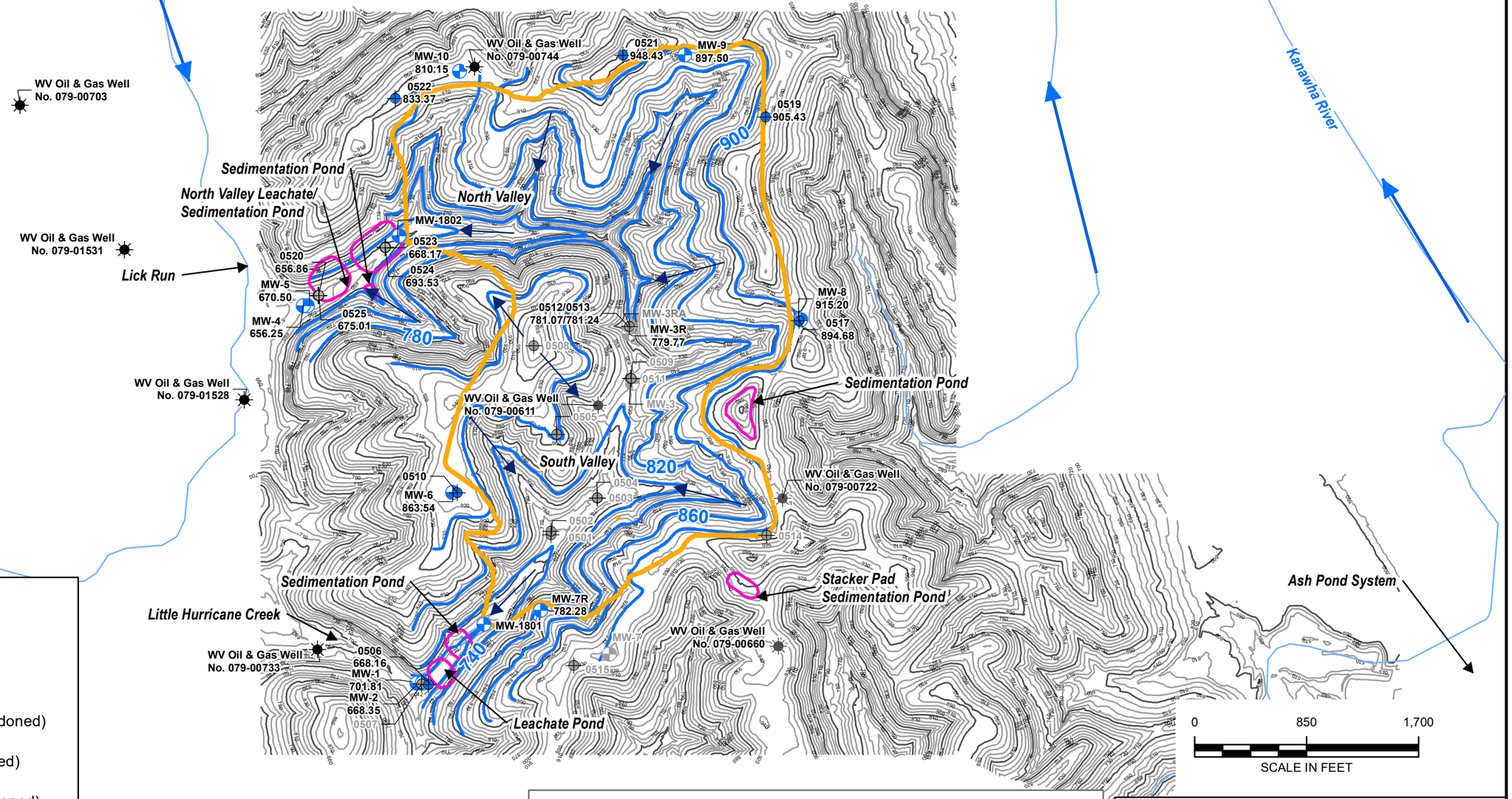
HORIZONTAL SCALE: 1"=400'
VERTICAL SCALE: 1"=60'

AEP AMOS GENERATING PLANT -FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION C-C'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
6C



Legend

- CCR Unit Boundary
- Pond Boundary
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Rivers and Streams
- Streamflow Direction
- Potentiometric Surface Contour Lines
- Estimated Groundwater Flow Path

NOTES:
1. PRE-CONSTRUCTION TOPOGRAPHY FROM AEP DRAWING 13-30500-11-E. CONTOUR INTERVAL: 10 FEET
2. WELL COORDINATE SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
3. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
4. MW-3 AND MW-7 WERE ABANDONED AND REPLACED BY MW-3R AND MW-7R. MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
5. MONITORING WELL MW-3R, MW-3RA, AND MW-7R AND LOCATIONS ARE APPROXIMATE.
6. MW-1801 AND MW-1802 WERE NOT GAUGED DURING THE NOVEMBER 2010 SAMPLING EVENT, AS THEY WERE INSTALLED AND SURVEYED IN AUGUST 2018.
7. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG"

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

POTENTIOMETRIC SURFACE MAP NOVEMBER 22, 2010

ARCADIS

FIGURE 7

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: webb
OH015976.0009.00001 (Mountaineer Ash Pond)
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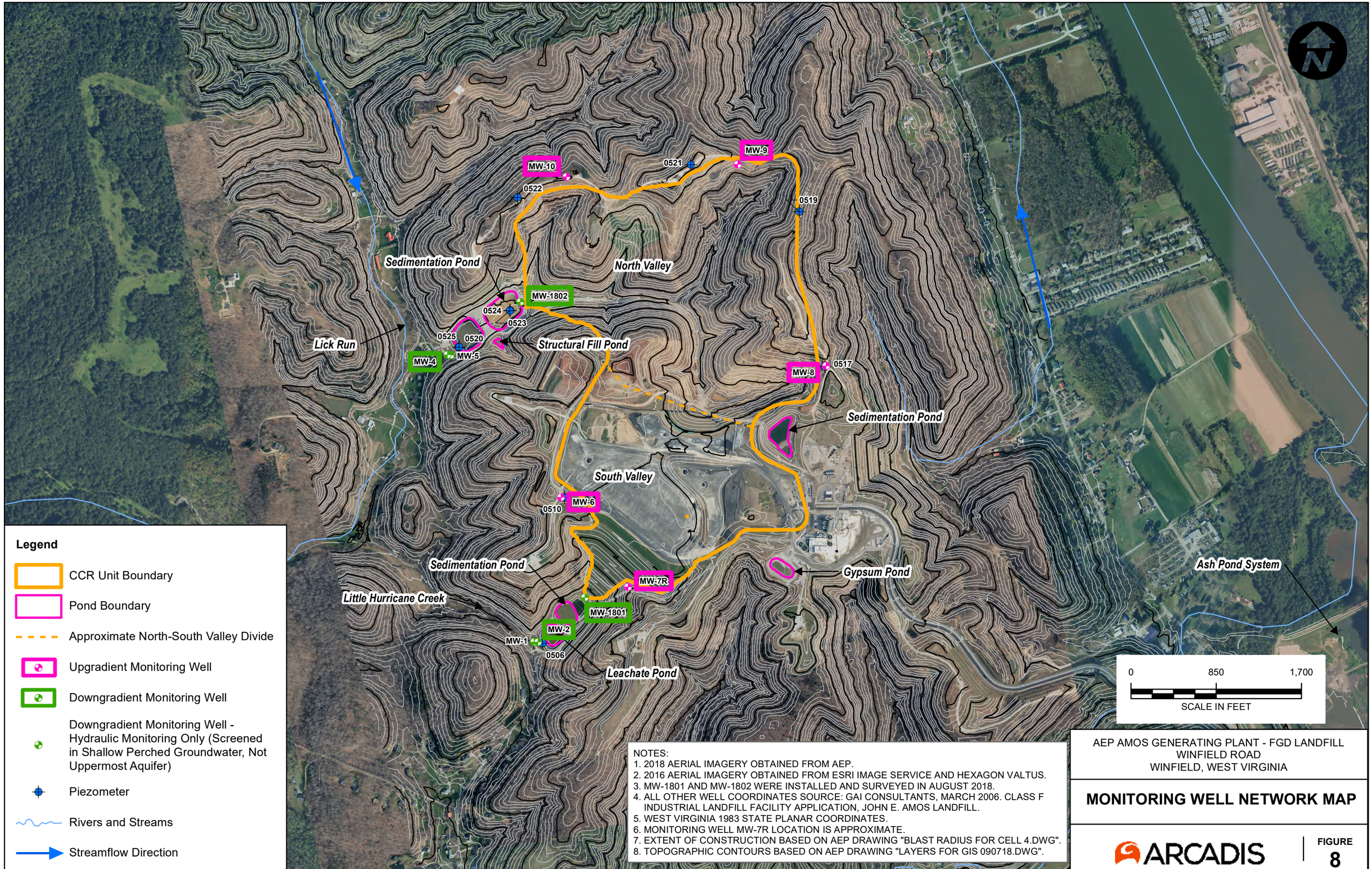

Legend

- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Upgradient Monitoring Well
- Downgradient Monitoring Well
- Downgradient Monitoring Well - Hydraulic Monitoring Only (Screened in Shallow Perched Groundwater, Not Uppermost Aquifer)
- Piezometer
- Rivers and Streams
- Streamflow Direction

NOTES:
1. 2018 AERIAL IMAGERY OBTAINED FROM AEP.
2. 2016 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE AND HEXAGON VALTUS.
3. MW-1801 AND MW-1802 WERE INSTALLED AND SURVEYED IN AUGUST 2018.
4. ALL OTHER WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
5. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
6. MONITORING WELL MW-7R LOCATION IS APPROXIMATE.
7. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
8. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

MONITORING WELL NETWORK MAP

ARCADIS

FIGURE
8

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: webb
OH015976.0009.00001 (Mountaineer Ash Pond)
Z:\GISProjects_ENV\AEP\Amos\mxd\Landfill Report\Sept2018\F8_FGDLandfill_aerial.mxd 5/20/2020 11:32:55 AM

APPENDIX A

Field Methodology

APPENDIX A

FIELD METHODOLOGY

Based on the recommended well network modifications, the following generalized tasks were completed:

- Installation of 2 bedrock borings at the FGD Landfill
- Installation and development of 2 new monitoring wells at the FGD Landfill

Arcadis provided oversight for drilling and installation of 2 bedrock monitoring wells by an AEP-licensed drilling crew. Implementation of the field activities began with the initial utility clearance activities beginning July 2018. Drilling, packer testing, well installation, and well development operations began on August 7, 2018 and ended on August 22, 2018. Well yield testing was completed on September 11 and 12, 2018.

Utilities Clearance

AEP completed a plant dig permit, which identified private plant utilities near the new monitoring well and borings locations. Arcadis retained the services of a utility locating subcontractor (The Underground Detective) to perform a geophysical survey (e.g. ground penetrating radar, electromagnetic survey, etc.) over an area of 25 feet by 25 to locate utilities at each new monitoring well location. The private utility locator also used an air knife/soil vacuum extraction system to pre-dig the proposed borehole locations to a diameter at least 10 percent larger than the largest diameter tooling to be used during drilling and to a depth of 8 feet below the ground surface (bgs) or to bedrock, whichever was encountered first.

Decontamination

All down-hole tools or equipment were decontaminated in accordance with ASTM D5088 prior to the start of drilling and between each borehole location. At a minimum, the tooling was washed with detergent solution followed by a potable water rinse. The use of a pressure washer was used when possible. Containerization was not required for decontamination water because all work was completed outside of the FGD Landfill area and not considered contaminated. Water for decontamination or drilling was potable and obtained from the AEP Amos Plant.

Borehole Advancement and Stratigraphy/Lithology

Bedrock boreholes began by using standard hollow-stem auger methods with a minimum 8.25” inner diameter auger in accordance with ASTM D5784 until the soil-rock interface was encountered. Continuous spit-spoon sampling and standard penetration testing was performed in accordance with ASTM D1586 until bedrock was encountered. A minimum 6-inch diameter PVC surface casing was temporarily set 2 feet into the competent bedrock prior to beginning rock coring. Bentonite chips were placed in the annulus between the borehole and the surface casing to ground surface, serving as a temporary seal around the surface casing during drilling operations. The chips were placed in a controlled manner to prevent contamination of the well. Chips were hydrated periodically during placement. The bentonite annulus seal was allowed to

set for approximately 12 hours (overnight) before continuing with rock coring. The 6-inch PVC casing was removed upon installation of the permanent well casing.

Rock core samples were completed with NQ sized wireline system in accordance with ASTM D 2113-93. Upon completion of coring, the bore holes were enlarged to 6" diameter using rotary drilling methods in accordance with ASTM D 5783-95.

Arcadis logged all geologic samples collected during the drilling process for bedrock monitoring wells. Field logging of the soil and rock samples were performed in accordance with ASTM D5434-12. Unconsolidated soils were classified under the Unified Soil Classification System (USCS), while rock core logging was classified in accordance with the *Midwest Geosciences Group; Field Guide for Rock Core Logging and Fracture Analysis*. Boring logs and well construction details for all installations completed during this scope of work are provided in **Appendix B**. No unconsolidated soil samples were collected. Rock coring was completed continuously using a NQ wireline system that retrieved a 2-inch diameter core to the termination depth. The borehole was flushed to remove any remaining drilling debris.

Packer Testing

Single-straddle packer tests were conducted on select intervals of the open core holes. Final determination of intervals for packer testing was determined based on review of lithologic boring logs, and consultation between Arcadis and AEP. At a minimum, straddle packer testing was completed at the anticipated depth interval corresponding to monitoring well screen depths. Upper and lower inflatable rubber packers attached to a rigid riser pipe were inserted to the specified test interval. Once at the test interval, the rubber packers were inflated to create a seal. The riser pipe was fitted with a pressure gauge at a known and documented distance above the ground surface, as well as a totalizing flow meter. Water was injected through the riser pipe at a constant pressure, while the Arcadis representative measured and recorded totalizing flow volume and gauge pressure at specified time intervals for a total of up to 30 minutes per each pressure. At the completion of the straddle packer test, water injection ceased and gauge pressure was monitored until it returned to pre-test conditions. Once gauge pressure stabilized, the packers were deflated and either removed from the borehole or to the next specified depth interval to repeat the straddle packer test procedure. Straddle packer test data was analyzed according to the method described in U.S. Department of the Interior, Bureau of Reclamation, 1977. Ground Water Manual, A Water Resources Technical Publication, pp. 258-264. After packer testing, the core hole was reamed to 8-inch diameter using air rotary drilling methods and water injections to remove cuttings in accordance with ASTM D 5782-95-Use of Direct Air Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water Quality Monitoring Devices. The bedrock boreholes were flushed of cuttings at the completion of reaming using potable water. The final borehole depth was confirmed via tagline measurement following borehole flushing.

Monitoring Well Installation and Construction

Monitoring well installation and construction was completed in accordance with the AEP- approved work plan prepared by Arcadis. Prior to beginning work, daily health and safety meetings were held each morning, including a thorough discussion of the day's scope of work, identified hazards, hazard mitigation,

and completion of the AEP Job Safety Analysis documentation in the presence of AEP staff. Health and safety documentation was retained by both Arcadis and AEP.

Based on the field conditions, Arcadis directed AEP regarding the total drilling and well completion depths, well construction configuration, and well materials to be used. Screened intervals for bedrock monitoring wells targeted the uppermost saturated bedrock unit. Final well depths and screened intervals are included in **Appendix B**.

All monitoring wells were constructed in general accordance with West Virginia Department of Environmental Protection Title 47 Series 60 Monitoring Well Design Standards dated June 21, 2011.

Bedrock monitoring wells were constructed of 2-inch Schedule 40 PVC risers and screens. The well was double-cased, with a 6-inch PVC surface casing installed into the upper two feet of bedrock. The surface casing was grouted in place using a bentonite grout. Well screens were constructed of 20 slot (0.020 ft screen openings) PVC. A primary filter pack of Global® #5 sand was placed across the screened interval to approximately 2 feet above the screen, followed by approximately 1 foot of secondary (finer gradation) filter pack composed of Global® #6 sand. Boring logs and well construction diagrams are provided in **Appendix B, Table 3** and well survey information can be seen in **Appendix C.**

Monitoring Well Development

Well development was completed at both newly-installed wells. Well development at new wells was performed a minimum of 48 hours after the completion of well construction. The static water level was measured in the well prior to initiation of development. All wells were developed through a pump and surge method in accordance with West Virginia Department of Environmental Protection Title 47 Series 60 Monitoring Well Design Standards dated June 21, 2011. The well was initially purged with a pump to remove loose material and fines from the well. Well development data are included as **Appendix D**.

Monitoring Well Yield Testing

Well yield testing was conducted by Arcadis in September 2018 at wells MW-1801 and MW-1802, both of which are installed in the uppermost aquifer. Yield tests were completed by pumping each well at variable and steady state extraction rates and measuring the water level response in each well during and after pumping (recovery). Extraction rates were maintained using a submersible pump. High-resolution water level data were collected during both pumping and recovery phases via data-logging pressure transducers installed in each test well. A summary of yield testing results is provided on **Table 2** and solution reports with individual curve matches are provided in **Appendix D.**

High Resolution Water Level Monitoring

Continuous water level data in the SRF and shallow alluvial zone were collected in May through August 2018 in order to better characterize hydrogeologic conditions and permeability within the SRF system and shallow alluvium at the FGD Landfill. Detailed information is presented in **Appendix D**.

Pressure transducers were installed at seven hydraulic monitoring locations that included three SRF monitoring wells located upgradient on ridges in the north valley (MW-8, MW-9 and MW-10), two down

gradient SRF monitoring wells with one in the south valley (MW-2) and north valley (MW-4), and two down gradient shallow alluvium monitoring wells with one in the south valley (MW-1) and one north valley (MW-5). Water levels were recorded continuously during the testing period.

APPENDIX B

Boring/Well Construction Logs and Closure Information

ARCADIS

GAI Consultants, Inc. 2006

Boring Logs

B-0501 to B-0525 & MW-1 to MW-10

gai consultants
transforming ideas into reality

N 540558.4978
E 1723508.1269 Grade El. 759.08

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. 0501

ELEVATION _____ GWL 0 HRS 8.4 PROJECT NO. C240387.42-01

HRS _____

DATE 18-19 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 1	S-1			V. LOOSE	BROWN	SANDY SILT	ml	SLIGHTLY MOIST
1.5	1	REC 0.2							
	1	S-2							
3.0	3 3	REC 0.8			LOOSE	BROWN	SANDY SILT AND SMALL ROCK FRAGS.	ml	SLIGHTLY MOIST
	1 1	S-3			V. STIFF	BROWN	SILTY CLAY	cl	* 2.0 TSF
4.5	3	REC 0.9				GRAY &			
	1	S-4				BROWN MOTTLED			
6.0	3 6	REC. 0.8			V. STIFF		SANDY CLAY MOIST	cl	* 2.75 TSF
	5 6	S-5				GRAY +			WATER @ 6'
7.5	4	REC 1.3			V. STIFF	BROWN MOTTLED	SANDY CLAY MOIST	cl	* 3.0 TSF
	4	S-6							
9.0	4 4	REC 1.5				GRAY +			
	3 6	S-7			V. STIFF	BROWN MOTTLED	SANDY CLAY MOIST	cl	* 3.0 TSF
10.5	7	REC							
	5	S-8				GRAY +			
12.0	8 10	1.3			V. STIFF	BROWN MOTTLED	SANDY CLAY MOIST	cl	* 3.75 TSF
	3 7	S-9			HARD	GRAY + BROWN	SANDY CLAY : DECOMP. CLAYSTONE	Cl	* 4.5 TSF
13.5	8	REC 1.5				MOTTLED			
	4	S-10				GRAY +			
15.0	6 10	REC. 1.5			HARD	BROWN MOTTLED	SANDY CLAY : DECOMP. CLAYSTONE	cl	* 4.5 TSF
	3 5	S-11			HARD		SANDY CLAY : DECOMP. CLAYSTONE	cl	* 4.0 TSF
16.5	5	REC. 1.5							
	3	S-12							
18.0	4 4	REC 1.5			HARD	GRAY	SANDY CLAY : DECOMP CLAYSTONE	cl	* 4.25 TSF
	2 2	S-13			HARD	GRAY	SANDY CLAY : DECOMP CLAYSTONE	cl	* 4.5 TSF
19.5	2	REC. 1.5							
	3	S-14				GRAY, BLUE			
21.0	6 16	REC. 1.5			HARD	BROWN MOTTLED	SANDY CLAY : DECOMP CLAYSTONE	cl	* 4.5 TSF
22.3	16 26 50/0.3	S-15 REC. 1.3		22.3	SOFT	GRAY	DECOMPOSED SANDY CLAYSTONE		
					V. SOFT TO SOFT	GRAY & MAROON MOTTLING	HIGHLY WEATHERED CLAYSTONE	VBR-BR	30° SLICKENSIDED FRACTURES AT 23.5, 23.7, 24.9
									LOW ANGLE FRACTURES AT
									22.7, 23.0, 23.6, 23.9, 24.05
	9.2 9.2	100%	71	27.4	↓	↓	↓	↓	24.2, 24.5, 24.6, 25.2, 26.0,
					SOFT	GRAY	SANDY CLAYSTONE	BR-BL	26.3, 27.7, 28.0, 28.4,
				25.0	↓	↓	↓	↓	29.6, 30.3
					SOFT TO	GRAY	INTERBEDDED SANDY SILT STONE AND SAND STONE	BL	45° FRACTURE 27.25 - 27.4

REMARKS ** DRILLED BY [illegible] IN [illegible] 4000-T2 TRACK MILL

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4"ø CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0501

(8-3)

gai consultants
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PROJECT AREA 2/3 AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0501

ELEVATION _____ GWL 0 HRS 8.4 PROJECT NO. C040384.40-01

HRS •

DATE 18-19 APR 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT	GRAY	INTERBEDDED SANDY SILTSTONE	BL	
31.5							AND SANDSTONE (CON'T)		LOW ANGLE FRACTURES
									33.6, 34.4, 36.0, 36.2,
									36.7, 37.35, 37.8, 38.0, 38.2,
				34.6					41.1,
					SOFT	GRAY + MAROON MOTTLED	CLAYSTONE	VBR-	
	10.0	10.0	100%	70				BR	30° FRACTURES W/ SLICKEN-
									SIDES 35.4, 39.25, 39.75,
									40.0, 41.3-41.5
									BROKEN ZONES 35.6-35.8
									40.0-41.0, 41.5-42.3
41.5									
				42.3					
					M. SOFT TO M. HARD	GRAY	SANDSTONE	BL	LOW ANGLE FRACTURES
									42.3, 43.25, 48.0, 48.1,
									48.5, 50.2, 51.5, 51.7
									52.2, 52.7 53.4
	9.3	10.0	93%	88					
				48.0					
				48.5	SOFT	DK GRAY	SANDY CLAYSTONE	BR	
					M. SOFT TO M. HARD	GRAY	INTERBEDDED SANDSTONE AND SANDY SILTSTONE	BL	
51.5									
				53.4					
					SOFT	GRAY + MAROON MOTTLED	SANDY TO SILTY CLAYSTONE	VBR-	LOW ANGLE FRACTURES
								BR	53.7, 54.05, 54.3, 54.85,
									55.4, 55.55, 55.7, 55.85
	9.3	10.0	93%	31					56.05, 56.5, 56.7, 56.9
									57.2, 58.0, 58.5, 58.95 59
									60.6, 60.85, 61.35
									BROKEN ZONE 59.3-60.6

REMARKS ** ~30° SLICKENSIDED FRACS. 54.4, 57.55, 57.9, 58.25, 58.75, 61.1

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0501

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PROJECT AREA 2-3 AMOS POWER PLANT ST ALBANS, WV BORING NO. B0501

ELEVATION _____ GWL 0 HRS 8.4 PROJECT NO. C040384.40-01

HRS _____

DATE 18-19 APR 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
61.5				61.6					
					SOFT	MAROON W/ GRAY, YELLOW, AND PURPLE MOTTLING	CLAYSTONE HIGHLY WEATHERED - CORE IS HIGHLY PITTED	VBR-BR	61.5-65.9 APPARENT ZONE OF CORE LOSS
									BROKEN ZONE: 69.5-66.7
									LOW ANGLE FRACTURES
	5.6 / 10.0	56%	28%						66.9, 67.15, 67.3, 67.75,
									67.85, 68.9, 69.1, 69.65,
									70.6
71.5									
									30° SLICKENSIDED
									FRACTURE 69.9, 71.1,
									71.4, 74.2, 75.0
	7.6 / 8.5	89%	27						BROKEN ZONE 71.5-72.3
									APPARENT CORE LOSS 72.3-
									73.2
									LOW ANGLE FRACTURES
80.0				80.0					74.55, 74.7, 75.35, 75.55,
							BOTTOM OF BORING : 80.0'		75.8, 76.1, 76.75, 77.5,
									77.65, 77.85, 78.2, 78.5
									78.65, 78.75, 78.85,
									79.0, 79.2, 79.5, 79.8,
									79.9

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B0501

N 540563.2422
E 1723508.0316 Grade El. 759.46

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0502

ELEVATION 758± GWL 0 HRS _____ PROJECT NO. C040384.40-01

HRS _____

DATE 21 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/O SAMPLING		
							TO 22'		
							SET PIEZOMETER -		
							TIP AT 21'		
				22.0			BOTTOM OF BORING: 22'		

REMARKS ** DRILLED BY TERRA TESTING INC. USING A SIMCO 4000 TX TRACK-MOUNTED DRILL
BORING ADVANCED USING 5 1/4" ID SOLID STEM AUGERS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0502
(3-4)

N 540843.8055
E 1723858.5630 Grade El. 775.00

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. 0503

ELEVATION _____ GWL 0 HRS 11.4 PROJECT NO. C040384.40-A

HRS _____

DATE 18-19 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 W.O.H	S-1			V. LOOSE	BROWN	CLAYEY SILT	ml	MOIST
1.5	W.O.H	REC 1.0							
	1	S-2							
3.0	1 1	REC 1.1			V. LOOSE	BROWN	CLAYEY SILT, TRACE SAND	ml	MOIST
	1 1	S-3			V. SOFT	BROWN	SILTY CLAY	cl	WET, * 0.5
4.5	3	REC 0.1				GRAY +			
	2	S-4							
6.0	4 6	REC 1.4			HARD	BROWN MOTTLED	SANDY CLAY	cl	SLIGHTLY MOIST, * 4.5
	3 6	S-5			M. DENSE	BROWN	SANDY SILT	ml	SLIGHTLY MOIST
7.5	8	REC. 0.4				GRAY +			
	3	S-6							
9.0	9 12	REC. 1.2			HARD	BROWN MOTTLED	SANDY CLAY: DECOMP. CLAYSTONE	cl	SLIGHTLY MOIST, * 4.5 TSF
	3 3	S-7			STIFF		SANDY CLAY " "	cl	MOIST * 3.75 TSF
10.5	4	REC. 0.4				GRAY +			
	6	S-8							
12.0	5 5	REC. 1.2			HARD	BROWN MOTTLED	SANDY CLAY " "	cl	SLIGHTLY MOIST * 4.5 TSF
	3 3	S-9			HARD	GRAY + BROWN MOTTLED	SANDY CLAY " "	cl	SLIGHTLY MOIST * 4.5 TSF
13.5	5	REC. 1.3							
	3	S-10							
15.0	5 5	REC. 1.0			HARD	GRAY	SANDY CLAY " "	cl	SLIGHTLY MOIST, 4.5 TSF
	3 3	S-11			HARD	GRAY	SANDY CLAY " "	cl	SLIGHTLY MOIST 4.5 TSF
16.5	4	REC 1.3							
	1	S-12							
18.0	2 1	REC 1.4			V. STIFF	GRAY	SANDY CLAY, SOME SILT "	cl	MOIST, * 3.75 TSF
	1 3	S-13			V. STIFF	DARK GRAY	SANDY CLAY, TRACE ORGANICS	cl	SLIGHTLY MOIST, * 3.75 TSF
19.5	6	REC. 1.3							
	6	S-14							
21.0	5 6	REC 1.2			V. STIFF	DARK GRAY	SANDY CLAY, TRACE ORGANICS	cl	SLIGHTLY MOIST, * 3.5 TSF
	2 2	S-15			LOOSE	BLUE + GRAY	CLAYEY SAND, TRACE ROCK FRAGMENTS	sc	MOIST
22.5	4	REC 1.3							
	28	S-16			SOFT	BLUE-GRAY	DECOMPOSED CLAYSTONE FRAGMENTS		
23.4	50/3.4	REC 0.9		23.4					
				1H/MR 24.0	SOFT	GRAY	DECOMPOSED CLAYSTONE	VBR	TOP OF ROCK 23.4
					M. SOFT	GRAY	SILTY SANDSTONE	VBR	CLAY SEAM 24.7, 29 ?
					TO M. HARD			BR	VERTICAL FRACTURES 23.4-24.4, 25.25-25.3, 27.45-27.55
	7.5 7.5	100%	35						LOW ANGLE FRACTURES: 23.6, 23.8, 24.05 24.15, 24.3, 24.4, 24.55, 24.9 25.05 25.15

REMARKS ** DRILLED BY TERRA TESTING USING A SIMCO 4000 T2 TRACK MOUNTED DRILL RIG. BORING ADVANCED USING 5 1/4" ϕ SOLID STEM AUGERS, NQ CASING, NQ-2 WIRELINE COARING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0503

(B-5)

gai consultants
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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0503

ELEVATION _____ GWL 0 HRS 11.4 PROJECT NO. C040384.40-01

HRS _____

DATE 18-19 APR 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.9				30.7					25.25, 25.3, 25.35, 25.5,
				32.0	SOFT	GRAY	CLAYSTONE	VBR-BR	25.55, 25.75 26.0, 26.15,
					SOFT	GRAY	SANDY CLAYSTONE	BR	26.25, 26.5, 26.7, 26.95, 27.2
				33.9	↓	↓	↓	↓	27.35, 27.45, 27.85, 27.95,
					M-SOFT	GRAY	SANDY SILTSTONE	BR	28.5, 28.75, 29.15, 29.35,
	10.0 10.0	100%	77	36.3	↓	↓	↓	↓	29.7, 30.3, 30.4, 30.9, 31.1
					SOFT	GRAY	CLAYSTONE		31.4, 31.7 32.15, 32.4
						GRAY + MAROON MOTTLED			32.7, 32.8, 33.4, 33.9, 34.4
									35.1, 35.5, 35.9, 36.7, 36.9
40.9									37.1, 37.6, 38.0, 38.75,
									39.2, 39.3, 39.5, 40.9,
									41.6, 42.3, 42.75, 43.0,
				42.5	↓	↓	↓	↓	44.2, 44.8, 45.05, 45.6,
					M. SOFT	GRAY	INTERBEDDED SANDY SILTSTONE AND	BR	46.15, 46.95, 47.6, 49.2,
							SANDSTONE		49.4, 50.0
	8.9 9.1	98%	82					BR-BL	30° FRACTURES 28.85,
				47.4	↓	↓	↓	↓	39.35, 42.7
					SOFT	GRAY + MAROON MOTTLED	SANDY CLAYSTONE	BR-BL	BROKEN ZONE 40.9-41.6
50.0				50.0	↓	↓	↓	↓	
							BOTTOM OF BORING 50.0		

REMARKS** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0503

(B-5)

N 540840.0544
E 1723859.8367 Grade El. 775.40

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0504

ELEVATION _____ GWL 0 HRS _____ PROJECT NO. C040384.40-01

HRS _____

DATE 20APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/O SAMPLING		
							TO 24' SET PIEZOMETER		
							TIP AT 23.2'		
				24.0					
							BOTTOM OF BORING: 24.0'		

REMARKS ** DRILLED BY PEN LA TESTING USING A SIMCO 4000 T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5 1/4" Ø SOLID STEM AUGERS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B0504

gai consultants
transforming ideas into reality

N 541325.3505
E 1723551.3362 Grade El. 910.89

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B 0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C040384.45.01

HRS

DATE 2025 APR 2025 CLASSIFIED BY DAN SANGER PAGE 1 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 3	S-1			LOOSE	TAN	SANDY SILT, SLIGHTLY MOIST	ml	
1.5	3	REC 0.7 S-2							
	5								
3.0	12 30	REC. 1.5			DENSE				DECOMPOSED SANDSTONE/
3.8	12 50/0.3	S-3 REC 0.8		3.8	V. DENSE				SANDY SHALE
				4.5	SOFT	TAN	SANDSTONE: HIGHLY WEATHERED	BR-VBR	TOP OF ROCK: 3.8'
				6.2	V. SOFT	TAN	SANDSTONE: COMPLETELY WEATHERED	VBR	
					M. SOFT TO M. HARD	TAN	SANDSTONE: MODERATELY WEATHERED, MICACEOUS, FINE TO MEDIUM GRAINED	BR-BL	VERTICAL FRACTURE 6.2-6.5
	7.2 7.2	100%	62						LOW & FRACTURES: 6.7, 7.25, 8.4, 9.8, 11.2, 11.45, 11.6
11.0				11.6	V. SOFT	TAN	SANDSTONE: COMPLETELY WEATHERED, MICACEOUS, FINE TO MEDIUM GRAINED	VBR	
				14.0	SOFT	TAN	SANDSTONE: HIGHLY WEATHERED, MICACEOUS, FINE TO MEDIUM GRAINED	BR	LOW & FRACTURES: 14.0, 14.2, 14.3, 14.35, 14.45, 14.55, 15.75, 16.5, 17.0,
	10.0 10.3	100%	36	18.5	V. SOFT TO SOFT	TAN	SANDSTONE: COMPLETELY WEATHERED, MICACEOUS, FINE TO MEDIUM GRAINED	VBR	
21.0				21.0	SOFT	TAN	SANDSTONE: HIGHLY WEATHERED MICACEOUS, FINE TO MEDIUM GRAINED	BR	LOW & FRACTURES: 21.1, 22.3, 22.45, 22.55, 22.7, 23.0, 23.1, 23.5, 23.75, 24.05, 24.55,
	8.7 10.0	87%	55						STAINED 30° FRACTURE 21.9

REMARKS** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL RIG. BORING ADVANCED USING 5¼" SOLID STEM AUGERS, CONTINUOUS SPT, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B 0505

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0505 ("27)

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C040384.40-01

HRS _____

DATE 20 APR 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
31.0				31.0	↓	↓	↓	↓	
				32.0	U. SOFT	TAN	SANDSTONE: COMPLETELY WEATHERED	VBR	
					M. HARD	BROWN	SANDSTONE: MODERATELY WEATHERED	BR-BL	
							MICACEOUS, MEDIUM GRAINED		
									70° HIGHLY STAINED
	10.0 10.0	100%	41						FRACTURE 34.6 - 35.1
				36.5	SOFT TO	BLUE-GRAY	SHALE	BR	VERTICAL FRACTURE 35.7-36.6
					M. SOFT				LOW ∠ FRACTURES: 35.1,
				39.2	↓	↓	↓	↓	35.3, 35.45
				40.0	M. SOFT	TAN	SILTSTONE	VBR	STAINED VERT. FRAC. 39.2-40.0
41.0				41.3	M. HARD	DK GRAY	SILTY SANDSTONE	BR	HIGH ∠ STAINED FRACS:
					M. HARD	OLIVE	SANDSTONE: V. FINE GRAINED		40.0-40.3, 40.55-40.7
									LOW ∠ STAINED FRAC 41.8
				43.7	↓	↓	↓	↓	NEAR VERTICAL STAINED —
					M SOFT	BLUE-GRAY	SILTY SHALE	VBR	FRACTURE 41.8-42.2
	10.0 10.0	100%	44		SOFT TO SOFT				HIGH ∠ STAINED FRACTURE
				47.0	↓	↓	↓	↓	45.6-46.1
					M. SOFT	OLIVE-GRAY	SANDSTONE, FINE GRAINED, SOME	BR	HIGH ∠ STAINED FRACTURE
							CROSS BEDDING		49.5-49.9, 52.1-52.9,
									54.15-54.3, 55.7-55.9
51.0									VERTICAL STAINED FRAC-
									TURE 51.5-52.2,
				55.4	↓	↓	↓	↓	
	10.0 10.0	100%	36		SOFT	GRAY	SANDY SHALE	VBR-	
									VERTICAL STAINED FRACS
									56.1-56.7,
								↓	HIGH ∠ + VERTICAL STAINED
					↓	↓	↓	BR	FRACTURES 57.2-59.6

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0505 (27)

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST ALBANS, WV BORING NO. B-0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C0340384.40-01

HRS _____

DATE 20-25 APR 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
61.0				61.2	↓	↓	↓	↓	30° STAINED FRAC. 60.3'
					SOFT TO	GRAY	CLAY SHALE	BR-	HIGH & STAINED FRAC-
					M-SOFT			BL	TURE AT 62'
						MAROON MOTTLING			
	10.0 10.0	100%	52	65.5					
				66.1	M-HARD	GRAY	SANDSTONE	BL	
				66.9	SOFT	GRAY + MAROON	CLAY SHALE	BR	HIGH & STAINED FRAC 66.5-66.7
					M-HARD	LT GRAY	SANDSTONE		HIGH & FRACTURE 67.7-67.9
				68.8	↓	↓	SHALY 67.7-68.8	↓	VERTICAL FRACTURE 68.2-68.6
					V-SOFT	BROWN-	CLAYSTONE - COMPLETELY WEATHERED	VBR-	:
71.0						GRAY		BR	
				73.0	↓	↓	↓	↓	
					SOFT TO	DK GRAY TO GRAY	CLAYSTONE	BR	SLICKENSIDES 73.55,
					M-SOFT				74.7, 74.8, 75.6, 75.9
	10.0 10.0	100%	40						76.5, 77.0, 77.35
				78.0	↓	↓	↓	↓	VERTICAL STAINED
					M-HARD	BROWN + GRAY	SANDSTONE: FINE TO MEDIUM GRAINED	BR	FRACTURE 77.7-80.5
81.0									
								BL	
						BROWN			
	10.0 10.0	100%	76						
								BR	VERTICAL STAINED
									FRACTURE 87.5-88.8
					↓	↓	↓	↓	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B0505

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C040384.40-01

HRS _____

DATE 20-25 APR 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
91.0					M. HARD	BROWN	SANDSTONE (CON'T)	BR -	
								BL	LOW & FRACTURES
									93.8, 94.2, 95.1,
									95.2, 95.6,
	10.0 10.0	100%	86			GRAY			
101.0				101.5					
					SOFT	GRAY	SILTY SHALE	VBR	MUCH OF CORE IS
									PIECES 0.1-0.2'
							: BECOMES SANDY AT 104.75		LOW & FRACTURES 101.4,
	10.0 10.0	100%	18						102.0, 102.5, 102.9, 103.4,
									104.3, 104.5, 104.75
				108.7					VERTICAL FRACTURE 106.7-
									107.7
					M. HARD	GRAY	SANDSTONE: FINE GRAINED		V. BROKEN ZONE 107.0 - 107.7
111.0									STAINED NEAR VERTICAL
				112.2					FRACTURE 108.1 - 108.7
					SOFT TO M. SOFT	DK GRAY ↓ MAROON	CLAYSTONE	VBR	
									45° SLICKENSIDE 112.9-113.0
									V. BROKEN ZONE 114.2 - 114.8
	9.2 10.0	92%			M. SOFT	GRAY			
									LOW & FRACTURE 17.8, 19.6,
									120.4
					SOFT	GRAY MAROON			

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C0Y0384.40-01

HRS _____

DATE 20-25 APR 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
121.0					SOFT	GRAY & MAROON	CLAYSTONE (CONT) MODERATELY	VBR-	JNT & FRACTURES
						MAROON	TO HIGHLY WEATHERED	BR	121.4, 121.7, 122.3, 122.6,
									122.9, 123.1 123.4, 123.8
									124.1
					V. SOFT TO		: HIGHLY WEATHERED		
	6.0	10.0	60%		SOFT			VBR	124.8-132.0 HIGHLY
									BROKEN ZONE
						GREEN-GRAY			
131.0									
						MAROON		BR	
									45° SLICKENSIDES
									133.3, 134.2, 134.9,
									136.9, 139.2-139.4
	9.2	10.0	92%	67	136.0				
					M. SOFT	GRAY WITH MAROON CLASTS + STRINGERS	SANDY CLAYSTONE	BR-	
								BL	SLICKENSIDES AT
									142.35, 143.9, 144.7
									145.1, 145.35, 146.25
141.0									148.3, 148.9, 150.4,
									150.65
								VBR-	
	10.0	10.0	100%	55				BR	
							: BECOMES SILTY AT 144.6		
					SOFT	MAROON			
								BR	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0505 (#27)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C040384.40-01

HRS _____

DATE 20-25APR2005 CLASSIFIED BY DAN SANGER PAGE 6 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
151.0				151.5	M. HARD	GREEN-GRAY	SANDSTONE	BR	
				153.2	M. SOFT	GRAY	SANDY SHALE	BR	LOW ∠ FRACTURE 153.4, 153.65
	10.0	10.0	100%	86	156.1	M. HARD	GRAY	SHALY SANDSTONE	BR-BL	LOW ∠ FRACTURE 154.35-154.5
					157.5	M. HARD	GRAY	SANDSTONE		LOW ∠ FRACTURE 157.35
161.0										
	10.0	10.0	100%	84						
					168.5	M. SOFT TO SOFT	GRAY TO DK GRAY	CLAYSTONE	VBR-BR	CLAY SEAM 167.55-167.70 LOW ∠ FRACTURES 168.75, 168.85, 169.15, 169.20, 170.7, 171.2, 171.6, 174.8, 174.95
171.0					173.4					
	9.3	10.0	93%	6.1		M. SOFT TO M. HARD	GRAY + MAROON	SANDY CLAYSTONE	BL	45° ∠ FRACTURE 169.75-170.1, 172.35, 172.7 LOW ∠ SLICKENSIDES 170.4, 170.7, 171.85, 172.9, 173.1, 173.4
					179.0	M. SOFT	MAROON	CLAYSTONE	BR-VBR	45° SLICKENSIDES 179.2-179.4, 179.7-179.9 - 180.0

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0505

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0505

ELEVATION _____ GWL 0 HRS 84.0 PROJECT NO. C040384.40-01

HRS _____

DATE 20 - 25 APR 2005 CLASSIFIED BY DAN SANGER PAGE 7 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
181.0					M. SOFT	MAROON	CLAYSTONE		LOW & SLICKENSIDE 181.9, 182.2, 183.2, 183.6, 184.0, 184.15, 184.4
				185.0				VBR	V. BROKEN 184.4-185.0
	10.0 / 10.0	100%	67		M. HARD	GRAY	SANDSTONE	BL	
									CLAY SEAM 188.7
				190.0					
191.0				191.0	M. SOFT	MAROON	CLAYSTONE	BR	
					M. HARD	GRAY	SANDSTONE	BL	
	9.0 / 9.0	100%	88						
				198.1					
					M. SOFT	GRAY & MAROON	SANDY CLAYSTONE	VBA-BR	SLICKENSIDES 198.45, 198.9, 199.25, 199.35, 199.6, 199.8
200.0							BOTTOM OF BORING: 200.0'		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0505

N 539424.9688
E 1722518.6810 Grade El. 709.52

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, W/ BORING NO. B-0506

ELEVATION _____ GWL 0 HRS 21.3 PROJECT NO. C04J384.43-01

HRS _____

DATE 21 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 2	S-1			LOOSE	BROWN	SANDY SILT SOME ORGANICS	ml	FILL
1.5	4	REC 0.6							
	4	S-2							
3.0	5 6	REC 0.9			M. DENSE	RED-BROWN	SANDY SILT MOIST	ml	
	3 5	S-3							
4.5	6	REC 1.5							
	7	S-4			M. DENSE	RED BROWN	CLAYEY SILT / SILTY CLAY W/ R.F.	ml/cl	
6.0	8 33	REC 1.5							
	4 5	S-5			M. DENSE	RED-BROWN	CLAYEY SILT AND ROCK FRAGMENTS	ml	VARIES
7.5	6	REC 0.2							
	11	S-6							
9.0	10 11	REC 0.6			M DENSE	RED BROWN	CLAYEY SILT AND ROCK FRAGMENTS	ml	MOIST
	7 12	S-7					(DECOMPOSED CLAYSTONE)		
10.5	15	REC 1.5							
	16	S-8							
12.0	18 18	REC 1.0			DENSE	RED BROWN	CLAYEY SILT AND ROCK FRAGMENTS	ml	SLIGHTLY MOIST
	8 11	S-9					(DECOMPOSED CLAYSTONE)		
13.5	18	1.5							
	22	S-10			DENSE	RED, BROWN	DECOMPOSED CLAYSTONE		DRY
15.0	26 30	REC 1.2			V. DENSE	YELLOW, GRAY	DECOMPOSED CLAYSTONE		DRY
	18 25	S-11			V. DENSE		DECOMPOSED CLAYSTONE		DRY
16.5	36	REC 1.5							
	12	S-12							
18.0	50/3.6	REC. 1.5		18.0	HARD		DECOMPOSED CLAYSTONE		DRY
				11/21/21	SOFT TO	MAROON	CLAYSTONE	BL	LOW % FRACTURES
	4.0 4.0	100%	90		M. SFT				19.65, 20.05, 21.6
22.0									

							: SANDY 24.7 - 25.4		BROKEN ZONE: 22.0-22.5
									45° & FRACTURE W/ SLICKEN-
	9.6 10.0	96%	86						SIDES 22.75-22.95
							: SANDY 27.4 - 29.4		LOW % FRACTURES
									24.6,
									45° % SLICKENSIDE 28.3-28.55

REMARKS** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000 T2 TRACK MOUNTED DRILL. BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" I.D. STEEL CASING, CONTINUOUS SPT, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0506

gai consultants
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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0506

ELEVATION _____ GWL 0 HRS 21.3 PROJECT NO. C040384.43-01

HRS _____

DATE 22-2 APR 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					SOFT TO	MAROON	CLAYSTONE (CONT)		LOW % FRACTURES W/
32.0					M. SOFT		: CORE SURFACE WEATHERED		SLICKENSIDES: 32.65
								↓	33.0, 33.25, 33.75,
								BL	34.05, 35.55, 36.65,
									38.4,
								↓	45° FRACTURES W/
	9.9	10.0	99%	58			: IRREGULAR CALCAREOUS	BR	SLICKENSIDES: 36.9,
							CLASTS 37.5-38.7	↓	37.25-37.45, 38.85-
								BL	38.95
42.0									
									LOW % FRACTURES W/
									SLICKENSIDES 42.4,
									42.65 42.95, 44.25
									45.25, 45.7, 45.9,
	10.0	10.0	100%	76					47.75,
									45° & FRACTURES W/
				51.0	↓	↓	↓		SLICKENSIDES = 48.6,
52.0				51.7	M. SOFT	GRAY	SANDY CLAYSTONE		48.8, 49.0
					↓	MAROON	CLAYSTONE	↓	
					↓	↓	↓	BR	LOW % FRACTURES W/
				54.9	HARD	GRAY	SANDSTONE 54.6-54.9	↓	SLICKENSIDES: 52.3, 52.4
							SANDY CLAYSTONE	BL	53.5, 54.2
	10.0	10.0	100%	73	56.5	↓	↓		
					M. SOFT	MAROON	CLAYSTONE		45° FRACTURES W/ SLICK.
					↓	↓	↓		ENSIDES 53.55-53.75
					↓	↓	↓	↓	54.45-54.6

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0506

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0506

ELEVATION _____ GWL 0 HRS 21.3 PROJECT NO. C040384.40-01

HRS _____

DATE 22-27 APR 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				62.4	M. HARD	GRAY	SHALY SILTSTONE	BL	
62.0									
				64.1	M. HARD TO HARD	LT GRAY	SANDSTONE		VERTICAL FRACTURE 64.7-65.7
	10.0 10.0	100%	76						65° FRACTURE 65.9-66.2
				71.5					
72.0				72.7	M. SOFT	GRAY	SILTY SHALE	BR	
					SOFT TO M. SOFT	MAROON + GRAY	CLAYSTONE	BR-BL	LOW ∠ FRACTURE 72.6
	8.0 8.0	100%	78						30° FRACTURE W/SLICKEN-SIDE 74.3
80.0				80.0					
							BOTTOM OF BORING: 80.0'		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0506

N 539428.8146
E 1722523.7682 Grade El. 709.99

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS W/ BORING NO. B-0507

ELEVATION _____ GWL 0 HRS DRY PROJECT NO. [illegible]

HRS _____

DATE 26 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/O SAMPLING		
							TO 18 FT.		
							PIEZOMETER INSTALLED,		
							TIP AT 17 FT		
18.0				18.0			↓		
							BOTTOM OF BORING: 18'		

REMARKS** DRILLED BY TERRA TESTING USING A SIMCO 4000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5¼" SOLID STEM AUGERS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0507

N 541996.9754
E 1723377.3436 Grade El. 979.22

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C040384.40-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	1 4 7	S-1 REC 1.0			M. DENSE	TAN	SILT AND DECOMPOSED SHALE	M	SLIGHTLY MOIST
	18	S-2			↓	↓	FRAGMENTS	↓	
3.0	34 50/0.4	REC 1.2			V. DENSE				
4.5	37 30 22	S-3			↓				
5.2	19 50/0.2	S-4 REC 0.7		5.2	↓	↓	↓	↓	
					SOFT	TAN TO BROWN	CLAY SHALE - HIGHLY	BR	LOW & FRACTURES:
					↓	↓	WEATHERED	↓	5.7, 6.25, 6.75, 6.9,
	5.7 5.7	100%	38		↓	↓	↓	↓	7.4, 7.7, STAINED:
					↓	↓	↓	↓	9.2, 9.6,
					↓	↓	↓	↓	RED STAINED 65° FRAC-
10.9				11.5	↓	↓	↓	↓	TURE: 8.4-8.6, 9.0,
				12.6	SOFT	TAN	SILTY SHALE	BR	10.4-10.7, 12.0-12.4
				13.7	5 FT	TAN + GRAY	SHALY SANDSTONE - WEATHERED	↓	LOW FRACTURE 12.9, 13.5
					SOFT	TAN	SHALE - GRADES FROM SILT	↓	BROKEN 14.1-14.3
					↓	↓	TO CLAY - WEATHERED	↓	VERTICAL FRACTURE 14.8-15.0
	9.7 10.0	97%	50	16.4	↓	↓	↓	↓	LOW FRACTURES 15.6, 15.9,
					SOFT	MAROON	CLAYSTONE	BR-BL	16.3, 16.45, 17.0, 17.3,
					↓	↓	↓	↓	18.2, 18.65, 20.6
					↓	↓	↓	↓	VERTICAL FRACTURE 20.9-21.3
20.9					↓	↓	↓	↓	70° FRAC. W/ SLICKENSIDES
					↓	↓	↓	↓	AT 22.2-22.4
					↓	↓	↓	↓	
					↓	↓	↓	↓	
					↓	↓	↓	↓	
					↓	↓	↓	BL	
	10.0 10.0	100%	64		↓	↓	↓	↓	
					↓	↓	↓	↓	
					↓	↓	↓	↓	
					↓	↓	↓	↓	
					↓	↓	↓	BR	

REMARKS** DRILLED BY TERRA TESTIN INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL

BORING ADVANCED USING 5¼" ID SOLID STEM AUGERS, CONTINUOUS SPT, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0508

gai consultants
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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C040384.10-01

HRS

DATE 27-28APR2005 CLASSIFIED BY DAN SANGER PAGE 2 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.9					SOFT	MAROON	CLAYSTONE	NBR	LOW & FRACTURES W/
								BR	SLICKENSIDES 31.0, 31.15,
									31.3, 31.5, 32.4, 33.0,
									NEAR VERTICAL FRACTURE
									31.8 & 32.1
	9.1.6	10.0	96%	65					70° FRAC W/ SLICKENSIDES
						GRAY+			32.4-32.65
				38.5		MAROON			70° FRAC W/ SLICK. 34.2
					M. SOFT	OLIVE-GRAY	SHALY SANDSTONE - V. FINE GRAINED	BR	LOW & FRACTURE 35.8, 37.3,
									37.5 37.85
40.9									LOW & ORANGE STAINED
									FRACTURE 39.0
									NEAR VERTICAL STAINED
									FRACTURE 39.4-39.7
				45.3					HIGH & FRACTURE 40.4
	10.0	10.0	100%	91	SOFT TO	BROWN-	SANDY SHALE	BR	BROKEN 40.4-40.9
				46.2	M. SOFT TO M. HARD	GRAY	SANDSTONE: FINE TO MED. GRAINED, MICACEOUS	BR-BL	LOW & FRACTURE 43.0
								BL	
50.9				51.0					
				51.9	M. SOFT	OLIVE	SANDY SHALE		
					M. SOFT TO M. HARD	OLIVE-GRAY	SANDSTONE		
				54.3					
				56.0	M. SOFT	OLIVE	SANDY SHALE		
	10.0	10.0	100%	87		MAROON TO GRAY	CLAYSTONE	BR	BROKEN ZONE 55.2-55.4
									LOW & FRACTURE 56.6,
									57.75
				59.7					

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0508

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C04D384.40-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.9				60.8	M. SOFT	GRAY	SANDY CLAYSTONE	BL	
					SOFT	GRAY	CLAY SHALE	BR	LOW % FRACTURES 61.5, 62.2, STAINED 45° FRACTURE
				64.2					
	10.0	10.0	100%	65.8		GRAY + MAROON	CLAY SHALE, TRACE SAND	BR	62.6-62.8, 63.6-63.8.
					SOFT TO V. SOFT	MAROON	CLAYSTONE - WEATHERED		STAINED VERTICAL FRAC 64.2-64.3, 64.7-64.8, 65.3-65.45
70.9									45° FRACTURES 72.9, 73.5
				73.5				BR	
				74.0			SANDY SHALE		
	10.0	10.0	100%	75	M. SOFT TO M. HARD	GRAY	SANDSTONE: V. FINE TO FINE GRAINED		SHALE PARTING 77.6
80.9									
				92.0					
	9.3	10.0	93%	71	M. HARD	GRAY	SANDSTONE: FINE TO MEDIUM GRAINED	BL	
				88.1					STAINED VERTICAL FRACTURE
					SOFT	DK GRAY	CLAYSTONE	BR	87.6-88.15 30° FRAC. W/ SLICKEN SIDES

REMARKS ** F8.9

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 7/3 JOHN E. AMOS POWER PLANT ST. ALBANS WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C0403844.40-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TOR/VANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
90.9					SOFT	DK GRAY	CLAYSTONE (CON'T)	BR	45° SLICKENSIDED FRACTURES 92.0-92.1, 92.55-92.65 BROKEN 92.9-93.2 30° SLICKENSIDED FRACTURES AT 93.0, 93.25, 93.6,
	10.0	10.0	100%	37					
				96.4	M-SOFT TO M. HARD	GRAY	SILTY FINE GRAINED SANDSTONE	BL	93.9, 94.3 45° FRACTURES W SLICKEN SIDES 94.05, 94.85, 95.75
100.9				101.1					
				101.2	SOFT	GRAY & MAROON	CLAYSTONE	VBR	NEAR VERTICAL FRACTURE 98.5-99.0
				104.0	M. SOFT	GRAY	SILTSTONE	BL	60° FRACTURE W/SLICKENSIDE 101.6-101.9, INTERSECTED BY 45° SLICKENSIDE
				105.2	SOFT	MAROON & GRAY MOTTLED	CLAYSTONE	BR	
	10.0	10.0	100%	75	M. HARD	GRAY	SANDSTONE		45° SLICKENSIDE @ 104.5
				106.8					VERTICAL FRACTURE (NO STAINING) 105.4-106.8
				108.9	M. SOFT	GRAY	SILTSTONE	BL	
110.9					SOFT TO M. SOFT	MAROON & GRAY MOTTLED	SILTY CLAYSTONE	BR BL	30° SLICKENSIDE 111.3
				112.3	M. SOFT	GRAY	SILTSTONE		SHALE PARTING 114.3
				114.7					
	10.0	10.0	100%	92					
				116.0		GRAY	SANDSTONE, FINE GRAINED SILTSTONE		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C040384.40-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
120.9				120.1	M. HARD	GRAY	SANDSTONE	BR	HEAVILY STAINED VERTICAL
				121.9	↓	↓	↓	↓	FRACTURE 120.2 – 122.2
				123.4	M. SOFT	GRAY	SILTSTONE	BL	SHALE PART. NO. 122.3
					M. HARD	GRAY	SANDSTONE	BL	
				125.5	↓	↓	↓	↓	
	10.0 10.0	100%	85		M. SOFT	GRAY	ARGILLACEOUS SILTSTONE	BL	
130.9									
							132.8-133.4 MAROON CLAYSTONE		
							133.4-134.0 SANDY		
	10.0 10.0	100%	79						
				137.4	↓	↓	↓	↓	
					M. SOFT TO M. HARD	GRAY	SANDY SILTSTONE W/ THIN	BR	NEAR VERTICAL FRAC-
							INTERMITTENT SANDSTONE		TURE (NO STAINING)
				140.0	↓	↓	STRINGERS	↓	138.1 – 140.0
140.9				141.4	M. SOFT	GRAY	ARGILLACEOUS SILTSTONE	BR	SLICKENSIDES 141.2
					SOFT	GRAY - MAROON - YELLOW	CLAYSTONE		LOW ∠ SLICKENSIDES
									141.4, 142.0, 143.5
									30° SLICKENSIDES 142.3,
						GRAY			142.5, 142.75, 144.9,
	10.0 10.0	100%	78	146.0	↓	↓	↓		145.6
				147.2	M. HARD	LT GRAY	SANDSTONE; MICACEOUS		
							INTERBEDDED SHALY SILTSTONE		
							AND SILTY SHALE		
				150.0	↓	↓	↓	↓	

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C040384.40-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 6 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN		SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2		3	4	5	6	7	8	9	10
150.9					150.0	M. HARD	GRAY	SANDSTONE: FINE TO MEDIUM GRAINED, MICACEOUS	BL	
	10.0	10.0	100%	100						
160.9										
	10.0	10.0	100%	100						
170.9										
					173.0	M. SOFT	GRAY	ARGILLACEOUS SILTSTONE	BR-BL	PARTING 173.4, 176.25
	10.0	10.0	100%	96						
					177.8	M. SOFT TO M. HARD	LT. GRAY	SHALY SANDSTONE: MICACEOUS	BL	

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0508

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0508

ELEVATION 982± GWL 0 HRS 87.3 PROJECT NO. C040384.41-01

HRS

DATE 27-28 APR 2005 CLASSIFIED BY DAN SANGER PAGE 7 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
180.9				181.6					
					M. SOFT	GRAY	SILTSTONE		
				184.3					
					SOFT TO M. SOFT	GRAY	SILTY CLAYSTONE	BR-BL	
	10.0	10.0	100%						45° SLICKENSIDES 185.6 -
						MAROON GRAY			185.75, 186.6-186.7,
							: SANDY 187.3-188.8		186.9-187.05
									30° SLICKENSIDES 186.9,
									187.2, 187.3
190.9									
							: 191.8-200.9 IRREGULAR	BL	
							CALCAREOUS CLASTS AND		
						MAROON AND GRAY	STRINGERS THROUGHOUT		
	10.0	10.0	100%	96					
								BR	
200.9									
							BOTTOM OF BORING: 200.9'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

N 541748.6664
E 1724111.6219 Grade El. 824.40

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0509

ELEVATION 825± GWL 0 HRS 53.4 PROJECT NO. C040384.40-01

23 HRS 16.0 ! after drilling

DATE 28APR-02MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 2	S-1			M. STIFF	TAN	SILTY CLAY MOIST	CL	* 0.75 TSF
1.5	2	REC 1.0							
	3	S-2							
3.0	3 4	REC 1.2			STIFF				* 1.5 TSF
	4 8	S-3			M. DENSE		CLAYEY SILT : DECOMPOSED	ML	DRY
4.5	10	REC 1.5				TAN & GRAY	CLAYSTONE		
	13	S-4							
6.0	15 19	REC 1.5			DENSE				DRY
	6 7	S-5			M. DENSE				DRY
7.5	12	REC 1.5							
	15	S-6							
9.0	15 16	REC 1.4			V. STIFF		SILTY CLAY : DECOMPOSED	CL	SLIGHTLY MOIST * 3.5 TSF
	5 7	S-7			V. STIFF		CLAYSTONE		" " "
10.5	10	REC 1.5							
	10	S-8							
12.0	11 15	REC 1.5			V. STIFF				" " * 4.0 TSF
	9 7	S-9			V. STIFF				" " * 4.0 TSF
13.5	10	REC 1.5							
	10	S-10							
15.0	11 12	REC 1.5			V. STIFF		: TALC ROCK FRAGMENTS		" " * 3.25 TSF
	4 8	S-11			MDENSE		CLAYEY SILT : DECOMPOSED CLAYSTONE	ML	" "
16.5	9	REC 1.5							
	6	S-12							
18.0	8 12	REC 1.5			STIFF		SILTY CLAY : DECOMPOSED CLAYSTONE	CL	MOIST * 1.5 TSF
	3 5	S-13			STIFF				MOIST * 1.75 TSF
19.5	6	REC 1.5							
	8	S-14							
21.0	11 9	REC 1.5			V-STIFF				MOIST * 2.25 TSF
	5 7	S-15			STIFF				MOIST * 2.0 TSF
22.5	6	REC 1.5							
	10	S-16							
24.0	10 8	REC 1.5			STIFF				MOIST * 1.5 TSF
	W.O.R. 7	S-17			M. DENSE	GRAY	DECOMPOSED SANDSTONE		
25.5	14	REC 1.5		25.9	V. DENSE	GREEN-GRAY			TOP OF ROCK: 25.9
25.9	50/0.4	5.1B RECOV		11:17	SOFT	BROWN	SANDSTONE : HIGHLY TO COMPLETELY	WR	
							WEATHERED		
	1.1 6.1	18%	0						

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000 T2 TRACK MOUNTED DRILL. BORING ADVANCED USING 5¼ SOLID STEM AUGERS, 4" I.D. STEEL CASING, NQ-2 WIRELINE CORING TOOLS.

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0509

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0509

ELEVATION 825± GWL 0 HRS 53.4 PROJECT NO. C0403&4.43-01

22HRS 16.0

DATE 28 APR-02 MAY 2005 CLASSIFIED BY D. AND SANGER PAGE 2 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
32.0				32.0	SOFT-	MAROON	CLAYSTONE	BR-	
								BL	
	7.1	71%	46						
					M. SOFT	GREEN-GRAY	: IRREGULAR CALCAREOUS		
42.0							SILTY AND SANDY (TO 43')		
									LOW & FRACTURE FREQUENCIES @ 44.4, 44.55, 46.2, 46.45, 46.95, 47.4, 49.0
	98	98%	79						
				49.7					
				SOH	M. HARD	LT GRAY	SANDSTONE		
					M. SOFT	GREEN-GRAY	CLAYSTONE		
52.0									
				53.9				BR	
					M. SOFT	GREEN-GRAY	SILTY TO SANDY CLAYSTONE	BR-BL	LOW & FRACTURE FREQUENCIES @ 54.9, 55.5, 57.2, 58.7, 59.0, 60.0
	10.0	100%	85				: IRREGULAR MAROON CLAYSTONE CLASTS		
							: SANDY 56.7 TO 57.3		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0509

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS WV BORING NO. B-0509

ELEVATION 825± GWL 0 HRS 53.4 PROJECT NO. C040384.40-01

23HRS 16.0

DATE 28APR-02MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							CLAYSTONE (CON'T)		LOW & FRACTURES
62.0									62.2, 62.6 62.8, 63.4,
									63.7 64.1, 64.3, 64.5,
									64.9, 65.2
				66.5					
	10.0	100%	67		M. SOFT	GRAY	INTERBEDDED SILTSTONE AND CLAYSTONE	FL	
72.0									
	10.0	10.0	100%	76.6					
					M. HARD	GRAY	SANDSTONE	BL	
				81.2					
82.0					M. SOFT	DK GRAY	SILTY TO SANDY SHALE	BR	LOW & FRACTURES 81.3,
				83.6					81.45, 82.7, 83.1 83.6
					SOFT	GRAY	CLAYSTONE		LOW & FRACTURES
									83.9, 84.1, 84.2, 84.7,
	12.0	10.0	100%	77					85.1, 85.5
									HIGH & FRAC W/ SLICKENSIDES
							BECOMES SILTIER @ 87.5		87.0-87.2

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0509

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT BORING NO. B-0509

ELEVATION 825± GWL 0 HRS 53.4 PROJECT NO. C0407844.40.01

23 HRS 16.0

DATE 28 APR - 02 MAY 2005 CLASSIFIED BY PAGE 4 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				91.0	↓	↓	↓	↓	
92.0					M. HARD	LT GRAY	SANDSTONE	BR	
				93.6					
					SOFT TO	MAROON	CLAYSTONE	BR	
					M. SOFT				30° FRACTURES 95.1,
	8.0	8.0	100%	62					95.6, 96.4, 97.3,
									98.4, 98.6
									60° SLICKENSIDE 98.0-
				98.9	↓	↓	↓	↓	98.2
100.2				100.0	M. HARD	GRAY	SILTY SHALE / SILTSTONE	BL	
							BOTTOM OF BORING 100.2'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0509

N 540879.8326
E 1722795.6504 Grade El. 925.74

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040324.40-01

HRS

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 1	S-1			V. LOOSE	TAN	SANDY SILT	ml	
1.5	1	REC 1.2							MOIST
	2	S-2							
3.0	4 7	REC 1.3			M. DENSE	TAN + GRAY	CLAYEY SILT	ml	SLIGHTLY MOIST
	7 7	S-3			V. STIFF		SILTY CLAY	cl	
4.5	10	REC 1.2							DRY
	10	S-4							
6.0	12 10	REC. 1.3			V. STIFF	GRAY	SILTY CLAY	cl	DRY
	13 13	S-5			HARD	GRAY	SILTY CLAY: DECOMPOSED CLAYSTONE		DRY
7.5	13	REC.			HARD	MAROON + YELLOW	DECOMPOSED CLAYSTONE		
8.4	14 50/0.4	S-6 REC 0.9		8.4	SOFT	LT. BROWN + OLIVE	INTERBEDDED CLAY SHALE AND	BR	TOP OF ROCK 8.4
	23 2.3	100%	30				CLAYEY SILTSTONE: HIGHLY		HEAVILY STAINED HIGH
10.7							WEATHERED		& FRACTURE 9.4, 9.7,
									LOW & STAINED FRACTURES
									9.8, 10.4, 10.7, 11.3, 12.6, 12.75
				14.0					13.9,
	10.0 10.0	100%	58		M. SOFT	BROWN	SANDSTONE: WEATHERED TO	BR-BL	
					M. HARD	GRAY	~15.25, MICACEOUS, FINE TO		
							MEDIUM GRAINED		STAINED LOW & FRACTURES
									17.0, 17.3, 18.0
20.7				20.7					
				22.0	SOFT	GRAY	CLAYSTONE	VBR	
					M. SOFT	GRAY	SILTSTONE / SILTY SHALE	BR	STAINED HIGH &
				23.9					FRACTURE (60-70°)
					SOFT	LT. GRAY	CLAYSTONE	VBR-	22.8-23.0
	10.0 10.0	100%	65			OK GRAY + MAROON		BR	NEAR VERTICAL PARTIALLY
									STAINED FRACTURE 23.3-23.9

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" I.D. STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510
(26)

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.43-01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.7					SOFT		CLAYSTONE (CONT) HIGHLY WEATHERED	BR-BL	
				35.0					
	9.5 10.0	95%	60		M. SOFT TO M. HARD	GREENISH GRAY	INTERBEDDED SILTY CLAYSTONE WITH CALCAREOUS CLASTS AND SANDY SILTSTONE	BR-BL	30° FRACTURE 36.2 60° FRACTURE 36.2-36.65
40.7						MAROON		VBR	
						GRAY		BL	
	10.0 10.0	100%	91			MAROON + GRAY (MOTTLED)			LOW ∠ FRACTURE 45.8, 46.0, 48.0, 52.5, 52.6, 53.5, 55.1, 55.5, 57.85
50.7								BR	
	10.0 10.0	100%	76						SLIGHTLY STAINED VERTICAL FRACTURE 55.75-56.1

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510 (24)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.40-01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2,	3	4	5	6	7	8	9	10
60.7					M-SFT	MAROON & GRAY	INTERBEDDED CLAYSTONE AND SILTSTONE (CONT)	BR-BL	LOW % FRACTURES
									61.1, 61.6, 62.0, 63.2
									63.5, 63.75, 63.9,
									64.65, 65.0
	10.0 10.0	100%	92						
70.7									
							SANDY SILTSTONE 73.0-75.0		
	10.0 10.0	100%	96						
80.7								↓	
								BR	30° SLICKENSIDES
									81.3, 81.5, 81.8, 82.1,
									82.7, 82.9, 83.8, 84.1
	10.0 10.0	100%	60						
				87.6	↓	↓	↓	↓	
					M. HARD	GRAY	SANDSTONE FINE TO MEDIUM GRAINED, MICACEOUS	BL	
								↓	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

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transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.40-01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
90.7					M. HARD	LT GRAY	SANDSTONE (CONT'D)	BL	
	10.0 10.0	100%	100						
100.7									
	10.0 10.0	100%	100						
110.7									
				112.0					
					M-SOFT TO M-HARD	GRAY	INTERBEDDED SANDSTONE AND SILTSTONE, SOME THIN SHALE UNITS	BR-BL	LOW ∠ FRACTURE 112.4, 114.4, 114.55, 114.7, 119.1
	10.0 10.0	100%	91						

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.40-01

HRS

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
120.7									
				121.5					
					SOFT TO M. SOFT	GRAY + MAROON	CLAYSTONE: IRREGULAR CALCAREOUS CLASTS + STRINGERS: 122.6-124.0, 135.0-138.7	BR-VBR	LOW & FRACTURES W/ SLICKENSIDES 122.35, 122.8, 123.35, 124.2, 124.7, 124.9, 125.4, 126.1, 127.65, 128.3, 129.1, 130.1, 130.45, 130.7, 131.5, 131.9, 133.6, 134.5, 135.3
	10.0	10.0 100%	47						
130.7									HIGH & SLICKENSIDE 133.25-133.6
	10.0	10.0 100%	60						
140.7				140.7					
					M. SOFT	GREEN-GRAY, MAROON, YELLOW MOTTLED	SILTY CLAYSTONE: INTERMITTENT IRREGULAR CALCAREOUS CLASTS AND STRINGERS	BR	MOST PIECES 0.2-0.4' LONG
	10.0	10.0 100%	73						

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

(26)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C0J384.40-01

HRS _____

DATE 03-MAY 2005 CLASSIFIED BY DAN SANGER PAGE 6 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
150.7							SILTY CLAYSTONE (CON'T)		
				153.2					
					M-HARD	LT GRAY	SANDSTONE: FINE TO MEDIUM	BL	
							GRAINED, MICACEOUS		
	10.0	10.0	100%						1 PIECE OF CORE: 7.6'
160.7									
									1 PIECE OF CORE 6.7'
	10.0	10.0	100%	100					
170.7									
				175.1					
	10.0	10.0	100%	53	SOFT TO M-SOFT	GRAY + MAROON	CLAYSTONE	VBK	MOST PIECES 0.2'
									~30° SLICKENSIDES
									176.0, 176.35, 177.55, 177.7,
									178.1, 178.45, 178.65, 179.0
									60° SLICKENSIDES 179.1-
									179.35, 179.65-179.85

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.40-01

HRS _____

DATE 03-14 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 7 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
180.7							CLAYSTONE (CONT)		
				181.5	M. SOFT	GRAY	SANDY SILTSTONE	BR-BL	
	10.0	10.0	100%	185.8	SOFT TO M. SOFT	MAROON	CLAYSTONE	BR	LOW & SLICKENSIDES 187.0, 187.6, 187.8, 189.0
190.7				190.2	M. HARD	LT GRAY	SILTY SANDSTONE	BL	
	10.0	10.0	100%	194.0	M. SOFT	GRAY + MAROON	INTERBEDDED SANDY CLAYSTONE AND SILTSTONE	BR	LOW & SLICKENSIDES 194.15, 196.1, 196.75, 197.15, 197.5, 197.85, 198.2,
200.7				198.2	M. SOFT TO M. HARD	GRAY + LT GRAY	INTERBEDDED SILTSTONE AND SANDSTONE	BR-BL	
	10.0	10.0	100%	208.0	SOFT TO M. SOFT	MAROON	SILTY CLAYSTONE	BR	LOW & SLICKENSIDES 204.25, 205.0, 205.25, 205.8, 206.7, 206.85, 207.25, 207.7, 207.85
				209.7					

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384 (13-01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 8 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
210.7					M. SOFT	GRAY	SHALY SILTSTONE, SOME SAND	BL-BR	
									VERTICAL FRACTURE
									(NOT STAINED)
									212.75 - 214.3
	10.0	10.0	100%	79					
						GRAY + MAROON			
						GRAY			
220.7									
				221.3					
					M. SOFT TO SOFT	MAROON + GRAY	SILTY CLAYSTONE	BR-BL	
									45° SLICKENSIDE 223.0
	10.0	10.0	100%	34				BR	225.2, 226.0, 226.6
								VBR	226.8
									LOW & SLICKENSIDES
									223.75, 224.25, 224.4,
									224.7, 224.8, 225.0,
230.7									225.4, 225.7, 226.0,
									226.1, 226.3
									226 - 233 VBR
								BR	PIECES 0.1 - 0.2' ✓
	9.7	10.0	97%						SLICKENSIDES (LOW
									& HIGH &)
									HIGH & SLICKENSIDES 233.4,
									233.9, 234.1, 236.6,
									237.6, 238.3, 240.2

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0510

ELEVATION _____ GWL 0 HRS 36.0 PROJECT NO. C040384.45.01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 9 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
240.7					M. SOFT	MAROON + GRAY	CLAYSTONE	VBR	PIECES ~ 0.1-0.2' W/
					SOFT	+ PURPLE			SLICKENSIDES
								BR	30° SLICKENSIDES
									APPROX. EVERY 0.4-0.5'
	10.0 / 10.0	100%	56						
				248.3				VBR	
					M. SOFT	MAROON	INTERBEDDED SANDY CLAYSTONE	BR-BL	
						+ GRAY	AND SILTSTONE		
250.7									
							BOTTOM OF BORING: 250.7'		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0510

N 541746.9425
E 1724116.3536 Grade El. 824.57

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0511

ELEVATION _____ GWL 0 HRS _____ PROJECT NO. C040384.40-01

HRS _____

DATE 03-04 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/6 SAMPLING		
							TO 26 FT		
							PIEZOMETER INSTALLED		
							TIP AT 25.5 FT		
							↓		
				26.0			↓		
							BOTTOM OF BORING: 26'		

REMARKS** DRILLED BY TERRATESTING, INC USING A SIMCO 4000-T2 TRUCK MOUNTED RIG.
BORING ADVANCED USING 6¼" SOLID STEM AUGERS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0511

N 542140.8876
E 1724101.7636 Grade El. 784.29

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0512

ELEVATION 795± GWL 0 HRS 2.6 PROJECT NO. C040384.40-01

HRS

DATE 04-05 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 1	S-1			V. LOOSE	BROWN	SILT, TRACE ORGANICS	ml	MOIST
1.5	2	REC 0.8							
	2	S-2							
3.0	2 3	REC 1.0			STIFF	BROWN	SILTY CLAY	cl	MOIST * 1.5 TSF
	2 3	S-3			LOOSE	BROWN	SANDY SILT, SOME ROCK FRAGMENTS	ml	SLIGHTLY MOIST
4.5	5	REC 1.3							
	5	S-4							
6.0	5 9	REC 1.2			STIFF	GRAY + BROWN	SILTY CLAY, TRACE ROCK FRAGMENTS	cl	SLIGHTLY MOIST * 1.5 TSF
	3 1	S-5			M. STIFF			cl	WET * 1.0 TSF
7.5	2	REC 0.8							
	9	S-6		8.0					
9.0	26 43	REC 1.5			V. DENSE	MAROON + GRAY	ROCK FRAGMENTS AND SANDY SILT:	gm	DRY
	32 32	S-7					DECOMPOSED CLAYSTONE	gm	DRY
10.5	36	REC 1.5							DRY
	13	S-8							
12.0	18 18	REC 1.5		12.0				gm	TOP OF ROCK: 12.0'
12.0	50/0.0	S-9 REC 0.0			M. SOFT	GREEN-GRAY, MAROON, PURPLE MOTTLED	SILTY CLAYSTONE	BR	
	10.0 10.0	100%	40					VBR	
								BR	
22.0				22.15					
					M. HARD	LT GRAY	SILTY SANDSTONE	BR	
	10.0 10.0	100%	91	28.5					
					M. SOFT TO M. HARD	GRAY	SILTY TO SANDY SHALE	BR-BL	

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL RIG ADVANCED USING 5¼" SOLID STEM AUGERS, 4" SD STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0512

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0512

ELEVATION 795± GWL 0 HRS 2.6 PROJECT NO. C04 0384.40-01

HRS

DATE 04-05 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT TO M. HARD	GRAY	SHALE (CON'T)	BR-BL	
32.0									
				35.7					
	10.0	10.0	100%		M. SOFT TO M. HARD	GRAY	INTERBEDDED SANDY SHALE AND SILTSTONE	BL	
42.0									
				42.95					
					SOFT	DK GRAY	CLAYSTONE	BR	LOW & SLICKENSIDE 43.1
									44.15, 45.0, 45.2, 45.8
				46.0					
	10.0	10.0	100%	47.6	M. SOFT	GRAY	SANDY SHALE	BR-BL	
					SOFT	GRAY + MAROON	CLAYSTONE	BR	
				49.7					LOW & FRACTURE 49.0
					M. SOFT TO M. HARD	LT GRAY	SANDY SILTSTONE	BL	
52.0				52.25					
					M. SOFT	MAROON	CLAYSTONE	BR	LOW & SLICKENSIDES
									52.55, 53.0, 53.6, 53.85,
									54.4, 54.65, 55.35
	9.9	10.0	99%	57.1					
					M. SOFT TO M. HARD	LT GRAY	INTERBEDDED SANDY SHALE AND SILTSTONE	BL	

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0512

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0512

ELEVATION 795± GWL 0 HRS 2.6 PROJECT NO. C04384.40-01

HRS

DATE 04-05 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT TO M. HARD	LT GRAY	INTERBEDDED SANDY SHALE AND SILTSTONE (CONT.)		
62.0							CLAYSTONE 62.7-63.2	VBR	
				64.2	SOFT TO M. SOFT	MAROON	CLAYSTONE	BR	VERTICAL FRACTURE 64.2-64.6
	10.0	10.0	100%	65.1	M. HARD	LT GRAY	SHALY SANDSTONE: FINE TO MEDIUM GRAINED, MICACEOUS	BL	
72.0									
				73.3	M. SOFT	MAROON + GRAY	SILTY CLAYSTONE	BR	VERTICAL FRACTURE 75.1-75.3
				76.5					45° FRACTURE 75.65
	10.0	10.0	100%	87	M. HARD	LT GRAY	SANDSTONE: MICACEOUS	BL	
82.0									
				85.0	M. SOFT	GRAY	SILTSTONE	BR	LOW % FRACTURES 85.0, 86.35, 86.5, 88.0, 89.3
	9.8	10.0	98%	77					
				89.7					

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0512

gai consultants
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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT BORING NO. B-0512

ELEVATION 795± GWL 0 HRS 2.6 PROJECT NO. C0403841.01-01

HRS

DATE 04-05 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT	MAROON + GRAY	INTERBEDDED CLAYSTONE	BR	
92.0							AND SILTSTONE		
				96.7					
	12.0	10.0	100%	67	M. SOFT	OLIVE-GRAY + MAROON + YELLOW	CLAYSTONE W/ INTERMITTENT	BR	
					TO SOFT		IRREGULAR CALCAREOUS CLASTS +		30° SLICKENSIDES 97.0,
							STRINGERS. PITTED CORE SURFACE		97.2, 97.6, 98.75,
									99.25, 99.35, 99.7
									100.1, 100.6, 102.3,
102.0									102.5, 103.8, 104.1,
								BL	109.15, 109.5, 109.75
	6.8	8.0	85%	52					
								BR	
110.0				110.0					
							BOTTOM OF BORING: 110.0'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0512

N 542140.8876
E 1724101.7636 Grade El. 784.29

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0513

ELEVATION _____ GWL 0 HRS _____ PROJECT NO. C040384.40-01

HRS _____

DATE 06 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							BORING NOT DRILLED		
							LOG INCLUDED FOR CON-		
							TINUITY AND COMPLETENESS		
							PIEZOMETER INSTALLED		
							IN SAME BOREHOLE		
							AS B-0512		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0513
(10)

N 540555.6419
E 1725145.9412 Grade El. 948.40

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0514

ELEVATION _____ GWL 0 HRS 32.1 PROJECT NO. C0410384.1.0.3-01

HRS _____

DATE 09-10 MAY 2005 CLASSIFIED BY DANIEL SANGER PAGE 1 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	4 4	S-1			LOOSE	BROWN	SILTY SAND, SOME ROCK	SM	
1.5	2	REC 0.9					FRAGMENTS		
	4	S-2							
3.0	3 2	REC. 0.2							
	2 5	S-3			V. STIFF	MAROON	SILTY CLAY	CL	* 3.5 TSF
4.5	4	REC 1.1							
	4	S-4							* 3.0 TSF
6.0	4 9	REC. 1.3							
	7 7	S-5							* 3.0 TSF
7.5	10	REC. 0.6							
	7	S-6							
9.0	9 9	REC 0.4			HARD		: DECOMPOSED		* > 4.5 TSF
	12 13	S-7					CLAYSTONE		
10.5	15	REC. 1.0		10.5					* > 4.5 TSF
	17	S-8			DENSE	TAN	DECOMPOSED SANDY SHALE	SM	
12.0	15 16	REC 1.4							
	21 20	S-9							
13.5	22	REC 1.5							
14.2		S-10 REC 0.7		14.2	V. DENSE	DK BROWN	DECOMPOSED SANDSTONE FRAGMENTS	SM	
					SOFT	LT. BROWN	HIGHLY WEATHERED SHALY	VBR-	HEAVILY STAINED
							SANDSTONE / SANDY SHALE	BR	VERTICAL FRACTURE
							HEAVILY STAINED		14.3-14.5, 17.5-17.7,
	7.8 7.8	100%	45						18.2-18.3
				19.3					STAINED SURFACES
					M. HARD	BROWN	SANDSTONE : STAINED TO		11.2, 15.5, 16.05, 16.15
							~ 22.2'		17.1, 17.6
22.0						GRAY			
				22.8					
				24.2	M. SOFT	GRAY	SILTSTONE STAINED 23.85-24.25	BR	LOW & STAINED FRACS 24.1, 24.15
					M. SOFT	DK	CLAYSTONE W/ CALCAREOUS	BR	LOW & STAINED FRACTURE
					SOFT TO	GRAY	CLASTS + STRINGERS		25.4, 26.6,
	10.0 10.0	100%	62				: SANDY 25.8-26.25		LOW & FRACTURES 27.4
				28.2					27.8
					M. SOFT	GRAY	INTERBEDDED SANDY SHALE AND	BR	
							SILTSTONE		

REMARKS ** DRILLED BY TERRA TESTING USING A SIMCO 4000-T2 TRACK MOUNTED RIG

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" I.D. STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0514

(22)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0514

ELEVATION _____ GWL 0 HRS 32.1 PROJECT NO. C04038410-01

HRS _____

DATE 09-10 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT	GRAY	SHALE / SILTSTONE (CONT)	BR	LOW % FRACTURES 29.5
32.0									31.0, 31.15, 32.9,
									33.45, 34.5
				34.8					
					SOFT	MAROON	CLAYSTONE	BR	~30° FRACTURES W/
	10.0 11.0	100%	52						SLICKENSIDES 35.8,
									37.8, 39.2, 39.8, 40.7
									41.15, 41.35
42.0				42.0					
					M. SOFT TO M. HARD	GRAY	INTERBEDDED SANDY SHALE AND SILTSTONE	BR-BL	
	10.0 10.0	100%	89	47.0					
					M. HARD	LT GRAY TO [illegible]	SANDSTONE	BL	
52.0									
	10.0 10.0	100%	97	57.9					
				59.3	M. SOFT	GRAY	SILTY SHALE	BR	~30° FRACTURES 57.9,
						DK. GRAY	CLAYSTONE, SLIGHTLY CALCAREOUS	VBR-BR	58.4

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0514

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS WV BORING NO. B-0514

ELEVATION _____ GWL 0 HRS 32.1 PROJECT NO. C040384.40-01

HRS

DATE 09-13 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT	GRAY + MAROON	CLAYSTONE (CON'T)	BR	LOW % FRACTURES
62.0									59.5, 59.9, 60.4, 61.2
									45° FRACTURE @
									SLICKENSIDE 62.1-62.25
									30° FRACTURES 62.6
	10.0	10.0	100%	86	66.7				62.7, 62.8, 63.0, 63.4
					M. SOFT TO M. HARD	GRAY	SANDY SHALE/SILTSTONE W/ NUMEROUS IRREGULAR CALCAREOUS CLASTS AND STRINGERS	BL	63.5, 64.1, 64.4, 65.25, 65.5, 65.75 66.1, 66.5
72.0									
							: MAROON CLAYSTONE 71.25-71.55, 72.0-72.4		SLICKENSIDES 71.4, 72.0
				76.0					
	10.0	10.0	100%	92	M. SOFT	MAROON	CLAYSTONE W/ NUMEROUS IRREGULAR CALCAREOUS CLASTS AND STRINGERS	BR	
						GRAY + MAROON MOTTLED			
82.0				82.2					
					M. SOFT TO M. HARD	GRAY	SILTY SHALE W/ INTERMITTENT CALCAREOUS STRINGERS, SOME THIN (≤ 2") SANDSTONES	BL	
									VERTICAL FRACTURE
	10.0	10.0	100%	90				BR	86.6-87.6
								BL	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0514

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PROJECT AREA 3/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0514

ELEVATION _____ GWL 0 HRS 32.1 PROJECT NO. C040384.40-01

HRS _____

DATE 09-10 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				90.65	M. HARD	LT. GRAY	SANDSTONE	BL	
92.0				93.0					
					M. SOFT	GRAY	SILTY TO SANDY SHALE	BL	
	10.0	10.0	100%	95					
							* CLAY SHALE 98.4-99.0	BR	LOW Q FRACTURES 98.4,
								BL	98.6, 98.95
102.0						MAROON + GRAY MOTTLED			SLICKENSIDE 102.0
									111.0 (~45°)
				104.3	M. HARD	LT GRAY	SANDSTONE	BL	
	10.0	10.0	100%	98					
112.0									
	10.0	10.0	[illegible]%	73					

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0514

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PROJECT NEEA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0514

ELEVATION _____ GWL 0 HRS 32.1 PROJECT NO. C040384.40-01

HRS _____

DATE 29-10 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. HARD	LT GRAY	SANDSTONE: MICACEOUS (CON'T)	BL	
122.0									
	10.0 10.0	100%	100						
132.0									
	10.0 10.0	100%	100						
142.0									
				143.2					
					M. SOFT	DK GRAY	CLAY SHALE	BR-BL	~30° FRACTURE/SLICK
	8.0 8.0	100%	87						143.7, 146.3, 148.8
									LOW ANGLE FRACTURE 146.3
150.0									

BOTTOM OF BORING: 150.0'

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0511

(22)

N 539572.1065
E 1723680.1660 Grade El. 933.64

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515
ELEVATION ______ GWL 0 HRS 42.3 PROJECT NO. C040384.40-01
HRS ______
DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	1 3 4	S-1 REC 1.3			STIFF	ORANGE-BROWN	SANDY CLAY	CL	* 1.5 TSF
					↓	↓	↓	↓	
3.0	3 5 5	S-2 REC 1.3			V. STIFF	BROWN + GRAY	SANDY CLAY	CL	* 2.5 TSF DRY
4.6	7 10 20	S-3 REC 1.2			DENSE	BROWN	DECOMPOSED SANDSTONE FRAGMENTS	↓	
5.4	16 50/0.4	S-4 REC. 0.9		5.4	V. DENSE	BROWN + GRAY	DECOMPOSED SANDSTONE AND SANDY CLAY	SC	TOP OF ROCK 5.4
				6.5	SOFT	BROWN	HIGHLY WEATHERED SANDSTONE	VBR-BR	
	3.6 4.9	73%	40		M. SOFT TO M. HARD	BROWN GRAY	MODERATELY WEATHERED SANDSTONE	BR	
				8.8	↓	↓		↓	
10.3					SOFT	MAROON TAN	CLAYSTONE: HIGHLY WEATHERED	VBR	~30° [illegible] w/ [illegible]
								BR	10.5, [illegible], 11.4, [illegible], 13.9
								BL	
	10.0 10.0	100%	65						
				17.3	↓	↓	↓	↓	
					M. SOFT TO SOFT	OLIVE-GRAY	CLAY SHALE: MODERATELY TO HIGHLY WEATHERED	BR	[illegible]
20.3				21.0	↓		↓	↓	NEAR VERTICAL [illegible]
				22.2	M. SOFT	↓	SILTY SHALE	BR	FRACTURE [illegible]
					M. SOFT TO M. HARD	OLIVE-GRAY	SILTY SANDSTONE: MICACEOUS	BL	
	10.0 10.0	100%	83						
						GRAY			
					↓	↓	↓	↓	

REMARKS** DRILLED BY TERRA TESTING USING A SIMCO 11000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5 1/4" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515
(24)

gai consultants
transforming ideas into reality

PROJECT KAMMER/JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 PROJECT NO. C24038.10-01

HRS _____

DATE 12-14 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.3							SANDSTONE (CON'T)		~65° STAINED FRACTURE
				32.1					30.6-31.0, LOST WATER
					SOFT	GRAY + MAROON	INTERBEDDED CLAYSHALE AND	UBR	1 JW & FRACTURES
				34.3			CLAYSTONE: HIGHLY WEATHERED	BR	32.2, 32.6, 32.9, 33.05,
	8.8	10.0	88%	51		GRAY W MAROON MOTTLING	CLAYSTONE	BR	34.0 34.3, 35.1
					SOFT				
42.3				40.8					
				42.6	M. SOFT TO M. HARD	GRAY	SANDY SILTSTONE	BR	VERT CALCFRACTURE 41.1 - 42.6
					M. SOFT	GRAY	CLAYSTONE W/ INTERMITTENT	BR	~25-30° FRACTURE
							IRREGULAR CALCAREOUS		W/SLICKENSIDES 43.15
	10.0	10.0	100%	63			NODULES AND STRINGERS		44.55, 45.45, 47.4,
						MAROON			47.75, 42.6, 49.85,
									53.5
50.3						GRAY	: BECOMES SANDY AT 50.1		
				53.7					
					M. SOFT	GRAY	SANDY SHALE : INTERMITTENT	BR	
	10.0	10.0	100%	93			SMALL (± 2 mm) CALCAREOUS		
						MAROON	NODULES		
						GRAY			

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515

(24)

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 PROJECT NO. C040384.40-01

HRS _____

DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
62.3							SANDY SHALE (CON'T)		LOW & FRACTURES
									63.0, 63.4, 68.0
							: MAROON CLAYSTONE 62.9-		(SLIGHT SLICKENSIDE),
							63.4		68.6,
									VERTICAL FRACTURE 69.1-
	10.0	10.0	100%	86					69.6, 70.3 - 70.7,
									70.85 - 71.05, 74.8 -
									75.1, 76.25 - 77.4
72.3									
									LOW & FRACTURE
									72.7, 79.4, 79.45,
									80.05
	10.0	10.0	100%	80					
80.3									
				83.5	↓	↓	↓		
					SOFT	DK GRAY	CLAYSTONE		PITTED CORE SURFACE.
									LOW & FRACTURES W/ SLICKEN-
	9.2	10.0	92%	72					SIDES 83.6, 83.95,
				87.7	↓	↓	↓	↓	84.2, 84.55, 84.7, 85.0,
									85.45
					M. SOFT	GRAY	SANDY SHALE	BR-BL	HIGH & FRACTURE W/ SLICKEN-
					↓	↓	↓	↓	SIDES 86.2 - 86.35

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515 (2 of 11)

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PROJECT ARER 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 PROJECT NO. C2403840-01

HRS _____

DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
90.3				90.5	SOFT TO M. SOFT	GRAY	CLAY SHALE	BL-BR	NEAR VERTICAL IRREGULAR FRACTURE W/ SLICKENSIDES 91.65-92.05 (NO STAINING)
				94.4	M. SOFT TO M. HARD	LT. GRAY	SHALY SANDSTONE * MICACEOUS	BR - BL	VERTICAL FRACTURE 92.4-92.8, 93.35-93.85
	10.0	10.0	100%						
100.3								BL	
	10.0	10.0	100%						
110.3							* SHALE CLASTS 112.5-113.4		
	10.0	10.0	100%						
				117.0	SOFT TO M. SOFT	GRAY	CLAY SHALE	BR	V. BROKEN 118.4-119.1 HIGH X FRACTURE 119.0-119.2

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 PROJECT NO. C040384.45-01

HRS _____

DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
120.3				120.5					
					M. SOFT	GRAY	SANDY SHALE	BR	
				122.6					
					M. SOFT TO M. HARD	LT GRAY	SHALY SANDSTONE: MICACEOUS	BR	
	10.0	10.0	100%	125.55	M. SOFT TO SOFT	GRAY & MAROON MOTTLED	CLAYSTONE	BR	45° SLICKENSIDE 126.9-127.05.
									PIECES ~0.2-0.4'
								VBR	LOW & FRACTURE EVERY 0.1-0.85'
130.3									25-30° SLICKENSIDES
									131.1, 131.25, 131.3
									131.75
									V. BROKEN ZONE 131.75-137.1: NUMEROUS ~30° SLICKENSIDES
	10.0	10.0	100%	32					PIECES 0.1-0.3'
						MAROON			CALCAREOUS NODULES
				138.5					
					M. SOFT	GRAY	SHALE WITH NUMEROUS IRREGULAR CALCAREOUS NODULES AND STRINGERS	BR-BL	137.2-138.0
148.3									
							: SANDY 148.3-148.6, 149.35-150.15		
	10.0	10.0	100%	9.1					

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515 (2/1)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT — BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 — PROJECT NO. C040384.41-01

HRS _____

DATE 10 - 11 MAY 2005 — CLASSIFIED BY DAN SANGER — PAGE 6 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
150.3							SHALE (CON'T)		
							: SANDY 154.6 - 155.7		60° IRREGULAR
							157.0 - 160.2 (FGN NODULES)		FRACTURE 155.2-155.5
	10.0 10.0	100%	88						
160.3				161.0					
					M. SOFT	GRAY & PURPLE	CLAYSTONE	BR - VBR	20-30° SLICKENSIDES
									161.4, 161.8, 162.2, 163.2, 163.35, 163.65
				164.7					164.0, 164.1
	10.0 10.0	100%	77		M. SOFT	GRAY	SANDY SHALE	BR-BL	
170.3				171.7					
					M. HARD	LT GRAY	SANDSTONE : MICACEOUS	BL	
				174.8					
	10.0 10.0	100%	100		M. SOFT	GRAY	SANDY SHALE	BL	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515 (24)

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT — BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 — PROJECT NO. C040384.40-01

HRS _____

DATE 10-11 MAY 2005 — CLASSIFIED BY DAN SANGER — PAGE 7 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
180.3							SANDY SHALE (CON'T)		
				184.0	SOFT TO M-SOFT	DK GRAY	CLAY STONE	VBR-BR	~30° SLICKENSIDES EVERY 0.2-0.4'
	10.0 10.0	100%	50			MAROON			
190.3				190.3	M. SOFT	GRAY + MAROON	SILTY TO SANDY SHALE	BL-BR	LOW ϑ FRACTURE 194.1, 194.3, 195.0, 196.05, 196.4, 196.9 197.6, 197.9
	10.0 10.0	100%	82	197.0	SOFT TO M. SOFT	MAROON	CLAY STONE	BR-VBR	30° FRACTURE 196.15 30° SLICKENSIDES ~ EVERY 0.4'
200.3				200.5	M. SOFT	MAROON	SILTY SHALE	BL	GRADES INTO SILTY SHALE
	10.0 10.0	100%	100	201.55	M. SOFT TO M. HARD	GRAY	SHALY SANDSTONE	BR	
					M. HARD	LT GRAY	SAND STONE	BR	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 423 PROJECT NO. C040384.40-01

HRS _____

DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 8 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
210.3				210.3	M. SOFT TO M. HARD	GRAY	SANDY SHALE	BR	
				212.4					
				214.3	M. SOFT	MAROON	SILTY SHALE	BR	
	10.0	10.0	100%		M. SOFT	BROWN, MAROON, GRAY MOTTLED	CLAYSTONE	BR	25-30° SLICKENSIDES
			88						215.0, 215.20, 215.55
									216.15, 217.85, 218.15
				218.8					60° SLICKENSIDE 215.3-215.45
220.3					M. HARD	LT GRAY	SHALY SANDSTONE	BR	
				221.5					
					M. SOFT	GRAY + MAROON	SANDY CLAYSTONE	BR	
				223.5					30° SLICKENSIDE 123.1
					M. SOFT	GRAY	SANDY SHALE	BR-BL	
									LOW % FRACTURES
	10.0	10.0	100%						125.55, 125.8
			90						
				229.7					
230.3					M. SOFT TO SOFT	GRAY, OLIVE, MAROON MOTTLED	CLAYSTONE	BR	20-30° SLICKENSIDES
									229.9, 231.4, 231.5
									232.2, 232.4, 232.5
									233.0, 233.2, 233.8,
									234.4 235.6, 236.1,
	10.0	10.0	100%						236.4, 237.5, 237.9,
			56						238.9, 239.1, 239.6,
									239.8, 240.1

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0515

ELEVATION _____ GWL 0 HRS 42.3 PROJECT NO. C040384.40-01

HRS _____

DATE 10-11 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 9 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
240.3					SOFT	MAROON	CLAYSTONE (CON'T)	VBR	20-30° SLICKENSIDES
									EVERY 0.1-0.3'
	10.0 10.0	100%	0						
250.3									
							BOTTOM OF BORING: 250.3'		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0515

N 540842.6369
E 1724930.8565 Grade El. 864.94

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PROJECT AREA 3/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-05 16

ELEVATION _____ GWL 0 HRS N/A PROJECT NO. C040384.40-01

HRS _____

DATE 13 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	4 4	S-1			LOOSE	BROWN	SANDY SILT, FEW ROCK FRAGMENTS	ml	DRY
1.5	5	Rec 1.5							
	7	S-2							
3.0	9 22	REC. 1.2			M. DENSE	BROWN/ MAROON	SILTY SAND AND ROCK FRAGMENTS;	SM-GM	DRY
3.9	34 50/0.4	S-3 Rec 0.9		3.9 FILL			DECOMPOSED CLAYSTONE		
							BORING CANCELLED AND BACKFILLED		

REMARKS ** DRILLED BY TERRA TESTING, INC USING A SIMCO 4000-T2 TRACK MOUNTED DRILL.
BORING ADVANCED USING 5¼" SOLID STEM AUGERS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0516
(23)

N 542185.2965
E 1725391.3276 Grade El. 945.55

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0517

ELEVATION 948± GWL 0 HRS 18.1 PROJECT NO. C040384.40-01

HRS

DATE 16-17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	3 3	S-1			V. STIFF	MAROON-RED	SILTY TO SANDY CLAY (DECOMPOSED	CL	* 2.5 TSF
1.5	4	REC. 1.5			↓	↓	CLAYSTONE)	↓	
	3	S-2			STIFF		↓		* 1.5 TSF
3.0	5 7	REC 0.8			HARD		DECOMPOSED CLAYSTONE,		74.5 TSF
	6 9	S-3					TRACE CALCAREOUS NODULES		
4.5	13	REC. 1.5							
	17	S-4							
6.0	19 22	REC. 1.2							
	9 20	S-5							
7.5	18	REC. 1.5							
	8	S-6		8.0	↓	↓	↓	↓	
9.0	25 42	REC 1.5			V. DENSE	YELLOW-GRAY	DECOMPOSED SANDY SHALE	CSM	
9.9	28 50/0.4	S-7 REC 0.9		9.9	↓	↓	↓	↓	
	2.0 2.1	95%	81	11.1	M. SOFT	OLIVE	SANDY SHALE	BR	
12.0					M. HARD	GRAY	SANDSTONE	BR	
				12.9	↓	↓	↓	↓	
					M. SOFT	OLIVE-GRAY	INTERBEDDED SANDY SHALE	BR-	
							AND SHALY SANDSTONE	BL	STAINED ~60° FRACTURE
	10.0 10.0	100%	74						13.45-13.6, 19.05-19.3,
									19.7-19.9, 20.2-20.5
									LOW ∠ FRACTURES 14.3,
									15.25, 15.4, 15.65
22.0									16.9, 19.3, 20.1, 20.65
									STAINED V. BROKEN
							: SANDSTONE 22.5-23.5		ZONE 19.3-19.7
				24.9	↓	↓	↓	↓	
					SOFT	MAROON	CLAYSTONE	BR-	STAINED LOW ∠ FRAC-
	9.9 10.0	99%	84	27.1	↓	↓	↓	VBR	TURES 22.35, 23.45,
					M-SOFT TO M. HARD	OLIVE-GRAY	SHALY SANDSTONE - MICACEOUS	BR- BL	23.9, 24.15, 24.25, 25.0
					↓	↓	↓	↓	VBR 25.7-26.2

REMARKS ** DRILLED BY TERRATESTING USING A SIMCO 4000-T2 TRACK MOUNTED DRILL

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" ∅ STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B0517

ELEVATION 948± GWL 0 HRS 18.1 PROJECT NO. C040384.40-01

HRS

DATE 16-17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. HARD	GRAY	SANDSTONE (CON'T)		
32.0									
									STAINED LOW ⊘ FRAC-
									TURES 32.3, 34.15
				36.2					
	10.0 10.0	100%	82		SOFT	MAROON	CLAYSTONE	BR	20-30° SLICKENSIDES
									36.7, 37.4, 37.8, 38.4
								VBR	38.8, 38.95, 39.2
				40.5					
					M. SOFT	GRAY	INTERBEDDED SHALE AND	BR	
42.0							SANDSTONE		
									44.6 CLAY SEAM
	9.6 10.0	96%	96	47.6					
					M. HARD	LT. GRAY	SANDSTONE - FINE TO MED GRAINED,	BL	
							MICACEOUS		
52.0									
									VERTICAL FRACTURE
									(NO STAINING) 53.3-54.4
				55.7					
	10.0 10.0	100%	70	56.7	M. HARD	LT GRAY	CALCAREOUS SANDSTONE	BR	LOW ⊘ FRACTURES 55.7,
									56.2, 56.7, 57.5, 58.1
					SOFT	GRAY	CLAY SHALE, SOME SILT	BR	59.25, 59.55, 59.7, 60.0,
				59.7					60.25,

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0517

ELEVATION 948± GWL 0 HRS 18.1 PROJECT NO. C0403440-01

HRS

DATE 16-17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					SOFT	DARK GRAY & MAROON	CLAYSTONE	BR-VBR	.25-35° SLICKENSIDES ~EVERY 0.2-0.4'
62.0									
	10.0 10.0	100%	67	66.7					
					M. HARD	GRAY	SILTSTONE W/ INTERMITTENT IRREGULAR CALCAREOUS NODULES AND STRINGERS, SOME SAND	BL	LAM & FRACTURE 70.35, INTERSECTING 45° FRACTURE AND 35° FRACTURE 71.6-71.9
72.0									NEAR VERTICAL FRACTURE 72.9-73.4
				75.5					
	10.0 10.0	100%	79		SOFT	MAROON	CLAYSTONE	BR-VBR	30° SLICKENSIDES ~EVERY 0.2-0.3'
				78.0					
					M. SOFT TO M. HARD	GRAY	SANDY SILTSTONE W/ INTERMITTENT IRREGULAR CALCAREOUS NODULES (≤ ½") AND STRINGERS	BR-BL	~45° FRACTURE AT LARGE CALC. NODULE AT 78.6-78.8
82.0				82.0					
					SOFT TO M. SOFT	MAROON & GRAY	INTERBEDDED CLAYSTONE AND SANDY SILTSTONE (UNITS ARE 0.9-1.5' IN THICKNESS) W/ INTERMITTENT IRREGULAR CALCAREOUS NODULES (1½") AND STRINGERS	BR-BL	SLICKENSIDES (30°) 82.25
	10.0 10.0	100%	97						

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0517

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST-ALBANS, WV BORING NO. B-0517

ELEVATION 948 ± GWL 0 HRS 18.1 PROJECT NO. C040384.40-01

HRS

DATE 16-17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				90.2	M. HARD	LT GRAY	SHALY SANDSTONE: MICACEOUS	BL-	
92.0									
	10.0 10.0	100%	90	97.4					
					SOFT TO M. SOFT	GRAY + MAROON	SILTY SHALE	BR	LOW ANGLE FRACTURE 98.15, 98.8, 101.0
102.0				101.8					60° FRACTURE 99.1-99.4 100.0-100.5
				103.0	M. HARD	LT. GRAY	SHALY SANDSTONE		
				106.0	M. SOFT	GRAY	SILTSTONE	BL	
	10.0 10.0	100%	94	108.7	M. SOFT	GRAY + MAROON	INTERBEDDED SILTSTONE AND SANDY CLAYSTONE		30° SLICKENSIDE 106.8
						MAROON BROWN, LGRAY	CLAYSTONE W/ INTERMITTENT IRREGULAR CALCAREOUS NODULES (±½") AND STRINGERS	BR	20-30° SLICKENSIDES 109.2, 109.85, 110.95, 111.2, 111.45,
112.0				112.0	M. SOFT TO M. HARD	GRAY	SANDSTONE WITH SOME SHALE SEAMS TO 120.6	BL	
	10.0 10.0	100%	100						

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT ALEA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0517
ELEVATION 948± GWL 0 HRS 18.1 PROJECT NO. C040384.40-21
HRS
DATE 10-17 MM4 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. HARD	GRAY TO	SANDSTONE (CONT)	BL	
122.0						LT. GRAY			
	10.0 10.0	100%	100						
132.0				132.0					
					M. SOFT	GRAY	SANDY SHALE	BL	
				136.0					
	10.0 10.0	100%	96		M. HARD	LT GRAY	SANDSTONE		
				139.0					
					M. SOFT	GRAY	SANDY SHALE		
				142.7					
142.0				142.0	M. SOFT	LT GRAY	SILTY SANDSTONE		
					M. SOFT	GRAY	SANDY CLAYSTONE	BR	SLICKEN SIDES
					TO SOFT				142.3, 143.65, 144.2,
						DK GRAY			144.7, 145.0 145.15,
	8.0 8.0	100%	95	146.0					145.75. NUMEROUS BREAKS DURING CORE EXTRACTION
					M. SOFT	GRAY	SILTSTONE	BL	CALCAREOUS NODULES
									146.0-146.2
150.0							BOTTOM OF BORING: 150'		

REMARKS **

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0517
(21)

N 541508.473
E 1724947.2614 Grade El. 1015.78

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT BORING NO. B-0518

ELEVATION 1005± GWL 0 HRS 14.2, BACKFILLED PROJECT NO. C040384.40-01

HRS

DATE 17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	2 2 4	S-1 REC 1.4			LOOSE	BROWN	FINE TO MEDIUM SAND	SP	
1.5	5	S-2							
	8 13	REC 1.3			M. DENSE				
3.0									
3.6	50 50/0.1	S-3 REC 0.6		3.6	V. DENSE				TOP OF ROCK: 3.6'
					SOFT	YELLOW-BROWN	SANDSTONE; MICACEOUS, COMPLETELY WEATHERED	VBR	AFTER THIS RUN, DROVE CASING TO 10.2'
	5.0 7.2	69%	0						
10.8									
							HIGHLY WEATHERED	BR	PIECES 0.3-0.6'
							COMPLETELY WEATHERED	VBR	PIECES ± 0.2'
	9.4 10.0	94%	46						
20.8									
	6.8 10.0	68%	18						

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0518
(29)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0518

ELEVATION 1005± GWL 0 HRS 14.2, BACKFILLED PROJECT NO. C040384.40-01

HRS

DATE 17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.8					SOFT	YELLOW-BROWN	SAND STONE (CONT)	VBR	
							; HIGHLY WEATHERED	BR	70° STAINED FRACTURE 30.8 - 31.3
	10.0	10.0	100%	39					
				-36.8					
					M. SOFT	BROWN	SANDY TO SILTY SHALE	BR	30° STAINED FRACTURES 37.6, 38.6, 39.0
				39.0		GRAY			
40.8					SOFT	MAROON, PURPLE, YELLOW, GRAY	CLAYSTONE	BR	SLICKENSIDES: 41.05, 41.3, 41.7, 42.9, 43.5, 44.9, 45.15, 45.85, 46.5, 47.3, 47.95, 48.15, 49.25, 49.8, 50.15, 50.45, 50.8, 51.1, 51.4, 51.8, 52.2, 52.75, 53.15, 53.7, 54.2
	10.0	10.0	100%	64					
50.8									
	9.5	10.0	95%	64					
								VBR	VERTICAL FRACTURE 56.4 - 58.7

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0518

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0518

ELEVATION 1005± GWL 0 HRS 14.2, BACKFILLED PROJECT NO. C040384.40-01

HRS

DATE 17 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.8					SOFT	MAROON,	CLAYSTONE (CONT)	BR-	
					↓	GRAY, PURPLE	↓	VBR	
	4.2			62.8	↓	YELLOW		↓	
					M. SOFT	GRAY	SANDY SILTSTONE W/ CALCAREOUS	BR-	
65.0				65.0	↓	↓	NODULES AND STRINGERS	BL	
							BOTTOM of BORING: 65' 11"		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0518

N 543732.8856
E 1725136.5233 Grade El. 991.07

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0519

ELEVATION _____ GWL 0 HRS 3285 PROJECT NO. C0403B4.41-01

HRS

DATE 17-19 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 2 3	S-1 REC. 1.2		0.7	V. LOOSE	BROWN	TOP SOIL		
1.5	8	S-2			LOOSE	BROWN	SANDY SILT	ML	
3.0	6 5	REC. 1.3			M. DENSE		↓	↓	
	7 10	S-3			↓	↓	SILT, TRACE CLAY		
4.5	12	REC. 1.2					↓		
	15 18 30	S-4			↓	↓	↓	↓	
6.0		REC. 1.0			DENSE	BROWN + GRAY	DECOMPOSED SHALE	GM	
	28 41	S-5			V. DENSE	↓	↓	↓	
7.4	50/0.4	REC 1.3		7.4					TOP OF ROCK 7.4
	3.1 3.1	100%	0	TERR	SOFT	BROWN +	CLAY SHALE: COMPLETELY	WBR	
					↓	GRAY	WEATHERED		NUMEROUS LOW &
10.5									FRACTURES
									HIGHLY BROKEN ZONE
									8.1-8.7
				13.7	↓		↓	↓	
				14.7	SOFT		CLAYSTONE: COMPLETELY WEATHERED	BR	HIGH ∠ FRACTURE 13.7
	9.5 10.0	95%	49	15.5	M. HARD		SANDSTONE	BR	
						MAROON W/ YELLOW MOTTLING			
					SOFT		CLAYSTONE: HIGHLY	BR	30° SLICKENSIDES
					↓	↓	WEATHERED		18.7, 19.4, 19.85
									23.0, 23.3 23.6,
20.5									23.9, 24.05
					SOFT TO		: SOME CALCAREOUS		
					M. SOFT		NODULES		
					↓	↓			45° FRACTURE 22.2
					M. SOFT	GRAY			
	10.0 10.0	100%	60			↓			
						GRAY W/	: PIECES 0.2-0.4' LONG		STAINED 20-30° FRAC-
						MAROON MOTTLING			TURES 24.7, 25.2, 25.8,
									26.0
					↓	↓	↓	↓	

REMARKS ** DRILLED BY TERRA TESTING USING A SIMCO 4000-T2 TRACK MOUNTED DRILL

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0519

gai consultants
transforming ideas into reality

PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST ALBANS, WV BORING NO. B-0519

ELEVATION _____ GWL 0 HRS _____ PROJECT NO. C040384.40-01

HRS _____

DATE 17-19 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.5				31.4			CLAYSTONE (CON'T)	VBR	
					M. SOFT	OLIVE-GRAY	SANDY SILTSTONE	BR	STAINED LOW & FRACTURE 32.2, 33.0, 33.3
				33.2	↓	GRAY	↓		
					SOFT TO M. SOFT	GRAY	CLAY SHALE		34.3, 34.8, 35.1, 35.45
				35.1	↓	↓	↓		
	10.0 10.0	100%	58	36.4	M. SOFT	OLIVE-GRAY	SANDY SILTSTONE	↓	
					SOFT TO M. SOFT	MAROON + GRAY	CLAYSTONE	BR-BL	
					↓	↓	↓	↓	
40.5				41.5	↓	↓	↓	↓	20° SLICKENSIDE, 40.5 70° SLICKENSIDE 41.0-41.3
					M. HARD	GRAY	SANDSTONE: MICACEOUS	BR-BL	
				43.8	↓	↓	↓	↓	NEAR VERTICAL FRACTURE
					M. SOFT	GRAY	SHALY SILTSTONE, SOME SAND	BR	42.85 - 43.8
	10.0 10.0	100%	71		↓	↓	↓	↓	
				47.4	↓	↓	↓	↓	
					M. SOFT	GRAY + MAROON + DK GRAY	SILTY CLAYSTONE	BR	20-30° SLICKENSIDES
50.5					↓	↓	↓	↓	48.65, 49.6, 50.2, 50.8, 52.8, 53.2, 53.5, 54.2, 54.8, 55.3, 55.6, 55.8, 56.0, 56.6, 57.0, 57.4, 57.8, 58.1, 58.4, 59.2
	10.0 10.0	100%	53		↓	↓	↓	↓	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0519

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST ALBANS, WV BORING NO. B-0519

ELEVATION _____ GWL 0 HRS 32.85 PROJECT NO. C040384.43-01

HRS

DATE 17-19 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.5					SOFT TO	MAROON	CLAYSTONE (CONT)	BR	20°-30° SLICKENSIDES
					M SOFT			↓	EVERY ~ 0.2-0.5'
								VBR	
								BR	
	8.7	10.0	87%	41					
								↓	
								VBR	
									30° SLICKENSIDES
70.5								↓	70.9, 71.7
								BR	VERTICAL FRACTURE
				71.9				↓	70.5-70.8, 71.9-72.1
					M. SOFT	GRAY	SANDSTONE; V. FINE GRAINED,	BR-BL	
					M. HARD		ARGILLACEOUS, SOME		
							CROSS BEDDING, FEW		
	10.0	10.0	100%	78			IRREGULAR CALCAREOUS		
							NODULES		
									VERTICAL FRACTURE
80.5									78.5-78.8, 80.0-80.5
									CLOSED VERTICAL FRAC-
	10.0	10.0	100%	95	86.2			↓	TURE 84.3-85.3
					M. SOFT	MAROON + GRAY	SANDY CLAYSTONE	BR	
									30° SLICKENSIDE 88.5,
				89.6				↓	89.15
					M. SOFT/M. HARD	LT GRAY	THALY SANDSTONE	BR	

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0519

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0519

ELEVATION _____ GWL 0 HRS 32.85 PROJECT NO. C040384.40-01

HRS _____

DATE 17-19 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
90.5					M. SOFT TO M. HARD	LT GRAY	SHALY SANDSTONE (CONT)	BR	10-20° FRACTURES
									91.1, 91.55, 92.0,
				94.0					92.4, 92.6, 93.1,
	10.0	10.0	100%	95.8	M. SOFT	GRAY + MAROON MOTTLED	SANDY CLAYSTONE	BR	VERTICAL FRACTURE
									92.6 - 93.1, 94.3-94.6
					M. SOFT TO SOFT	MAROON	CLAYSTONE	BR-VBR	20-30° SLICKENSIDES
									EVERY ~0.1-0.3'
100.5									100.5 - 102.7 VERY
								VBR	BROKEN ZONE, HEAVILY
						GRAY			STAINED 100.5 - 101.7
				104.5					
	10.0	10.0	100%		M. SOFT TO M. HARD	LT. GRAY	SILTY SANDSTONE	BR-BL	
110.5				110.5					
					M. HARD	LT. GRAY	SANDSTONE; MICACEOUS	BL	110.5 - 114.7 - 1 PIECE
				114.7					
	10.0	10.0	100%		M. SOFT	GRAY	SANDY SHALE	BL	VERTICAL FRACTURE
				117.5					115.25 - 115.75
					M. SOFT	GRAY + MAROON MOTTLED	CLAYSTONE	BR	20-30° SLICKENSIDES
									EVERY ~0.3-0.5'

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0519

(20)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0519

ELEVATION _____ GWL 0 HRS 32.85 PROJECT NO. C040384.03-01

HRS

DATE 17-19 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 5

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
120.5					M. SOFT	GRAY - MAROON	CLAYSTONE (CONT)	VBR	20-30° SLICKENSIDES
								BR	@ EVERY 0.1-0.3'
							; SANDY 124.0-125.1		
	10.0	10.0	100%	47					
				129.1	M. HARD	LT GRAY	SHALY SANDSTONE	BR	RQD IN THIS UNIT
				129.15	M. SOFT	GRAY W/ MAROON MOTTLING	INTERBEDDED SANDY CLAYSTONE AND SILTSTONE SOME SANDSTONE	BR	
130.5									
				133.8					
	10.0	10.0	100%	76	M. SOFT	MAROON	CLAYSTONE	VBR	
				135.3	M. SOFT TO M. HARD	GRAY	SANDY CLAYSTONE WITH SMALL CALCAREOUS NODULES AND STRINGERS	BR	LOW % FRACTURES 136.05, 136.4, 136.8, 137.3, 137.9, 138.4, 138.9, 139.8
140.5					M. SOFT	MAROON			
				142.0					
					M. SOFT TO M. HARD	LT GRAY	SHALY SANDSTONE	BL	
							; CLAYSTONE SEAM 144.1 - 144.65		
	10.0	10.0	100%	80					
				146.3	M. SOFT	GRAY	SANDY CLAYSTONE	BR	VERTICAL FRACTURE 147.2 - 148.15
				147.4		MAROON	CLAYSTONE		
				148.8					
150.5					M. HARD	GRAY	SANDY SHALE/SHALY SANDSTONE	BL	

REMARKS ** BOTTOM OF BORING 150.5

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0519

N 542378.3755
E 1721739.7942 Grade El. 679.31

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PROJECT AREA 3/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0520

ELEVATION _____ GWL 0 HRS 18.6 PROJECT NO. C0403849.40-01

HRS _____

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 3 4	S-1 REC 0.4			STIFF	MAROON	SANDY CLAY AND ROCK FRAG-	CL	* 2.0 TSF
1.5	4	S-2					MENTS		
3.0	4 4	REC. 1.5							* 2.5 TSF
	5 5	S-3							* 2.0 TSF
4.5	6	REC. 1.5							
	5 6 10	S-4			M. DENSE	BROWN + BLACK	CLAYEY SILT AND ORGANICS	ML	WET
6.0		REC. 1.5							
	8 13 35	S-5		7.0					
7.5		REC. 1.5							
7.6	50/0.1	S-6 REC 0.1		7.6	V. DENSE	GRAY + MAROON	DECOMPOSED CLAYSTONE	GM	TOP OF ROCK: 7.6'
				10.0	SOFT	MAROON	CLAYSTONE: HIGHLY WEATHERED	VBR-BR	MOST PIECES 0.2'
	4.4 4.4	100%	12				: GRAY 10.9 - 11.2		
12.0				12.0					
					SOFT	GRAY	SANDY SHALE: WEATHERED	VBR-BR	
				13.7					
					SOFT	MAROON	CLAYSTONE	BR	VERTICAL FRACTURE
									16.6 - 17.4
						GRAY	: CALCAREOUS NODULES 16.0-16.5		
	9.3 10.0	93%	51				: SANDY 16.5-17.1		
						MAROON			25° SLICKENSIDE 19.75
22.0									
									30° SLICKENSIDE 26.4
	9.2 10.0	92%	65						27.7, 28.7, 29.25, 29.8

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL

BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0520

(15)

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0520

ELEVATION _____ GWL 0 HRS 18.6 PROJECT NO. C040384.45-01

HRS

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					SOFT	MAROON	CLAYSTONE (CONT)	BR	
32.0									
				35.5					
	9.9 / 10.0	99%	47	37.2	M. HARD	LT. GRAY	SHALY SANDSTONE / SANDY SHALE	BL	
					M. SOFT	MAROON	CLAYSTONE	BR	
				40.2					
					M. HARD	LT GRAY	SHALY SANDSTONE / SANDY SHALE	BR	VERTICAL FRACTURE
42.0				41.7					40.4-41.0, 42.0-42.3
					M. SOFT	MAROON + GRAY	INTERBEDDED SANDY CLAYSTONE	BR-BL	
					M. HARD		AND SANDY SHALE, FEW THIN		
							(≤0.5') SANDSTONE UNITS,		
	10.0 / 10.0	100%	85				FEW IRREGULAR CALCAREOUS		
							NODULES AND STRINGERS		
52.0				52.1					
					M. HARD	LT GRAY	SHALY SANDSTONE	BL	
				54.4					
					M. SOFT	MAROON + GREEN-GRAY	CLAYSTONE W/ NUMEROUS IRREGULAR	BL-BR	SLICKENSIDES 56.1,
							CALCAREOUS NODULES AND		56.5, 56.7, 57.0,
	10.0 / 10.0	100%	81				STRINGERS		60.7, 61.0, 61.3,

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0520 (15)

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0520

ELEVATION _____ GWL 0 HRS 18.6 PROJECT NO. C040384.40-01

HRS _____

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 4

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. SOFT	MAROON + GRAY	CLAYSTONE (CON'T)	BR	
62.0									
				66.2					
	10.0	10.0	100%		M. SOFT	GRAY	SANDY CLAYSTONE, FEW SANDY SILTSTONE SEAMS	BR	
72.0									
				73.6					
					M. SOFT	GRAY	INTERBEDDED SILTSTONE AND FINE GRAINED SANDSTONE	BR-BL	
	10.0	10.0	100%	96					
				81.1					
82.0					M. HARD	LT. GRAY	SANDSTONE	BL	
	9.9	10.0	99%	100					

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0520

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0520

ELEVATION _____ GWL 0 HRS 18.6 PROJECT NO. C0403840.YD-J1

HRS _____

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 4/ of 4/

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					M. HARD	LT GRAY	SANDSTONE (CON'T)	BL	
A2.0									
	7.6 8.0	95%	77						
				97.8					
					M. SOFT	GRAY + MAROON	CLAYSTONE	BR	
100.0									
							BOTTOM OF BORING: 100'		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0520

(5)

N 544199.5521
E 1724054.5791 Grade El. 1004.35

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PROJECT AREA 3/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0521

ELEVATION ~1003 GWL 0 HRS 24.6 PROJECT NO. C040384.40-01

HRS

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	2 3	S-1			V. STIFF	MAROON	SILTY CLAY/CLAYEY SILT	CL/ML	≥ 3.0 TSF
1.5	4	REC. 1.2							
	6	S-2			DENSE	BROWN-GRAY	SANDY SILT, FEW SHALE FRAGMENTS	ML	
3.0	7 24	REC. 1.2			↓	↓	↓	↓	
3.4	50/0.4	S-3 REC 0.3		3.4	V. DENSE		DECOMPOSED SANDY SHALE		
						OLIVE-BROWN			
					SOFT		SILTY SHALE, SOME SAND	BR	STAINED VERTICAL
									FRACTURE 4.5 - 5.1,
									6.1 - 6.7
	7.0 7.0	100%	40						LOW ∠ STAINED FRACTURES
									4.0, 5.1, 5.5, 6.1, 8.0,
10.4				10.3				↓	8.55, 9.55
					M. SOFT	BROWN-GRAY	SANDY SHALE	VBR-BR	
				13.3					PIECES 0.1 - 0.4'
					M-HARD	BROWN-GRAY	SANDSTONE: MEDIUM GRAINED	BL	
	10.0 10.0	100%	78						
20.4									
	10.0 10.0	100%	92						LOW ∠ FRACTURES
									28.2, 28.45, 28.85, 29.35,
									29.85, 30.15, 30.3
									VERTICAL STAINED
					↓	↓	↓	↓	FRACTURE 29.3 - 29.7

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5¼ SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0521
(R)

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0521

ELEVATION 1003± GWL 0 HRS 24.6 PROJECT NO. C040384.40-01

HRS

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.4					M. HARD	BROWN-GRAY	SANDSTONE: MEDIUM GRAINED, MICACEOUS (CON'T)	BL	ALL BREAKS ARE MECHANICAL - CORE IN 4' AND 6' PIECES - BROKE DURING HANDLING
	10.0 10.0		100% 100						
40.4									
	10.0 10.0		100% 100						
50.4									
	9.7 10.0		97% 94						0.05' CARBONACEOUS SHALE AT 59.8

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0521

ELEVATION 603 ± GWL 0 HRS 24.6 PROJECT NO. C040384.40-21

HRS

DATE 23 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.4					M-HARD	BROWN-GRAY	SANDSTONE (CONT)	BL	
				64.0					
				65.1	M-SOFT	LT GRAY	SANDY CLAYSTONE W/ CALCAREOUS NODULES	BR	
	9.6 10.0	96%	58	66.5		GRAY	SILTY CLAYSTONE		
						MAROON	CLAYSTONE		30° SLICKENSIDES 66.75, 67.6, 68.0, 68.25, 68.4, 68.6, 69.1, 69.45, 69.7, 70.3, 70.4
70.4				70.4					
							BOTTOM OF BORING: 70.4'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0521

gai consultants
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N 543873.4417
E 1722326.4148 Grade El. 901.64

PROJECT ARCH 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040384.4/0-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	2 2	S-1			V. STIFF	MAROON	SILTY CLAY	CL	* 3.5 TSF
1.5	3	REC 0.6							
	3	S-2							
3.0	5 6	REC. 1.2		3.4					
	18 38	S-3			V. DENSE	OLIVE-GRAY	DECOMPOSED SANDY SHALE		
4.2	50/0.2	REC 1.0		4.2					
					SOFT TO M. SOFT	OLIVE + GRAY	INTERBEDDED SANDY SHALE AND SHALY SANDSTONE	BR	TOP OF ROCK: 4.2' LOW & FRACTURES
									4.7, 5.1, 6.1, 6.65,
	6.3 6.3	100%	63						6.95, 7.35
									STAINED 30° FRAC
									TUBE 8.4
10.5									VERTICAL STAINED
									FRACTURE 8.85-9.2
									STAINED LOW & FRAC-
									TURES 10.8, 11.6, 12.55,
									12.65, 14.7, 14.9, 15.2,
	10.0 10.0	100%	36						15.3, 15.9, 16.05,
								VBR	16.45, 16.5, EVERY 0.1
								BR	TO 0.3' 16.5-
				20.0					
20.5					SOFT TO V. SOFT	MAROON + GRAY	CLAYSTONE	BR	
								BL	
	8.8 10.0	88%	46					VBR-BR	
				27.0	M. HARD	GRAY	SHALY SANDSTONE	BR	STAINED VERTICAL
									FRACTURE 27.0-28.0
									30.7-30.9

REMARKS ** DRILLED BY TERRA TESTING, INC USING A SIMCO 4000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040384.40-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.5				31.1					
					V. SOFT	MAROON	CLAYSTONE	VBR	NO RECOVERY IN THIS UNIT
	3.6 10.0	36%	24						
				37.5					
					M. SOFT	OLIVE + GRAY	INTERBEDDED CLAYSTONE AND SANDY SHALE	BR	LOW & FRACTURES 41.45, 41.7, 41.9, 43.7, 43.8, 46.8, 48.4, 49.4, 50.0, 50.9, 51.1, 51.4, 52.2 STAINED HIGH & FRACTURES 45.5-46.5 47.4-47.9, 48.7-48.95,
40.5									
	10.0 10.0	100%	56						
50.5									
				52.3					
					M. SOFT	OLIVE-GRAY	SANDY SHALE	BR	LOW & FRACTURES 52.7, 53.9, 54.3, 54.65, 55.1, 56.4, 57.45, 59.3 STAINED LOW & FRACTURE 53.45, 55.75-55.9, 56.5, 57.1, 58.4 60.0
	10.0 10.0	100%	80						
				57.9					
					SOFT TO M. SOFT	MAROON + GRAY	CLAYSTONE	BR-VBR	HIGH & STAINED FRACTURE 58.7-59.3

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040324.4J-01

HRS

DATE 24 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 3 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.5				60.7					
					M. SOFT	GRAY	SANDY SHALE	BR	STAINED LOW & FRAC-
				63.0	↓	↓	↓	↓	TURES 60.75, 61.0,
				64.0	M. SOFT	MAROON	CLAY STONE		61.5, 61.9
					M. SOFT	GRAY	SHALY SANDSTONE / SANDY		HEAVILY STAINED NEAR
	10.0 10.0	100%	36				SHALE		VERTICAL FRACTURE 65.35-67.2
									67' 100% WATER LOSS *
									STAINED VERTICAL FRAC-
								↓	TURE 68.1-68.7, 69.2-
70.5				70.4				VBR	70.3
						MAROON + GRAY	CLAY STONE	BR	VERTICAL FRACTURE
									74.6-76.5
								VBR	
	10.0 10.0	100%	61					BR	
							: SANDY 78.5-80.5		
80.5									LOW & FRACTURE 80.8,
								↓	81.2, 83.1, 83.7, 84.5
								VBR	V. BROKEN ZONE 81.3-83.1
						DK GRAY			
								BR	HIGH & FRACTURE 84.2-
	10.0 10.0	100%	57	86.1	↓	↓	↓	↓	84.45
					M. SOFT	GRAY	SILTSTONE	BR	LOW & FRACTURE 87.1, 87.65
									88.3,
									NEAR VERTICAL STAINED
					↓	↓	↓	↓	FRACTURE 88.5-89.2

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV — BORING NO. B-0522

ELEVATION 902± — GWL 0 HRS 56.8 — PROJECT NO. C040384.40-01

HRS

DATE 24-25 MAY 2005 — CLASSIFIED BY DAN SANGER — PAGE 4 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
90.5				90.0	MI HARD	LT GRAY	SHALY SANDSTONE MICACEOUS	BL	
	10.0 10.0	100%	93						
100.5									
	10.0 10.0	100%	95				: SHALE 107.0 – 107.6 (BA)		
110.5							: SHALE PEBBLES/CHIPS 108.6 – 109.8		
	10.0 10.0	100%	95						

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522 (18)

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040384.40-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 5 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
120.5					M-HARD	LT GRAY	SANDSTONE (CONT)	BL	
					HARD				
	10.0 10.0	100%	100						
130.5									
	10.0 10.0	100%	100						
140.5									
	10.0 10.0	100%	100						

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040384.45-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 6 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
150.5				150.8			SANDSTONE (CONT)		
					S>FT	MAROON, GRAY, PURPLE, YELLOW	CLAYSTONE, SOME SAND	BR	30° SLICKENSIDES 153.05, 153.6, 154.0
				154.5	M. SOFT TO M. HARD	GRAY TO LT. GRAY	INTERBEDDED SANDY SHALE AND SANDSTONE	BR	
	10.0 10.0	100%	75						
160.5									
	10.0 10.0	100%	100						
170.5									
				173.0	S>FT	GRAY	CLAY SHALE	BR	
				174.7					
	10.0 10.0	100%	72		S>FT	DK GRAY + MAROON	SILTY TO SANDY CLAYSTONE - IRREGULAR CALCAREOUS STRINGERS 179.4-180.0	BR	20-30° SLICKENSIDES 175.0, 175.4, 175.55, 176.1, 176.6, 177.35, 177.65, 177.75 178.35, 179.15, 179.4,

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. 60433.01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 7 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
180.5				180.0	M. SOFT	GRAY	SHALY SILTSTONE	BL	
				183.0	↓	↓	↓	↓	
					M. SOFT	MAROON + GRAY	CLAYSTONE	BL-	30° SLICKENSIDES AT
					SOFT TO			BR	185.1, 185.3, 185.5,
	10.0 10.0	100%	78						186.4, 186.7, 187.0, 187.2,
									187.55, 188.1
				188.6					
190.5					SOFT TO	MAROON	INTERBEDDED CLAYSTONE AND	BL	
					M. SOFT	+ GRAY	SANDY SHALE, SOME SANDSTONE,		
	10.0 10.0	100%	90						
200.5				200.5					
					M. SOFT	MAROON	CLAYSTONE	BR-BL	20-30° SLICKENSIDES
						+ GRAY			202.3, 202.65, 202.9,
									203.2, 203.45, 203.7
	10.0 10.0	100%	86	206.5					
					M. HARD	GRAY	SANDY SILTSTONE	BL	
				209.7					

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

(:2)

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902 ± GWL 0 HRS 56.8 PROJECT NO. C0403841.40-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 8 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
210.5					M. HARD	LT. GRAY	SANDSTONE: FINE TO MEDIUM GRAINED, MICACEOUS	BL	
	10.0 10.0	100%	100						
220.5				220.0	M. SOFT TO SOFT	MAROON, GRAY, PURPLE, GREEN-GRAY	CLAYSTONE: SILTY 220-225'	BR	
	10.0 10.0	100%							225-230.5 - CORE PIECES 0.2-0.4' W/20-30° SLICKENSIDES
							: CALCAREOUS NODULES 227.5-235.5'		
230.5									
	10.0 10.0	100%							

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0522

ELEVATION 902± GWL 0 HRS 56.8 PROJECT NO. C040384.40-01

HRS

DATE 24-25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 9 of 9

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
240.5					M. SOFT TO SOFT	MAROON, GRAY, PURPLE, GREEN-GRAY	CLAYSTONE (CON'T)	BR	CORE PIECES 0.2-0.4' 4/20-30° SLICKENSIDES
	10.0 10.0	100%					: SILTY 247.8-248.9		
250.5							BOTTOM OF BORING: 250.5'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0522

N 542742.2422
E 1722248.6749 Grade El. 696.90

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST ALBANS, WV BORING NO. B-0523

ELEVATION _____ GWL 0 HRS 22.0 PROJECT NO. C040384.10-01

HRS _____

DATE 24 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 1	S-1			V. LOOSE	BROWN	SILT, SOME CLAY	ml	
1.5	1	REC 0.7		2.0	↓	↓	↓	↓	
	2	S-2			LOOSE				
3.0	4 4	REC 1.2							
	4 5	S-3					CLAYEY SILT AND ROCK		
4.5	5	REC. 0.6					FRAGMENTS		
	4	S-4							
6.0	4 3	REC. 0.5		6.0	↓	↓	↓	↓	
	4 4	S-5			STIFF	BROWN/ GRAY/ MAROON	CLAYEY SILT / SILTY CLAY AND	ml-cl	MOIST * 2.0 TSF
7.5	7	REC. 0.3					ROCK FRAGMENTS		
	8	S-6			V. STIFF		SILTY CLAY - DECOMPOSED		* 3.0 TSF
9.0	8 5	REC 1.5					CLAYSTONE		
	5 10	S-7							
10.5	10	REC 1.1							
	10	S-8							
12.0	13 38	REC. 0.6		12.0	HARD	↓	↓	↓	* > 4.5 TSF
	10 23	S-9			V. DENSE	MAROON + GRAY + YELLOW	DECOMPOSED CLAYSTONE	gm-gc	
13.5	34	REC. 1.3							
	23	S-10							
15.0	25 34	REC 0.9							
	17 28	S-11							
16.5	38	REC. 0.8							
	20	S-12							
17.9	38 50/0.4	REC 0.4		17.9	↓	↓	↓	↓	TOP OF ROCK: 17.9'
					SOFT	MAROON + BROWN + GRAY	CLAYSTONE: HIGHLY	BR-BL	LOW & FRACTURE
	3,4 4,1	83%	41				WEATHERED		19.5, 20.3, 20.5
									21.0, 21.2
22.0									45° SLICKENSIDE
									20.5 - 20.65
									LOW & FRACTURES
									23.6, 24.55, 24.85
									26.4, 27.9, 29.1
	10.0 10.0	100%	88						30.3, 30.6, 31.2,

REMARKS** DRILLED BY TERRA TESTING, INC USING A SIMCO 4000-T2 TRACK MOUNTED DRILL. BORING ADVANCED USING 5¼" SOLID STEM AUGERS, 4" STEEL CASING, NQ-2 WIRELINE CORING TOOLS.

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0523

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0523

ELEVATION 690± GWL 0 HRS 22.0 PROJECT NO. C0403B4 40-0

HRS

DATE 24 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 2 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
					SOFT TO M. SOFT	MAROON + GRAY	CLAYSTONE (CON'T)	BR	
32.0									LOW & FRACTURES 34.0, 34.5, 34.7
				34.7					
				36.5	M. SOFT	GRAY	SHALY SANDSTONE		
	10.0	10.0	100%	38.5	SOFT	MAROON	CLAYSTONE	VBR- BR	LOW & FRACTURES 37.05, 37.9, 38.1
				40.3	M. SOFT TO M. HARD	GRAY	SHALY SANDSTONE	BR	LOW & FRACTURE 39.95
42.0					SOFT	MAROON + GRAY	CLAYSTONE	BR	LOW & FRACTURES 40.5, 40.6, 40.8, 40.9, 41.1, 42.4, 43.3, 43.45 43.7
	8.0	8.0	100%						38 SLICKENSIDES 42.75, 43.9, 44.2, 44.4, 44.7, 44.85, 45.0 45.75, 48.0, 49.4
50.0									VERTICAL FRAC. 48.0-48.5
							BOTTOM OF BORING: 50.0'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0523

N 542745.0961
E 1722251.4149 Grade El. 696.91

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PROJECT AREA 2/3 JOHN E. AMOS POWER PLANT ST. ALBANS, WV BORING NO. B-0524

ELEVATION _____ GWL 0 HRS DRY PROJECT NO. C040384.40-01

HRS _____

DATE 25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/O SAMPLING		
							TO 18 FT		
							INSTALL PIEZOMETER,		
							TIP AT 18 FT		
							SEE BORING B-0523 FOR SOIL		
							DESCRIPTIONS		
18.0				18.0					
							BOTTOM OF BORING: 18.0 FT		

REMARKS ** DRILLED BY TERRA TESTING USING A SIMCO 4000-T2 TRACK MOUNTED DRILL
BORING ADVANCED USING 5¼" SOLID STEM AUGERS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0524
(14)

N 542379.9472
E 1721745.3670 Grade El. 679.43

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PROJECT AREA 2/3, JOHN E. AMOS POWER PLANT, ST. ALBANS, WV BORING NO. B-0525

ELEVATION _____ GWL 0 HRS DRY PROJECT NO. C0403814.40-01

HRS _____

DATE 25 MAY 2005 CLASSIFIED BY DAN SANGER PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AUGER W/O SAMPLING TO 10 FT. INSTALL PIEZOMETER, TIP AT 10 FT SEE BORING B-0520 FOR SOIL DESCRIPTION ↓		
10.0				10.0			↓ BOTTOM OF BORING 10.0 FT		

REMARKS ** DRILLED BY TERRA TESTING, INC. USING A SIMCO 4000-T2 TRACK MOUNTED DRILL. BORING ADVANCED USING 5¼" SOLID STEM AUGERS

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. B-0525

(16)

N 539371.31
E 1753962.87 Grade El. 709.57 Top of PVC Riser El. 711.47

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PROJECT Area 2/3 John E. Amos Power Plant BORING NO. 0536 (MW-1)

ELEVATION _____ GWL 0 HRS Dry PROJECT NO. C0Y0384.40.01
24 HRS 13.8

DATE 7-12-05 CLASSIFIED BY TR Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red	Clayey Silt and Rock		Start 1:35
						BR	Fragments - Trace Sand		Moist
				8.0		↓	↓		
						BR	Sand and Rock Fragments		Damp, RF > 2" ϕ
				10.0		↓	↓		
						Red	Clayey Silt and Rock		Moist RF < 2" ϕ
				11.0		BR	Fragments		
						Red	Decomposed Claystone		Damp.
						↓	↓		Dry @ 14'
				19.0		↓	↓		
							Bottom @ 19.0'		Finish 2:00
							Installation		Material
							Sand 19.0' to 18.0'		10' Screen, cap
							10' Screen 18.0 to 8.0'		9 Bags Sand
							Sand 18.0' to 6.0'		1 3/4 Bucket Pellets
							Bentonite Pellets 6.0' to 3.0'		10 Bags Concrete Mix
							Water added to pellets		16"x5' steel Casing
							1.9' Stick up PVC		
							2.3' Stick up Steel Casing		

REMARKS ** 4 1/4" ID Hollow Stem Augers to 19.0', 4000-TZ Simco Track Drill
Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0536 (MW-1)

N 539367.47
E 1753964.89 Grade El. 709.41 Top of PVC Riser El. 711.01

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PROJECT Area 2/3 John E Amos Power Plant BORING NO. 0535 (MW-2)

ELEVATION _____ GWL 0 HRS 40.1' PROJECT NO. C040384.40.01

24 HRS 38.2'

DATE 7-12-05 CLASSIFIED BY T. R. Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red	Clayey Silt and Rock		Moist, Start 8:45
						BRN	Fragments - trace sand		RF >2" ϕ
				10.0		↓	↓		
						Red	Decomposed Claystone		Dry
				18.0		↓	↓		TOR 18.0'
				20.0		Red	weathered Claystone		Auger to 20.0'
						BRN	Fine Grain Sandstone w/		
				23.0		Red	Interbedded Claystone		
					Hard	Gray	Interbedded sandstone &		
					↓	↓	Siltstone - few thin Red		
				30.0	↓	↓	Claystone Seams		
						Red	Claystone		few sec. of moist
				54.2		↓	↓		cuttings @ 42.0'
						Gray	Siltstone/shale		[illegible]
				58.0		↓	↓		[illegible]
				60.0		Red	Claystone		Moist cuttings/rock
						Gray	Siltstone		@ 62 wait 15 min
				62.5		↓C	↓		water in hole
							Bottom @ 62.5'		End 10:35 AM
							Installation		Materials
							Sand 62.5 to 62.0'		20' 2" ϕ PVC Screen
							Screen 62.0' to 42.0'		4 Bags Sand
							Sand 62.0' to 37.0'		1/4 Bucket Pellets
							Bentonite Pellets 37.0 - 34.0		4 Bags Volclay grout
							Pellets into water		10 Bag Concrete Mix
							Volclay to 4.0'		
							Concrete 4.0 to 0.0', 6' ϕ Pad		
							Steel Casing 2.1' stick up		

REMARKS** 4¼" ID Hollow Stem Augers to 20', 4" ϕ Air Rotary to 62.5', Simco 4000-T2 Track Drill, Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

N 541672.50
E 1755563.50 Grade El. 823.00 Top of PVC Riser El. 825.00

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PROJECT Area 2/3 John E Amos Power Plant BORING NO. 0527 (MW-3)

ELEVATION _____ GWL 0 HRS Dry PROJECT NO. C040384.40.01

45 HRS 17.0

DATE 6-24-05 CLASSIFIED BY T R Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red-BR.	Silty Clay		Start 10:15 AM
				2.0'		↓	↓		Damp
						BR ↓	Clayey Silt ↓		Dry
				12.0'					
						Red-BR. ↓	- Silty Clay to Decomposed claystone ↓		Dry, slow augering damp at ≈16'
				25.5		Gray BR ↓	Weathered sandstone - with fine mica grains ↓		moist at ≈25' Auger Refusal 25.5' 6-27-05 WL=17'
				30.0		Red ↓	Siltstone ↓		Start air rotary @ 8:30 AM
				41.0			Bottom @ 41.0'		Finish @ 9:00 AM
									Clean hole 9:00 to 11:00. Drilling while cleaning 41.0' Material
							Installation:		
							Pellets 41 to 32.5'		20' 2" ϕ screen
							Sand 32.5 to 32.0		2 caps
							20' Screen 32.0'-12.0'; 1½" cap		12 bags sand
							32.0 to 9.0' Sand		1 bucket pellets
							Bentonite pellets 9.0' to 7.0'		½ Bag Volclay
							1 bucket water poured on pellets		10 Bags Concrete Mix
							Volclay grout to 3.3'		6"x5' Steel Casing
							Concrete Mix 10 Bags		
							5' steel pipe 6" ϕ 2.5' stick up		
							2' PVC stick up		
							2.5' steel Casing stick up		

REMARKS ** 30' south of 0509, 4¼" ID HSA to 25.5', 4" ϕ air rotary w/hammer to 41.0'
Simco 4000-T2 Track Rig, Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0527 (MW-3)

N 542305.16
E 1753086.04 Grade El. 674.76 Top of PVC Riser El. 676.36

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PROJECT Area 2/3 John E Amos Power Plant BORING NO. 0532 (mw-4)

ELEVATION _____ GWL 0 HRS 19.2' PROJECT NO. C040384.40.01

24 HRS 17.9'

DATE 7-7-05 CLASSIFIED BY T R Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				2.0		BR	Sandy Silt		Damp, start 9:45
						BR	Sand and Rock Fragments		Damp
				6.0		↓	of shale		
						BR	Sandy Clay - some Rock		RF < 2" ϕ, moist
				9.0		↓	Fragments of Sandstone		Auger to 10.0' refusal
						Red	Decomposed claystone		Damp, TOR 10.0'
						↓	weathered to claystone		
				12.5		↓	↓		
						Gray	Siltstone Interbedded with		
						Red	Claystone/clayshale		
				41.0		↓	↓		
						Gray	Silt shale/Siltstone - trace		
				49.0		↓	Red seams of claystone		
					Soft	Red	Claystone		
				53.0		↓	↓		
						Gray	Interbedded Silt-shale &		
				58.0		Red	claystone		
						Gray	Siltstone		Wet cuttings last
				70.0		↓	↓		dust @ 58.0', water
						Gray	Sandstone		from hole by 62.0'
				78.5		↓	↓		more water @ 71.0'
							Bottom @ 78.5'		
							Installation		Materials
							Sand 78.5 to 78.0', 20'		4 Bags Sand
							Screen 78.0 to 58.0', Sand		½ bucket pellets
							78.0 to 53', Bentonite to		2 bags Volclay grout
							49.0', Volclay grout to 3'		10 Bags Concrete Mix
							Concrete to 0.0, 6'ϕ Pad		6"x5' Steel Casing
							PVC stickup 1.6', Steel 2.1'		

REMARKS** 4¼" ID HSA to 10.0', 4" ϕ Air Rotary 10.0' to 78.5', Simco 4000-TZ Track Rig
Doug Novotny Driller, Terra Testing.

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0532 (mw-4)

N 542305.96
E 1753080.68 Grade El. 674.84 Top of PVC Riser El. 676.84

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PROJECT Area 2/3 John E BORING NO. 0533 (MW-5)

ELEVATION _____ GWL 0 HRS Dry PROJECT NO. C040384.40.01

24 HRS 8.16'

DATE 7-7-05 CLASSIFIED BY T R Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						BR	Sandy Silt		Damp
				3.0		↓	↓		
						BR	Sand and Rock Fragments		Damp
				6.0		↓	↓		
						BR	Sandy Clay and Rock		Moist
				9.0		↓	Fragments		
				10.2		Red	Decomposed claystone		Dry
							Bottom @ 10.2'		
							Installation		Material
							3" sand to 10.0'		4 Bag Sand
							5' Screen w/ cap 10.0'-5.0'		1/2 Bucket Pellets
							Sand 10.0 to 4.0'		10 Bags Concrete Mix
							Bentonite Pellets 4.0'-3.0'		6"x5' Steel Casing
							Cemment 3.0'-0', c'ϕPad		
							2' stick up PVC		
							2.2' stick up steel casing		

REMARKS** 4¼" ID HSA to 10.2', Simco 4000 -T2 Track Rig
Doug Novotny Driller, Tetra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0533 (MW-5)

N 540837.74
E 1754220.53 Grade El. 927.29 Top of PVC Riser El. 929.59

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PROJECT Area 2/3 John E. Amos Power Plant BORING NO. 0526 (MW 6)

ELEVATION ____ GWL 0 HRS 62.5' in well PROJECT NO. C040384.40.01

24 HRS 62.5'

DATE 6-23-05 CLASSIFIED BY TR Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red Brn.	Clayey Silt ↓		Start 9:00 AM
				10.5		Yellow	Highly weathered siltstone		
						BR	to fine grain claystone		
				13.5			↓		Auger to 14'
						Lt Brn Gray	Sandstone @ 25'		Air Hammer 14' to 91'
				28.0			↓		8'/10min in sandstone
						Gray	Shale		
				30.0			↓		
						Red	Claystone		
				36.0			↓		
						Gray	Sandstone		
				38.0			↓		
						Gray	Interbedded shale and		
			WL	76.0		Red	siltstone / fine sandstone		Water encountered
							water @ 76'		@ 76'
				91.0			↓		End 11:30 AM
							Bottom of Boring @ 91.0'		
							Installation		Material
							Clean hole 11:30-12:25		
							Stabilize water @ 62.55' 2:00		
							Place bentonite pellets 91.0'		2 buckets bentonite
							to 78.5', Sand 78.5' to 78.0'		4 50lbs bags sand
							Set 20' screen @ 78' to 58'		2½ 50lb bag volclay
							3" screen cap on end, stick up		10 Bags Concrete Mix
							2.3', Sand 78.0 to 55',		6" x 5' steel casing
							bentonite pellets 55' to 50'		
							Volcay grout to 4.0' 6-29-05		
							Concrete to surface, 2.5' Steel Stick-up		

REMARKS** 4¼" ID Hollow Stem Augers to 14', 4" ϕ downhole hammer w/air to 91.0'
Simco 4000-T2 Track Rig, Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0526 (MW-6)

N 539635.79
E 1755425.04 Grade El. 943.15 Top of PVC Riser El. 945.15

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PROJECT Area 2/3 John E Amos Power Plant BORING NO. 0528 (MW-7)

ELEVATION _____ GWL 0 HRS 40.0 PROJECT NO. C040384.40.01

18 HRS 37.0

DATE 6-27-05 CLASSIFIED BY TR Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						BR	Silty Sand and Sandstone		Start 3:50 PM
				2.0		↓	Rock Fragments		Dry
						Yellow	Decomposed Sandstone		Dry
				6.0		BR	↓		Auger Refusal @ 6.0'
						Gray	Sandstone		Dry
						BR	↓		
				22.0	Hard	Gray	18.0' to 22.0'		≈ 1"/min
						BR	Siltstone		
						to Gray	↓		
						Red	from 24'		Water Encountered
						& Gray	↓		@ 40.0'
				55.5		↓	↓		End 5:00 PM
							Bottom @ 55.5'		Clean with air
									until 5:40PM
							Installation		Materials
							Sand 55.5' to 52.0'		4 bag sand
							20' Screen 52.0 to 32.0'		1/4 bucket pellets
							Sand 52.0 to 30.0'		2 Bags Volclay
							Bentonite Pellets 30.0' to 28.0'		1.0 Bags Concrete
							Bucket of water on Pellets		6" Φ steel Casing
							Volclay Grout to 3.3'; 3.3' of		5' total length
							Concrete. Pad 6' diameter		
							2' stickup PVC		
							2.5' stickup steel casing		

REMARKS** 4 1/4" ID HSA to 6.0'; 4" ϕ Air Rotary w/hammer to 55.5'

Simco 4000-T2 Track Rig, Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0528 (MW-7)

N 542134.95
E 1756839.14 Grade El. 945.01 Top of PVC Riser El. 947.01

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PROJECT Area 2/3 John E Amos Power Plant BORING NO. 0534 (MW-8)

ELEVATION _____ GWL 0 HRS 19.8' PROJECT NO. C040384.40.01

48 HRS 23.8'

DATE 7-11-05 CLASSIFIED BY T R Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red	Silty Clay		Start 11:00 AM
				6.0		↓	↓		Moist
						Red	Decomposed Claystone		Dry
				9.0		↓	↓		
						Gray/	Sandy shale / sandstone		TOR 10.0'
				23.0		BR	Med Grain.		10:30 a/n Rotary.
						Red	Claystone		Slight Hammering
				26.0		↓	↓		
				28.0		BR	Sandstone / Sandy shale		
					Hard	Gray	Sandstone		
					↓	BR	@ 34		
				37.0	↓	↓	↓		
						Red	Claystone		Moist @ top 6"
				41.0		↓	↓		Moist cuttings back
					Hard	Gray	Sandstone / Sandy shale		± 1/2 of 10' Run
					↓	↓	↓		
				60.5	↓	↓	↓		End 12:35 PM
							Bottom @ 60.5'		
							Installation		Material
							60.5' to 60.0' Sand		20' Screen, 2 caps
							3" cap on bottom 20' Screen		5 Bags Sand
							Screen 60.0 to 40.0',		1/4 Bucket Pellets
							Sand 60.0 to 30.0',		3 Bags Volclay
							Bentonite Pellets to 27.0'		11 Bags Concrete Mix
							Volclay Grout to 3.0'		6"x5' Steel Casing
							Concrete 3.0 to 0.0', 6'ϕ Pad		
							2' stick up of NC		
							2.5' Stickup of steel Casing		

REMARKS** 4¼" ID Hollow Stem Augers to 10.0', 4"ϕ Air Rotary to 60.5', 4000-T2 Simco Track Rig, Doug Novotny Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0534 (MW-8)

N 544221.98
E 1756158.78 Grade El. 933.39 Top of PVC Riser El. 935.39

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PROJECT Area 2/3 John E Amos BORING NO. 0530 (MW-9)

ELEVATION _____ GWL 0 HRS 47.4' PROJECT NO. C040384.40.01

24 HRS 30.2'

DATE 6-30-05 CLASSIFIED BY T. R. Gower PAGE 1 of 1

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Red	Silty Clay		Start 11:10 AM
				2.0			↓		Moist
						Red	Decomposed Claystone		Dry, Augr to 5.0'
				5.0			↓		Air Rotary 11:30
						Red	Claystone / clayshale		Hammer in claystone
				15.0		trace gray	↓		Less @ 12'
						BR	Fine grain Sandstone		
				29.0	Hard	Gray	18 to 20'		
				31.0		BR	Sandy shale		
						Red	Claystone / clayshale		
				35.0			↓		
						Gray trace red	Siltstone w/sandstone seams / siltshale		
				44.0			Water Encountered @ 42'		Water Encountered 42'
						Red	Claystone		
				51.0			↓		
					Hard	Gray	Sandstone		End Drilling 12:40PM
				62.5			↓		
							Bottom @ 62.5'		Let sit 15 min blow
									out water = 30 sec
							Installation		then dry, 15 min
							62.5 to 62.0' Sand		on 15 sec of water
							20' Screen 62.0' to 42.0'		Add potable water to
							Sand 62.0' to 37.0'		clean hole 50 gal total
							Bentonite Pellets 37.0'-34.5'		Material
							Volclay grout to 3.0'		5 Bags Sand
							Concrete 3.0'-0.0', 6' Diameter		20' Screen
							Pad, 2' stickup PVC		1/4 bucket pellets
							2 1/2' stick up 6" ϕ steel		water added, 2 bags
							Casing 2.5' stickup		Volclay, 9 bags Concrete

REMARKS ** 25 ft N345°W from Survey Pt. 307, 4 1/4" ID HSA to 5.0', 4" ϕ Air rotary w/hammer to Simco 4000-T2 Track Rig, Doug Novotny-Driller, Terra Testing

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0530 (MW-9)

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N 544019.11
E 1754183.58 Grade El. 909.43 Top of PVC Riser El. 911.43

PROJECT Area 2/3 John E Amos Power Station BORING NO. 0531 (MW-10)

ELEVATION _____ GWL 0 HRS Dry PROJECT NO. 040384.40.01

24 HRS 102'

DATE 6-30-05 CLASSIFIED BY T. R. Gower PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
				9.0		BR	Clayey Silt		Start 4:00.
						Red	Decomposed Claystone		Dry
				11.0		↓	weathered to claystone		Auger to 10.0'
						Lt BR	Silty Shale / siltstone		
				20.0		↓	↓		
						BR	Sandstone		
				26.0		↓	↓		
						Lt Gray	Siltstone - Red @ 29.0'		
				34.0		↓	Gray @ 31.0'		
				36.0		Red	Claystone		
					Hard	Gray	Fine grain Sandstone		
				40.5		↓	↓		
						Red	Claystone		
				46.0		Gray	↓		
				58.0		Gray	Siltstone		Stop 5:00 @ 52'
				60.0		Red	Claystone		
						Gray	Siltstone / v. Fine Grain		
				71.0		↓	Sandstone, shaley		
					Hard	Gray	Sandstone		
				76.0	↓	↓	↓		
					Soft	Red	Siltstone / Claystone		
				81.0	↓	↓	↓		
				82.0	Hard	Gray	Sandstone		
						Gray	Siltstone		
				84.0		↓	↓		
					Hard	Gray	Sandstone w/ 6" seams		
					↓	↓	of softer siltstone		Stop @ 112' 11:05 AM
				125.0		↓	↓		
						Red	Claystone		
				138.0		↓	↓		

REMARKS** 4¼" ID Hollow Stem Augers to 10.0', 4" ϕ Air Rotary w/hammer 10.0' to 157.0'
Simco 4000-T2 Track Rig, Doug Novotny Driller, Terra Testing.

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING NO. 0531 (MW-10)

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PROJECT Area 2/3 John E Amos Power Station BORING NO. 0531 (MW-10)

ELEVATION _____ GWL 0 HRS Dry PROJECT NO. 040384.40.01

24 HRS 102

DATE 7-1-05 CLASSIFIED BY T. R. Gower PAGE 2 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
						Gray	Siltstone		Dry
				149.0		↓	↓		
						Gray	Sandstone		
				152.0		↓	↓		
				153.0		Red	Claystone		
				154.0		DK Gray	Sandstone w/mica grains		
						Gray	Siltstone		
						↓	↓		
				157.0		↓	↓		End 12:05 PM
							Bottom @ 157.0'		
							Installation		Material
							Hole measured @ 154.0'		11 bags sand
							Sand to 153.0', 20' screen		1/4 bucket pellets
							153.0' to 133.0', Sand		4 1/2 bags volclay
							153.0 to 85.0', bentonite		10 Bags Concrete Mix
							pellets to 81.0', Volclay		6" ϕ x 5' Steel
							to 3.5', Concrete 3.5 to 0.0'		Casing
							6" ϕ x 5' steel casing, 6'		
							diameter Pad		
							2' stick up PVC		
							2.5' stick up steel casing		

REMARKS ** _____

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

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Definition of Terms
Used to Describe Subsurface Materials

SOILS

DENSITY OF GRANULAR SOILS BASED ON STANDARD PENETRATION RESISTANCE

DESIGNATION	STANDARD PENETRATION RESISTANCE (BLOWS/FOOT)
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	OVER 50

CONSISTENCY OF COHESIVE SOILS IS BASED ON FIELD AND/OR LABORATORY TESTS

CONSISTENCY	UNC COMPRESSIVE STR. (TONS PER SQUARE FOOT)	FIELD IDENTIFICATION
VERY SOFT	LESS THAN 0.25	EASILY PENETRATED SEVERAL INCHES BY FIST
SOFT	0.25 TO 0.50	EASILY PENETRATED SEVERAL INCHES BY THUMB
MEDIUM STIFF	0.50 TO 1.0	CAN BE PENETRATED SEVERAL INCHES BY THUMB WITH MODERATE EFFORT
STIFF	1.0 TO 2.0	READILY INDENTED BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT
VERY STIFF	2.0 TO 4.0	READILY INDENTED BY THUMBNAIL
HARD	MORE THAN 4.0	INDENTED WITH DIFFICULT BY THUMBNAIL

ADDITIONAL TERMS USED IN THE DESCRIPTION OF SOILS:

AND	INDICATES APPROXIMATELY EQUAL AMOUNTS OF MATERIALS, SUCH AS A SAND AND GRAVEL MIXTURE. IF THE MATERIALS OCCUR IN THIN SEPARATE SEAMS, IT IS NOTED IN THE DETAILED WORD CLASSIFICATION. THE THICKNESS IS GIVEN WHERE POSSIBLE.
SOME	INDICATES A SIGNIFICANT AMOUNT OF THE ACCESSORY MATERIAL. EXAMPLE: MEDIUM DENSE SILTY SAND - SOME GRAVEL
TRACE	INDICATES A MINOR AMOUNT OF THE ACCESSORY MATERIAL EXAMPLE: LOOSE SILTY SAND - TRACE OF GRAVEL
INTERBEDDED	USED TO DESCRIBE THIN ALTERNATING SEAMS. THICKNESS IS GIVEN WHERE POSSIBLE EXAMPLE: HARD INTERBEDDED SILT AND CLAY (APPROXIMATELY 1/16" THICK)

ROCK

TERM	DEFINITION
SEAM	THIN (12 INCHES OR LESS) PROBABLY CONTINUOUS LAYER
SOME	INDICATES SIGNIFICANT (15 TO 40 PERCENT) AMOUNTS OF THE ACCESSORY MATERIAL EXAMPLE: ROCK COMPOSED OF SANDSTONE (70%) AND SEAMS OF SHALE (30%) WOULD BE: SANDSTONE - SOME SHALE SEAMS
FEW	INDICATES: MINOR (0-15 PERCENT) AMOUNTS OF THE ACCESSORY MATERIAL EXAMPLE: ROCK COMPOSED OF SANDSTONE (90%) AND SEAMS OF SHALE (10%) WOULD BE: SANDSTONE - FEW SHALE SEAMS
INTERBEDDED	USED TO INDICATE THIN OR VERY THIN ALTERNATING SEAMS OF MATERIAL OCCURRING IN APPROXIMATELY EQUAL AMOUNTS EXAMPLE: ROCK COMPOSED OF SANDSTONE (50%) AND SHALE (50%) SEAMS WOULD BE INTERBEDDED SANDSTONE AND SHALE.

THE DEGREE OF BROKENNESS OF THE ROCK IS DESCRIBED BY ONE OF THE FOLLOWING TERMS:

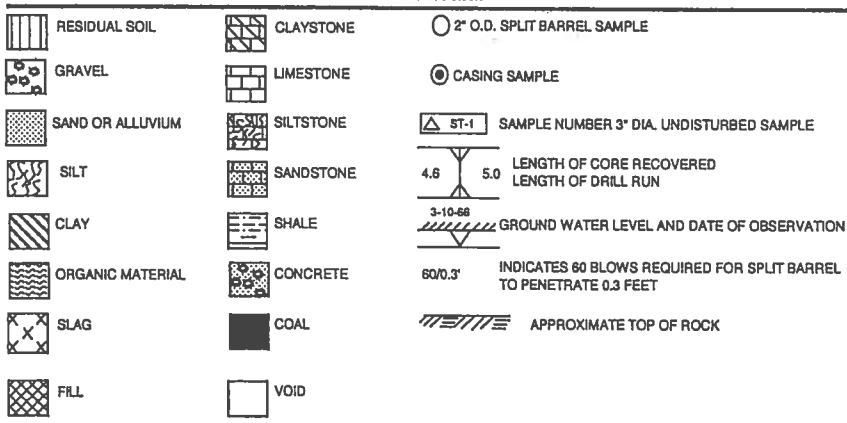
DESCRIPTIVE TERMS	ABBREVIATION	SPACING
VERY BROKEN	(V. BR.)	LESS THAN 2 INCHES
BROKEN	(BR.)	2 INCHES - 1 FOOT
BLOCKY	(BL.)	1 FOOT - 3 FEET
MASSIVE	(M.)	3 FEET - 10 FEET

RQD-ROCK QUALITY DESIGNATION IS CUMULATIVE LENGTH OF PIECES OF CORE EQUAL TO OR GREATER THAN FOUR INCHES IN LENGTH DIVIDED BY THE TOTAL LENGTH OF CORE RUN, EXPRESSED AS A PERCENTAGE.

THE FOLLOWING BASIC NAMES ARE APPLIED TO SEDIMENTARY ROCK:

ROCK TYPE	CHARACTERISTICS
SANDSTONE	MADE UP PREDOMINANTLY OF GRANULAR MATERIALS RANGING BETWEEN 1/16 AND 2MM IN DIAMETER
SILTSTONE	MADE UP OF GRANULAR MATERIALS LESS THAN 1/16 MM IN DIAMETER. FRACTURES IRREGULARLY, MEDIUM THICK TO THICK BEDDED
CLAYSTONE	VERY FINE GRAINED ROCK MADE UP OF CLAY MATERIALS. FRACTURES IRREGULARLY, VERY SMOOTH TO TOUCH. GENERALLY HAS IRREGULARLY SPACED PITTING ON SURFACE OF DRILLED CORES.
SHALE	A FISSILE VERY FINE GRAINED ROCK. FRACTURES ALONG BEDDING PLANES
LIMESTONE	ROCK MADE UP PREDOMINANTLY OF CALCITES (CA CO3) EFFERVESCES UPON THE APPLICATION OF HYDROCHLORIC ACID
COAL	ROCK CONSISTING MAINLY OF ORGANIC REMAINS

LEGEND



ARCADIS

GAI Consultants, Inc. 2006

Well Construction Diagrams

B-0501 to B-0515, B-0517, B-0519 to B-0525 & MW-1 to MW-10

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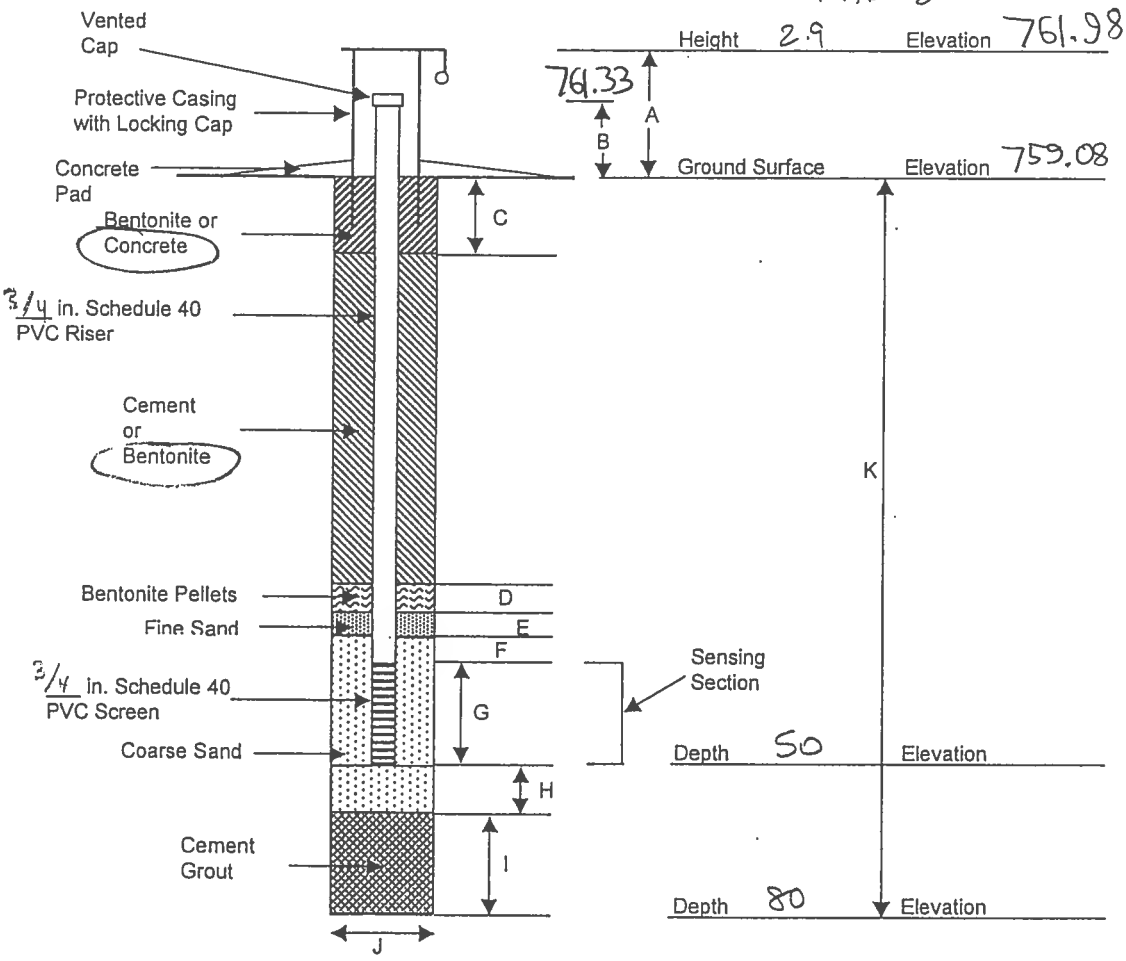
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 21 APR 2005 Engineer/Geologist DRS Well No. B-0501

N 540,558.4978
E 1723508.1269
NAD 83 WV SOUTH



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.9	2.25	35	0	0	5
G	H	I	J	K	
10	3	30	0.25	80.0	

Remarks _____

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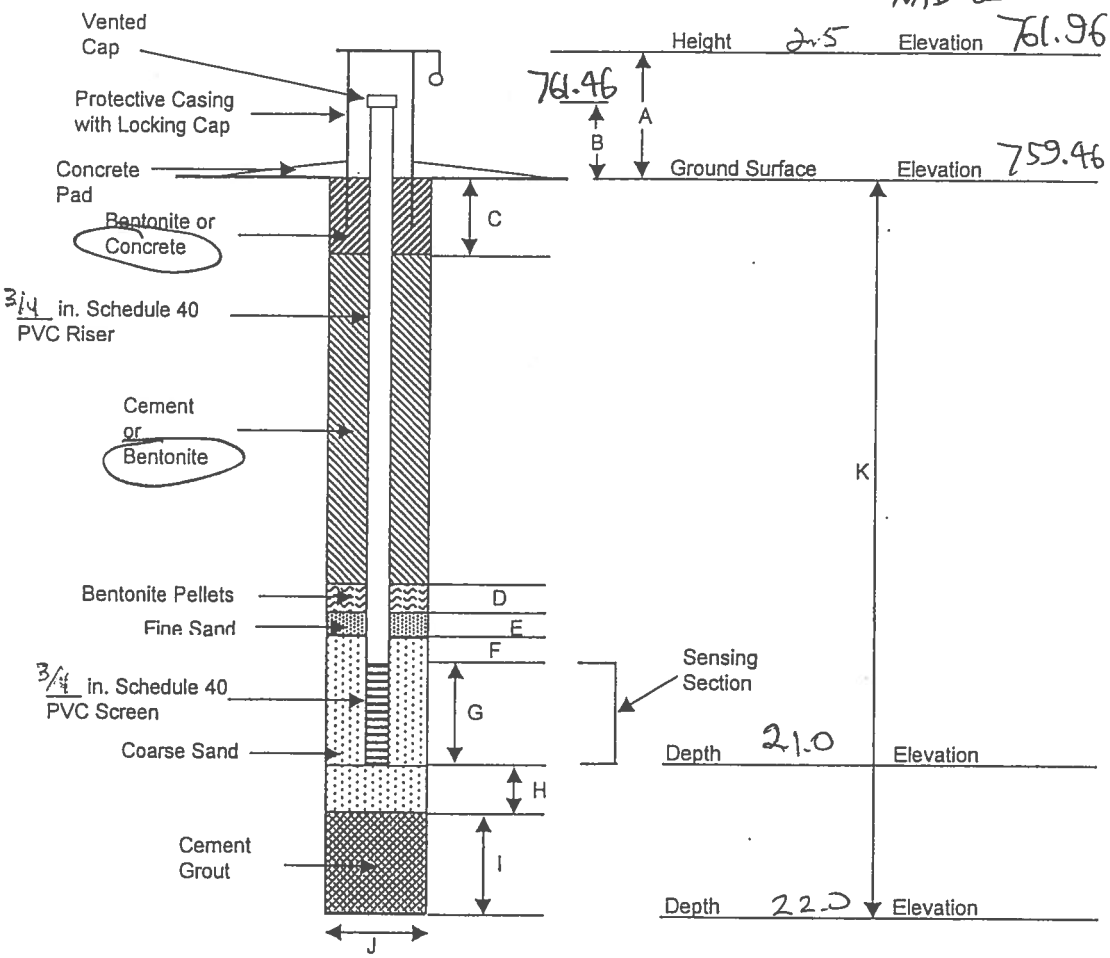
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 21 APR 2005 Engineer/Geologist DBS Well No. B0502

N 540563.2422
E 1723508.0316
NAD 83 WV SOUTH



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.5	2.0	7.0	0	0	4
G	H	I	J	K	
10	1	0	0.25	22.0	

Remarks _____

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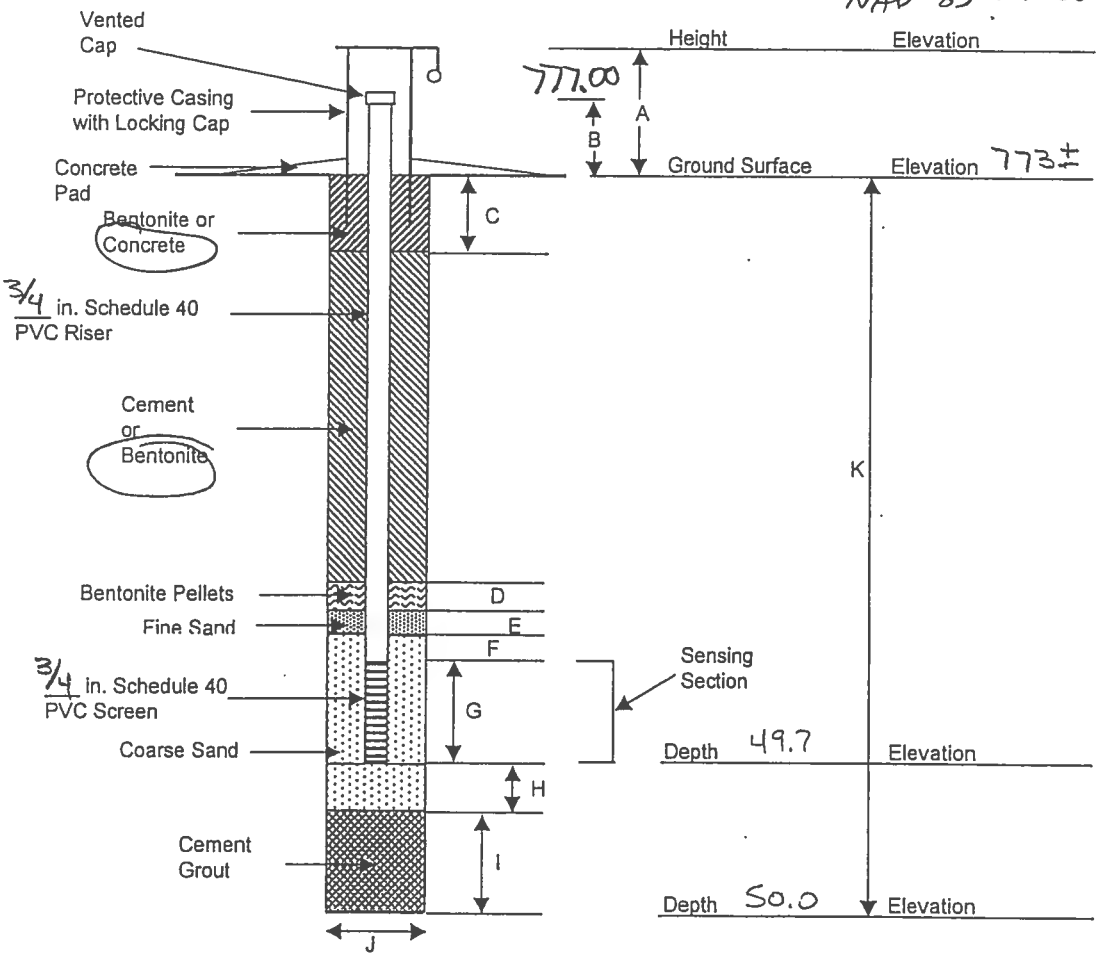
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C2403x41.40-01

Date 20 APR 2005 Engineer/Geologist DRS Well No. 0503

N 540843.8055
E 1723858.5630
NAD 83 WV SOUTH



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.6	2.0	34.7	0	0	5
G	H	I	J	K	
10	0.3	0	0.25	50.0	

Remarks _____

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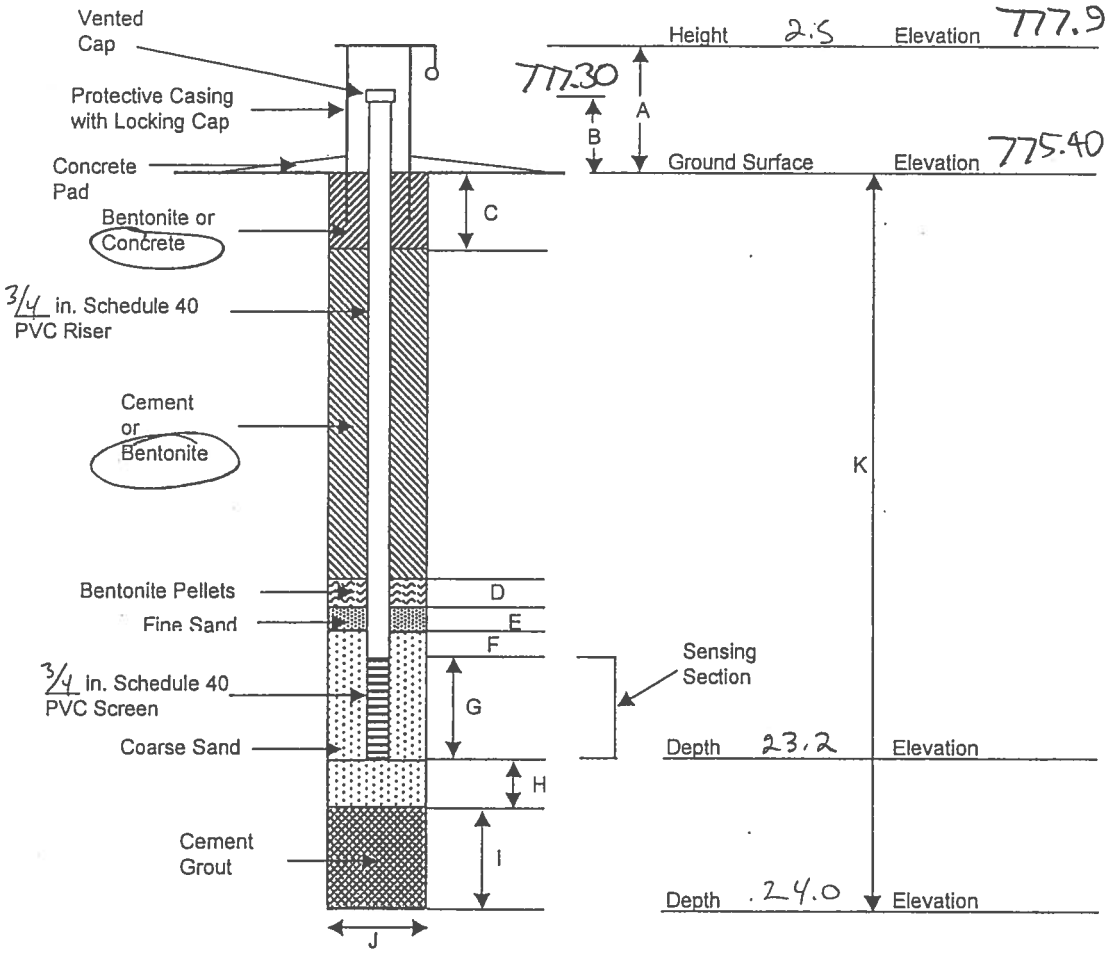
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 20 APR 2005 Engineer/Geologist DBS Well No. B 0504

N 540840.0544
E 1723859.8367



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.5	1.9	8.2	0	0	5
G	H	I	J	K	
10	0.8	0	0.25	24.0	

Remarks _____

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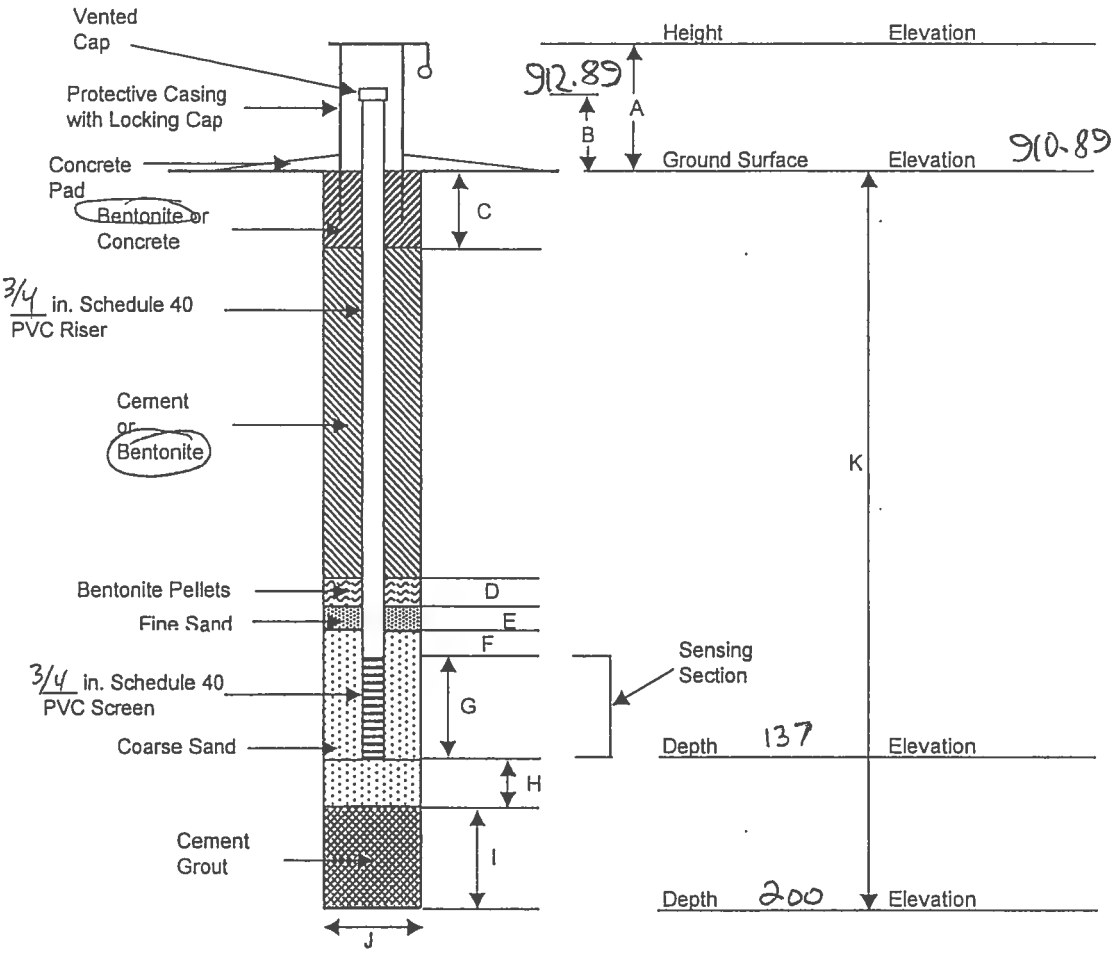
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 27 APR 2005 Engineer/Geologist DBS Well No. B 0505 ~~(27)~~

N 541325.3505
E 1723551.3362



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.5	2.0	10	0	0	107
G	H	I	J	K	
20	3	60	0.25	200	

Remarks _____

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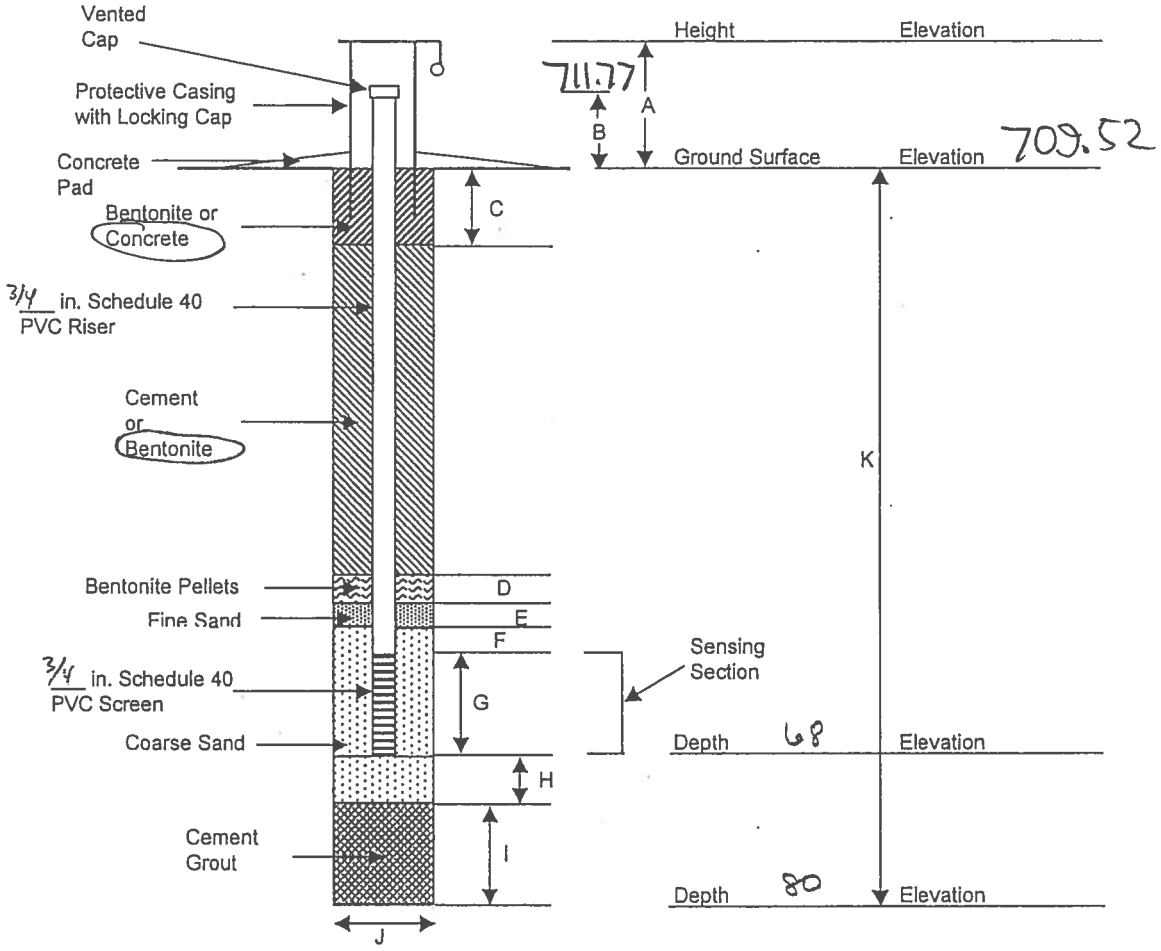
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C04038Y.40-01

Date 28 APR 2005 Engineer/Geologist DBS Well No. B0506

N 539424.9688
E 1722518.6810



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.55	2.25	20	0	0	38
G	H	I	J	K	
10	2	10	0.25	80	

Remarks _____

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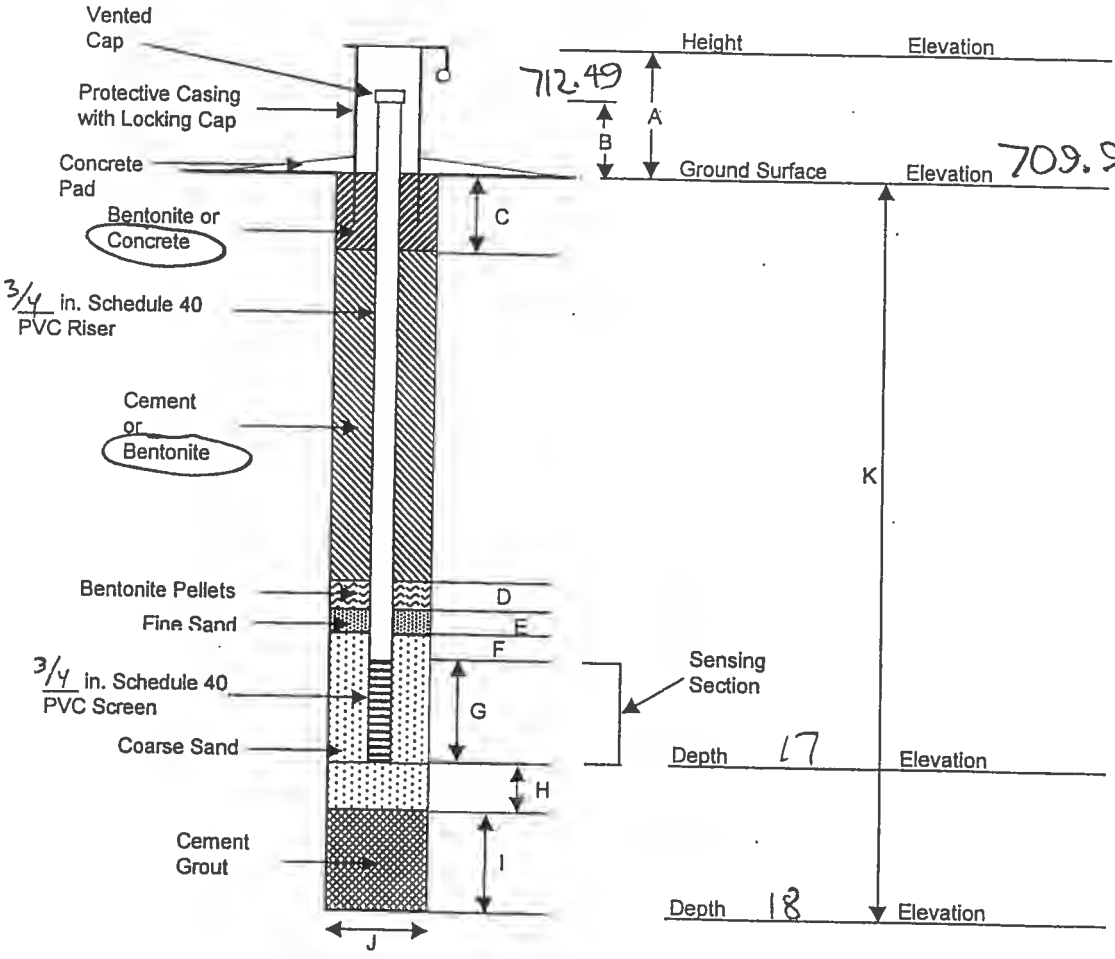
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 22 APR 2005 Engineer/Geologist DBS Well No. B0507

N 539428.8146

E 1722523.7682



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.72	2.50	4	0	0	3
G	H	I	J	K	
10	1	0	0.25	18	

Remarks _____

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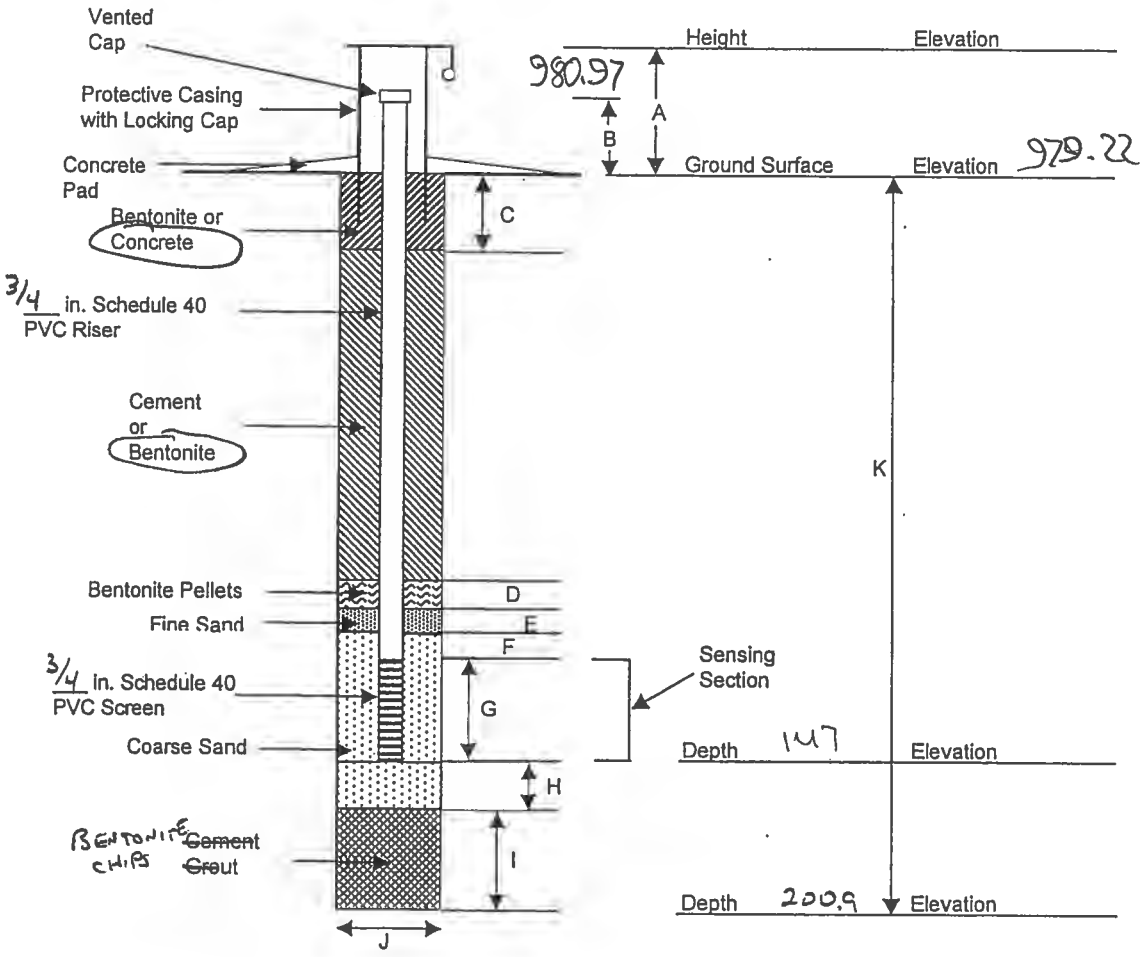
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. CO40384.40-01

Date 03 MAY 2005 Engineer/Geologist JBS Well No. B-0508

N 541996.9754
E 1723377.3436



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.5	1.75	77	—	—	50
G	H	I	J	K	
20	3	50.9	0.25	200.9	

Remarks _____

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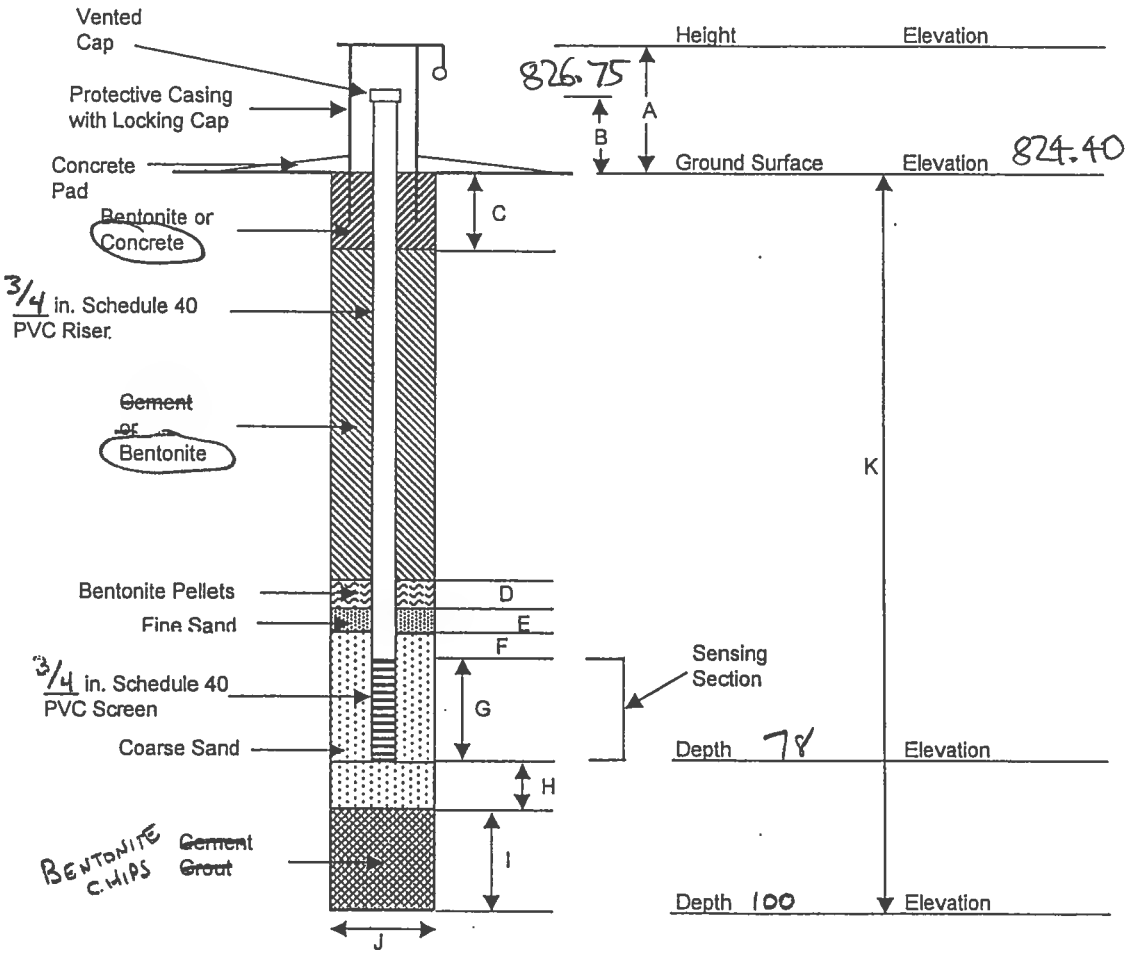
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 03 MAY 2005 Engineer/Geologist DBS Well No. B-0509

N 541748.6664
E 1724111.6219



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2-6	2.35	20	—	—	48
G	H	I	J	K	
10	2.0	20	0.25	100	

Remarks _____

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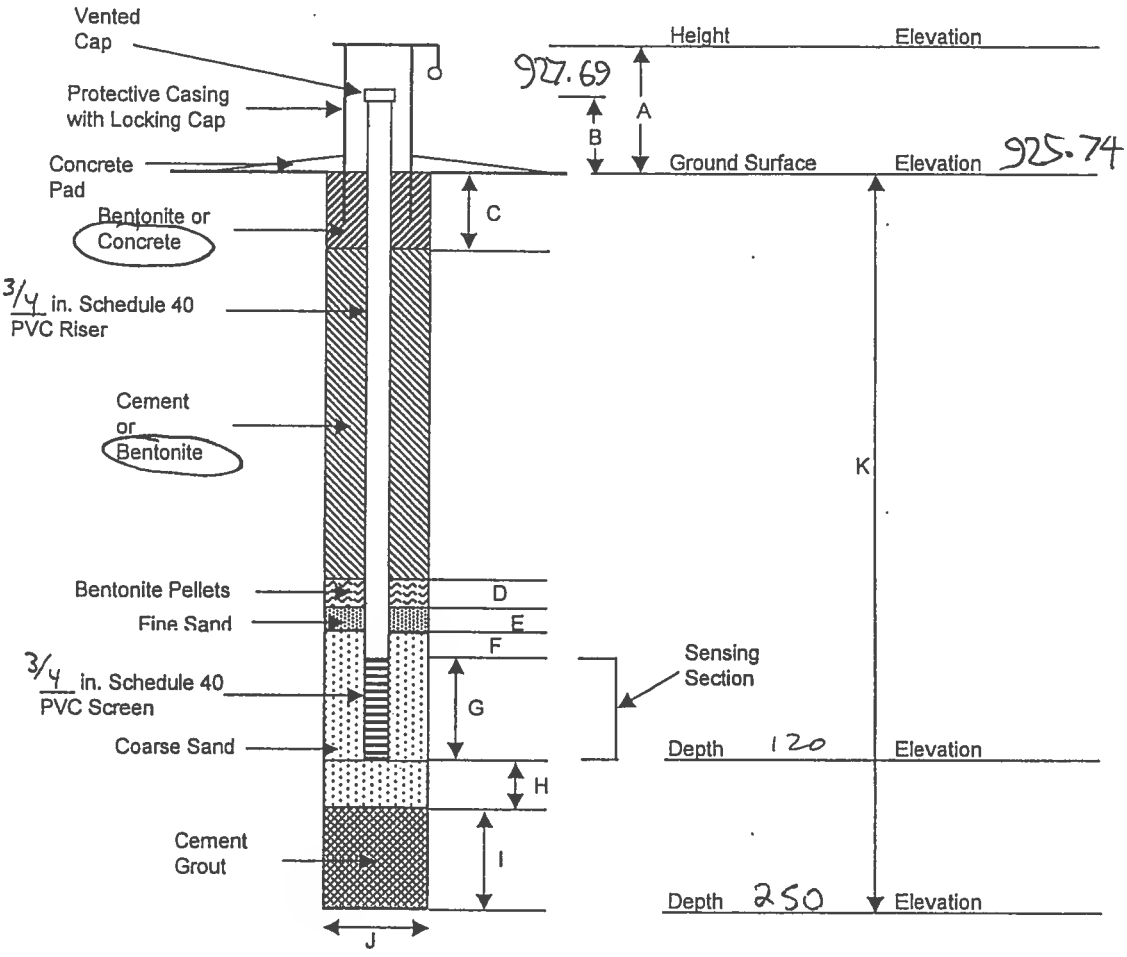
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 10 MAY 2005 Engineer/Geologist DBS Well No. B-0510 ~~(TW)~~

N 540879. 8326
E 1722795. 6504



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.6	1.95	30	—	—	70
G	H	I	J	K	
20	2	128.7	0.25	250.7	

Remarks _____

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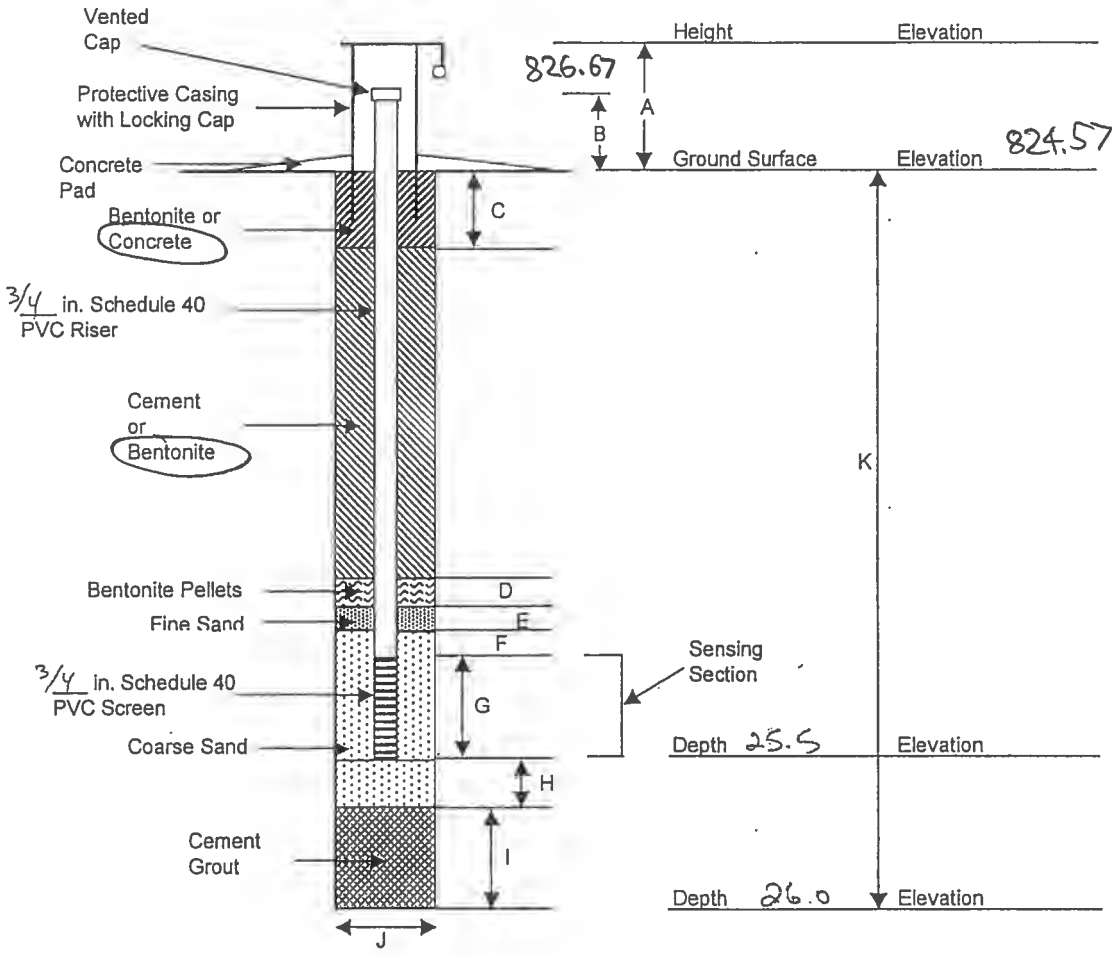
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3, JOHN E. AMOS POWER PLANT Project No. C040324.45-01

Date 04 MAY 2005 Engineer/Geologist DBS Well No. B-0511

N 541746.9425
E 172416.3536



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.45	2.1	3.5	—	—	12.0
G	H	I	J	K	
10	0.5	—	0.25	26.0	

Remarks _____

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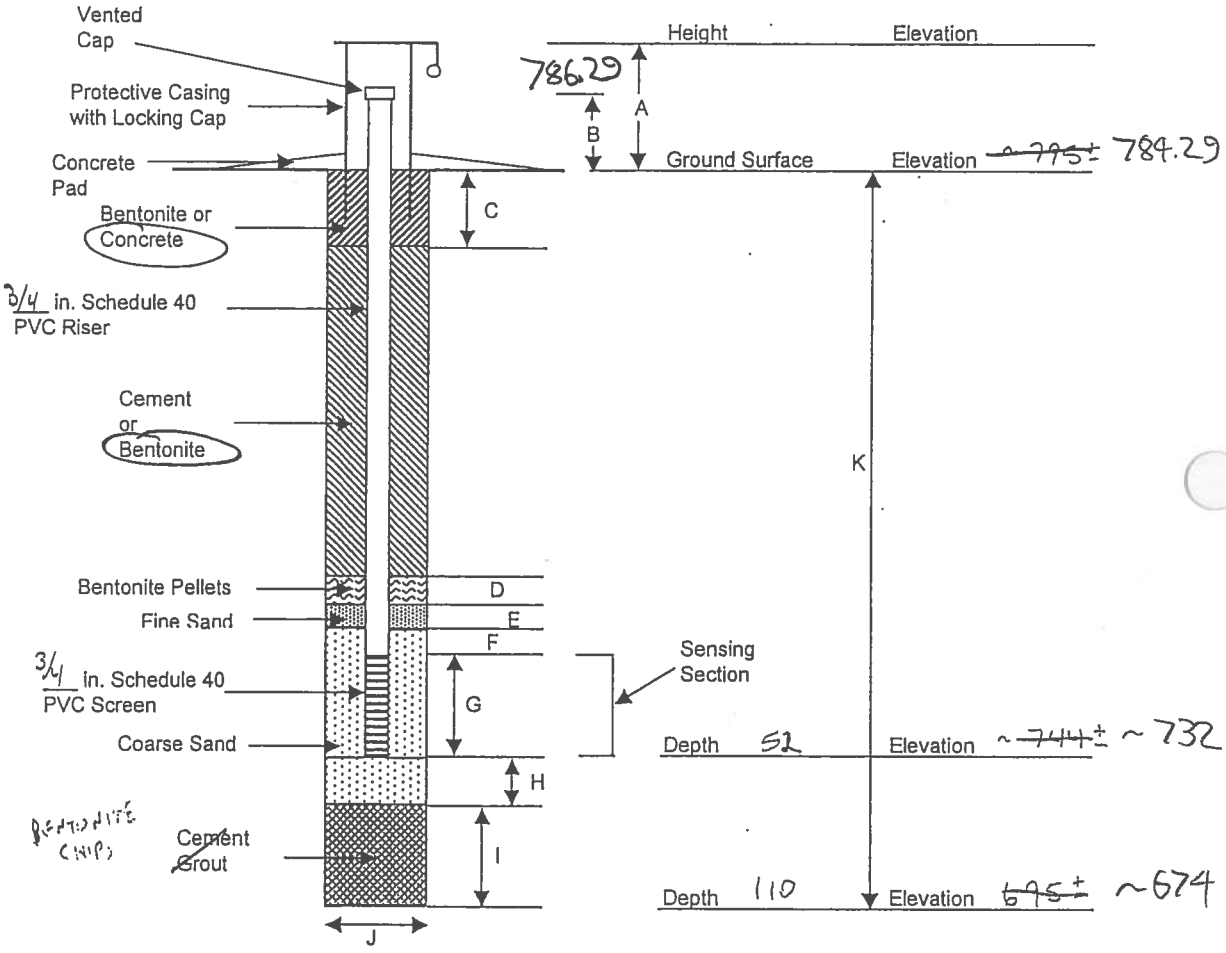
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C0403P4.41-01

Date 06 MAY 2005 Engineer/Geologist DBS Well No. B-0512

N 542140.8876
E 1724101.7636



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.6	2.0	20.0	—	—	22.0
G	H	I	J	K	
10	2	56	0.25	110	

Remarks PIEZOMETER B-0513 INSTALLED IN SAME BORE HOLE (TIP AT 14/FT)

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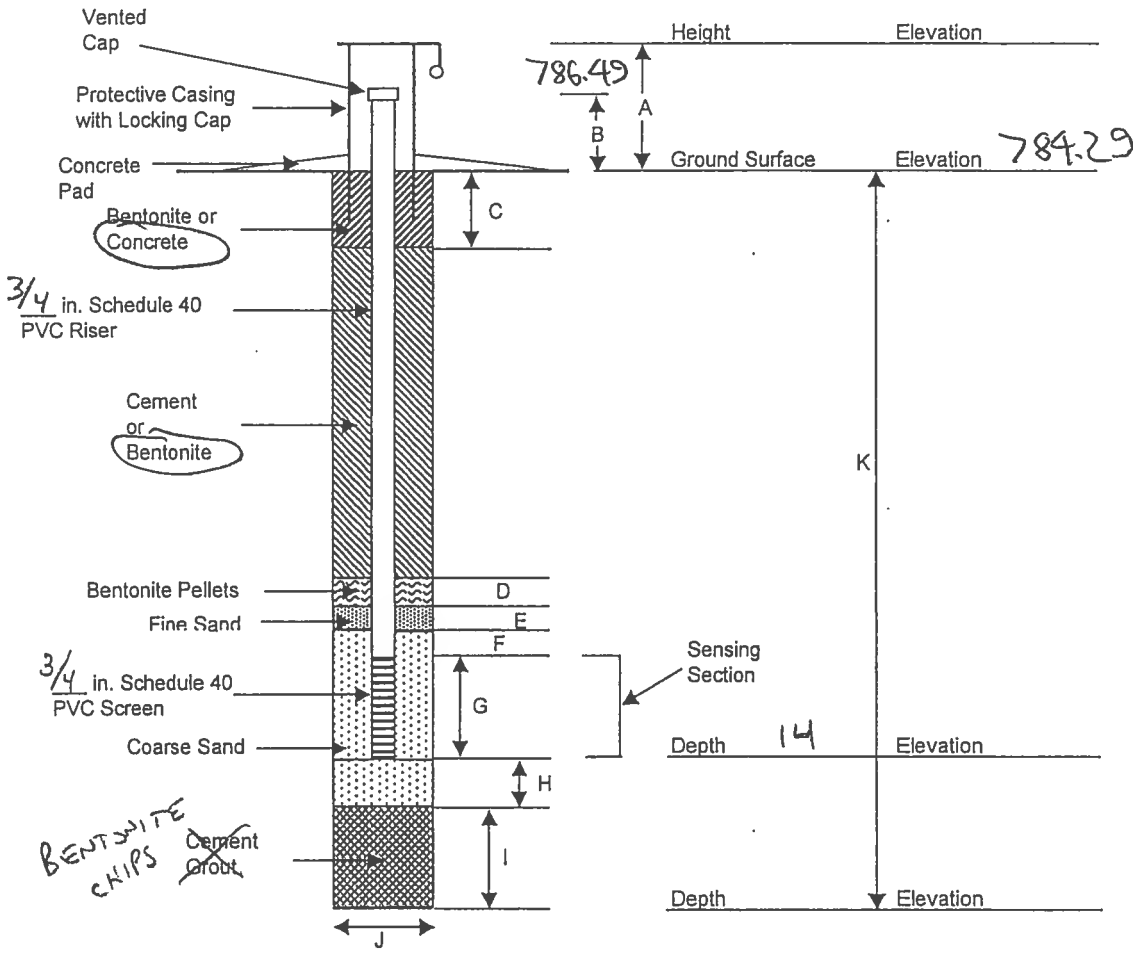
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 06 MAY 2005 Engineer/Geologist DBS Well No. B-0513

N 542140.8876
E 1724101.7636



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.6	2.2	3	—	—	1.5
G	H	I	J	K	
10	2	3**	0.25	*	

Remarks *NOTE: PIEZOMETER INSTALLED IN SAME BORE HOLE AS B-0512

** 2 FT SEAL BETWEEN SAND PACK FOR B-0512 AND SAND PACK FOR B-0513

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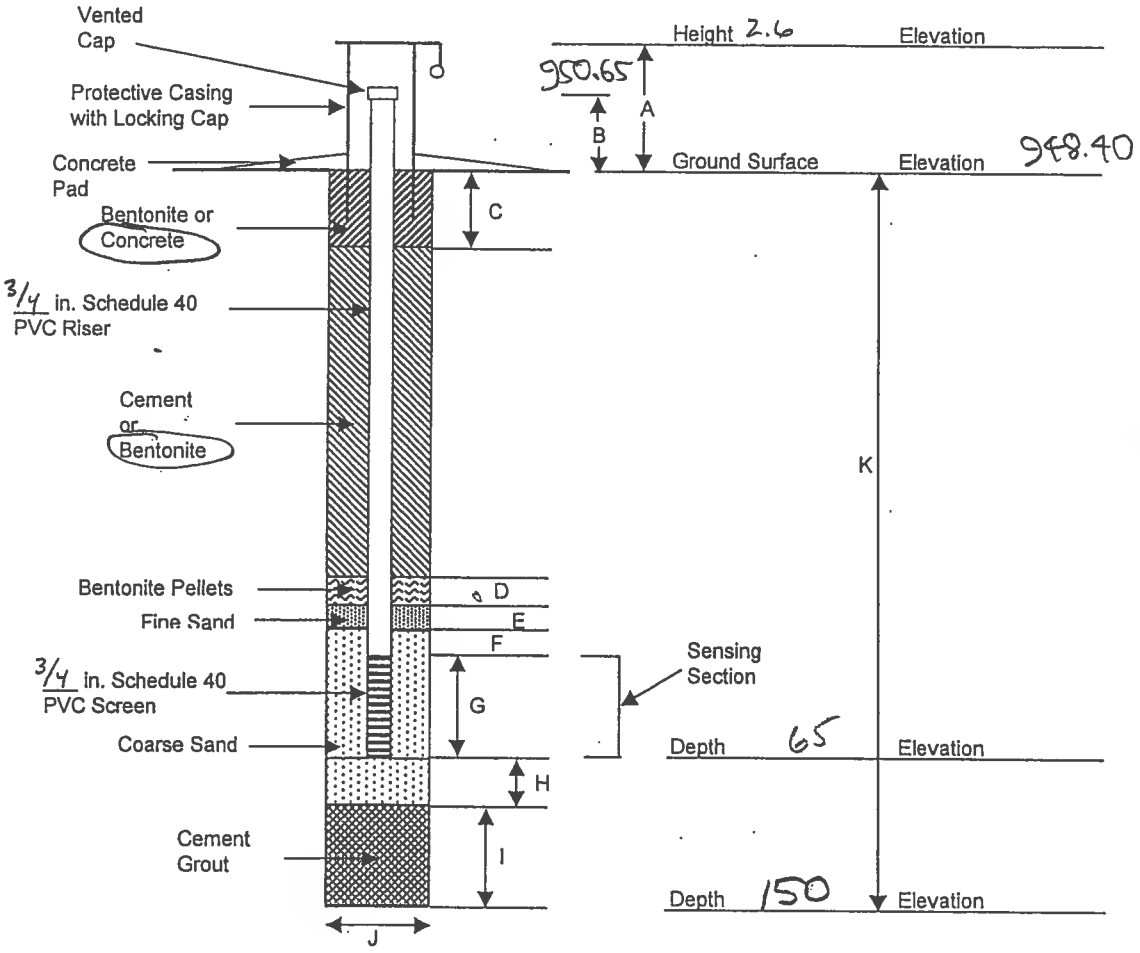
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 12 MAY 2005 Engineer/Geologist DBS Well No. B-051 (+2?)

N 540555.6419
E 1725145.9412



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.6	2.25	17	—	—	38
G	H	I	J	K	
10	2	83	0.25	150	—

Remarks _____

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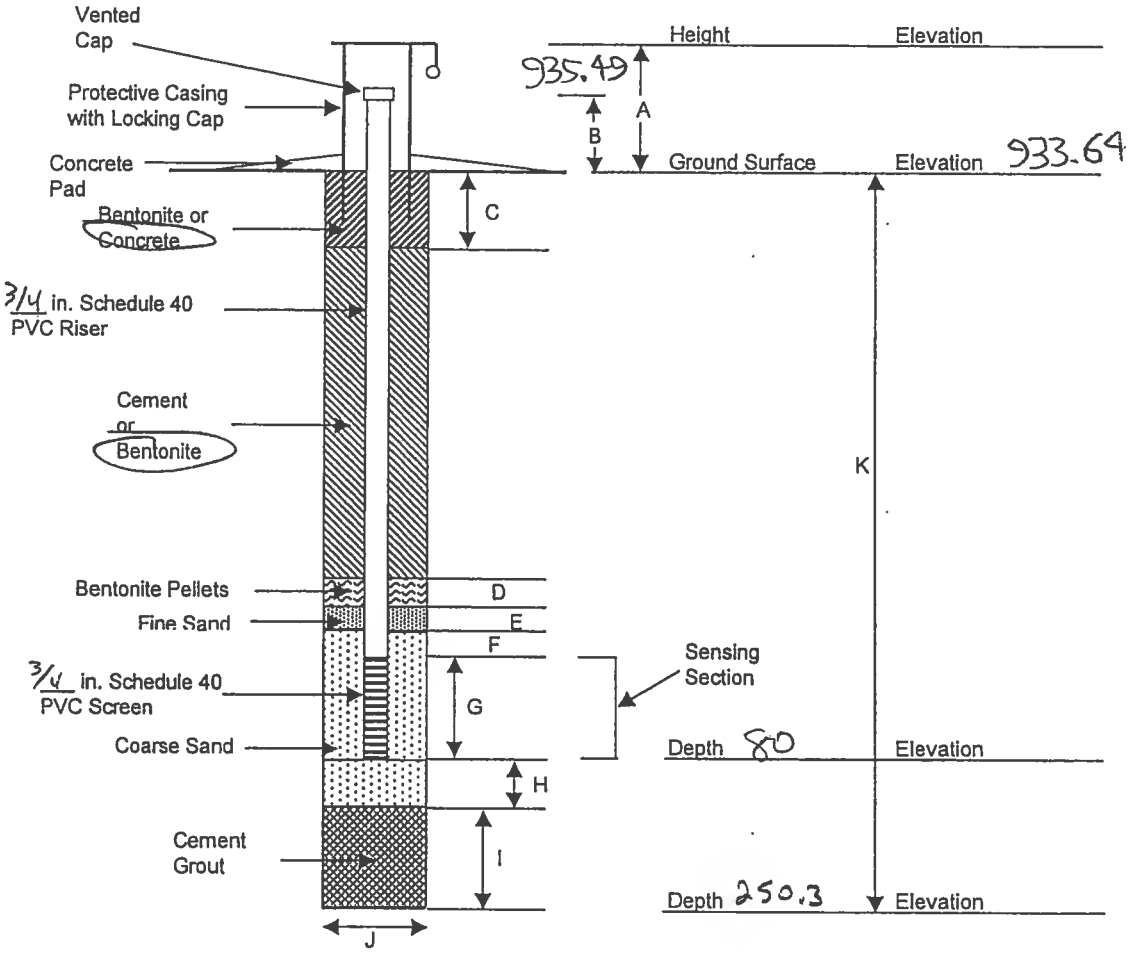
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3, JOHN E. AMOS POWER PLANT Project No. C040384.40-01

Date 16 MAY 2005 Engineer/Geologist DBS Well No. B-0515

N 539572.1065
E 1723680.1660



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.1	1.85	20.0	—	—	50
G	H	I	J	K	
10	2	168.3	0.25	250.3	

Remarks _____

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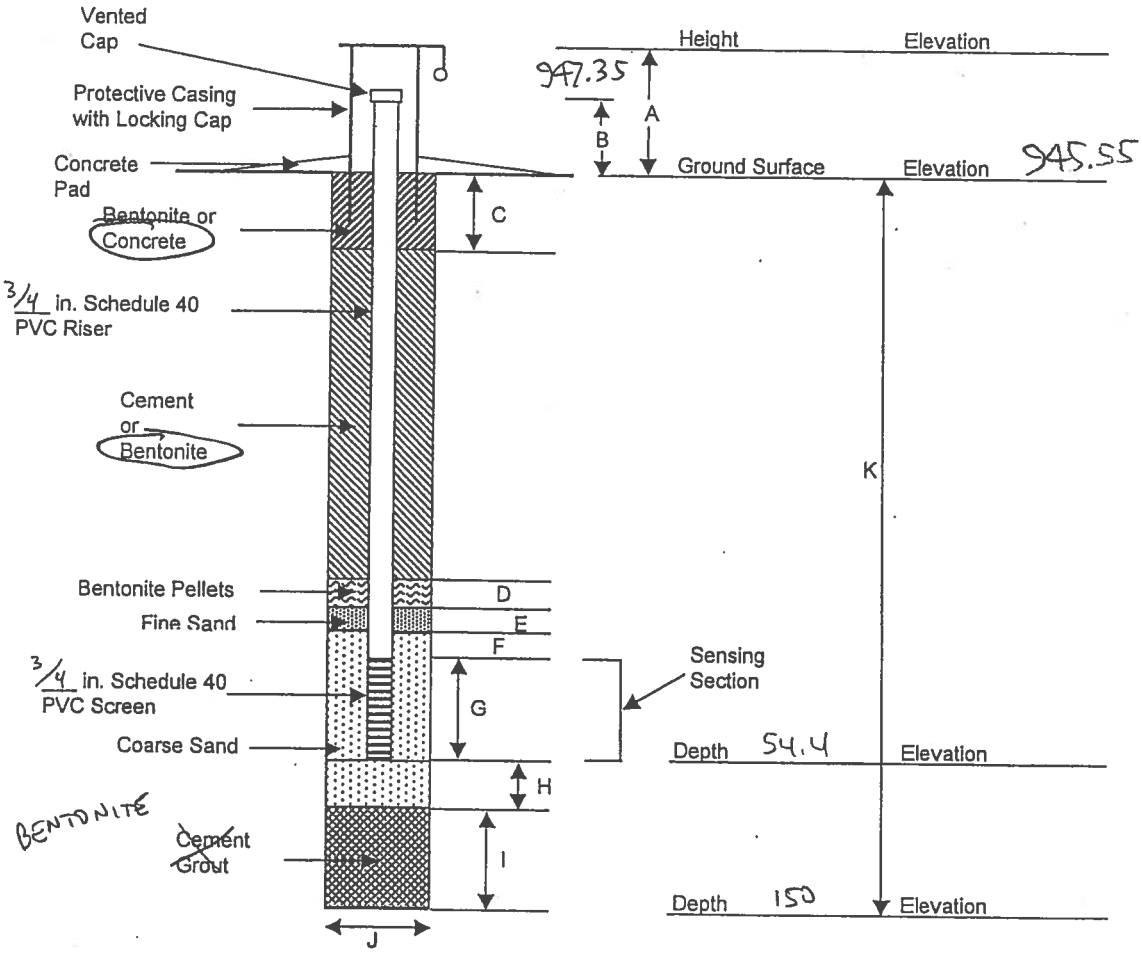
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 19 MAR 2005 Engineer/Geologist DBS Well No. B-0517

N 542185.2965
E 1725391.3276



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.3	1.8	14	—	—	30.4
G	H	I	J	K	
10	2	93.6	0.25	150	

Remarks PACKER ASSEMBLY STUCK IN HOLE. SALVAGED UPPER PACKER AND PUMP. PUSHED REMAINDER DOWN HOLE.

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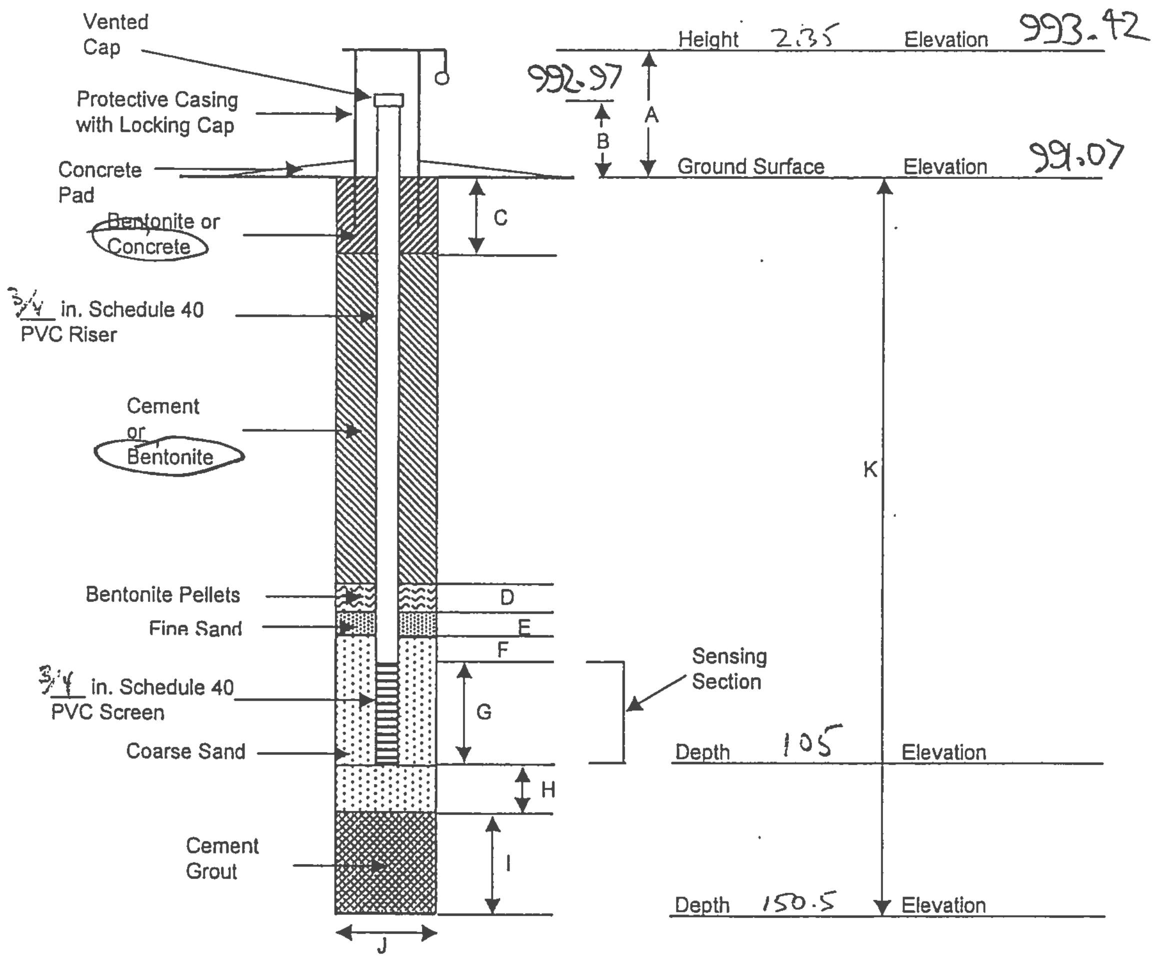
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 3/9 CONNEAUT FORGE PLANT Project No. 040384.40-01

Date 19 MAY 2005 Engineer/Geologist DBS Well No. B-0519

N 543732.8856
E 1725136.5233



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.35	1.9	15	—	—	80
G	H	I	J	K	
10	3	42.5	0.25	150.5	

Remarks ______________________

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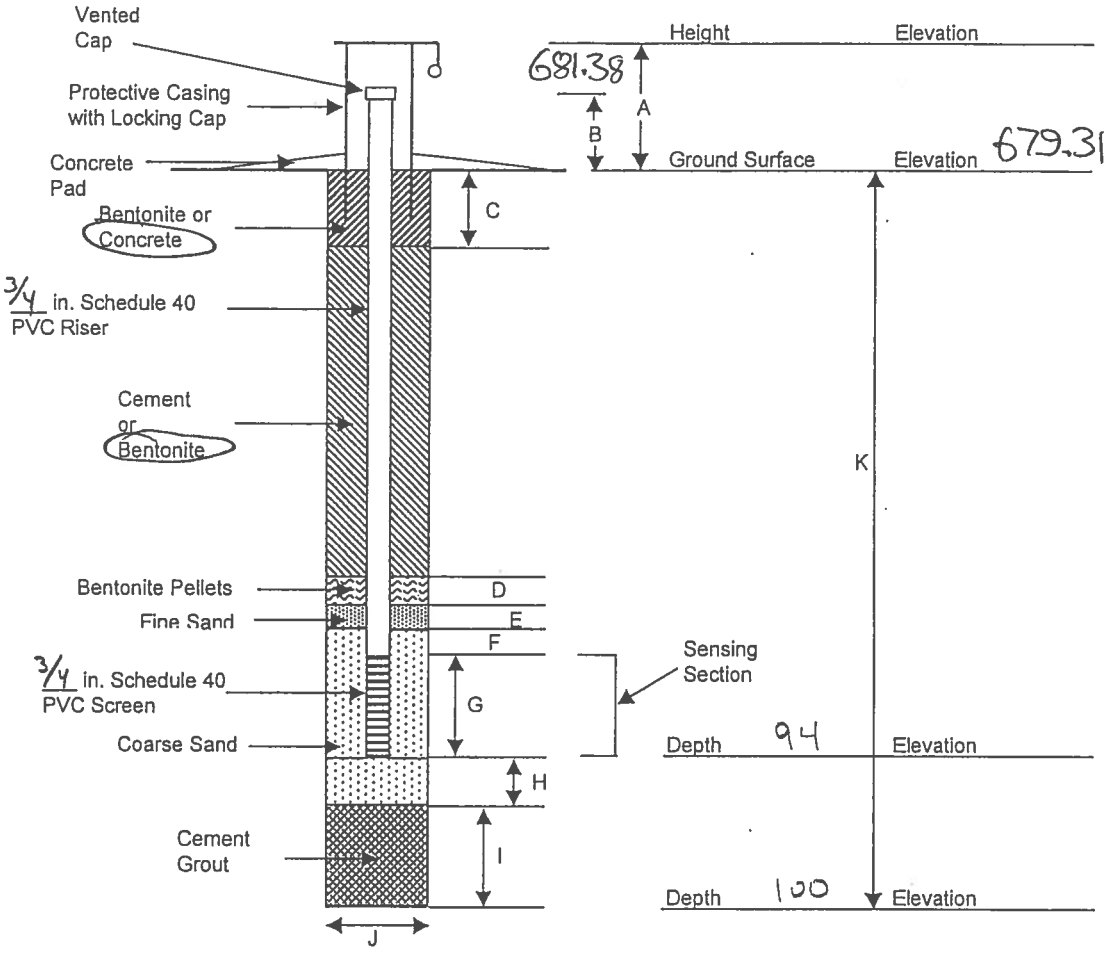
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT — Project No. C04037.84.V5-01

Date 24 MAY 2005 — Engineer/Geologist DBS — Well No. B-0520

N 542378.3755
E 1721739.7942



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.4	2.07	34	—	—	50
G	H	I	J	K	
10	2	4	0.25	100	

Remarks _____

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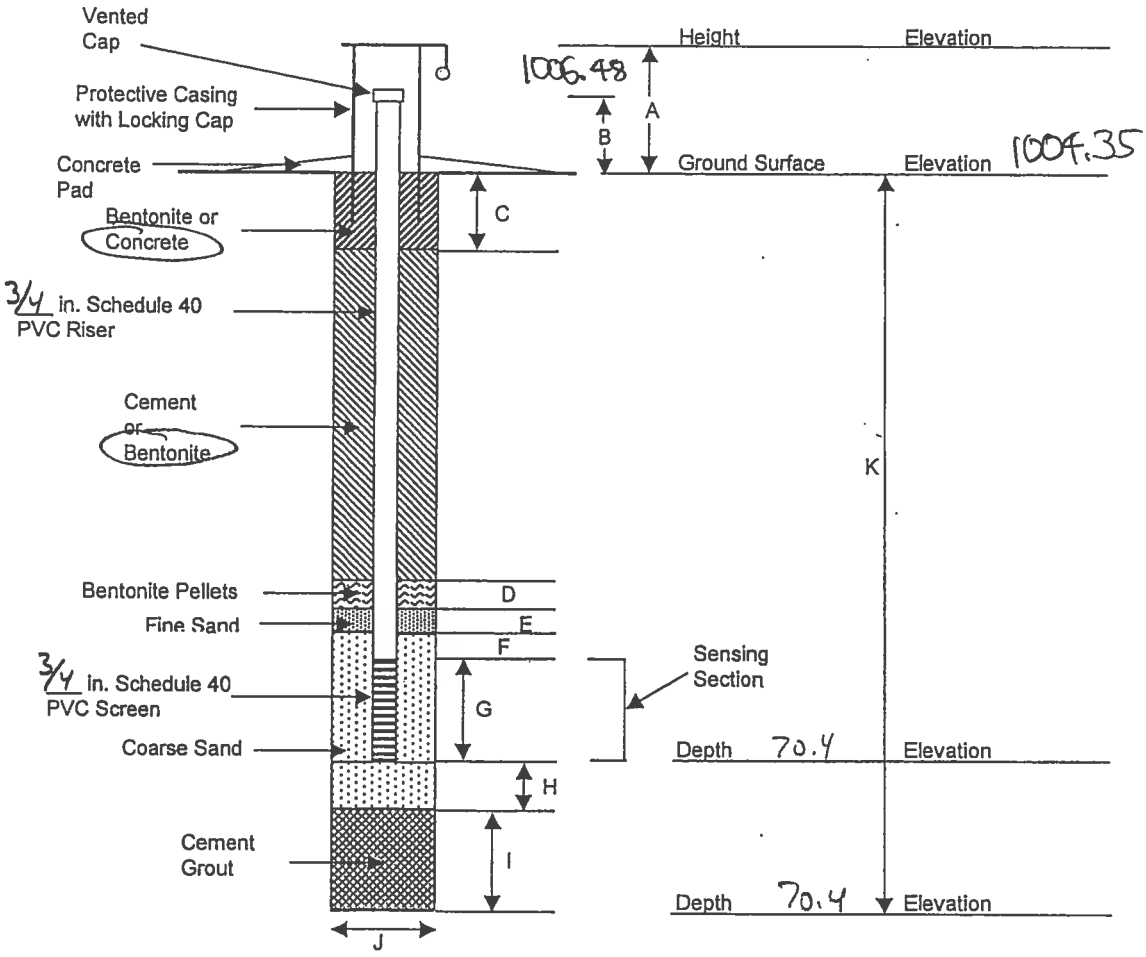
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3, AMOS POWER PLANT Project No. C040384.40-01

Date 23 MAY 2005 Engineer/Geologist DBS Well No. B-0521

N 544199.5521
E 1724054.5791



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.58	2.13	12.4	—	—	48
G	H	I	J	K	
10	—	—	0.125	70.4	

Remarks _____

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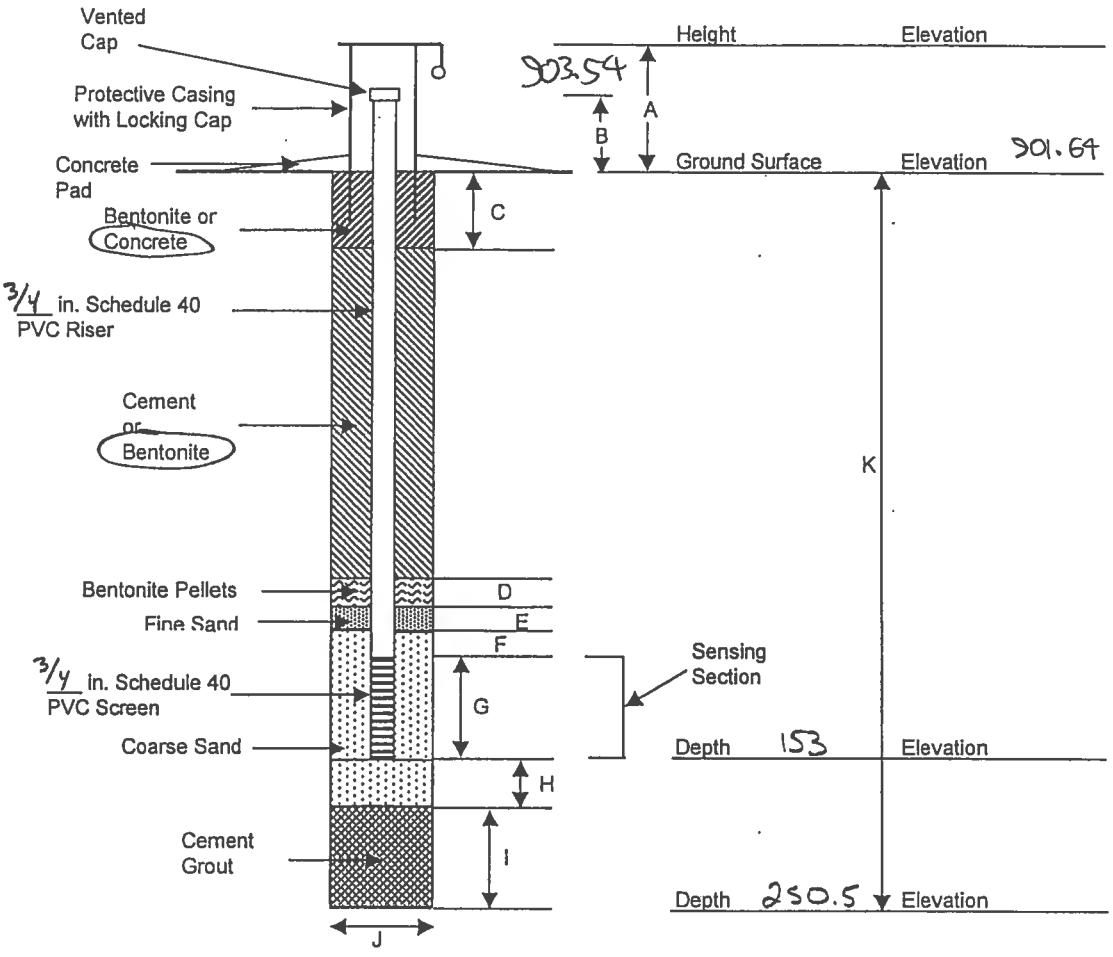
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 25/26 MAY 2005 Engineer/Geologist DBS Well No. B-0522

N 543873.4417
E 172326.4148



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.18	1.9	35	—	—	98
G	H	I	J	K	
20	2	95.5	0.25	250.5	

Remarks _____

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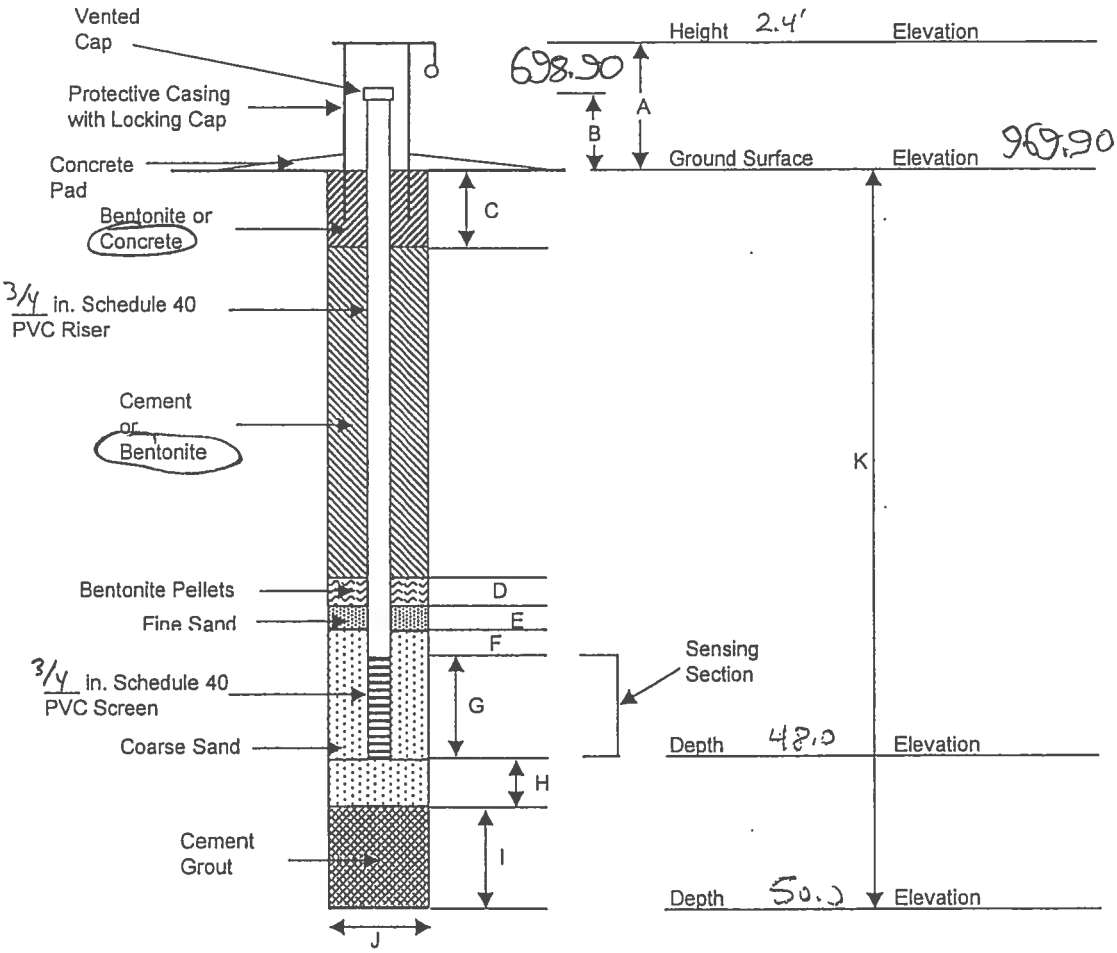
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3 AMOS POWER PLANT Project No. C040384.40-01

Date 25 MAY 2005 Engineer/Geologist DBS Well No. B-0523

N 542742.2422
E 1722248.6749



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.4	2.0	24	—	—	14
G	H	I	J	K	
10	2	—	0.25	50.0	

Remarks _____

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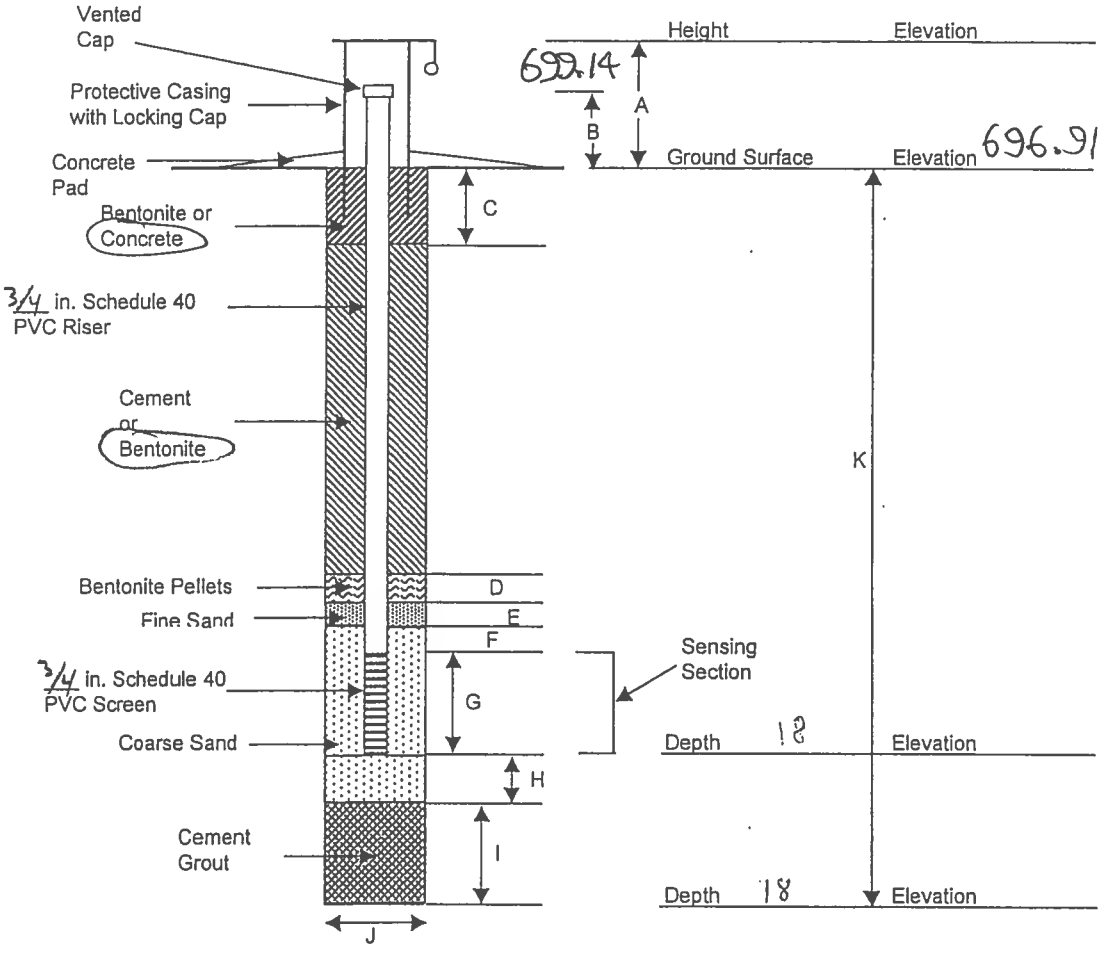
MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AREA 2/3, AMOS POWER PLANT Project No. C040324.43-01

Date 25 MAY 2005 Engineer/Geologist DBS Well No. B-0524

N 542745.0961
E 1722251.4149



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.55	2.23	3	—	—	5
G	H	I	J	K	
10	—	—	0.25	18	

Remarks _____

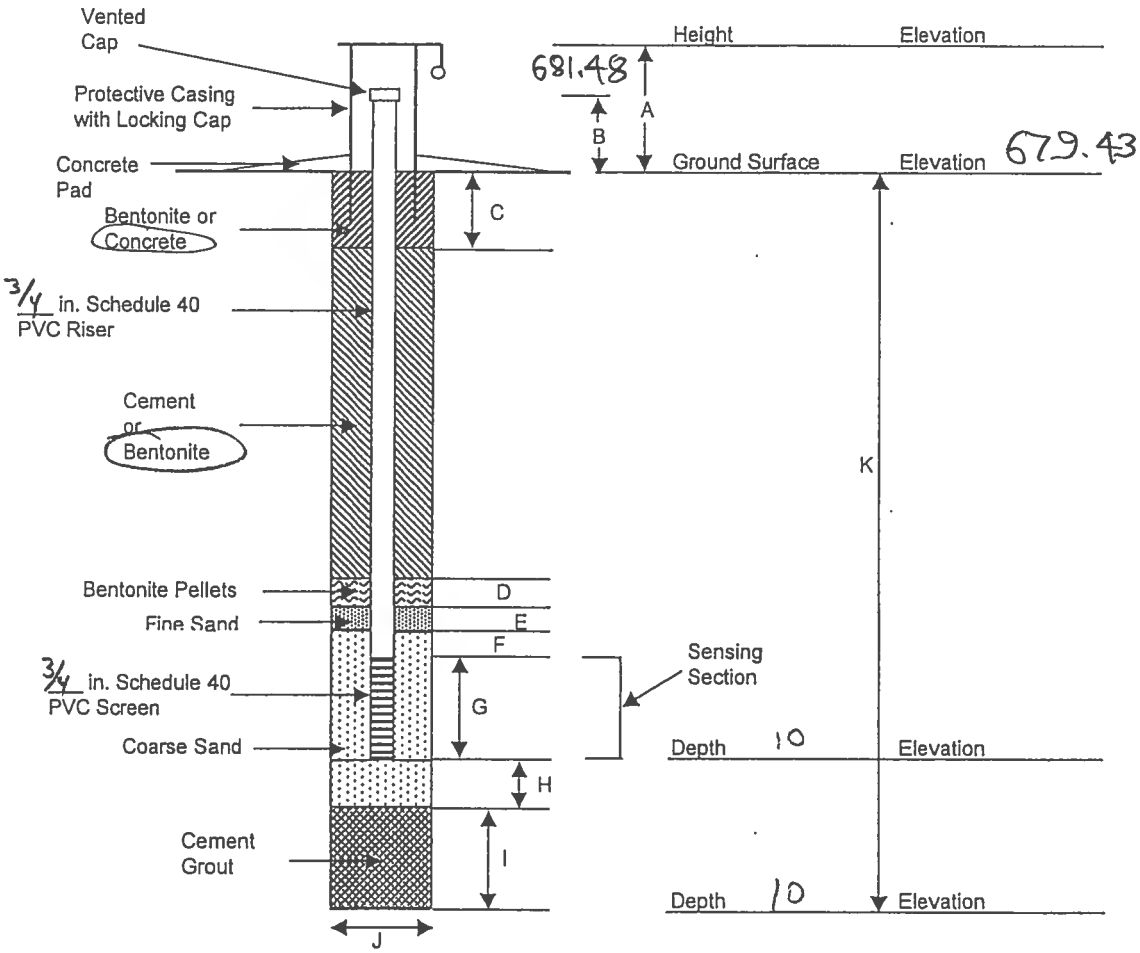
gai consultants
transforming ideas into reality

MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project ALEA 2/3 AMOS POWER PLANT Project No. 604324.10-01

Date 25 MAY 2025 Engineer/Geologist DBS Well No. B-0525

N 542379.9472
E 1721745.3620



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.3	2.05	2	—	—	3
G	H	I	J	K	
5	0	—	0.25	10	

Remarks _____

TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

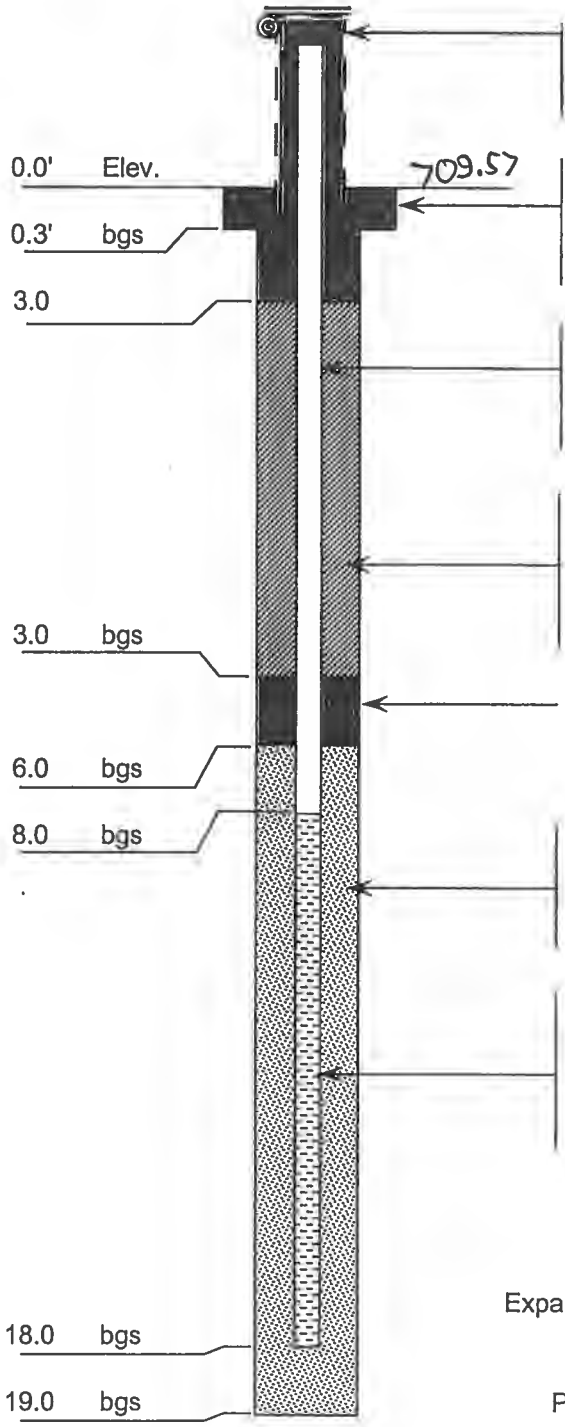
Geotechnical & Environmental Drilling

Well No: 05-36/MW-1 **Project:** John E. Amos Power Plant

Well Tag: 0275-24-05 **TTI Proj. No:** 05639

Date Installed: 07/12/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 28' 41.8" **Longitude:** W 081° 51' 33.8"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	10	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	N/A	lbs.

Bentonite 87 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	9	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	10	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0024-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0024-05
Grid Location:
a. Latitude: 38 28 41 ..8
b. Longitude: 81 51 33 ..8
c. Method Used: GPS

Company/Project Well No.:
05639/05-36-MW-1

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

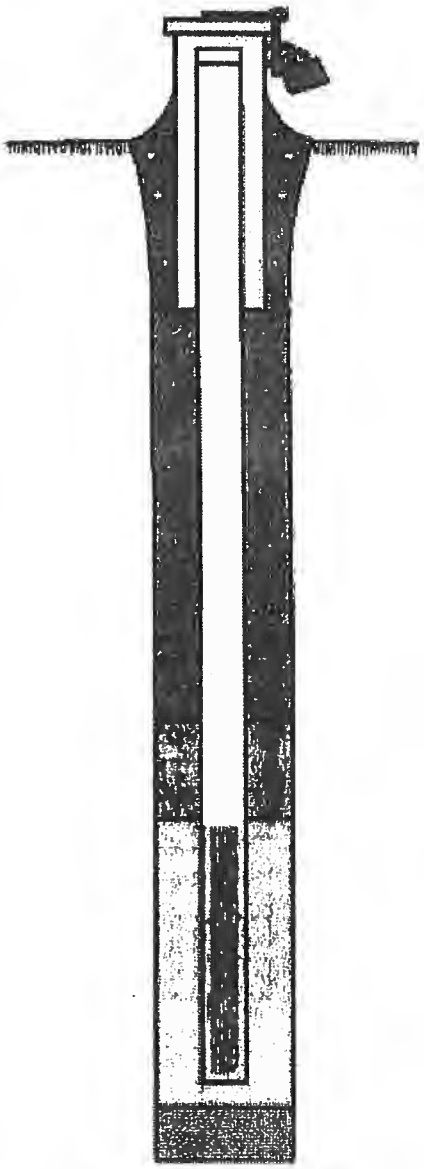
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
07/12/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1. Cap and Lock: YES
2. Protective Cover: Protective Cover Pipe
3. Monitoring Well Reference Point: 0 ft.
4. Borehole Diameter: 4 inches.
5. Ground Surface Seal:
   a. Material: concrete
   b. Installation Procedure: Hand Mixed
6. Surface Seal Bottom/Annular Space Top: 3 ft.
7. Well Riser: a. OD Well Riser: 2.38 inches. b. ID Well Riser: 2 inches.
   c. Material: PVC
   d. Installation Procedure: Thru Augers & Open Bedrock Hole
8. Annular Space Seal:
   a. Material: not applicable -
   b. Installation Procedure: pour
9. Well Development Procedure: other - By Client
10. Drilling Method Used: percussion -
11. Annular Space Seal Bottom/Filter Seal Top: 3 ft.
12. Drilling Fluid Used: Yes Source: Air
13. Filter Pack Seal:
    a. Material: bentonite pellet
    b. Installation Procedure: Gravity Fed
    c. Volume Added: 87 pounds
14. Bottom of Bentonite Seal/Filter Pack Top: 6 ft.
15. Depth to Top of Screen: 8 ft.
16. Screen:
    a. Material: PVC
    b. Installation Procedure: Thru Augers & Open Bedrock Hole
    c. Slot Size: .01 inches. d. Screen Length: 10 ft.
17. Filter Pack:
    a. Material: medium sand
    b. Installation Procedure: Gravity Fed
18. Well Depth: 18 ft.
19. Bottom of Filter Pack: 19 ft.
20. Bottom of Borehole: 19 ft.
21. Backfill Material (below filter pack): Sand
22. Decontamination Procedures: None
23. Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24. WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

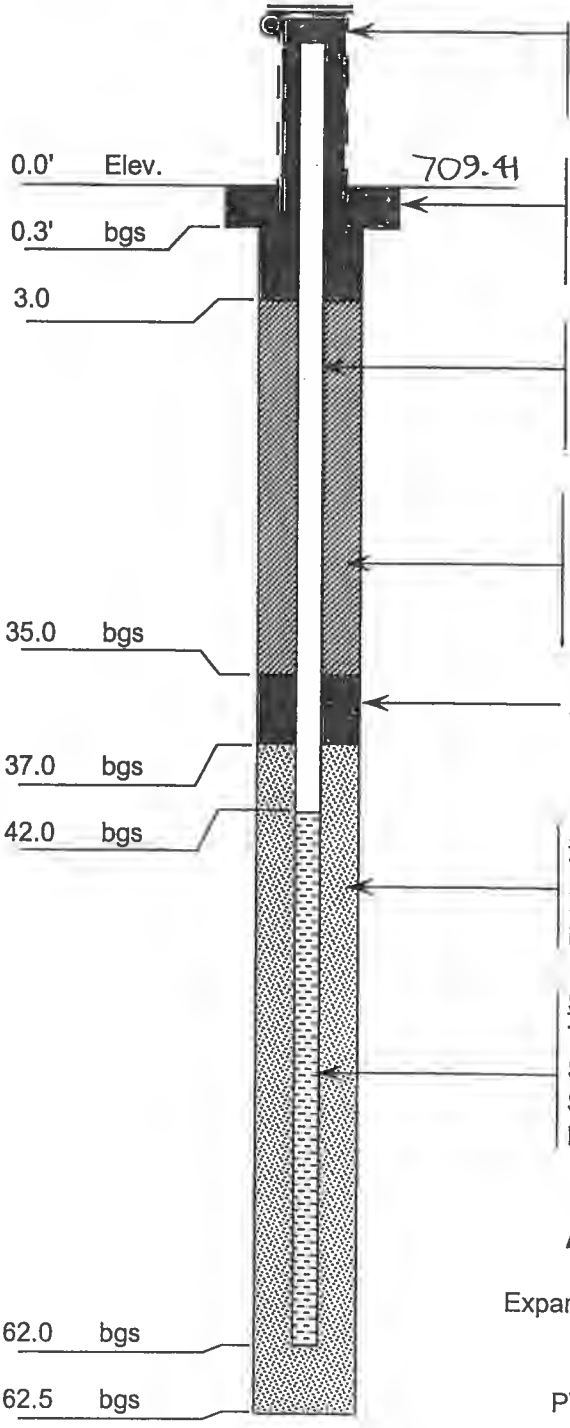
Geotechnical & Environmental Drilling

Well No: 05-35/MW-2 **Project:** John E. Amos Power Plant

Well Tag: 0275-25-05 **TTI Proj. No:** 05639

Date Installed: 07/12/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 28' 41.8" **Longitude:** W 081° 51' 33.3"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	44	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	200	lbs.

Bentonite 12.5 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0025-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0025-05
Grid Location:
a. Latitude: 38 28 41 ..8
b. Longitude: 81 51 33 ..3
c. Method Used: GPS

Company/Project Well No.:
05639/05-35-MW-2

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

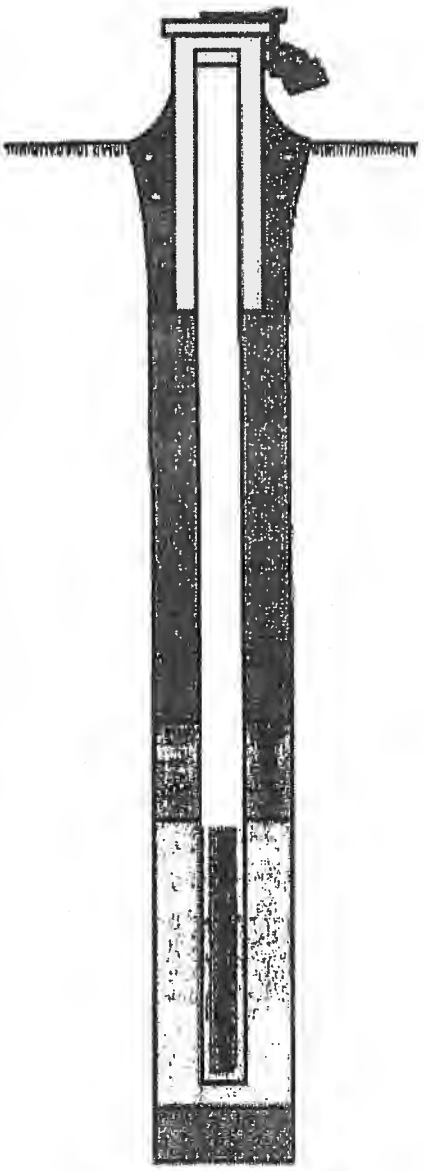
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
07/12/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 35 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 12.5 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 37 ft.
15.Depth to Top of Screen: 42 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravty Fed
18.Well Depth: 62 ft.
19.Bottom of Filter Pack: 62.5 ft.
20.Bottom of Borehole: 62.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

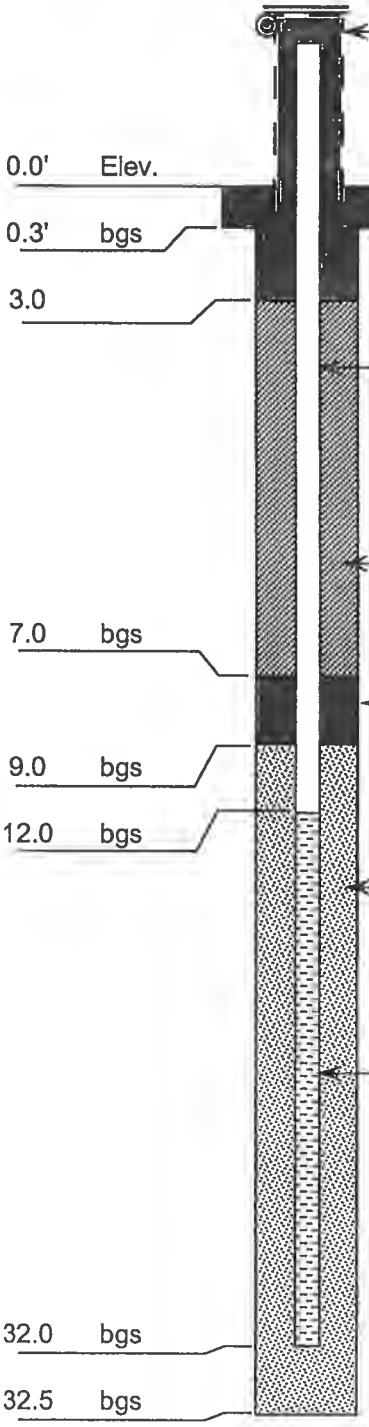
Geotechnical & Environmental Drilling

Well No: 05-27/MW-3 **Project:** John E. Amos Power Plant

Well Tag: 0275-26-05 **TTI Proj. No:** 05639

Date Installed: 06/27/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 29' 04.4" **Longitude:** W 081° 51' 13.5"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	14	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	25	lbs.

Bentonite 50 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	12	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0026-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0026-05
Grid Location:
a. Latitude: 38 29 4 ..4
b. Longitude: 81 51 13 ..5
c. Method Used: GPS

Company/Project Well No.:
05639/05-27-MW-3

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

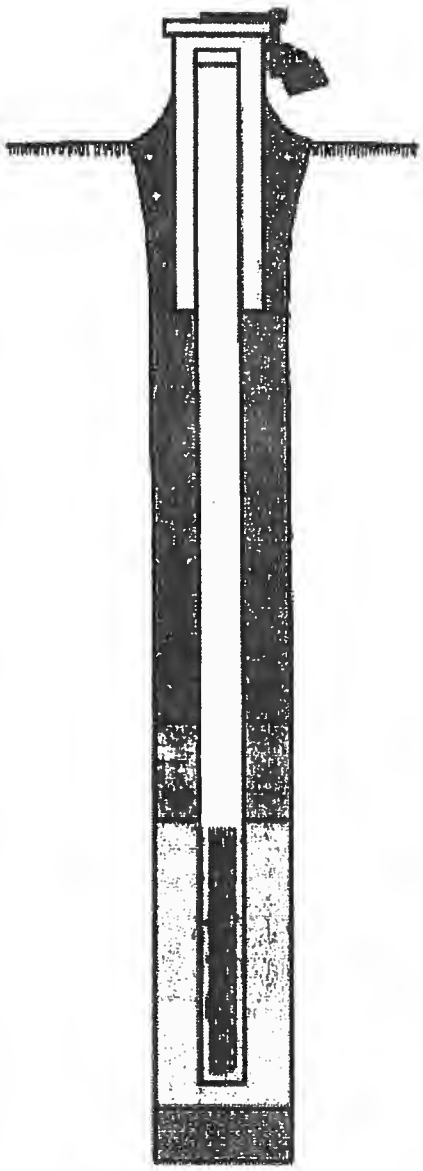
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
06/27/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 7 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 50 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 9 ft.
15.Depth to Top of Screen: 12 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity fed
18.Well Depth: 32 ft.
19.Bottom of Filter Pack: 32.5 ft.
20.Bottom of Borehole: 32.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

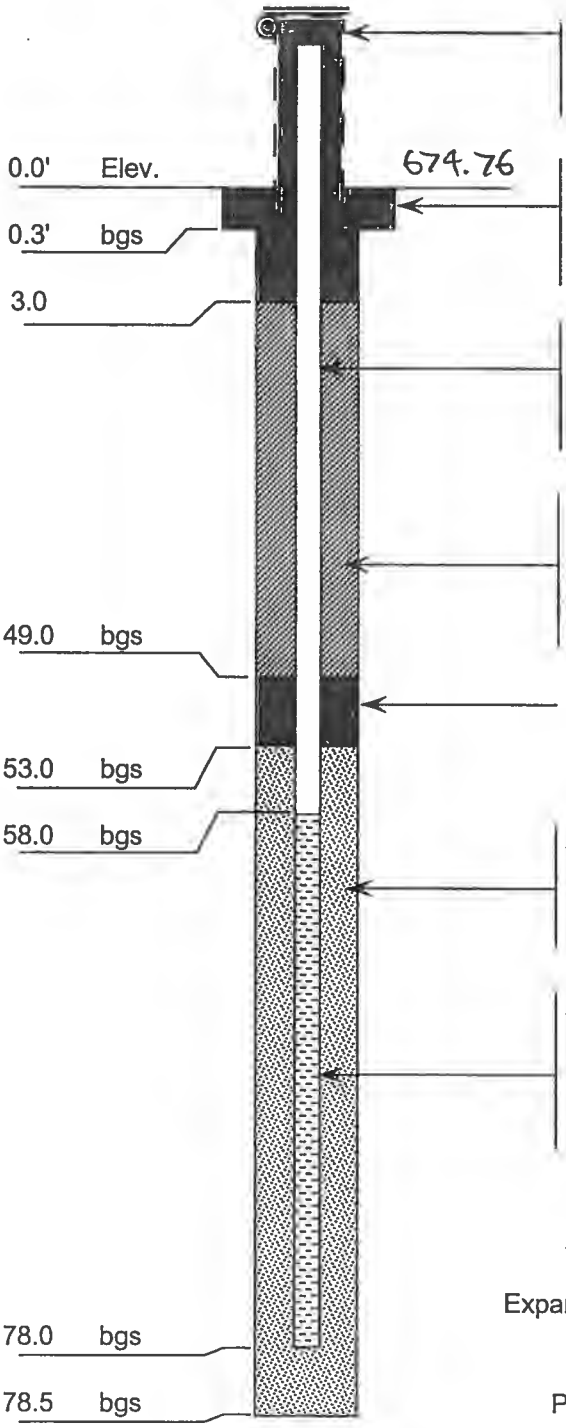
Geotechnical & Environmental Drilling

Well No: 05-32/MW-4 **Project:** John E. Amos Power Plant

Well Tag: 0275-27-05 **TTI Proj. No:** 05639

Date Installed: 07/07/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 29' 10.03" **Longitude:** W 081° 51' 45.0"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	60	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	100	lbs.

Bentonite 50 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0027-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0027-05
Grid Location:
a. Latitude: 38 29 10 ..03
b. Longitude: 81 51 45 .
c. Method Used: GPS

Company/Project Well No.:
05639/05-32-MW-4

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

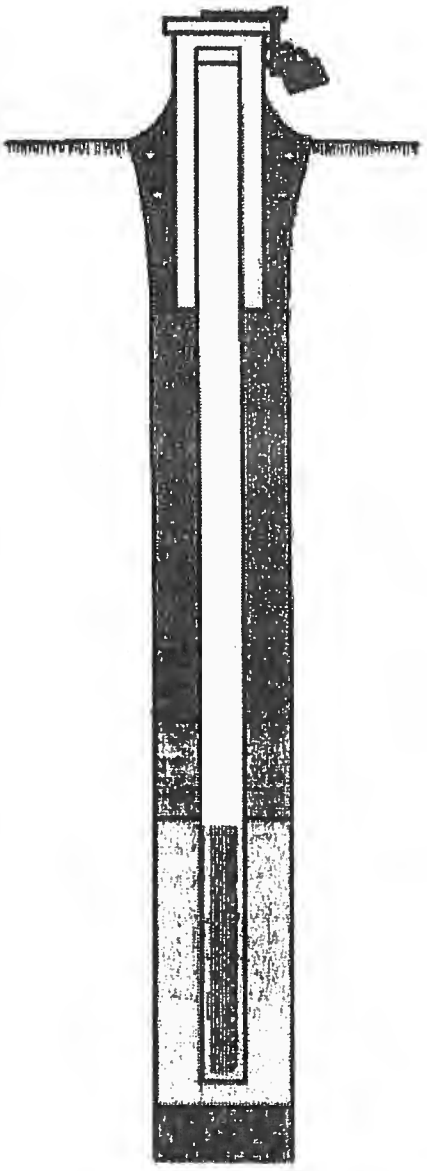
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
07/07/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 49 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 50 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 53 ft.
15.Depth to Top of Screen: 58 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 78 ft.
19.Bottom of Filter Pack: 78.5 ft.
20.Bottom of Borehole: 78.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

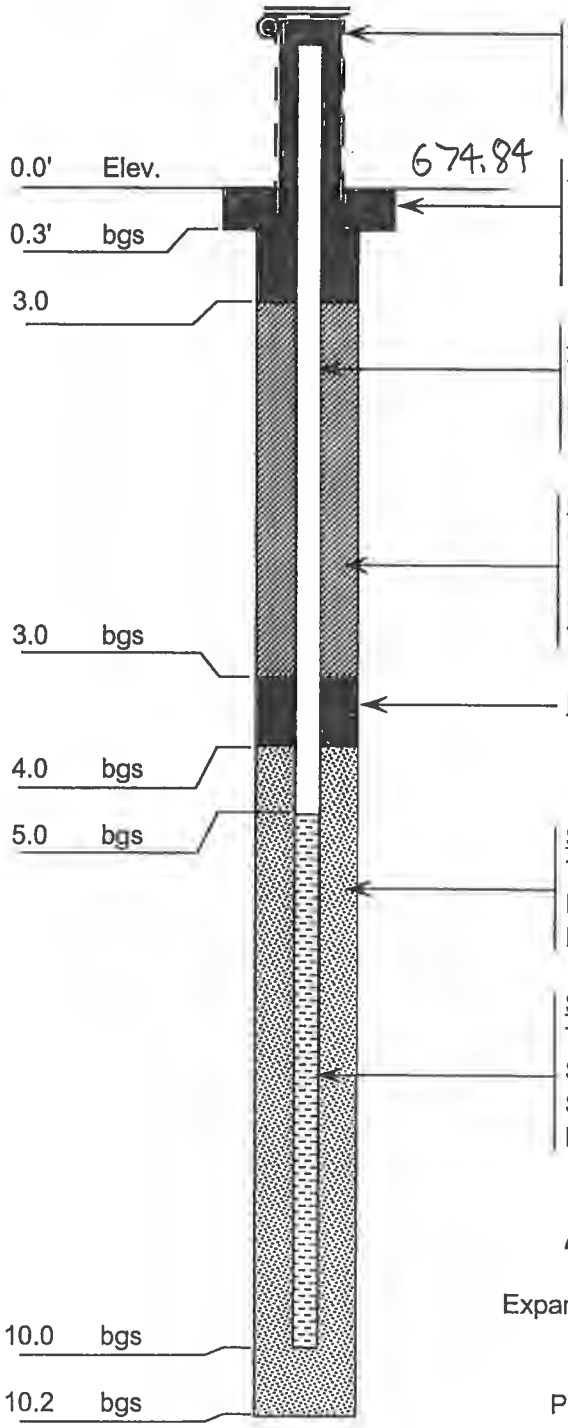
Geotechnical & Environmental Drilling

Well No: 05-33/MW-5 **Project:** John E. Amos Power Plant

Well Tag: 0275-28-05 **TTI Proj. No:** 05639

Date Installed: 07/07/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 29' 10.00" **Longitude:** W 081° 51' 44.6"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	7	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	N/A	lbs.

Bentonite 25 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	5	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0028-05

Site Name/Physical Address:
Site: . Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0028-05
Grid Location:
a. Latitude: 38 29 10 .
b. Longitude: 81 51 44 ..6
c. Method Used: GPS

Company/Project Well No.:
05639/05-33-MW-5

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

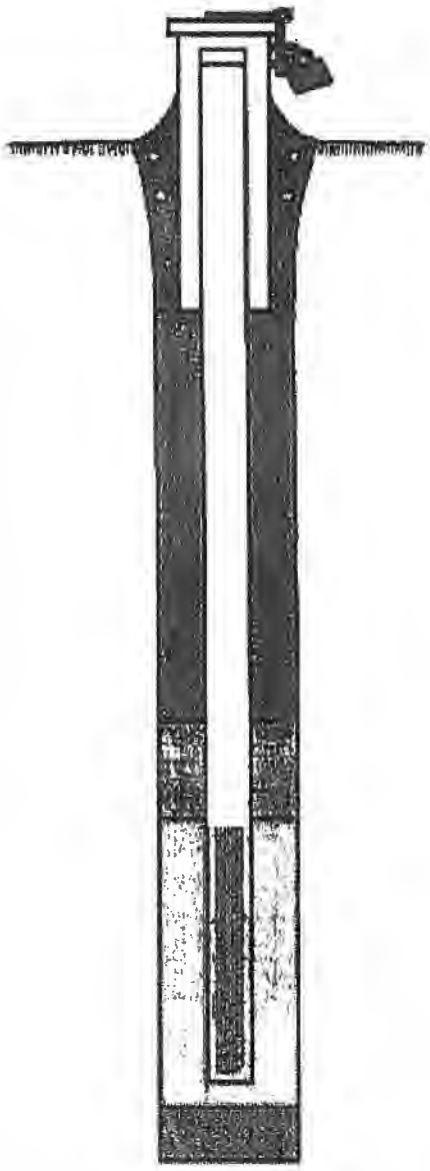
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
07/07/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 3 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 25 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 4 ft.
15.Depth to Top of Screen: 5 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 5 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 10 ft.
19.Bottom of Filter Pack: 10.2 ft.
20.Bottom of Borehole: 10.2 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

Geotechnical & Environmental Drilling

Well No: 05-26/MW-6 **Project:** John E. Amos Power Plant

Well Tag: 0275-29-05 **TTI Proj. No:** 05639

Date Installed: 06/23/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 28' 56.1" **Longitude:** W 081° 51' 30.6"

STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	60	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	125	lbs.

Bentonite 100 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0029-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0029-05
Grid Location:
a. Latitude: 38 28 56 ..1
b. Longitude: 81 51 30 ..6
c. Method Used: GPS

Company/Project Well No.:
05639/05-26-MW-6

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

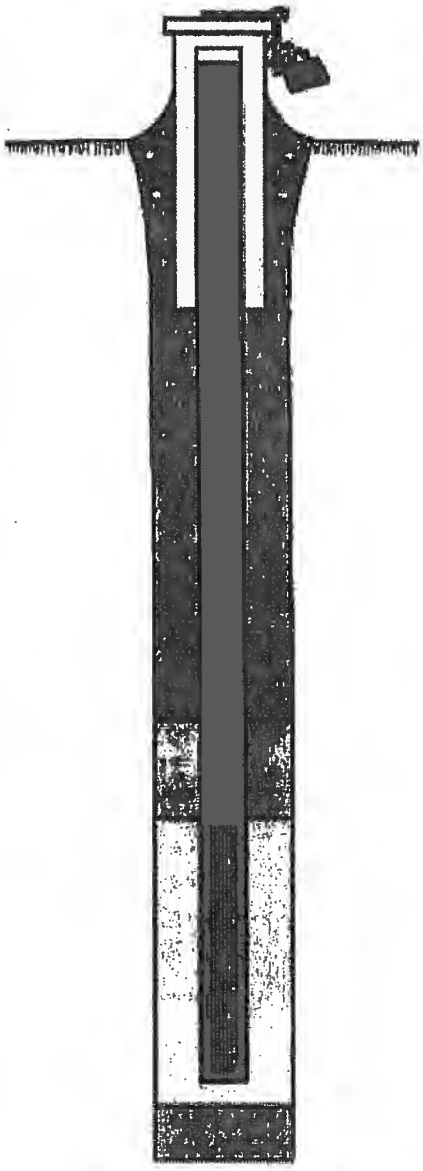
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
06/23/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 53 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 100 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 55 ft.
15.Depth to Top of Screen: 58 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 78 ft.
19.Bottom of Filter Pack: 78.5 ft.
20.Bottom of Borehole: 91 ft.
21.Backfill Material (below filter pack): Bentonite Pellets
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



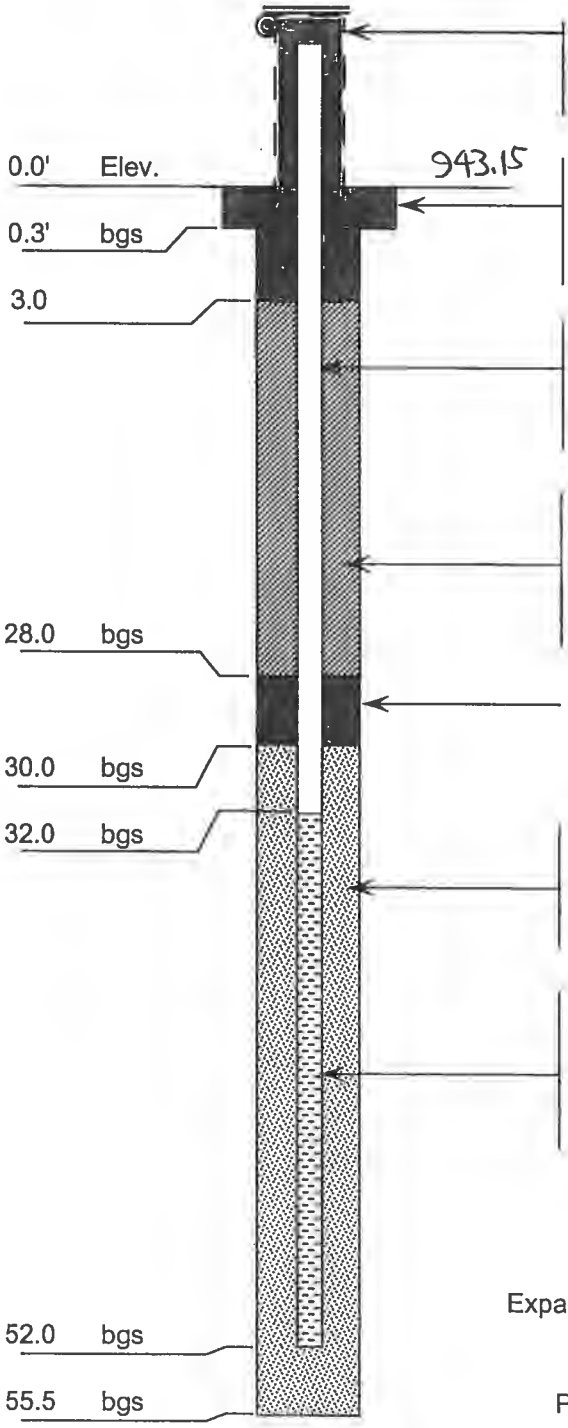
TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

Geotechnical & Environmental Drilling

Well No: 05-28/MW-7
Well Tag: 0275-30-05
Date Installed: 06/28/05
GPS Location: **Latitude:** N 39° 28' 44.1"

Project: John E. Amos Power Plant
TTI Proj. No: 05639
Client: GAI Consultants, Inc.
Longitude: W 081° 51' 15.5"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	34	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	100	lbs.

Bentonite 12.5 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0030-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0030-05
Grid Location:
a. Latitude: 38 28 44 ..1
b. Longitude: 81 51 15 ..5
c. Method Used: GPS

Company/Project Well No.:
05639/05-28-MW-7

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

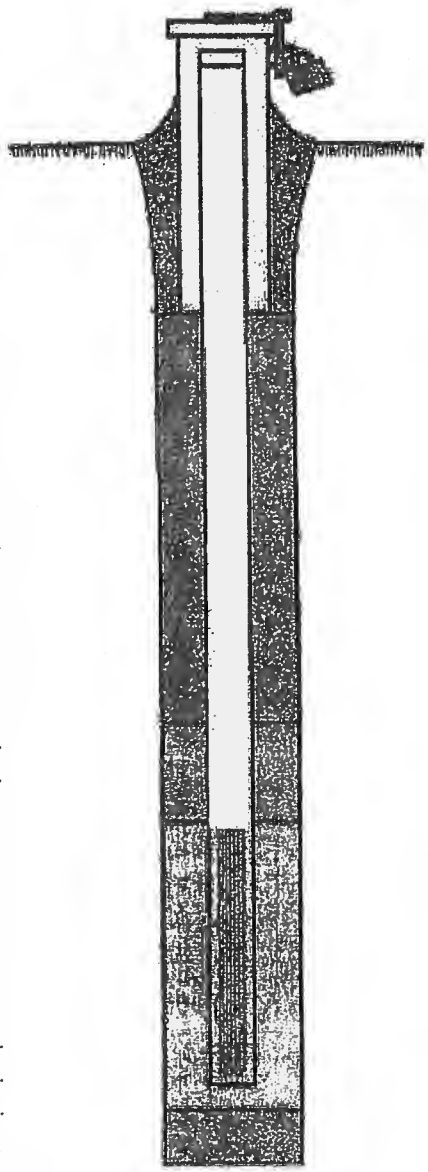
Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
06/28/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 28 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 12.5 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 30 ft.
15.Depth to Top of Screen: 32 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 52 ft.
19.Bottom of Filter Pack: 55.5 ft.
20.Bottom of Borehole: 55.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



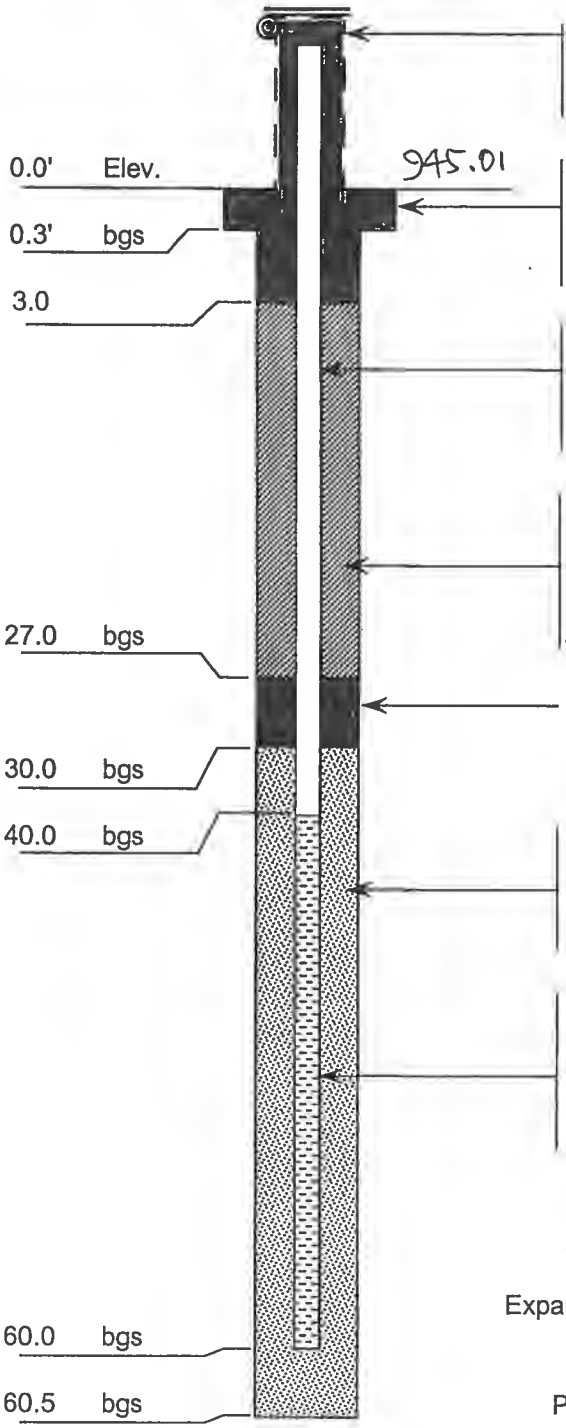
TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

Geotechnical & Environmental Drilling

Well No: 05-34/MW-~~11~~08
Well Tag: 0275-33-05
Date Installed: 07/11/05
GPS Location: **Latitude:** N 38° 29' 09.3"

Project: John E. Amos Power Plant
TTI Proj. No: 05639
Client: GAI Consultants, Inc.
Longitude: W 081° 50' 57.5"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	42	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	150	lbs.

Bentonite 12.5 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	5	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0033-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

Well Registration No. WV00275-0033-05
Grid Location:
a. Latitude: 38 29 9 ..3
b. Longitude: 81 50 57 ..3
c. Method Used: GPS

Company/Project Well No.:
05639/05-34-MW-11

Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Purpose of Monitoring Well:
Monitor Groundwater

Date Well Installed:
07/11/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 27 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 12.5 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 30 ft.
15.Depth to Top of Screen: 40 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 60 ft.
19.Bottom of Filter Pack: 60.5 ft.
20.Bottom of Borehole: 60.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350

TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

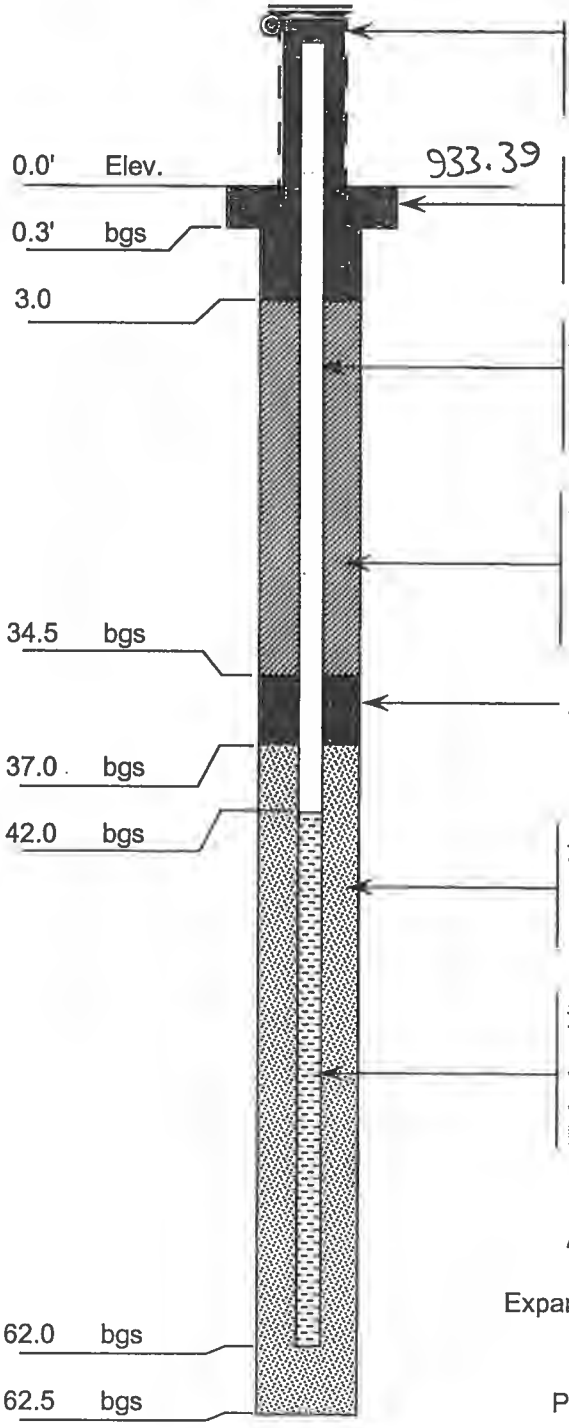
Geotechnical & Environmental Drilling

Well No: 05-30/MW-9 **Project:** John E. Amos Power Plant

Well Tag: 0275-31-05 **TTI Proj. No:** 05639

Date Installed: 06/30/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 29' 29.1" **Longitude:** W 081° 51' 8.8"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	44	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	100	lbs.

Bentonite 12.5 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	4	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0031-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0031-05
Grid Location:
a. Latitude: 38 29 29 ..1
b. Longitude: 81 51 8 ..8
c. Method Used: GPS

Company/Project Well No.:
05639/05-30-MW-9

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

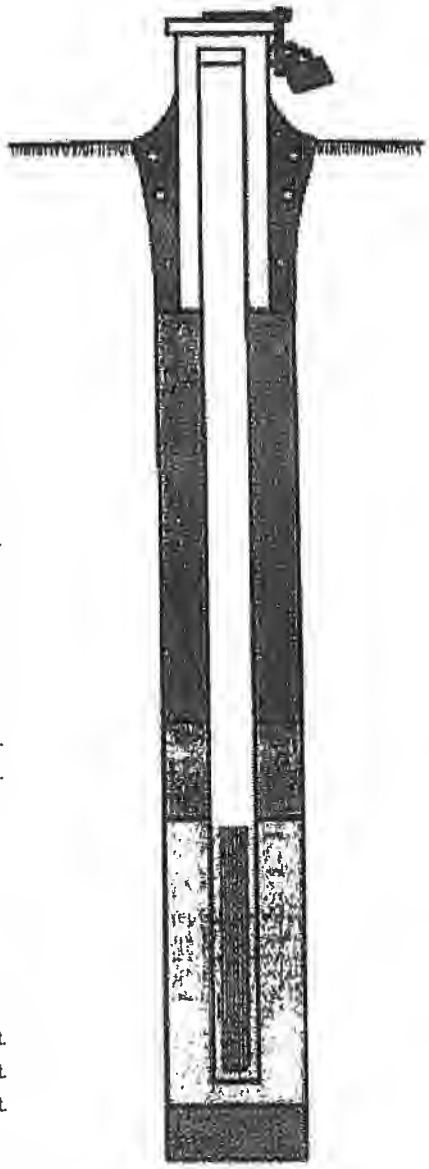
Installed By (Name, Firm, Address):
Installer: Jim Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
06/30/2005

Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1.Cap and Lock: YES
2.Protective Cover: Protective Cover Pipe
3.Monitoring Well Reference Point: 0 ft.
4.Borehole Diameter: 4 inches.
5.Ground Surface Seal:
a.Material: concrete
b.Installation Procedure: Hand Mixed
6.Surface Seal Bottom/Annular Space Top: 3 ft.
7.Well Riser: a.OD Well Riser: 2.38 inches. b.ID Well Riser: 2 inches.
c.Material: PVC
d.Installation Procedure: Thru Augers & Open Bedrock Hole
8.Annular Space Seal:
a.Material: high solids grout -
b.Installation Procedure: pour
9.Well Development Procedure: other - By Client
10.Drilling Method Used: percussion -
11.Annular Space Seal Bottom/Filter Seal Top: 34.5 ft.
12.Drilling Fluid Used: Yes Source: Air
13.Filter Pack Seal:
a.Material: bentonite pellet
b.Installation Procedure: Gravity Fed
c.Volume Added: 12.5 pounds
14.Bottom of Bentonite Seal/Filter Pack Top: 37 ft.
15.Depth to Top of Screen: 42 ft.
16.Screen:
a.Material: PVC
b.Installation Procedure: Thru Augers & Open Bedrock Hole
c.Slot Size: .01 inches. d.Screen Length: 20 ft.
17.Filter Pack:
a.Material: medium sand
b.Installation Procedure: Gravity Fed
18.Well Depth: 62 ft.
19.Bottom of Filter Pack: 62.5 ft.
20.Bottom of Borehole: 62.5 ft.
21.Backfill Material (below filter pack): sand
22.Decontamination Procedures: None
23.Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24.WV Contractor License No. WV002350



TERRA TESTING

WELL / PIEZOMETER SCHEMATIC

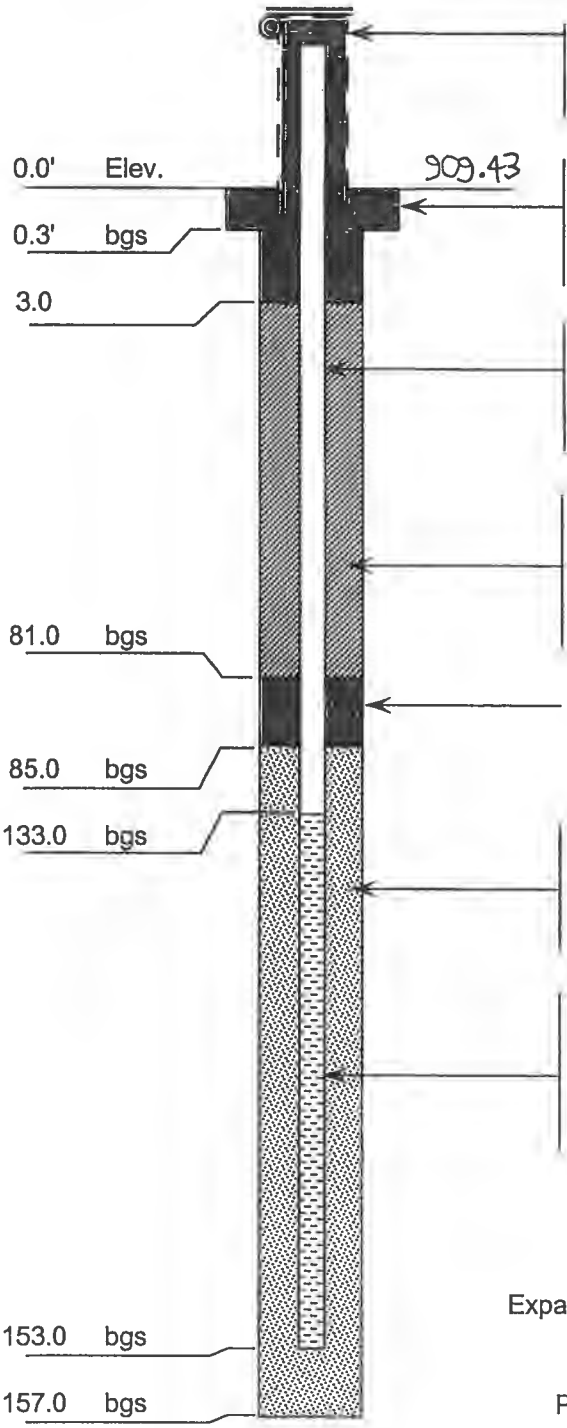
Geotechnical & Environmental Drilling

Well No: 05-31/MW-10 **Project:** John E. Amos Power Plant

Well Tag: 0275-32-05 **TTI Proj. No:** 05639

Date Installed: 07/06/05 **Client:** GAI Consultants, Inc.

GPS Location: **Latitude:** N 38° 29' 27.7" **Longitude:** W 081° 51' 30.3"



STEEL PROTECTIVE COVER (Stick-up)

Size:	6" x 5'
Riser Stick-up:	2'

CONCRETE PAD

Size:	6' diameter
No. of Bags:	10
Bags Size:	80

Riser:

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Length	135	feet

Grout Backfill

Cement:	N/A	No. of Bags
Bags Size:	N/A	lbs.
Gran. Bentonite	N/A	lbs.
Volclay	225	lbs.

Bentonite 12.5 lbs.

Sand Pack

Type:	Best #430	
Bags Size:	50	lbs.
No. of Bags	10	

Screen

Type:	Sch. 40 PVC	
Size:	2	inches I.D.
Slot Size:	0.01	inches
Length:	20	feet

Additional Well Supplies

Expanding Locking Cap	Y
Locks	
PVC Slip Cap	
PVC Threaded Cap	
PVC Bottom Plug	Y
Auger Plugs	
No. of 55-gallon Drums Used	
No of Guard Posts Used	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction
Well Number: WV00275-0032-05

Site Name/Physical Address:
Site: Proposed Landfill
Line 1: Area 2/3
Line 2: Blue Lick Road
City: Windfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00275-0032-05
Grid Location:
a. Latitude: 38 29 27 ..7
b. Longitude: 81 51 30 ..3
c. Method Used: GPS

Company/Project Well No.:
05639/05-31-MW-10

Purpose of Monitoring Well:
Monitor Groundwater

Well Owner (Name, Firm, Address):
Owner: Tom Carroll
Line 1: John E. Amos Power Plant
Line 2: 1530 Winfield Road
City: Windfield
State: WV
Zip: 25213-
Phone: 304-759-3156

Installed By (Name, Firm, Address):
Installer: Vern Curtis / Douglas Novotny
Line 1: Terra Testing, Inc.
Line 2: 260 Meadowlands Boulevard
City: Washington
State: PA
Zip: 15301-
Phone: 724-746-9100

Date Well Installed:
07/06/2005

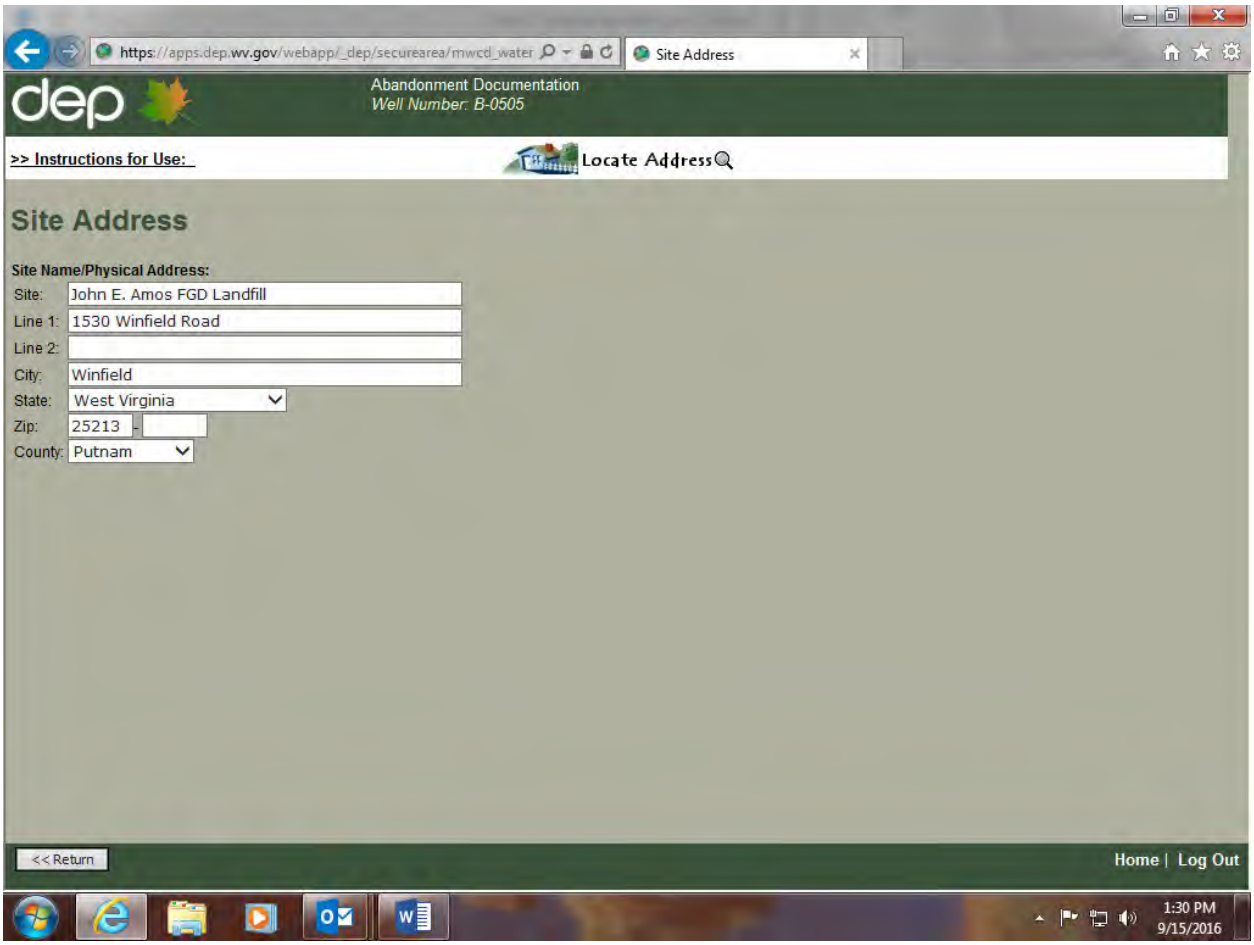
Driller's WV Cert No.
WV00275

Section B: (all number fields must be in decimal format)

1. Cap and Lock: YES
2. Protective Cover: Protective Cover Pipe
3. Monitoring Well Reference Point: 0 ft.
4. Borehole Diameter: 4 inches.
5. Ground Surface Seal:
   a. Material: concrete
   b. Installation Procedure: Hand Mixed
6. Surface Seal Bottom/Annular Space Top: 3 ft.
7. Well Riser: a. OD Well Riser: 2.38 inches. b. ID Well Riser: 2 inches.
   c. Material: PVC
   d. Installation Procedure: Thru Augers & Open Bedrock Hole
8. Annular Space Seal:
   a. Material: high solids grout -
   b. Installation Procedure: pour
9. Well Development Procedure: other - By Client
10. Drilling Method Used: percussion -
11. Annular Space Seal Bottom/Filter Seal Top: 81 ft.
12. Drilling Fluid Used: Yes Source: Air
13. Filter Pack Seal:
    a. Material: bentonite pellet
    b. Installation Procedure: Gravity Fed
    c. Volume Added: 12.5 pounds
14. Bottom of Bentonite Seal/Filter Pack Top: 85 ft.
15. Depth to Top of Screen: 133 ft.
16. Screen:
    a. Material: PVC
    b. Installation Procedure: Thru Augers & Open Bedrock Hole
    c. Slot Size: .01 inches. d. Screen Length: 20 ft.
17. Filter Pack:
    a. Material: medium sand
    b. Installation Procedure: Gravity Fed
18. Well Depth: 153 ft.
19. Bottom of Filter Pack: 157 ft.
20. Bottom of Borehole: 157 ft.
21. Backfill Material (below filter pack): sand
22. Decontamination Procedures: None
23. Special Circumstances and Exceptions: Yes Variance Number: MW-07-05
24. WV Contractor License No. WV002350

ARCADIS

WVDEP Monitoring Well &
Piezometer Closure Information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Site Address
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Site Address
Site Name/Physical Address:
Site: John E. Amos FGD Landfill
Line 1: 1530 Winfield Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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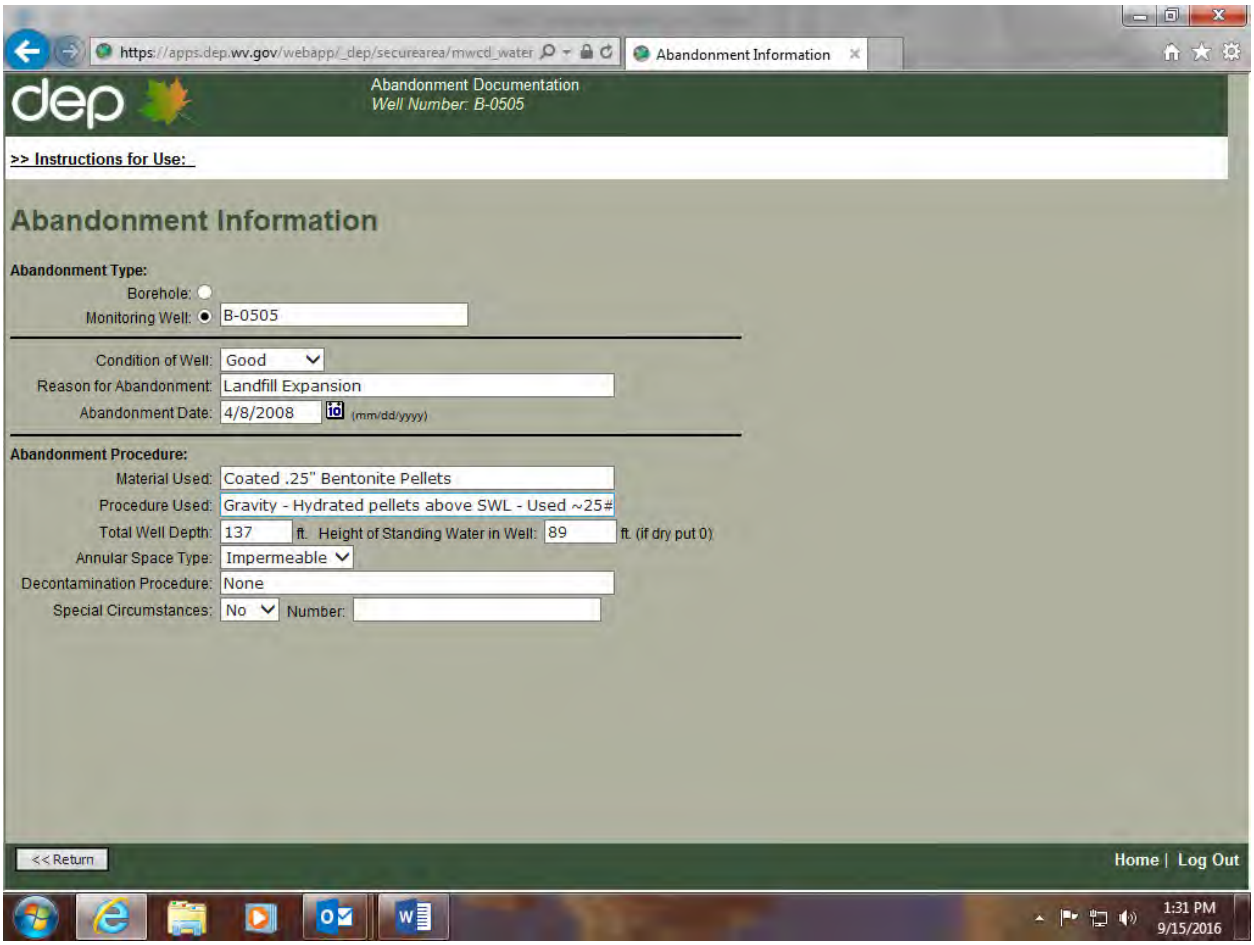
9/15/2016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Abandonment Information
dep
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>> Instructions for Use:
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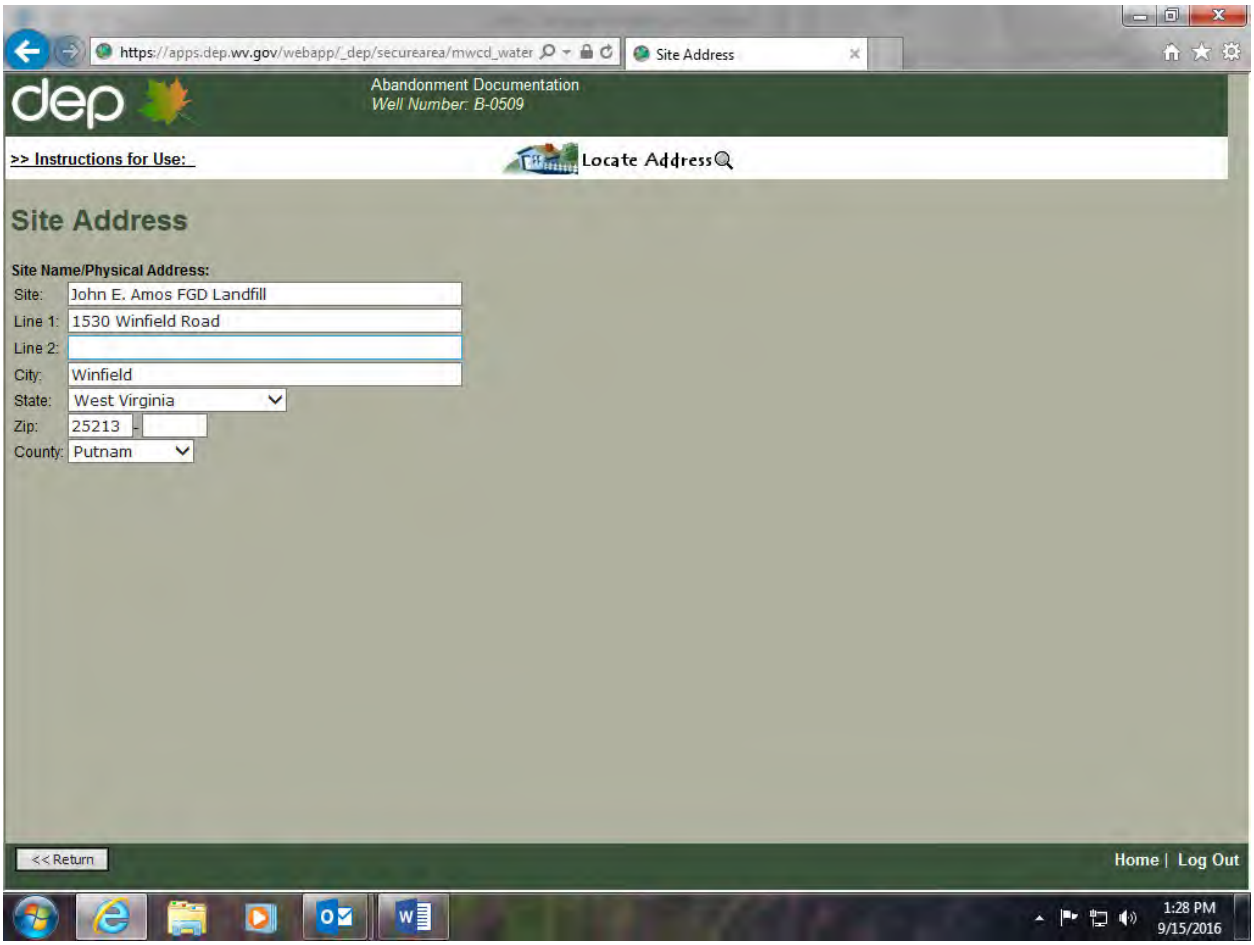
Abandonment Type:
Borehole:
Monitoring Well: B-0505
Condition of Well: Good
Reason for Abandonment: Landfill Expansion
Abandonment Date: 4/8/2008 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: Coated .25" Bentonite Pellets
Procedure Used: Gravity - Hydrated pellets above SWL - Used ~25#
Total Well Depth: 137 ft. Height of Standing Water in Well: 89 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
<< Return
Home | Log Out
1:31 PM
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0509
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: John E. Amos FGD Landfill
Line 1: 1530 Winfield Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
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Home | Log Out
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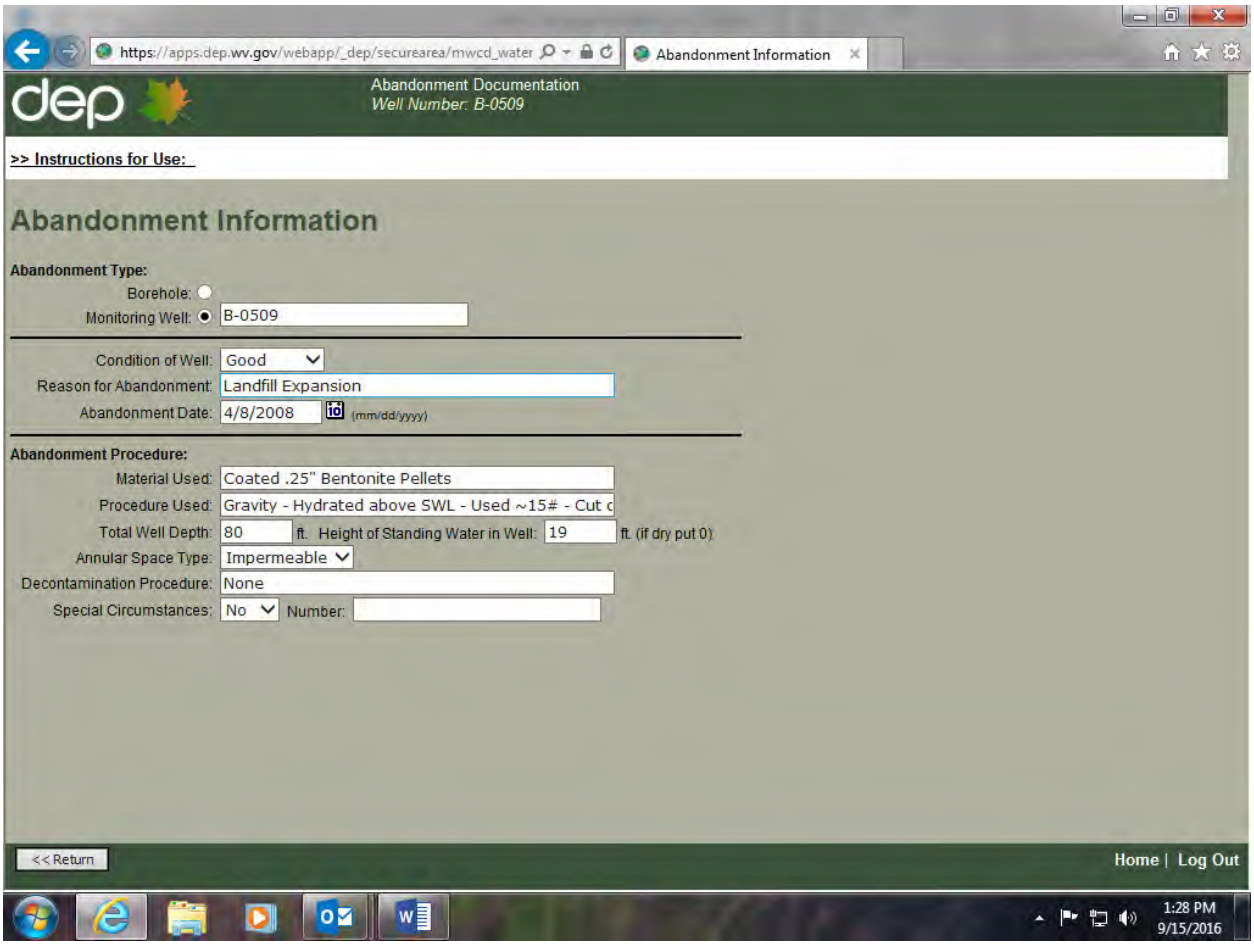
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: B-0509
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0509
Condition of Well: Good
Reason for Abandonment: Landfill Expansion
Abandonment Date: 4/8/2008 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: Coated .25" Bentonite Pellets
Procedure Used: Gravity - Hydrated above SWL - Used ~15# - Cut c
Total Well Depth: 80 ft. Height of Standing Water in Well: 19 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
<< Return
Home | Log Out
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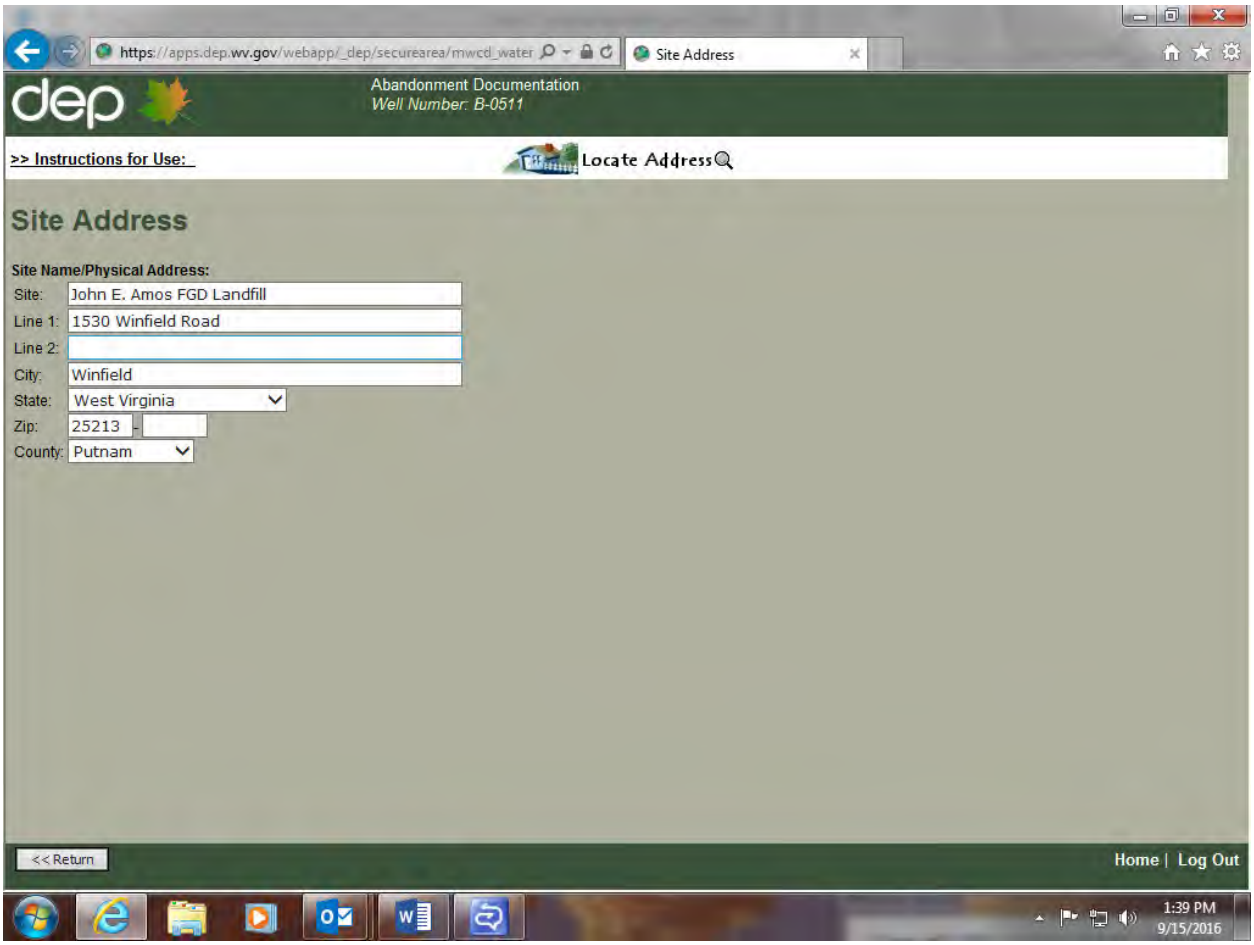
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0511
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: John E. Amos FGD Landfill
Line 1: 1530 Winfield Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
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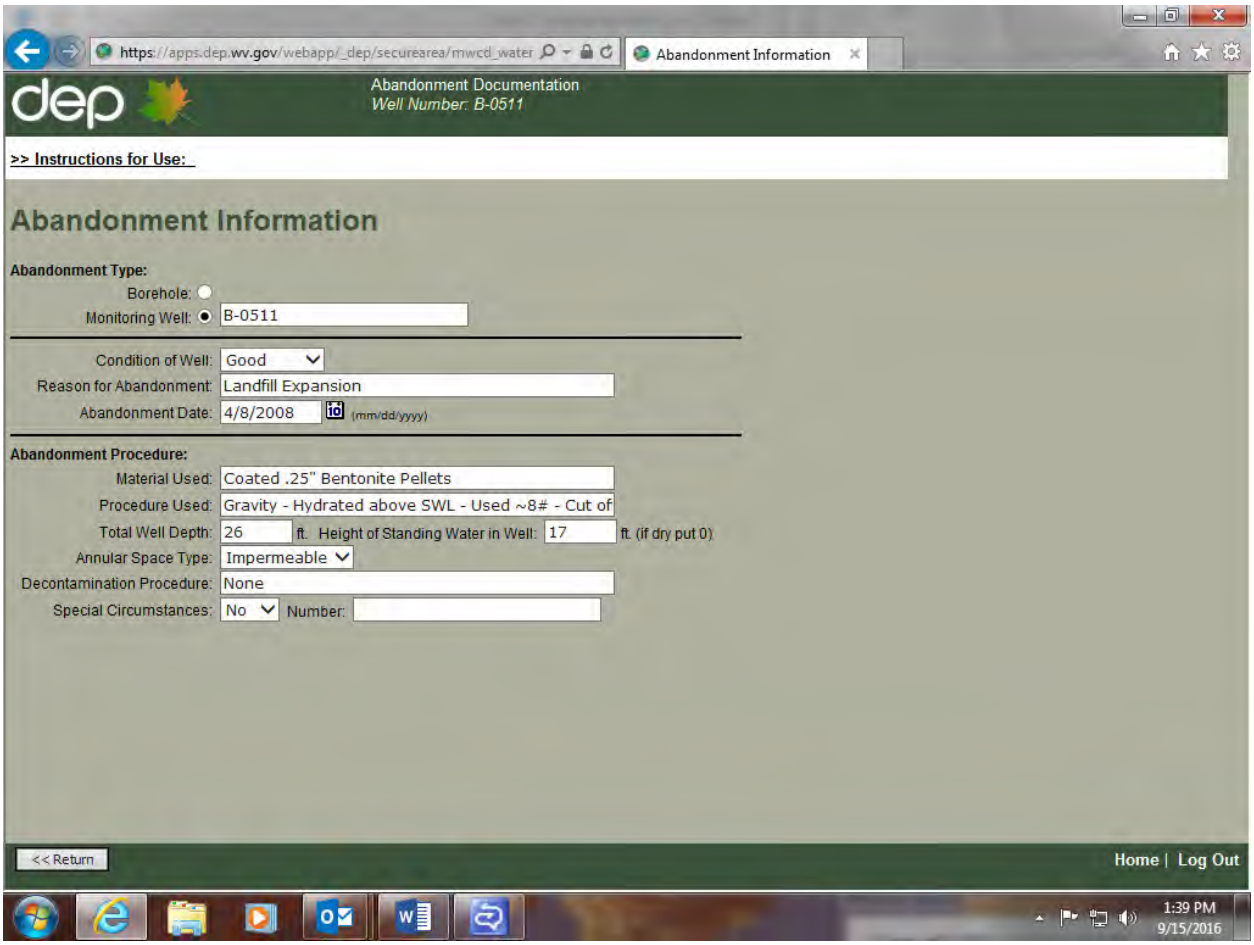
9/15/2016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Abandonment Documentation
Well Number: B-0511
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0511
Condition of Well: Good
Reason for Abandonment: Landfill Expansion
Abandonment Date: 4/8/2008 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: Coated .25" Bentonite Pellets
Procedure Used: Gravity - Hydrated above SWL - Used ~8# - Cut of
Total Well Depth: 26 ft. Height of Standing Water in Well: 17 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
<< Return
Home | Log Out
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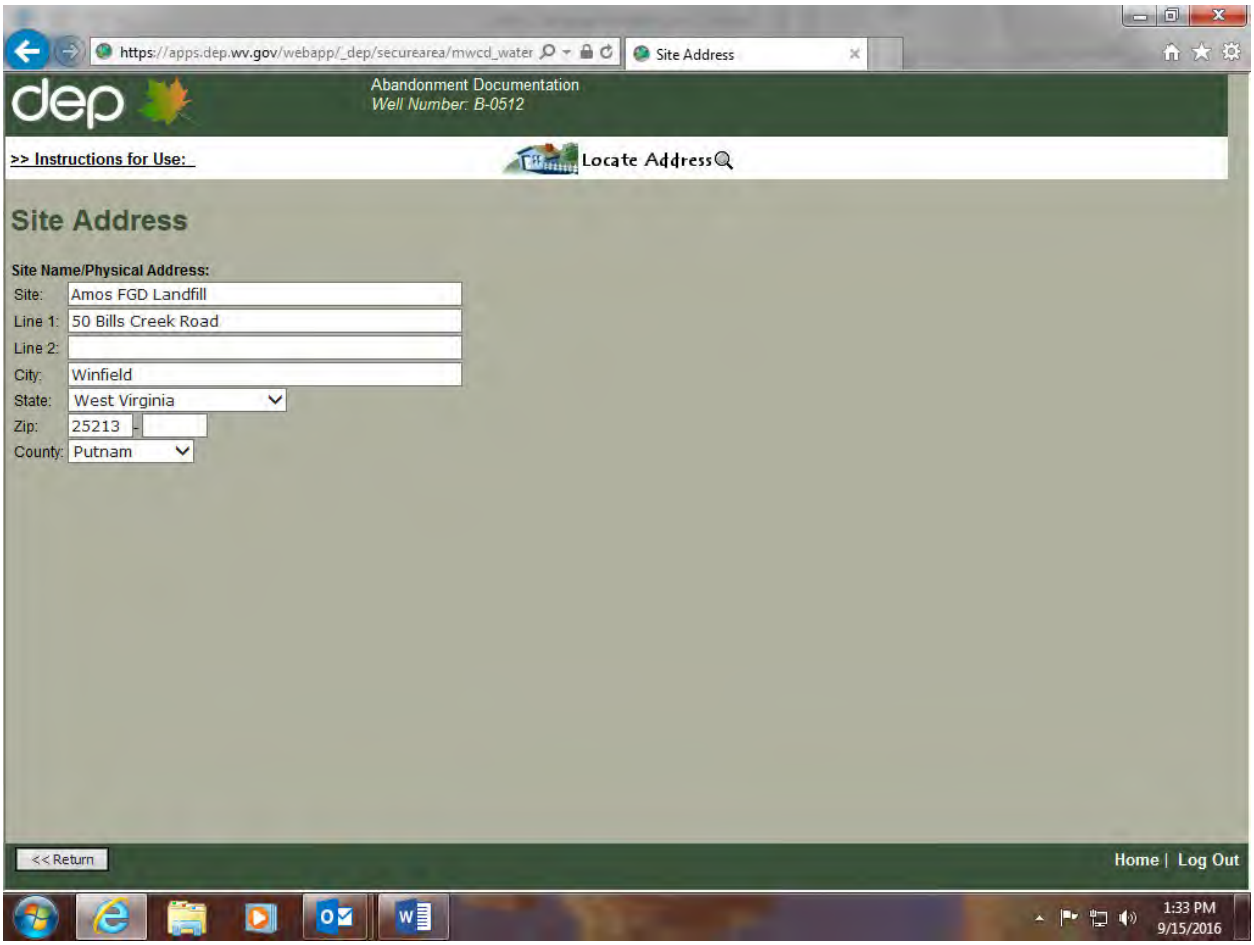
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0512
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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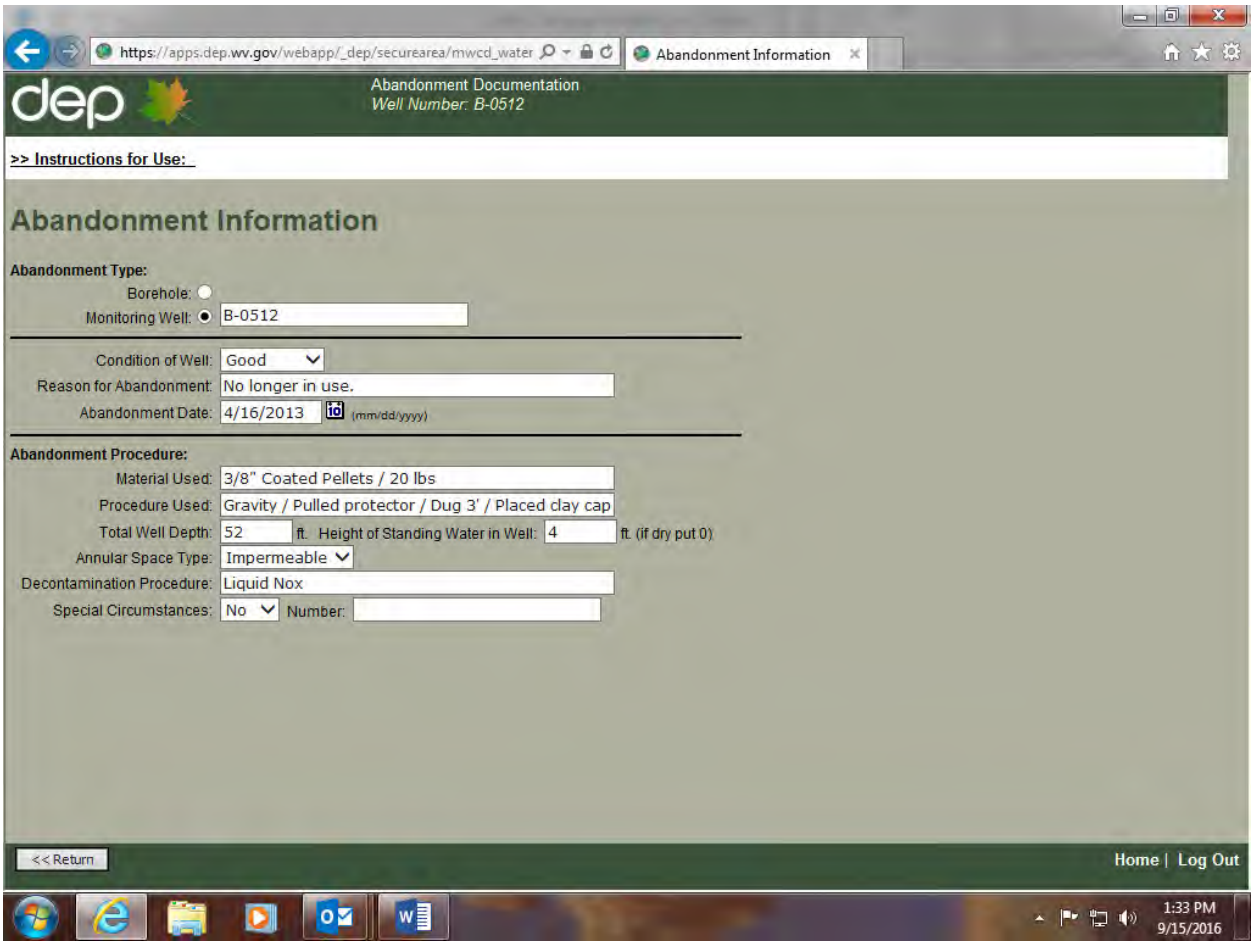
9/15/2016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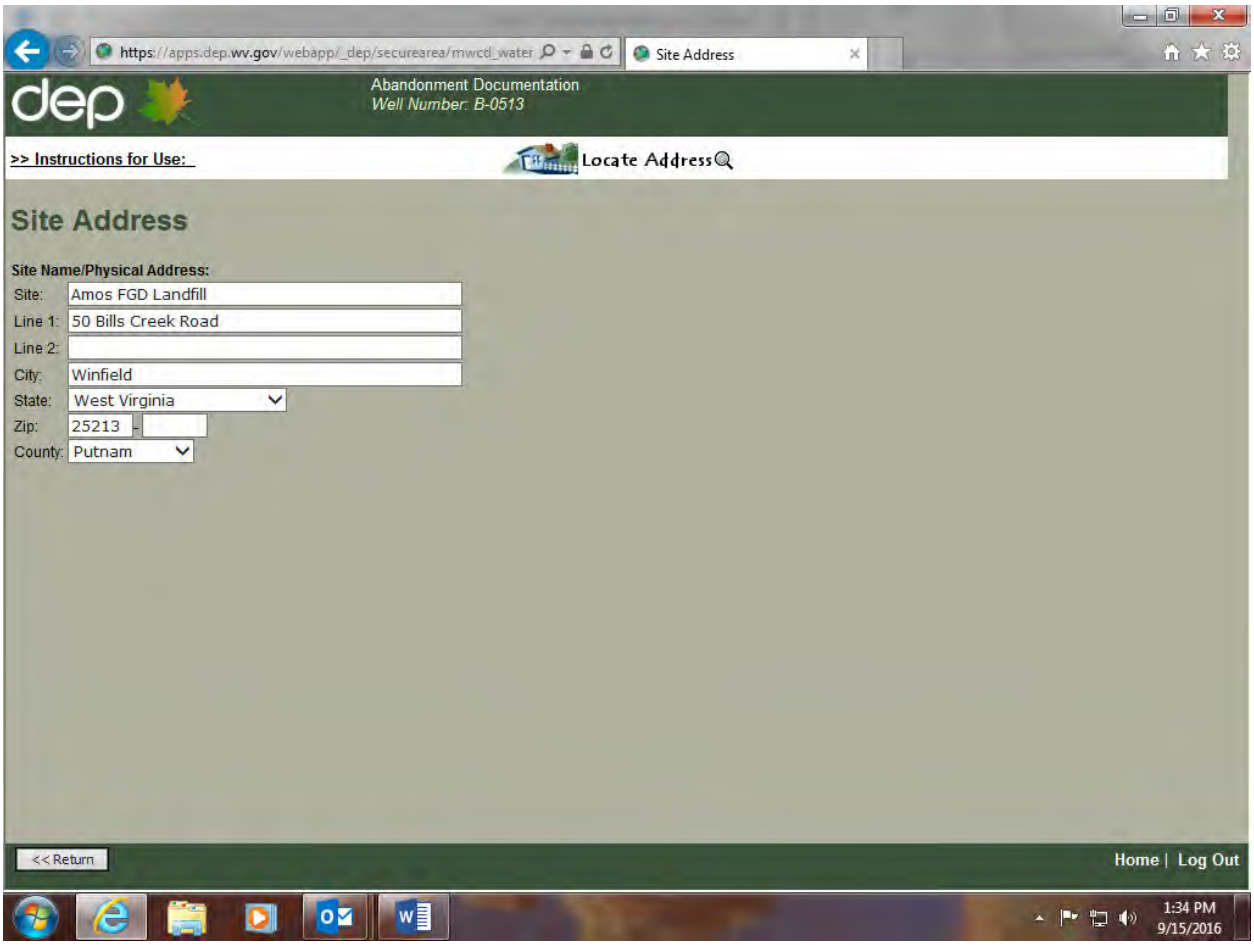
Abandonment Information
dep
Abandonment Documentation
Well Number: B-0512
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0512
Condition of Well: Good
Reason for Abandonment: No longer in use.
Abandonment Date: 4/16/2013 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 3/8" Coated Pellets / 20 lbs
Procedure Used: Gravity / Pulled protector / Dug 3' / Placed clay cap
Total Well Depth: 52 ft. Height of Standing Water in Well: 4 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: Liquid Nox
Special Circumstances: No Number:
<< Return
Home | Log Out
1:33 PM
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0513
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
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Home | Log Out
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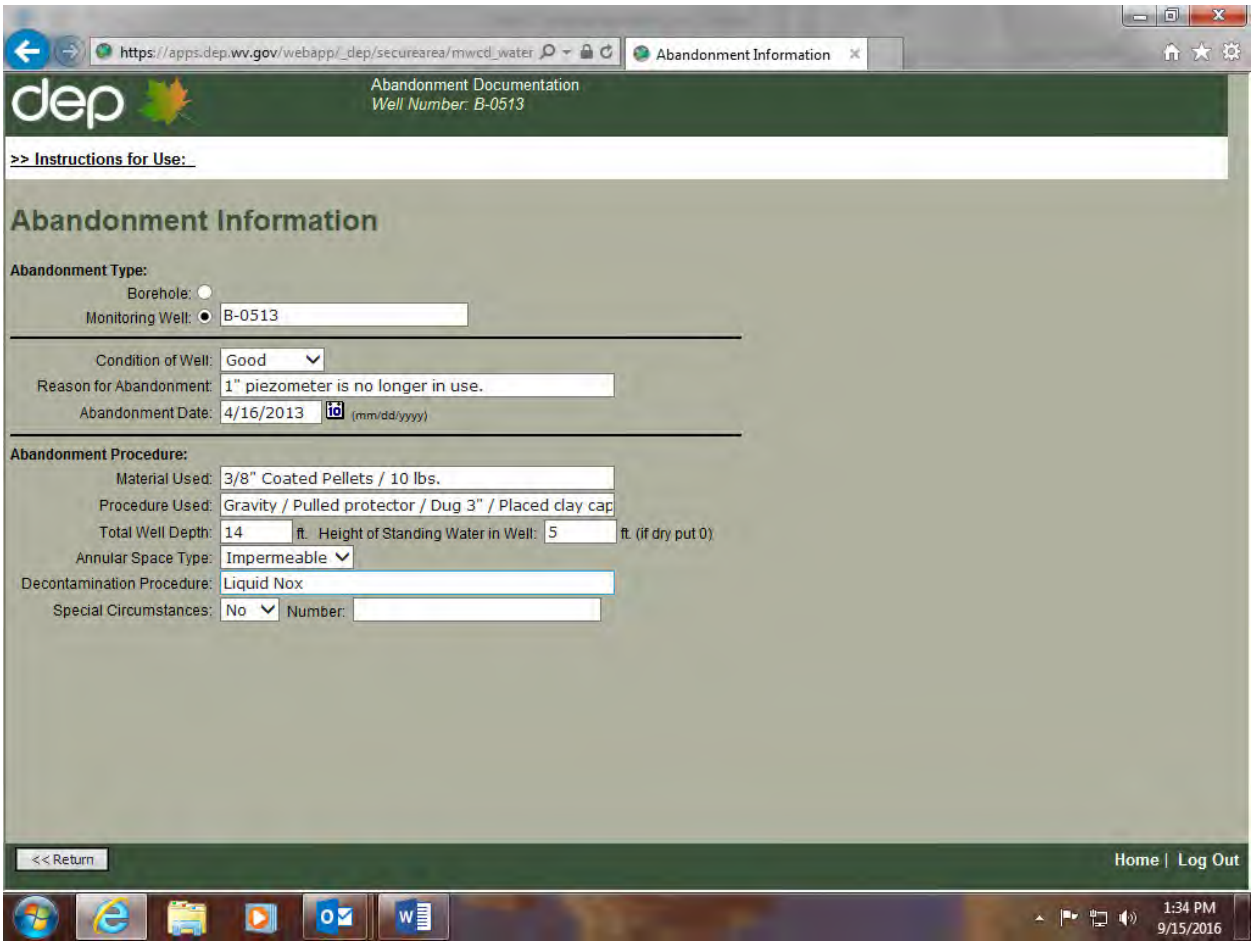
9/15/2016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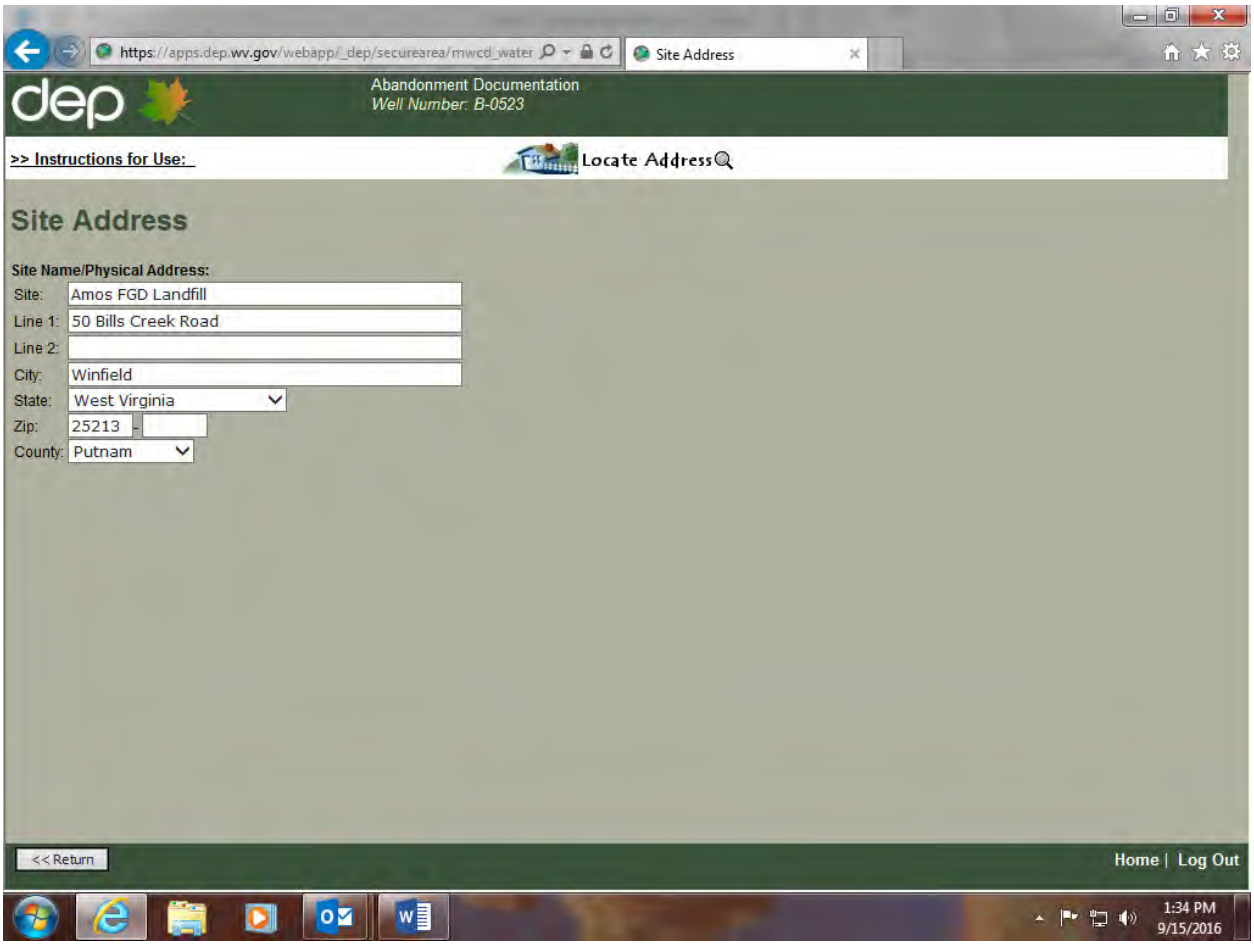
Abandonment Information
dep
Abandonment Documentation
Well Number: B-0513
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0513
Condition of Well: Good
Reason for Abandonment: 1" piezometer is no longer in use.
Abandonment Date: 4/16/2013 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 3/8" Coated Pellets / 10 lbs.
Procedure Used: Gravity / Pulled protector / Dug 3" / Placed clay cap
Total Well Depth: 14 ft. Height of Standing Water in Well: 5 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: Liquid Nox
Special Circumstances: No Number:
<< Return
Home | Log Out
1:34 PM
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0523
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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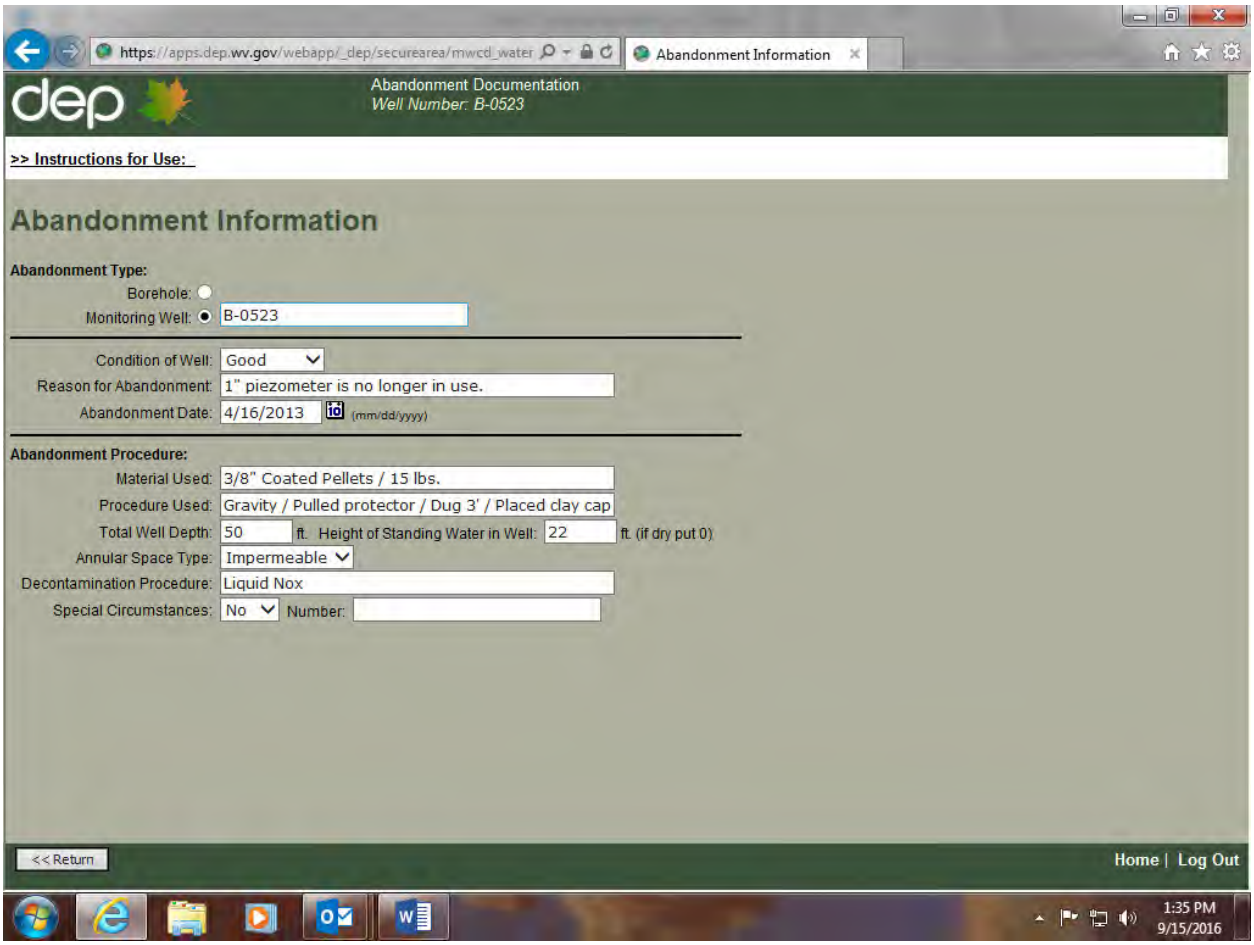
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: B-0523
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0523
Condition of Well: Good
Reason for Abandonment: 1" piezometer is no longer in use.
Abandonment Date: 4/16/2013 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 3/8" Coated Pellets / 15 lbs.
Procedure Used: Gravity / Pulled protector / Dug 3' / Placed clay cap
Total Well Depth: 50 ft. Height of Standing Water in Well: 22 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: Liquid Nox
Special Circumstances: No Number:
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Home | Log Out
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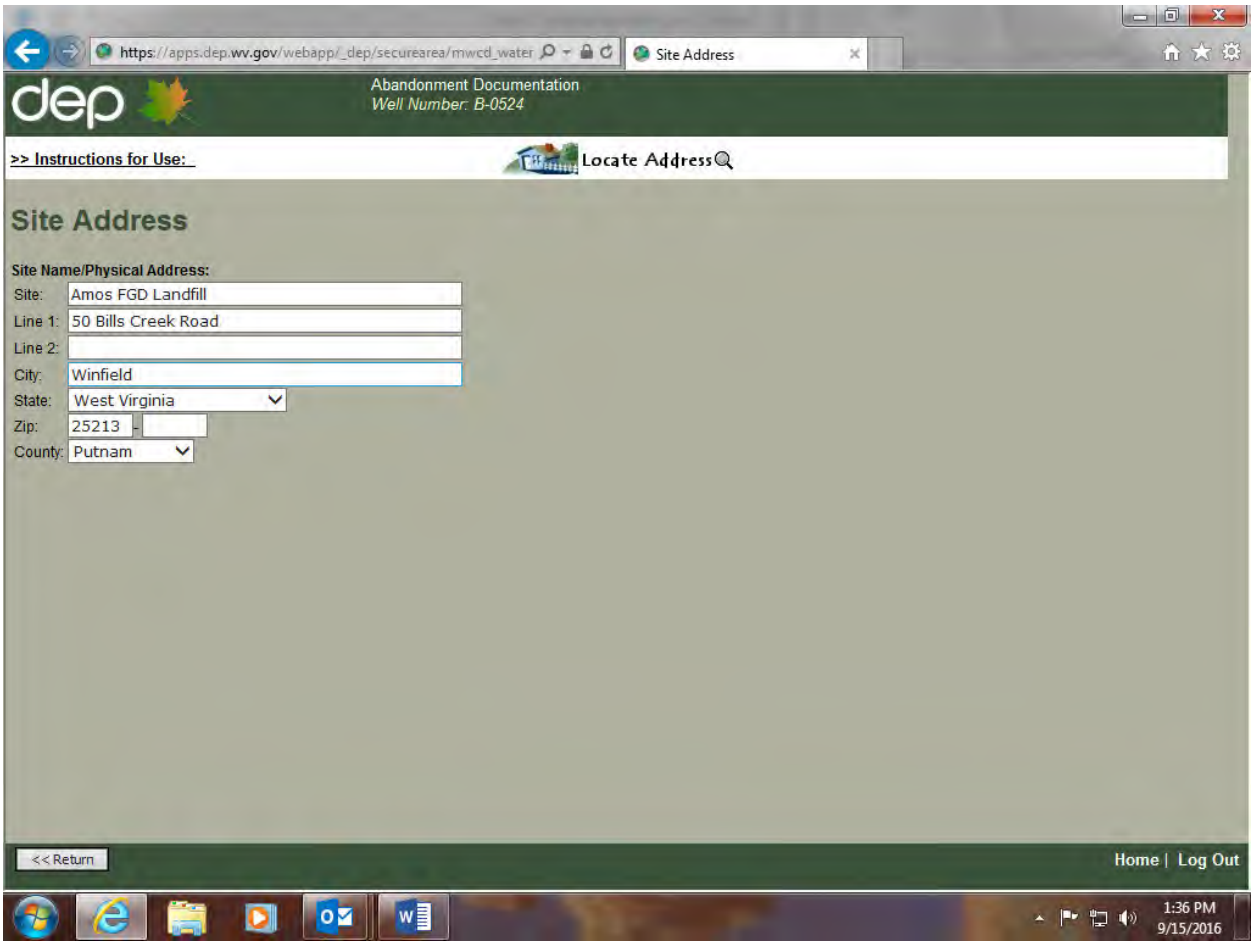
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: B-0524
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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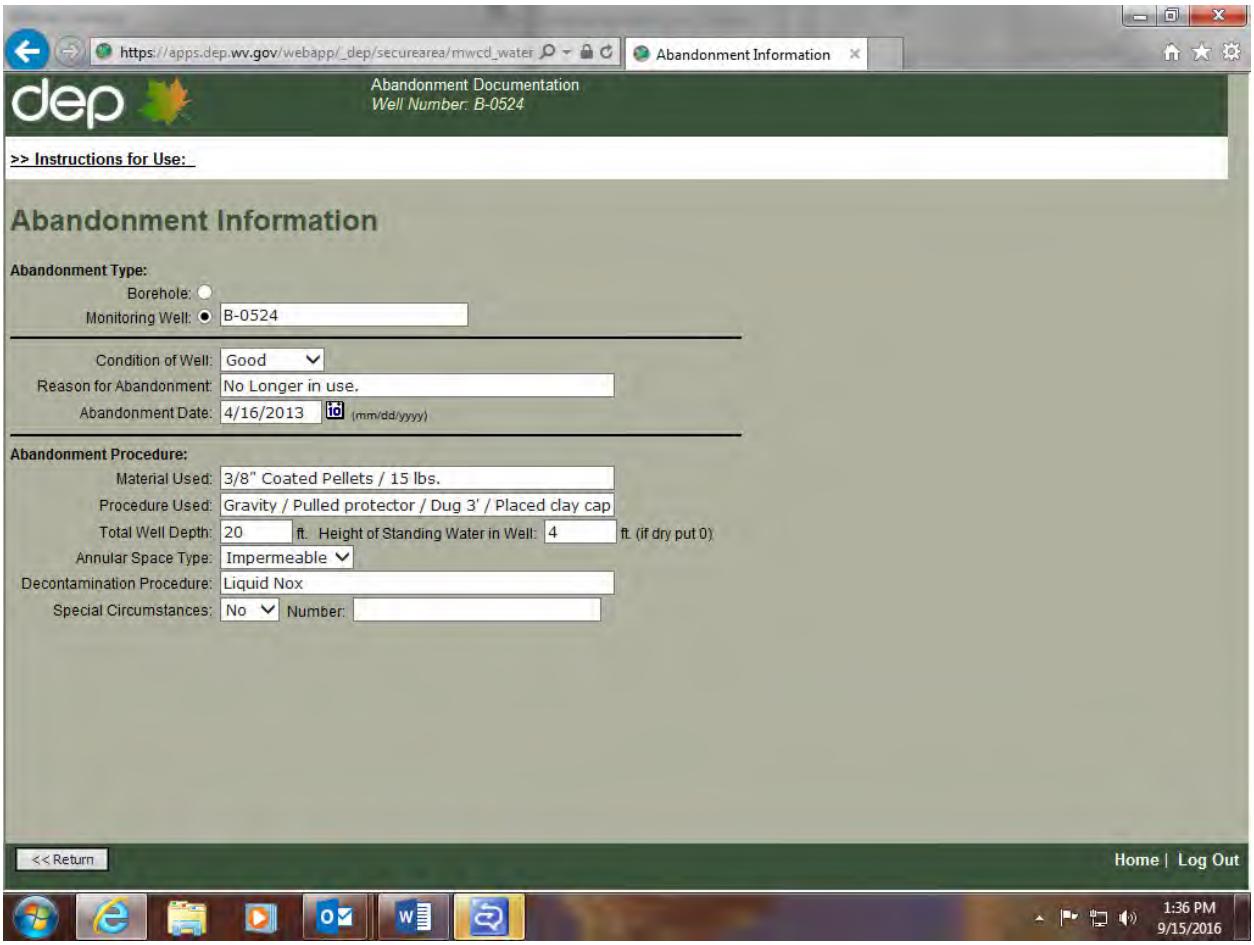
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: B-0524
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: B-0524
Condition of Well: Good
Reason for Abandonment: No Longer in use.
Abandonment Date: 4/16/2013 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 3/8" Coated Pellets / 15 lbs.
Procedure Used: Gravity / Pulled protector / Dug 3' / Placed clay cap
Total Well Depth: 20 ft. Height of Standing Water in Well: 4 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: Liquid Nox
Special Circumstances: No Number:
<< Return
Home | Log Out
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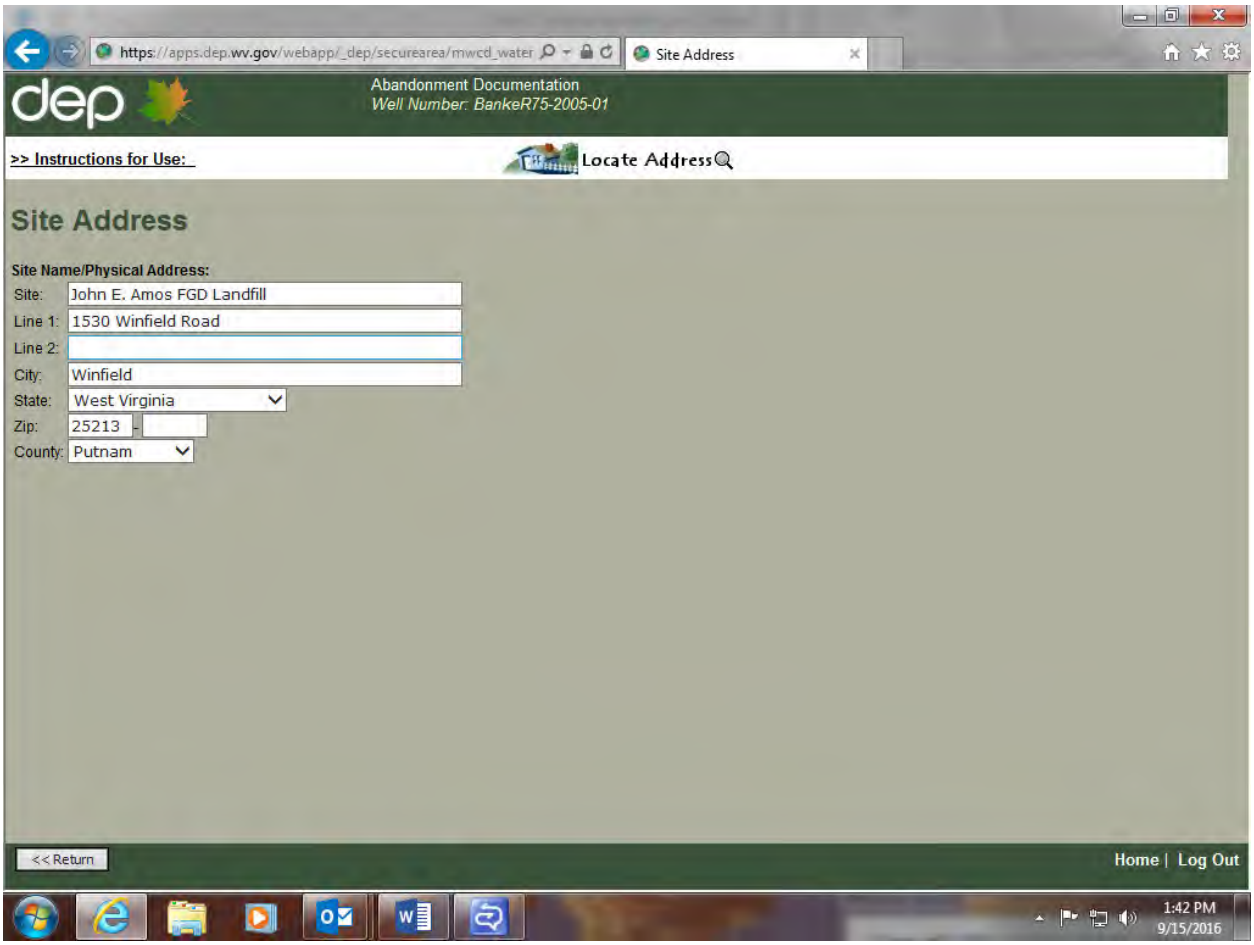
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: BankeR75-2005-01
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: John E. Amos FGD Landfill
Line 1: 1530 Winfield Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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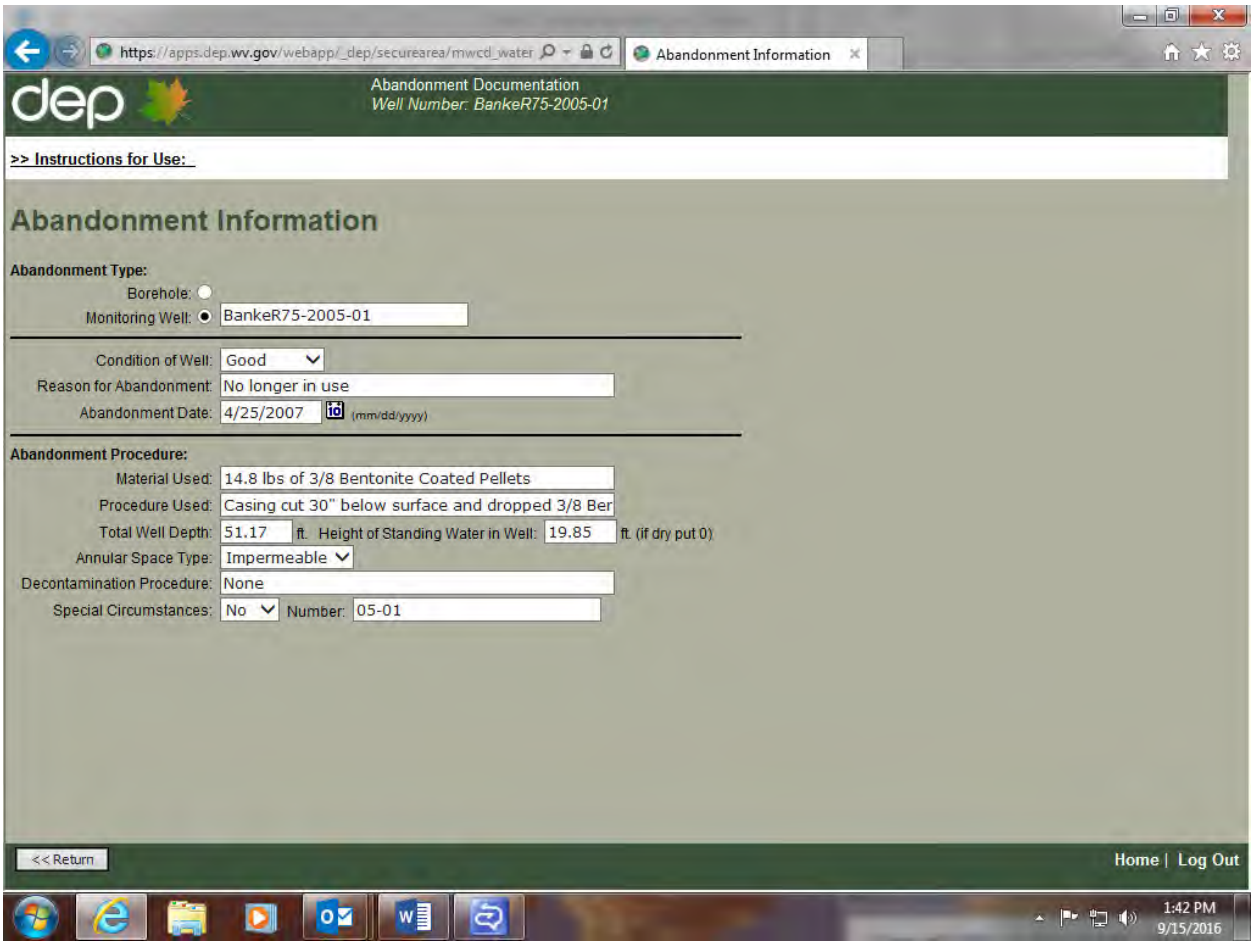
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: BankeR75-2005-01
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: BankeR75-2005-01
Condition of Well: Good
Reason for Abandonment: No longer in use
Abandonment Date: 4/25/2007 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 14.8 lbs of 3/8 Bentonite Coated Pellets
Procedure Used: Casing cut 30" below surface and dropped 3/8 Ber
Total Well Depth: 51.17 ft. Height of Standing Water in Well: 19.85 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number: 05-01
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Home | Log Out
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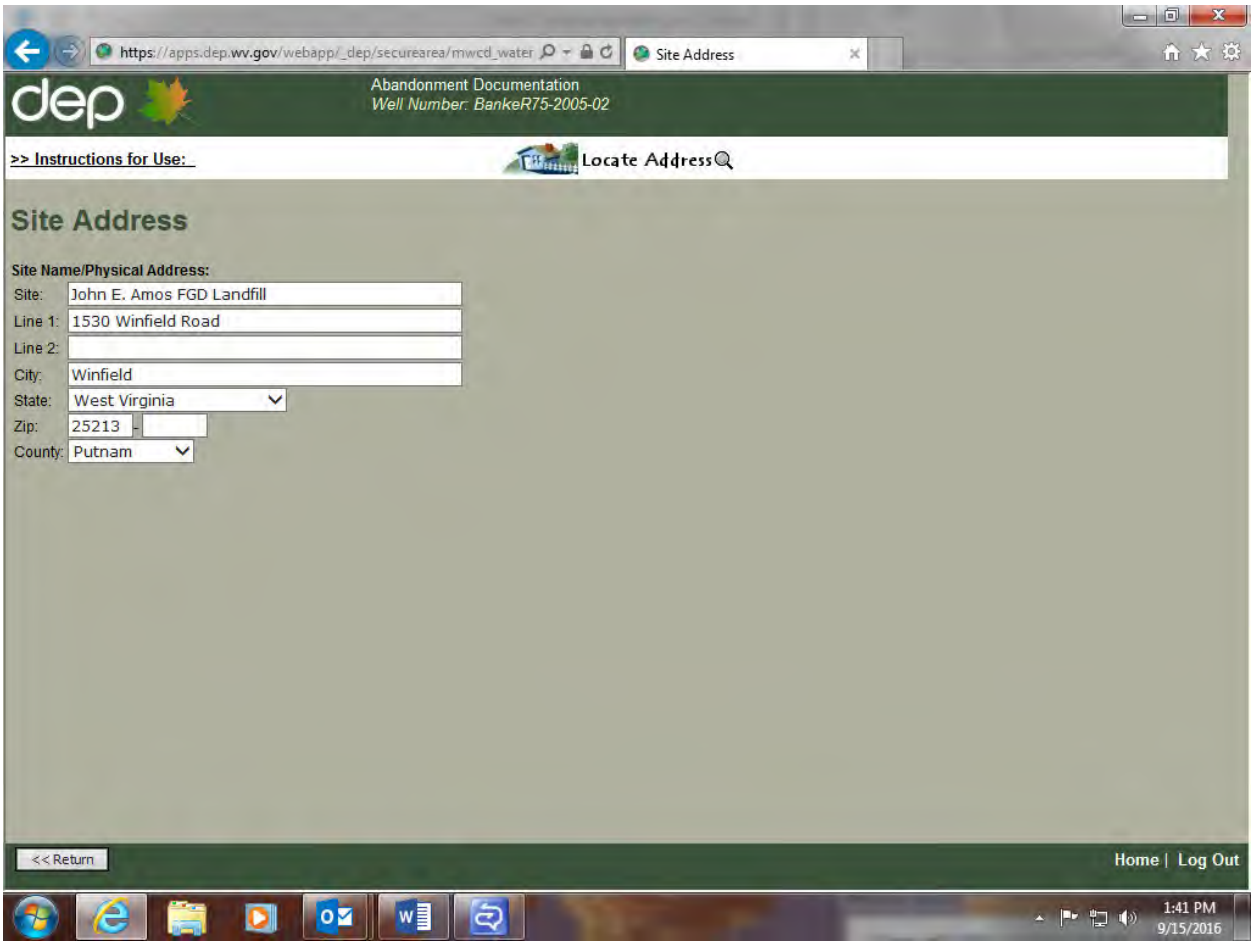
9/15/2016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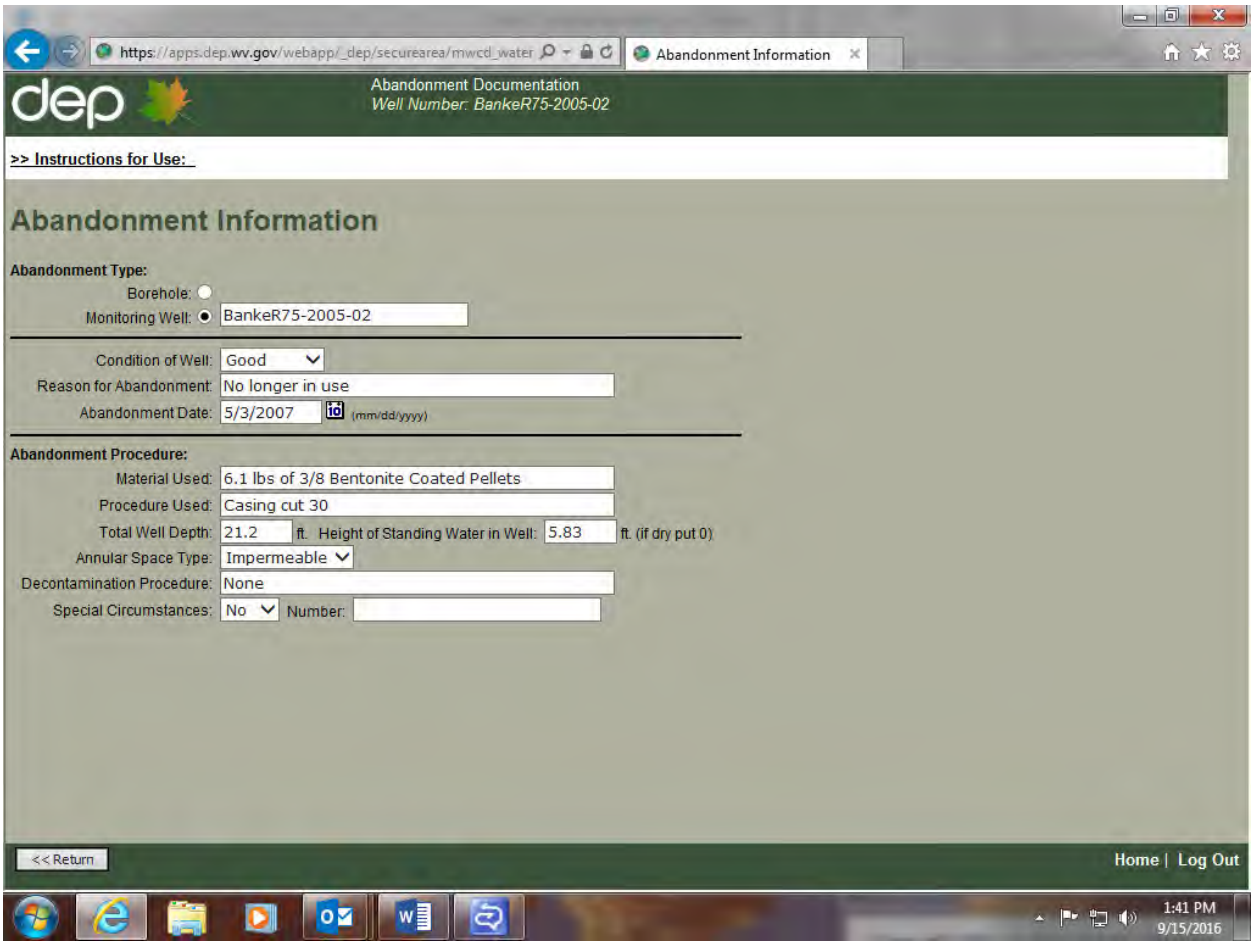
Site Address
dep
Abandonment Documentation
Well Number: BankeR75-2005-02
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: John E. Amos FGD Landfill
Line 1: 1530 Winfield Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
1:41 PM
9/15/2016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Abandonment Documentation
Well Number: BankeR75-2005-02
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: BankeR75-2005-02
Condition of Well: Good
Reason for Abandonment: No longer in use
Abandonment Date: 5/3/2007 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 6.1 lbs of 3/8 Bentonite Coated Pellets
Procedure Used: Casing cut 30
Total Well Depth: 21.2 ft. Height of Standing Water in Well: 5.83 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
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Home | Log Out
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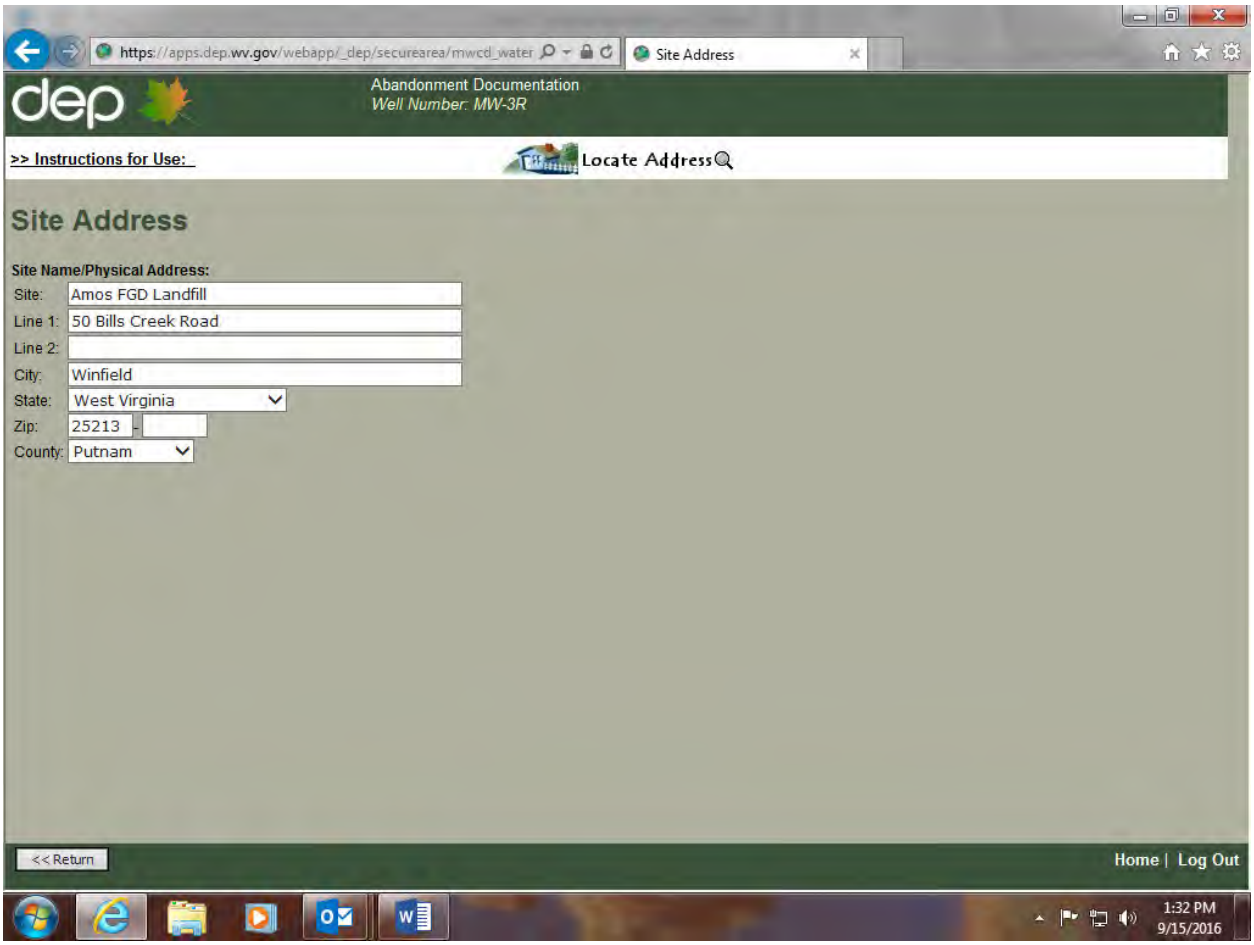
9/15/2016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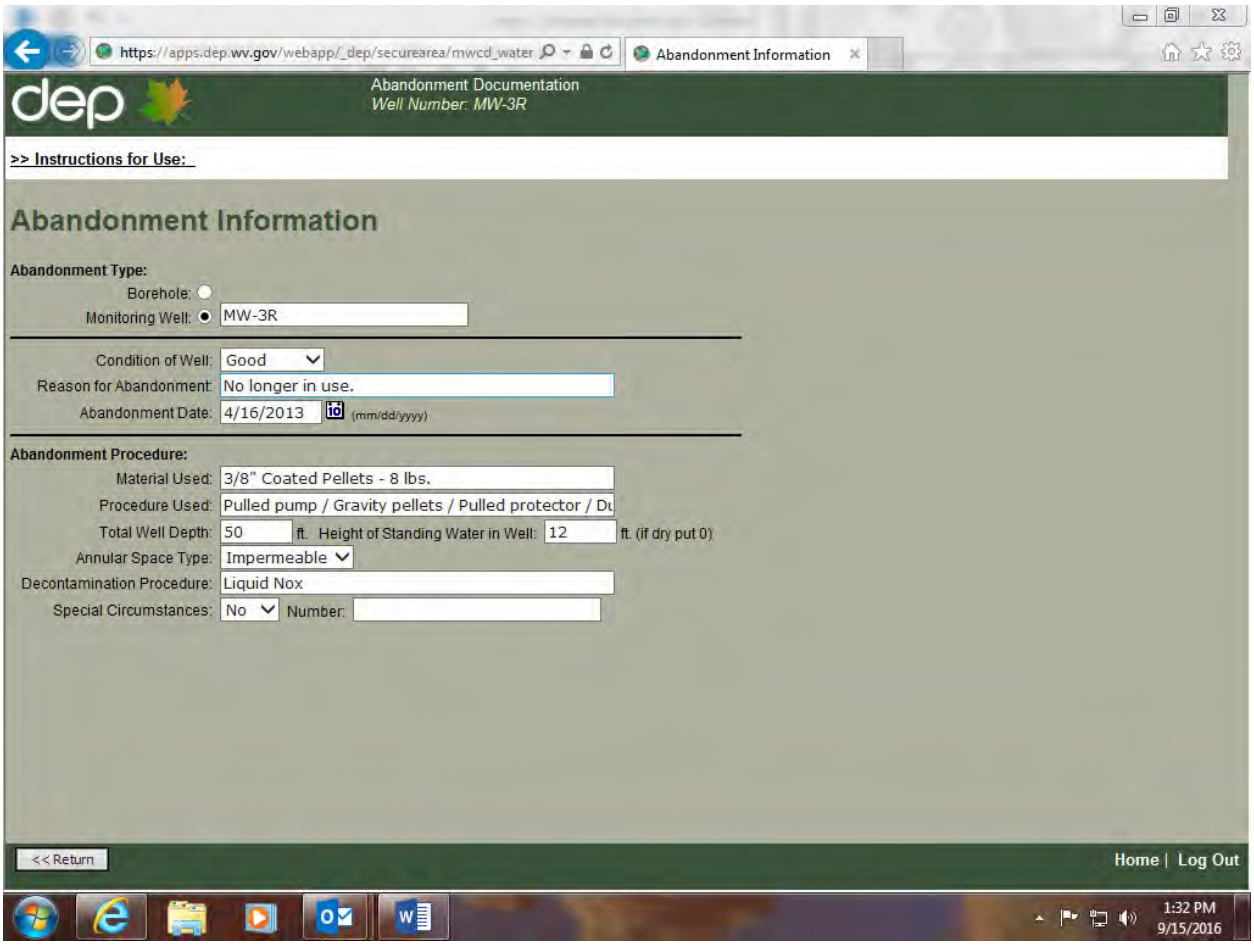
Site Address
dep
Abandonment Documentation
Well Number: MW-3R
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
1:32 PM
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: MW-3R
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: MW-3R
Condition of Well: Good
Reason for Abandonment: No longer in use.
Abandonment Date: 4/16/2013 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 3/8" Coated Pellets - 8 lbs.
Procedure Used: Pulled pump / Gravity pellets / Pulled protector / Du
Total Well Depth: 50 ft. Height of Standing Water in Well: 12 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: Liquid Nox
Special Circumstances: No Number:
<< Return
Home | Log Out
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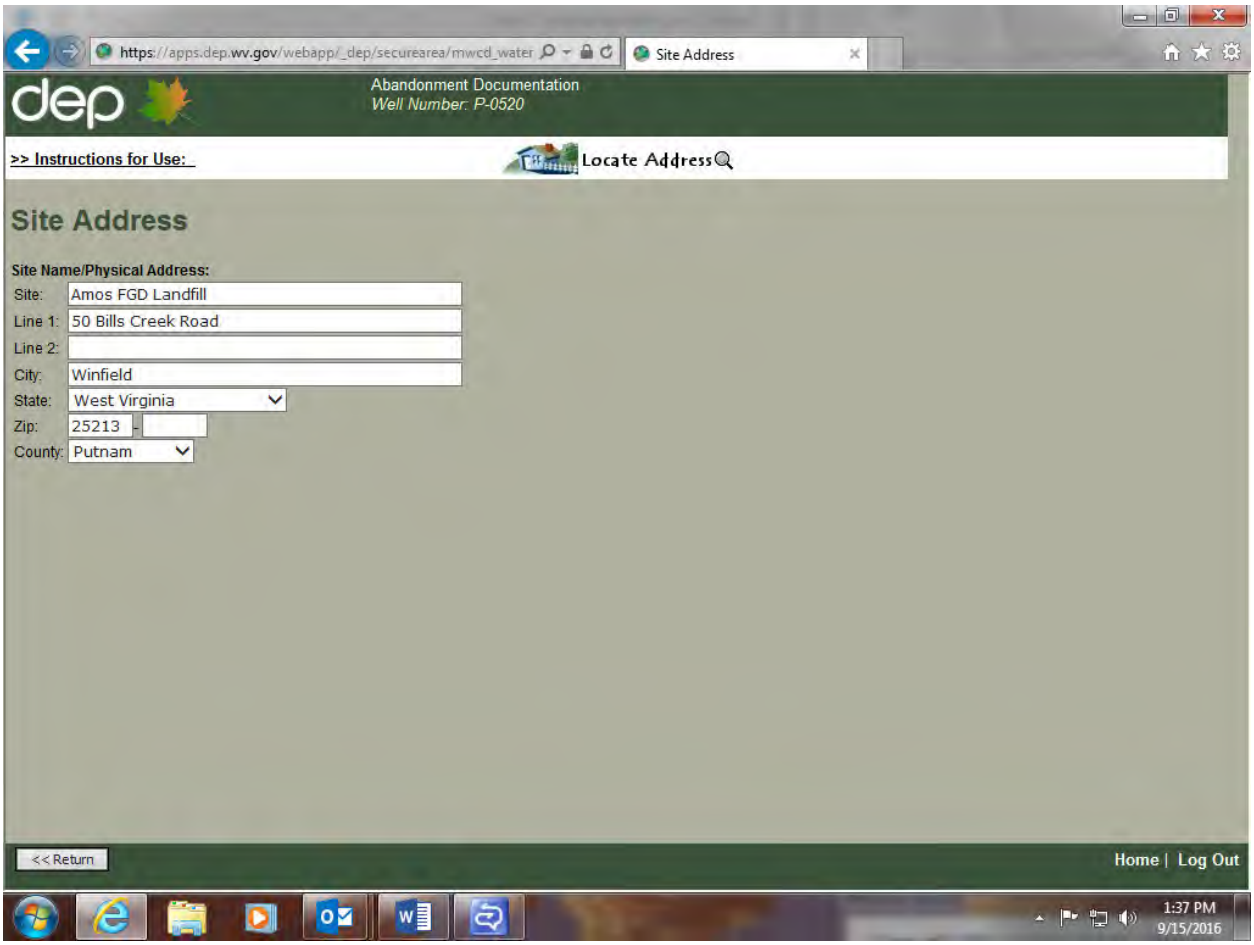
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: P-0520
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Road
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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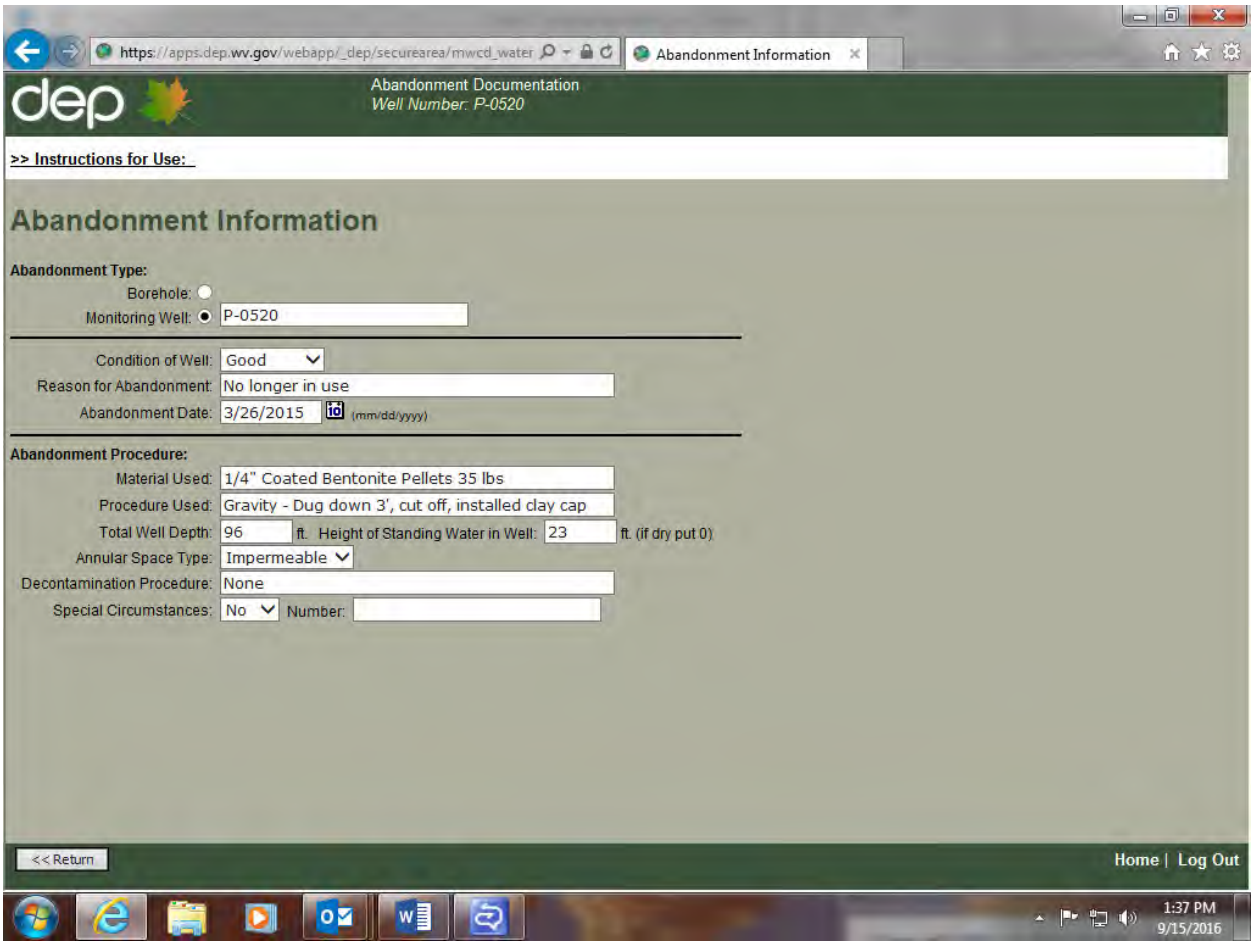
9/15/2016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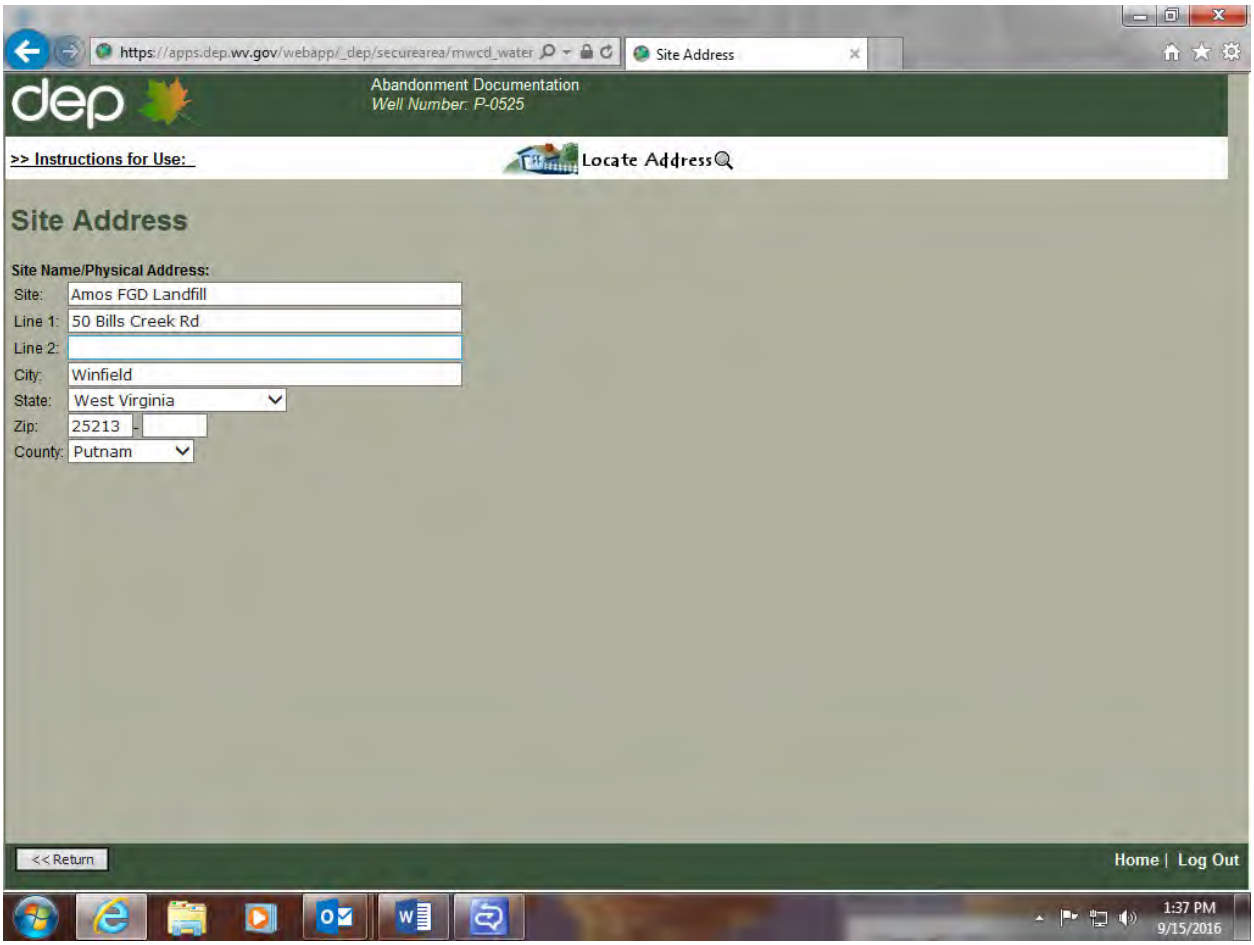
Abandonment Information
dep
Abandonment Documentation
Well Number: P-0520
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: P-0520
Condition of Well: Good
Reason for Abandonment: No longer in use
Abandonment Date: 3/26/2015 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 1/4" Coated Bentonite Pellets 35 lbs
Procedure Used: Gravity - Dug down 3', cut off, installed clay cap
Total Well Depth: 96 ft. Height of Standing Water in Well: 23 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
<< Return
Home | Log Out
1:37 PM
9/15/2016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Site Address
dep
Abandonment Documentation
Well Number: P-0525
>> Instructions for Use:
Locate Address
Site Address
Site Name/Physical Address:
Site: Amos FGD Landfill
Line 1: 50 Bills Creek Rd
Line 2:
City: Winfield
State: West Virginia
Zip: 25213 -
County: Putnam
<< Return
Home | Log Out
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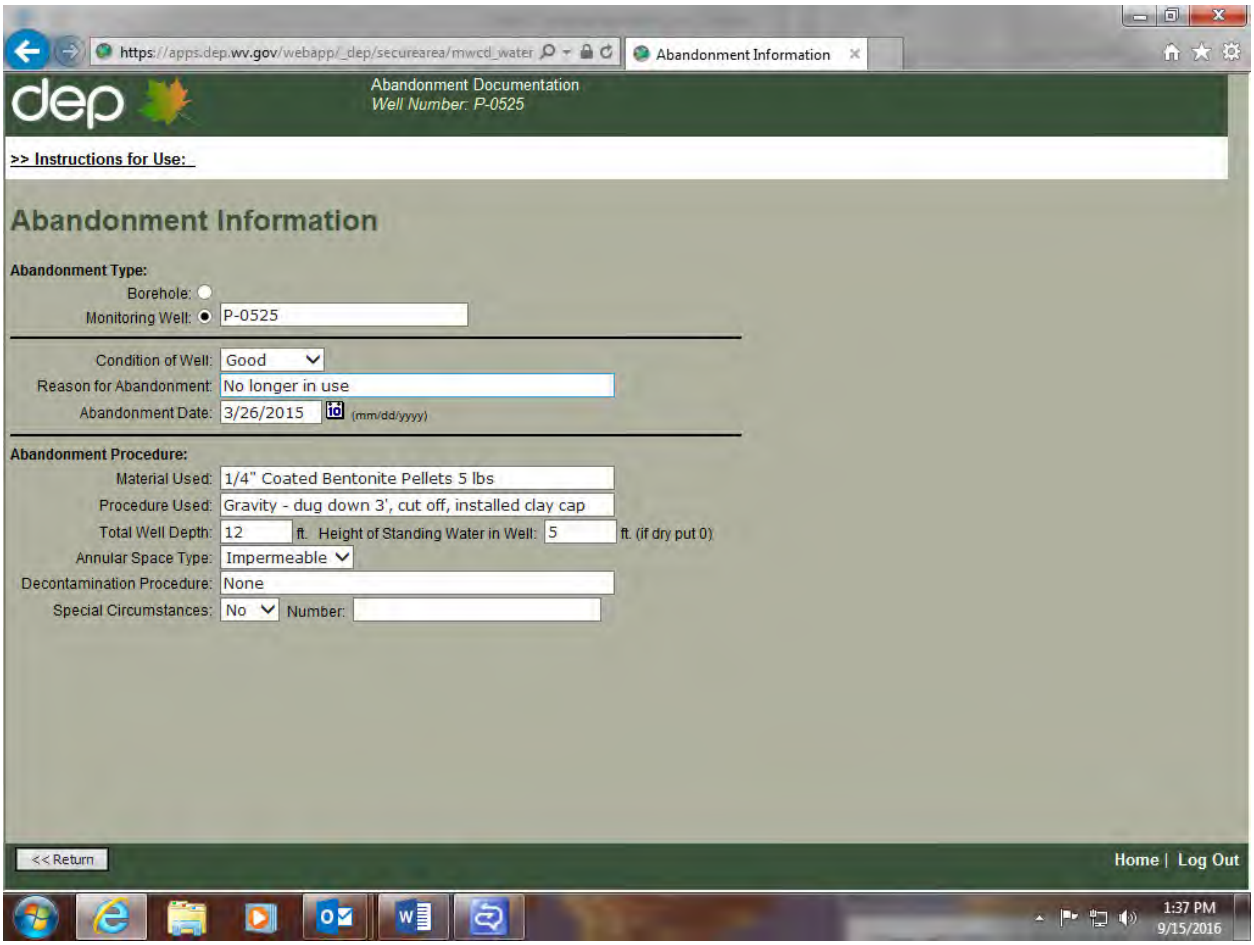
9/15/2016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Abandonment Information
dep
Abandonment Documentation
Well Number: P-0525
>> Instructions for Use:
Abandonment Information
Abandonment Type:
Borehole:
Monitoring Well: P-0525
Condition of Well: Good
Reason for Abandonment: No longer in use
Abandonment Date: 3/26/2015 (mm/dd/yyyy)
Abandonment Procedure:
Material Used: 1/4" Coated Bentonite Pellets 5 lbs
Procedure Used: Gravity - dug down 3', cut off, installed clay cap
Total Well Depth: 12 ft. Height of Standing Water in Well: 5 ft. (if dry put 0)
Annular Space Type: Impermeable
Decontamination Procedure: None
Special Circumstances: No Number:
<< Return
Home | Log Out
1:37 PM
9/15/2016

ARCADIS

WVDEP Monitoring Well & Piezometer Pending Closure Information

WVDEP Monitoring Well Piezometer Pending Closure Information
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Facility	Reg #	Type	City	County	Well #	Latitude			Longitude			Method	Owner	Phone #	Date of Finish	Abandon Date	Reason for Install	Driller First Name	Driller Last Name	Certificate #
Proposed Landfill - Amos Power Plant	NA	AMW	Winfield	Putnam	B-0508	38	29	7.1	81	51	22.9	GPS	Amos Power Plant	304-759-3156	5/3/2005	8/22/2006	NA	Marvin	Roush	00015
Proposed Landfill - Amos Power Plant	NA	AMW	Winfield	Putnam	05639/05-28 MW 7	38	28	44.1	81	51	15.5	GPS	Amos Power Plant	304-759-3156	6/28/2005	8/22/2006	NA	Marvin	Roush	00015

Notes:
Information provided by West Virginia Department of Environmental Protection as pending database upload.
NA - Not Applicable
GPS - Global Positioning System

ARCADIS

WVDEP Oil & Gas Well Closure Information

WVDEP Office of Oil and Gas - Well Search

Disclaimer: Per §22-6-6. Permit required for all well work; permit fee; application; soil erosion control plan.

(a) It is unlawful for any person to commence any well work, including site preparation work, which involves any disturbance of land, without first securing a well work permit from the director of the WVDEP Office of Oil and Gas.

The appearance of an API number on the web page does not signify that a permit has been issued. The API number is used as a tracking mechanism until the permit has been issued. Under no circumstances should well work be commenced without a signed permit.

Well API	Operator	Surface Owner	Well Number	Well Status	Well Type	Last Permit Issue Date
4707900611	MEADOWS Jr, S. L. PRODUCTION Inc.	APPALACHIAN POWER COMPANY	616	Plugged	Vertical	09/21/2007

The operator listed above is the CURRENT operator of the well.

This operator may or may not have recorded production for this well for the years listed below.

The production listed below spans this well's 5 last years, regardless of the operator who originally recorded a particular year's production numbers.

Well Lifetime Gas Production

No Production Reported

Well Lifetime Oil Production

No Production Reported

Well Lifetime NGL Production

No Production Reported

The West Virginia Department of Environmental Protection (WVDEP) makes oil and gas well information and production data available to the general public through this internet service free of charge.

The oil and gas related data originate from the information reported to the Office of Oil and Gas at WVDEP by West Virginia oil and gas operators. The WVDEP does not guarantee their accuracy, precision, or completeness.

Neither the West Virginia Department of Environmental Protection nor its staff members are liable or responsible for any damage or loss resulting from the use of these data or from inaccuracies contained in the data.

We encourage you to report any problems, inconsistencies, or errors noted in using this data to the Office of Oil and Gas so that we can correct them and provide better service.

Office of Oil and Gas
Department of Environmental Protection
601 57th St
Charleston, West Virginia 25304
Phone: (304) 926-0499
Fax: (304) 926-0452

WVDEP Office of Oil and Gas - Well Search

Disclaimer: Per §22-6-6. Permit required for all well work; permit fee; application; soil erosion control plan.

(a) It is unlawful for any person to commence any well work, including site preparation work, which involves any disturbance of land, without first securing a well work permit from the director of the WVDEP Office of Oil and Gas.

The appearance of an API number on the web page does not signify that a permit has been issued. The API number is used as a tracking mechanism until the permit has been issued. Under no circumstances should well work be commenced without a signed permit.

Well API	Operator	Surface Owner	Well Number	Well Status	Well Type	Last Permit Issue Date
4707900660	MEADOWS Jr, S. L. PRODUCTION Inc.	AMERICAN ELECTRIC POWER	2	Plugged	Vertical	09/08/2006

The operator listed above is the CURRENT operator of the well.

This operator may or may not have recorded production for this well for the years listed below.

The production listed below spans this well's 5 last years, regardless of the operator who originally recorded a particular year's production numbers.

Well Lifetime Gas Production

No Production Reported

Well Lifetime Oil Production

No Production Reported

Well Lifetime NGL Production

No Production Reported

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The appearance of an API number on the web page does not signify that a permit has been issued. The API number is used as a tracking mechanism until the permit has been issued. Under no circumstances should well work be commenced without a signed permit.

Well API	Operator	Surface Owner	Well Number	Well Status	Well Type	Last Permit Issue Date
4707900722	MEADOWS Jr, S. L. PRODUCTION Inc.	AMERICAN ELECTRIC POWER	3	Plugged	Vertical	09/08/2006

The operator listed above is the CURRENT operator of the well.

This operator may or may not have recorded production for this well for the years listed below.

The production listed below spans this well's 5 last years, regardless of the operator who originally recorded a particular year's production numbers.

Well Lifetime Gas Production

No Production Reported

Well Lifetime Oil Production

No Production Reported

Well Lifetime NGL Production

No Production Reported

The West Virginia Department of Environmental Protection (WVDEP) makes oil and gas well information and production data available to the general public through this internet service free of charge.

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ARCADIS

Arcadis, Inc. 2018

Boring and Well Construction Logs

MW-1801 and MW-1802

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 38.5 E 81.6**

GROUND ELEVATION **735.6** SYSTEM **NAVD88**

Water Level, ft	▽ 21.0	▼	▼
TIME			
DATE	8/15/2018		

BORING NO. **MW-1801** DATE **5/3/19** SHEET **1** OF **5**

BORING START **8/7/18** BORING FINISH **8/8/18**

PIEZOMETER TYPE **PVC** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.8** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **50.4** BOTTOM **114.4**

WELL DEVELOPMENT **Surge/Purge** BACKFILL **Bentonite Grout**

FIELD PARTY **Zachary Racer (AEP)** RIG **Direct Circulation - Wireline Core**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
									CL ML	0-5': SILTY CLAY; 2.5YR 5/6 (red); moist; backfill material.		0-49': Riser
		5.0	6.5	50/4	3.6		5			5-6': SANDSTONE.		
		6.5	8.0	48-23-15	3.6				CL ML	6-6.3': SHALE; GLEY1 5/N (gray); dry; thin bedded; hard.		
									ML	6.3-6.5': SILTY CLAY; red; moist; hard		
		8.0	9.5	11-3-5	7.2				MH	6.5-8': SILT; 10YR 6/2 (tan); with sandstone and shale fragments; compacted fill material. 8-9.5': CLAYEY SILT; 5YR 4/2 (brown); firm; moist; fill material.		
		9.5	11.0	4-4-7	10.8		10		CL ML	9.5-11': SILTY CLAY; 10YR 6/3 (brown) to brown clayey silt; dry; crumbly; fill material.		
		11.0	12.5	4-8-50/3	10.8				CL ML	11-12.5': SILTY CLAY; 5YR 4/2 (brown); moist; firm.		
		12.5	14.0	50/3					ML	Note: Sandstone at 12-12.3'. 12.5-14': SILT, compacted; 10YR 7/4 (tan); very hard; dry; fill material.		
		14.0	15.5	50/4						14-14.5': SILTY SHALE material, weathered; mottled tan and dark brown; dry; very hard.		
		14.9	19.9		51		15			14.5-14.9': SANDSTONE; strong field strength; 2.5Y 6/2; fine-grained texture; massive structure; slightly to moderately decomposed; moderately disintegrated with Fe staining; fracture at 14.3-14.5'. 14.9-19.9': SHALE; moderate field strength; GLEY1 5/GY; fine-grained texture; thinly bedded; moderately decomposed along bedding planes; moderately disintegrated along bedding planes and fracture; vertical fracture with Fe staining at 15.5-16.5'.		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **A. Gillespie**

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1801** DATE **5/3/19** SHEET **2** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/7/18** BORING FINISH **8/8/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		19.9	24.9	8-7-6	55					19.9-24.9': SHALE; moderate field strength; GLEY1 5/GY; fine-grained texture; thinly bedded; moderately decomposed along bedding planes; moderately disintegrated; moderately to intensely fractured. Transition to strong field strength, 2.5YR 4/4; fine-grained texture; massive structure to thinly bedded; slightly decomposed; slightly disintegrated; slightly to moderately fractured.		
		24.9	34.9	4-4-13	72		25			24.9-25.2': SHALE; strong field strength; fine-grained structure; massive structure to thinly bedded; slightly decomposed; slightly disintegrated; slightly to moderately fractured. 25.2-30.7': CLAYSTONE/MUDSTONE, highly weathered; very weak field strength; 10YR 5/3; very fine-grained texture with sandstone fragments; massive structure; highly decomposed; intensely disintegrated; unfractured.		
		34.9	38.3	4-5-8	36		30			30.7-32.5': SHALE; moderate field strength; 2.5YR 4/4 (red); fine-grained texture; thinly bedded; moderately decomposed; slightly to moderately disintegrated; slightly to moderately fractured. 32.5-34.9': CLAYSTONE/MUDSTONE; moderate field strength; GLEY1 4/104; fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; moderately to intensely fractured.		
		38.3	44.9	5-7-13-9-6-6	70		35			34.9-38.3': CLAYSTONE/MUDSTONE; moderate to weak field strength; 2.5YR 4/4 (red) mottled with tan, black, and gray; fine-grained texture; massive structure; moderately to highly decomposed; intensely disintegrated, mottling tan and gray; moderately to intensely fractured. 38.3-44.9': CLAYSTONE/MUDSTONE; moderate to weak field strength; 2.5YR 4/4 (red) mottled with tan, black, and gray; fine-grained texture; massive structure; highly decomposed; intensely disintegrated; intensely fractured.		
		44.9	50.0	4-4-7-8	50		40					
							45			44.9-50': CLAYSTONE/MUDSTONE; moderate to weak field strength; 2.5YR 4/4 (red) mottled with		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1801** DATE **5/3/19** SHEET **3** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/7/18** BORING FINISH **8/8/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		44.9	50.0	4-4-7-8	50					tan, black, and gray; fine-grained texture; massive structure; highly decomposed; intensely disintegrated; intensely fractured.		49-52': Bentonite Pellets
		50.0	55.0	4-4-5-4	50		50			50-56.7': CLAYSTONE/MUDSTONE; moderate field strength; 2.5YR 4/4 (red) mottled with tan, black, and gray; fine-grained texture; massive structure; moderately to highly decomposed, becomes less weathered at 50.3'; highly disintegrated, highly mottled; moderately to intensely fractured.		52-53': Secondary Filter Pack 53-75': Primary Filter Pack
		55.0	59.8	5-7-5-36	52		55					55-75': Screen
		59.8	64.8	8-5-4-4-7-5-5-4	60		60			56.7-58': SANDSTONE, interbedded; strong field strength; GLEY1 6/N (gray-green); fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated along fracture; moderately fractured at 56.7' and 57.1-57.5'. 58-58.8': SHALE, interbedded; strong field strength; 2.5YR 4/4 (red); fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated along fracture. 58.8-59.2': SANDSTONE, interbedded; strong field strength; GLEY1 6/N (gray-green); fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated along fracture. 59.2-59.8': SHALE, interbedded; strong field strength; 2.5YR 4/4 (red); fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated along fracture.		
		64.8	74.8	4-5-4-6	76		65			59.8-60.7': SANDSTONE; strong field strength; GLEY1 6/N; fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated; unfractured. 60.7-63.9': SHALE; moderate field strength; 2.5YR 4/4 (red); fine-grained texture; thinly bedded; moderately decomposed along bedding planes; moderately disintigrated with silt filled fractures; moderately fractured. 63.9-64.3': SANDSTONE; strong field strength; GLEY1 6/N (gray-green); fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated; unfractured.		
							70			64.3-64.8': SHALE; moderate field strength; 2.5YR 4/4 (red); fine-grained texture; thinly bedded; moderately decomposed; moderately		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1801** DATE **5/3/19** SHEET **4** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/7/18** BORING FINISH **8/8/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		64.8	74.8	4-5-4-6	76					disintigrated; moderately fractured.		
										64.8-74.8': SHALE, highly weathered at base; moderate to weak field strength along some bedding planes; 2.5YR 3/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintigrated, becomes more limestone fragments last 1 ft, 3-5 cm; moderately to intensely fractured.		
		74.8	85.0				75			74.8-85': SHALE, highly weathered; weak field strength; 2.5YR 4/4 (red) with tan and gray mottling; fine-grained texture; massive structure; highly decomposed; highly disintigrated, mottled; intensely fractured.		75-105': Bentonite
		85.0	95.0	5-4-4	120		80			85-92.7': SANDSTONE; strong field strength; fine-grained texture; thinly bedded; fresh; slightly disintigrated, calcite in light colored beds/thin; slightly fractured.		
							85					
							90			92.7-94.6': SHALE; moderate field strength; fine-grained texture; massive structure; slightly decomposed; slightly disintigrated, some mottling; moderately fractured.		
		95.0	105.0	7-4-4	120		95			94.6-95': SANDSTONE; strong field strength; fine-grained texture; thinly bedded; fresh; slightly disintigrated, calcite in light colored beds/thin; slightly fractured at 94.6-95'.		
										95-100.1': SANDSTONE; strong field strength; fine-grained texture; thinly bedded; fresh; slightly disintigrated; slightly fractured at 95-95.2'.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1801** DATE **5/3/19** SHEET **5** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/7/18** BORING FINISH **8/8/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		95.0	105.0	7-4-4	120		100			100.1-101.5': SHALE and sandstone interbedded; moderate field strength; fine-grained texture; thinly bedded; slightly decomposed; slightly disintigrated; slightly fractured at 100.2-100.5'. 101.5-105': SHALE; moderate to weak field strength; fine-grained texture; massive structure; highly decomposed; moderately to highly disintigrated mottling with silt filled fractures; highly fractured.		
							105					
							110					
							115					
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 38.5 E 81.9**

GROUND ELEVATION **709.8** SYSTEM **NAVD88**

Water Level, ft	▽ 35.0	▼	▼
TIME			
DATE	8/21/2019		

BORING NO. **MW-1802** DATE **5/3/19** SHEET **1** OF **5**

BORING START **8/20/18** BORING FINISH **8/21/18**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.91** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **50** BOTTOM **114.4**

WELL DEVELOPMENT **Surge/Purge** BACKFILL **Bentonite Grout**

FIELD PARTY **Zachary Racer (AEP)** RIG **Direct Circulation - Wireline Core**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
									GW	0-3.5': GRAVEL backfill; large rip-rap and smaller compacted gravels.		0-41': Bentonite Grout
									CL	3.5-4.5': SILTY CLAY; brown; moist; soft; backfill material.		
		4.5	6.0	6-4-5	0		5			4.5-6': NO RECOVERY, due to gravel blocking cutting shoe.		
		6.0	7.5	4-3-4	3.6				CL	6-17': SILTY CLAY; 7.5YR 4/3 (brown); moist; firm; compacted backfill material; becomes wet at 12.5'.		
		7.5	9.0	3-4-5	7.2							
		9.0	10.5	4-4-6	18		10					
		10.5	12.0	5-4-5	13.2							
		12.0	13.5	3-4-6	15.6							
		13.5	15.0	3-5-8	14.4							
		15.0	16.5	4-7-9	15.6		15					
		16.5	18.0	6-25-8	16.8					17-17.5': SANDSTONE, weathered; GLEY1 7/N (gray); dry.		
		18.0	19.5	7-23-15	14.4				CL	17.5-19.5': SILTY CLAY; GLEY1 6/N (gray) mottled with brown, red, tan; moist; soft; crumbles easily.		
		19.5	21.0	20->50/4	10.8				CL			

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **A. Gillespie**

AEP - AEP.GDT - 5/3/19 11:49 - S:\KNOXVILLE-TN\FOR NICOLE AEP LOG EDIT FILES\GINT LOGS OUTPUT\AEP MOUNTAINEER\AEP MOUNTAINEER.GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **2** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		19.5	21.0	20->50/4	10.8					19.5-22.5': SILTY CLAY; GLEY1 6/N (gray) mottled with brown, tan; dry; soft; crumbles easily.		
		21.0	22.5	27-50/5	9.6							
		22.5	24.4	4	23					22.5-24': SILTSTONE; moderate to weak field strength; GLEY1 6/N; fine-grained texture; massive structure; highly decomposed; moderately to highly disintegrated with tan/brown mottling; moderately to intensely fractured.		
		24.4	29.4		22		25			24-24.4': SILTSTONE; weak field strength; 10R 4/4 (red) mottled; fine-grained texture; massive structure; highly decomposed; moderately to intensely fractured. 24.4-29.4': SILTSTONE; weak field strength; 10R 4/4 (red) mottled with tan, gray, and black; fine-grained texture; massive structure; highly decomposed; highly disintegrated, highly mottled; moderately fractured.		
		29.4	33.7	5-11-6	40		30			29.4-32.8': SHALE, weathered; moderate field strength; 10YR 4/4 (red) mottled; fine-grained texture; massive structure; moderately decomposed; moderately to intensely disintegrated; moderately fractured.		
		33.7	39.4	5-4-4-7-5	59		35			32.8-33.7': SHALE; moderate field strength; 5YR 5/4 (tan) mottled; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; moderately to intensely fractured. 33.7-39.4': SHALE; moderate field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; intensely fractured.		
		39.4	44.4	4-6-4-4	57		40			39.4-44.4': SHALE; moderate field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; intensely fractured.		41-44': Bentonite Pellets
		44.4	54.4	7-8-7-5-5-24-5	120		45			44.4-47.8': SHALE, highly weathered; weak field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure;		44-45': Secondary Filter Pack 45-71': Primary Filter Pack

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **3** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		44.4	54.4	7-8-7-5-5-24-5	120					highly decomposed; intensely disintegrated; intensely fractured.		
										47.8-49.9': SHALE, less weathered; moderate field strength; 10R 3/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; moderately fractured.		
							50			49.9-50.8': SHALE, interbedded with sandstone; moderate field strength; GLEY1 4/N; fine-grained texture; thinly bedded; moderately decomposed; slightly disintegrated; moderately fractured.		50-70': Screen
										50.8-52.8': SHALE; moderate to strong field strength; 10R 4/3 (red); fine-grained texture; massive structure; slightly decomposed; moderately disintegrated; slightly fractured.		
										52.8-53.1': SHALE, interbedded with sandstone; strong field strength; GLEY1 4/5GY; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; unfractured.		
		54.4	64.4	8-12-5-6-7-4-4-4	114		55			53.1-54.4': SHALE; moderate field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; moderately fractured.		
										54.4-55.4': SANDSTONE, interbedded with shale; moderate field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; slightly to moderately fractured.		
							60			55.4-57.1': SHALE, interbedded with sandstone; moderate field strength; GLEY1 4/3, 10R 4/3; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
										57.1-64.4': SHALE, weathered; moderate to weak field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated with intense gray mottling; intensely fractured.		
		64.4	74.4	4-6-8-6-4-5-4-4-5	117		65			64.4-70.5': SHALE, highly weathered; moderate to weak field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately to intensely disintegrated with gray mottling; intensely fractured.		
							70			70.5-74.4': SHALE, interbedded with sandstone; strong field strength; 10R 4/3 (red) interbedded with GLEY1 4/N (gray-green); fine-grained		

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **4** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		64.4	74.4	4-6-8-6-4-5-4-4-5	117					texture; thinly bedded; slightly to moderately decomposed along some bedding planes; moderately disintegrated with silt filled fractures; moderately fractured.		
		74.4	84.4	8-7-5-5-14-8-7-22-12	120		75			74.4-77.1': SHALE, with some interbedded sandstone lenses; moderate field strength; 10R 4/3 (red); fine-grained texture; thinly bedded; slightly to moderately decomposed at some bedding planes; slightly disintegrated; moderately fractured.		
							80			77.1-82.7': SANDSTONE, with some red shale lenses; strong field strength; GLEY1 4/N; fine-grained texture; thinly bedded; fresh; moderately disintegrated, calcite reacts to HCl in light colored bands within 0.5' of surrounding contact lines, no HCl/calcite in fractures, no Fe staining; moderately fractured.		
										82.7-84.4': SHALE, with some interbedded sandstone lenses; moderate field strength; 10R 4/3 (red); fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
		84.4	94.4	10-11-6-7-7-8-9-8-7-6-6-7-10	120		85			84.4-86.7': SHALE, with sandstone lenses; moderate field strength; 10R 4/2 (red) with GLEY1 4/N lenses; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
										86.7-89.2': SANDSTONE, with shale lenses; moderate field strength; GLEY1 4/N with 10R 4/2 lenses; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
							90			89.2-94.4': SANDSTONE; strong field strength; GLEY1 6/N; fine-grained texture; thinly bedded, micaceous; fresh; slightly disintegrated, some calcite in light bands, no staining, no calcite in fractures; slightly to moderately fractured along bedding planes; fracture at 92.8'.		
		94.4	104.4	7-4-5-4-9-9-8-5-11-5-6-10-19	120		95			94.4-104.4': SANDSTONE; strong field strength; GLEY1 6/N; fine-grained texture; thinly bedded, micaceous, cross-bedding at 94.4-94.8; fresh; slightly disintegrated, calcite in some light bedded planes, no calcite or Fe staining noted in fractures; slightly to moderately fractured along bedding planes.		

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **5** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		94.4	104.4	7-4-5-4-9-9-8-5-11-5-6-10-19	120		100					
		104.4	114.4	15-6-21-6-4-4-8-8-6-4-13-5-7	120		105			104.4-108': SANDSTONE; strong field strength; GLEY1 6/N; fine to medium-grained texture; thinly bedded, micaceous, shale fragments; fresh; moderately disintegrated, calcite along entire sandstone void and shale fragments at base, calcite in void; slightly fractured.		
										108-108.9': SHALE, with interbedded sandstone; moderate field strength; GLEY1 4/N, 10R 4/3 bands; thinly bedded; moderately decomposed between bedding planes; moderately disintegrated along bedding planes; moderately fractured.		
							110			108.9-114.4': SHALE; moderate field strength; 10R 4/3 (red) with GLEY1 4/N mottling; fine-grained texture; massive structure; moderately decomposed; moderately to intensely disintegrated, mottling; moderately fractured.		
							115					
							120					

AEP - AEP.GDT - 5/3/19 11:49 - S:\KNOXVILLE-TN\FOR NICOLE AEP LOG EDIT FILES\GINT LOGS OUTPUT\AEP MOUNTAINEER\AEP MOUNTAINEER.GPJ

APPENDIX C

Well Survey

Prepared for:

ARCADIS U.S., INC.-Columbus
630 Plaza Drive, Suite 600
Highlands Ranch, CO 80129

BANKS ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP

Water Well Report

FGD LANDFILL

WV

PO #: WV015976.0004

ES-124909

Thursday, July 20, 2017

Banks Environmental Data, Inc. - 1601 Rio Grande, Ste. 331 - Austin, TX 78701 - 800.531.5255 P - 512.478.1433 F
www.banksenvdata.com

Table of Contents

Banks Environmental Data, Inc. - 1601 Rio Grande, Ste. 331 - Austin, TX 78701 - 800.531.5255 P - 512.478.1433 F
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Geographic Summary

Location
WV
Target location is 0.405 square miles and has a 3.4 mile perimeter

Coordinates	
Longitude & Latitude in Degrees Minutes Seconds	NA
Longitude & Latitude in Decimal Degrees	NA
X and Y in UTM	NA

Elevation
NA

Zip Codes Searched	
Search Distance	**Zip Codes (historical zip codes included)**
Target Property	25213, 25070, 25109, 25124, 25560
0.5 miles	25213, 25070, 25109, 25124, 25560

Topos Searched	
Search Distance	**Topo Name**
Target Property	Saint Albans (1980)
0.5 miles	Saint Albans (1980)

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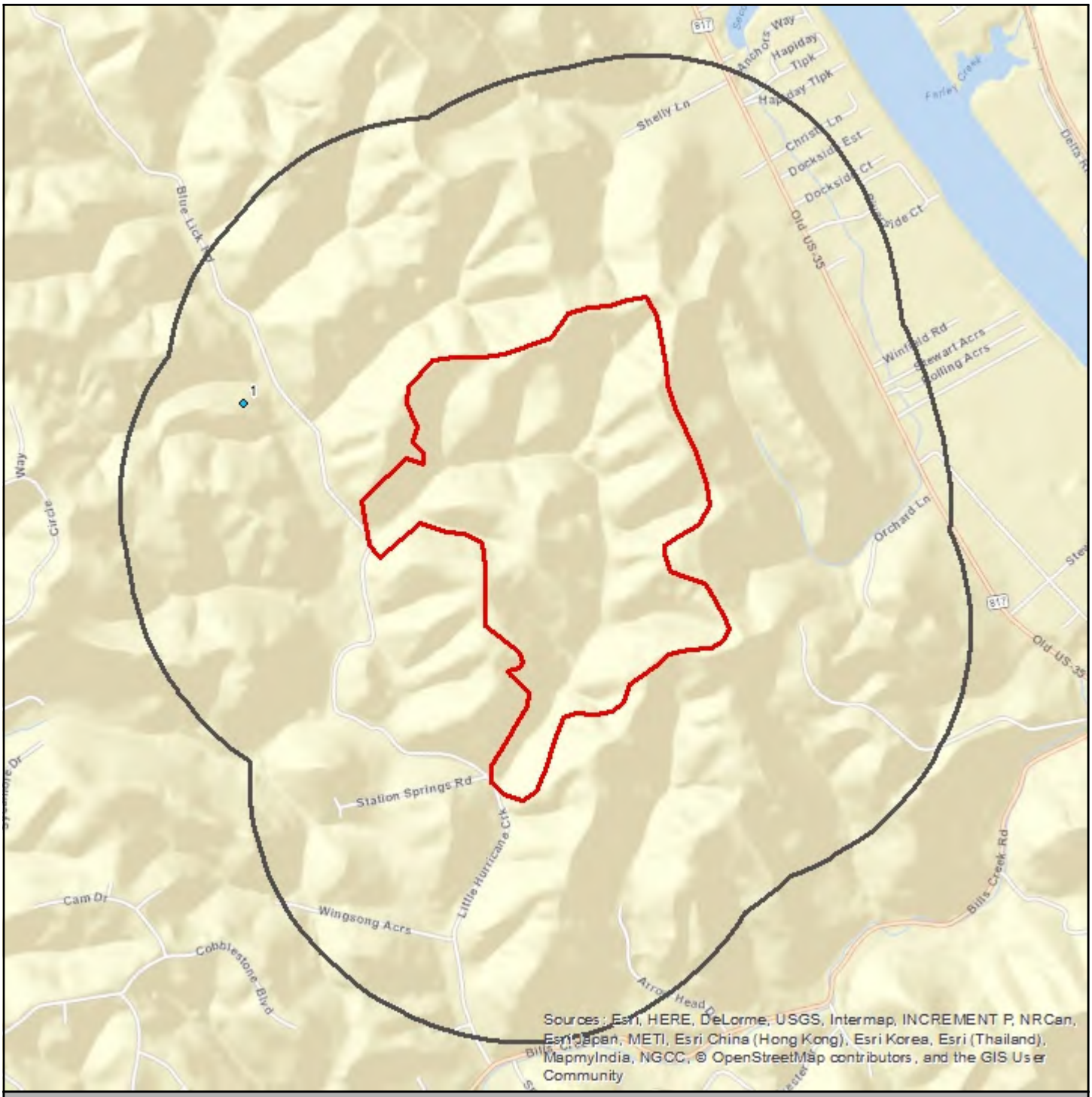
Summary Map - 0.5 Mile Buffer



FGD LANDFILL

- Well
- Well Cluster
- Target Property
- Search Buffer

1 : 19,000
1 inch = 0.300 miles
1 inch = 1583 feet
1 centimeter = 0.190 kilometers
1 centimeter = 190 meters

N

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33 0' 00" North
Second Standard Parallel: 45 0' 00" North
Central Meridian: 96 0' 00" West
Latitude of Origin: 39 0' 00" North

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Topographic Overlay Map - 0.5 Mile Buffer

BANKS ENVIRONMENTAL DATA
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FGD LANDFILL

Well

Well Cluster

Target Property

Search Buffer

Target Property Quad Name(s)
Saint Albans (1980)

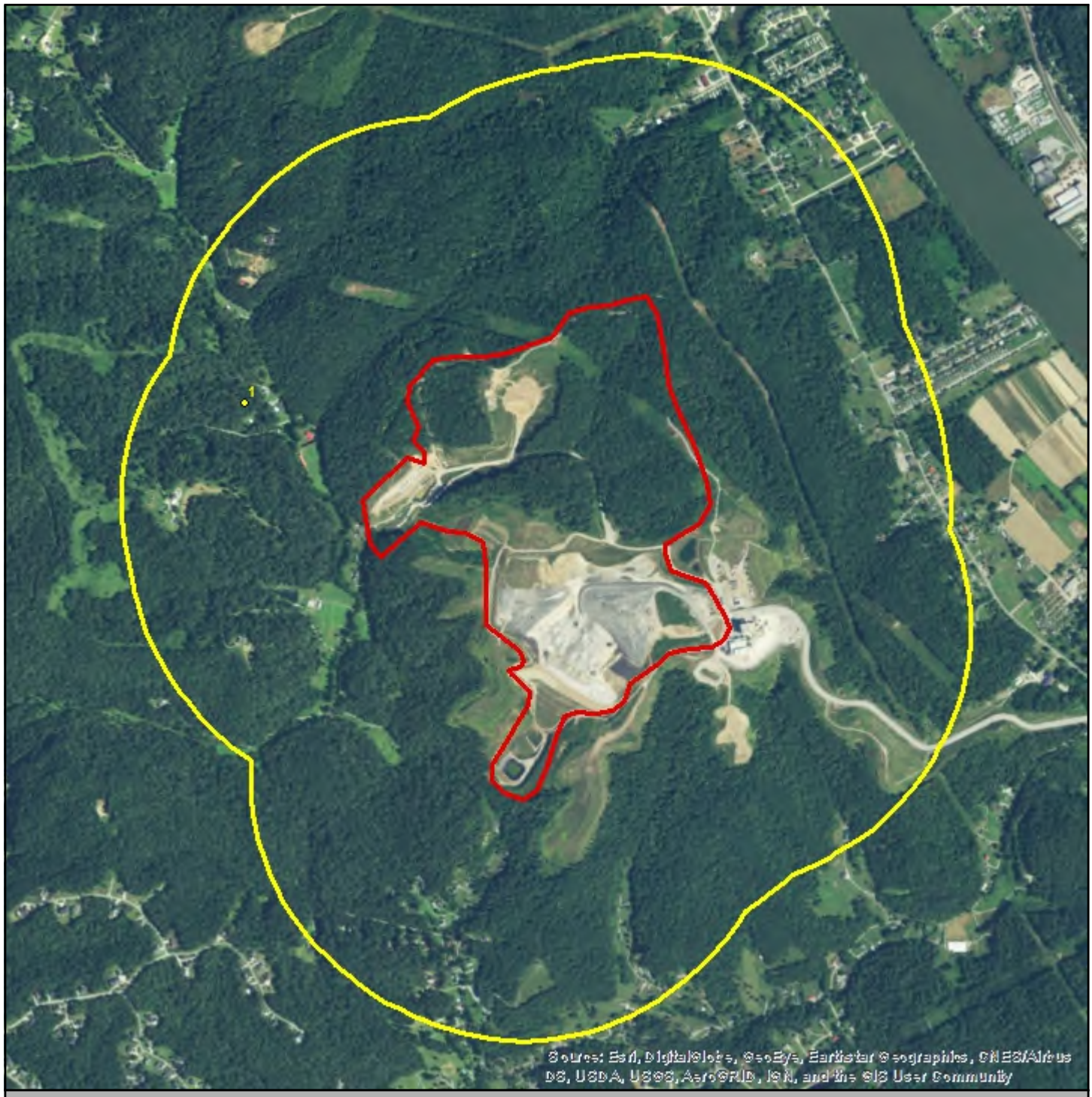
1 : 19,000
1 inch = 0.300 miles
1 inch = 1583 feet

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33 0' 00" North
Second Standard Parallel: 45 0' 00" North
Central Meridian: 96 0' 00" West
Latitude of Origin: 39 0' 00" North

N

Current Imagery Overlay Map - 0.5 Mile Buffer

BANKS ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP



FGD LANDFILL

- Well
- Well Cluster
- Target Property
- Search Buffer

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1 inch = 0.300 miles
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N

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33 0' 00" North
Second Standard Parallel: 45 0' 00" North
Central Meridian: 96 0' 00" West
Latitude of Origin: 39 0' 00" North

Water Well Details

Map ID	Source ID	Dataset	Owner of Well	Type of Well	Depth Drilled	Completion Date	Longitude	Latitude	Elevation	Driller's Logs
1	USGS-382926081520101	WW USGS	USGS	Not Reported	91	01/01/1953	-81.8668	38.490646	763 ft	N/A

Well Summary

Water Well Dataset	# of Wells
WW USGS	1
Total Count	**1**

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Dataset Descriptions and Sources

Dataset	Source	Dataset Description	Update Schedule	Data Requested	Data Obtained	Data Updated	Source Updated
WV WW - West Virginia Water Wells	West Virginia Department of Health and Human Resources	This dataset contains groundwater well information provided by West Virginia Department of Health and Human Resources.	As requested	N/A	N/A	N/A	N/A
WW USGS - USGS Water Wells	U.S. Geological Survey	This dataset contains groundwater well records from the U.S. Geological Survey.	Semi-annually	04/18/2017	04/18/2017	05/07/2017	04/18/2017

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Disclaimer

The Banks Environmental Data Water Well Report was prepared from existing state water well databases and/or additional file data/records research conducted at the state agency and the U.S. Geological Survey. Banks Environmental Data has performed a thorough and diligent search of all groundwater well information provided and recorded. All mapped locations are based on information obtained from the source. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the appropriate regulatory authority or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the regulatory authority by the water driller and, thus, may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Environmental Data cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the regulatory authorities.

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APPENDIX D

Hydrographs and Hydraulic Testing Results

ARCADIS

Well Development Field Logs

WELL DEVELOPMENT LOG

Site/Well No. MW-1801

Project AEP Amos Plant - FGD Landfill Project No. WV015976 Page 1 of 1

Site Location Winfield, WV Date 8/17/2018

Weather NR Development Time Begin 9:45 End 1:45

Evacuation Data

Measuring Point	TOC	Sample Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	Average
Land Surface Elevation (ft)	NA	Evacuation Method	Submersible Pump
Sounded Well Depth (ft bmp)	78.50	Volumes Purged	6
Depth to Water (ft bmp)	29.15		
Water-Level Elevation (ft)	NA	**Field Parameters**	
Water Column in Well (ft)	49.35	Color	Red
Casing Diameter/Type	2" PVC	Odor	NR
Gallons in Well	7.90	Appearance	Cloudy

Time	Min Elapsed	Total Gallons Removed	Depth To Water (ft btoc)	Rate (mL/min)	Conductivity (mS/cm or umhos/cm)	Turbidity (NTU)	Temperature (^{o}F/^{o}C)	pH (s.u.)	ORP (mV)	Dissolved Oxygen (g/mL)	Well Volume (Gal)	Remarks
9:45	0	NA	34.00	1400	NR	NR	NR	NR	NR	NR	NA	Dark Red
10:00	15	6	42.00	1400	NR	NR	NR	NR	NR	NR	5.84	Dark Red
10:15	30	8	46.70	600	NR	NR	NR	NR	NR	NR	5.09	Surge/Dark Red
10:30	45	13	59.00	1400	NR	NR	NR	NR	NR	NR	3.12	Dark Red
10:45	60	19	58.70	1400	NR	NR	NR	NR	NR	NR	3.17	Dark Red
11:00	75	25	63.40	1400	NR	NR	NR	NR	NR	NR	2.42	Dark Red
11:15	90	28	65.10	750	NR	NR	NR	NR	NR	NR	2.14	Red Cloudy
11:30	105	31	65.10	750	NR	NR	NR	NR	NR	NR	2.14	Surge/Red Cloudy
11:45	120	33	65.80	750	NR	NR	NR	NR	NR	NR	2.03	Red Cloudy
12:00	135	36	66.70	750	NR	NR	NR	NR	NR	NR	1.89	Red Cloudy
12:15	150	39	67.30	600	NR	NR	NR	NR	NR	NR	1.79	Red Cloudy
12:30	165	40	67.30	300	NR	NR	NR	NR	NR	NR	1.79	Red Cloudy
12:45	180	41	67.59	300	NR	NR	NR	NR	NR	NR	1.75	Surge/Red Cloudy
1:00	195	42	68.00	300	NR	NR	NR	NR	NR	NR	1.68	Red Cloudy
1:15	210	44	68.60	300	NR	NR	NR	NR	NR	NR	1.58	Red Cloudy
1:30	225	45	69.65	300	NR	NR	NR	NR	NR	NR	1.42	Red Cloudy
1:45	240	N/A	70.01	NR	NR	NR	NR	NR	NR	NR	1.36	NR

Development Personnel: AEP Staff: Rick Baker

Notes: Water Quality Parameters collected during yield testing on 9/12/2018 by Arcadis

Well Casing Volumes (gallon/feet)

1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units	ORP	Oxidation-Reduction Potential
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride	mV	millivolts
ft	feet	msl	mean sea-level	s.u.	Standard units	NA	Not Available
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter	NR	Not Recorded
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds		

WELL DEVELOPMENT LOG

Site/Well No. MW-1802

Project AEP Amos Plant - FGD Landfill Project No. WV015976 Page 1 of 2

Site Location Winfield, WV Date 8/23/2018

Weather Fog in AM, cool, sunny, 58-78°F Development Time Begin 8:00 End 15:47

Evacuation Data

Measuring Point	TOC	Sample Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	Average
Land Surface Elevation (ft)	NA	Evacuation Method	Submersible Bladder
Sounded Well Depth (ft bmp)	73.60	Volumes Purged	36
Depth to Water (ft bmp)	49.07		
Water-Level Elevation (ft)	NA	**Field Parameters**	
Water Column in Well (ft)	24.53	Color	NR
Casing Diameter/Type	2" PVC	Odor	NR
Gallons in Well	3.92	Appearance	NR

Time	Min Elapsed	Total Gallons Removed	Depth To Water (ft btoc)	Rate (mL/min)	Conductivity (mS/cm or umhos/cm)	Turbidity (NTU)	Temperature (°F/°C)	pH (s.u.)	ORP (mV)	Dissolved Oxygen (g/mL)	Well Volume (Gal)	Remarks
8:00	0	NA	49.07	1500	NR	NR	NR	NR	NR	NR	N/A	
8:15	15	3	57.30	800	NR	NR	NR	NR	NR	NR	2.61	
8:30	30	6	57.85	800	NR	>1,000	NR	NR	NR	NR	2.52	Surge
8:40	40	8	59.30	800	NR	>1,000	NR	NR	NR	NR	2.29	
8:50	50	11	60.10	800	NR	>1,000	NR	NR	NR	NR	2.16	
9:00	60	13	60.50	800	NR	>1,000	NR	NR	NR	NR	2.10	
9:15	75	16	60.91	800	NR	NR	NR	NR	NR	NR	2.03	
9:30	90	19	61.74	800	NR	>1,000	NR	NR	NR	NR	1.90	
9:35	95	20	NR	1100	NR	NR	NR	NR	NR	NR	NA	Surge
9:45	105	NA	63.18	NR	NR	>1,000	NR	NR	NR	NR	1.67	
10:00	120	28	64.01	1100	NR	NR	NR	NR	NR	NR	1.53	
10:05	125	NA	64.45	NR	NR	NR	NR	NR	NR	NR	1.46	
13:15	315	110	51.83	1600	NR	NR	NR	NR	NR	NR	3.48	Surge
13:25	325	114	57.98	1600	NR	>1,000	NR	NR	NR	NR	2.50	
13:30	330	116	59.99	1100	NR	NR	NR	NR	NR	NR	2.18	

Development Personnel: AEP Staff: Rick Baker

Notes: Water Quality Parameters collected during yield testing on 9/11/2018 by Arcadis

Well Casing Volumes (gallon/feet)

1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units	ORP	Oxidation-Reduction Potential
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride	mV	millivolts
ft	feet	msl	mean sea-level	s.u.	Standard units	NA	Not Available
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter	NR	Not Recorded
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds		

WELL DEVELOPMENT LOG

Site/Well No. MW-1802

Project AEP Amos Plant - FGD Landfill Project No. WV015976 Page 2 of 2

Site Location Winfield, WV Date 8/23/2018

Weather Fog in AM, cool, sunny, 58-78°F Development Time Begin 8:00 End 15:47

Evacuation Data

Measuring Point	TOC	Sample Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	Average
Land Surface Elevation (ft)	NA	Evacuation Method	Submersible Bladder
Sounded Well Depth (ft bmp)	73.60	Volumes Purged	36
Depth to Water (ft bmp)	49.07		
Water-Level Elevation (ft)	NA	**Field Parameters**	
Water Column in Well (ft)	24.53	Color	NR
Casing Diameter/Type	2" PVC	Odor	NR
Gallons in Well	3.92	Appearance	NR

Time	Min Elapsed	Total Gallons Removed	Depth To Water (ft btoc)	Rate (mL/min)	Conductivity (mS/cm or umhos/cm)	Turbidity (NTU)	Temperature (°F/°C)	pH (s.u.)	ORP (mV)	Dissolved Oxygen (g/mL)	Well Volume (Gal)	Remarks
13:35	335	117	50.91	1100	NR	>1,000	NR	NR	NR	NR	3.63	
13:40	340	119	61.45	1100	NR	NR	NR	NR	NR	NR	1.94	
13:45	345	120	NR	700	NR	>1,000	NR	NR	NR	NR	NA	
13:50	350	121	61.73	700	NR	NR	NR	NR	NR	NR	1.90	
14:00	360	122	60.65	700	NR	NR	NR	NR	NR	NR	2.07	
14:10	370	NA	NR	NR	NR	NR	NR	NR	NR	NR	NA	
14:15	375	125	58.45	700	NR	NR	NR	NR	NR	NR	2.42	
14:20	380	126	58.95	700	NR	NR	NR	NR	NR	NR	2.34	
14:30	390	128	60.50	700	NR	NR	NR	NR	NR	NR	2.10	
14:35	395	129	NR	600	NR	NR	NR	NR	NR	NR	NA	Surge
14:40	400	130	61.49	600	NR	>1,000	NR	NR	NR	NR	1.94	
14:50	410	131	60.80	600	NR	NR	NR	NR	NR	NR	2.05	
15:00	420	133	60.78	600	NR	>1,000	NR	NR	NR	NR	2.05	
15:10	430	134	61.24	600	NR	>1,000	NR	NR	NR	NR	1.98	
15:25	445	137	61.30	600	NR	NR	NR	NR	NR	NR	1.97	
15:27	447	137	NR	1100	NR	>1,000	NR	NR	NR	NR	NA	Surge
15:30	450	138	61.91	1100	NR	>1,000	NR	NR	NR	NR	1.87	
15:40	460	141	63.51	1100	NR	>1,000	NR	NR	NR	NR	1.61	
15:47	467	N/A	64.30	NR	NR	NR	NR	NR	NR	NR	1.49	

Development Personnel: AEP Staff: Rick Baker

Notes: Water Quality Parameters collected during yield testing on 9/11/2018 by Arcadis

Well Casing Volumes (gallon/feet)

1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units	ORP	Oxidation-Reduction Potential
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride	mV	millivolts
ft	feet	msl	mean sea-level	s.u.	Standard units	NA	Not Available
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter	NR	Not Recorded
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds		

ARCADIS

Packer Test Logs

BEDROCK INJECTION PACKER TESTING LOG

Boring No.	MW-1801	Contractor	AEP	Page	1	of	1
Project	AEP Amos FGD Landfill Well Install	Project No.	WV015976.0012	Arcadis Staff	Allan Gillespie		
Site Location	Winfield, WV			Date	8/13/2018		

Base of Top Packer (ft bgs/ft amsl)	55.00	Surface Elevation (ft amsl)	N/A
Top of Bottom Packer (ft bgs/ft amsl)	65.00	Distance from Gauge to Ground Surface (ft)	6.60
Depth to Water Prior to Install (ft bgs/ft amsl)	17.10	Diameter of Boring (inches)	2.98
Depth to Water After Install (ft bgs/ft amsl)	17.10	used reading from 8/14, no data recorded for 8/13	

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	968.0	0.0	N/A
1	969.9	1.9	N/A
2	971.9	1.9	N/A
3	974.2	2.1	N/A
4	976.5	2.1	N/A
5	979.0	2.2	N/A
10	991.3	2.3	N/A
15	1004.6	2.4	N/A
20	1018.3	2.5	N/A
25	1032.2	2.6	N/A
30			

Test 2

Constant Pressure (psi)

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 1

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

Test 1

Q =	5.7E-03	ft^3/s
h1 =	23.7	ft
h2 =	138.4	ft
H =	162.1	ft
r =	0.1	ft
A =	10.0	ft
A/r =	80.5	unitless
Cs =~	110	unitless
K =	7.9E-05	cm/s

Zone 3
Method 2

$$K = \frac{Q}{C_s r H}$$

Test 2

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Q= flow rate
H = h1+h2 = effective head
Cs = conductivity coefficient
h1 = distance between gage and water table
r = radius of test hole
h2 = applied pressure at gage
A = length of test section

Reference
US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

BEDROCK INJECTION PACKER TESTING LOG

Boring No.	MW-1801	Contractor	AEP	Page	1	of	1
Project	AEP Amos FGD Landfill Well Install	Project No.	WV015976.0012	Arcadis Staff	Allan Gillespie		
Site Location	Winfield, WV			Date	8/9/2018		

Base of Top Packer (ft bgs/ft amsl)	65.0	Surface Elevation (ft amsl)	NA
Top of Bottom Packer (ft bgs/ft amsl)	75.0	Distance from Gauge to Ground Surface (ft)	6.6
Depth to Water Prior to Install (ft bgs/ft amsl)	13.0	Diameter of Boring (inches)	3.0
Depth to Water After Install (ft bgs/ft amsl)	13.0		

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	886.90	0	N/A
1	886.90	0.000	N/A
2	886.90	0.000	N/A
3	886.90	0.000	N/A
4	886.90	0.000	N/A
5	886.90	0.000	N/A
10	886.90	0.000	N/A
15	886.90	0.000	N/A
20			
25			
30			

Test 2

Constant Pressure (psi) 100

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	887.00	0.0	N/A
1	887.00	0.0	N/A
2	887.10	0.1	N/A
3	887.20	0.1	N/A
4	887.25	0.1	N/A
5	887.40	0.1	N/A
10	887.90	0.1	N/A
15	888.60	0.1	N/A
20	889.50	0.1	N/A
25	890.80	0.2	N/A
30			

Pre-Test 1

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

Test 1

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Zone 3
Method 2

$$K = \frac{Q}{C_s r H}$$

Test 2

Q =	3.4E-04	ft^3/s
h1 =	19.6	ft
h2 =	230.7	ft
H =	250.3	ft
r =	0.1	ft
A =	10.0	ft
A/r =	80.5	unitless
Cs =~	110	unitless
K =	3.02E-06	cm/s

Q= flow rate
h1 = distance between gage and water table
h2 = applied pressure at gage
H = h1+h2 = effective head
r = radius of test hole
A = length of test section
Cs = conductivity coefficient

Reference

US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

BEDROCK INJECTION PACKER TESTING LOG

Boring No.	MW-1802	Contractor	AEP	Page	1 of 1
Project	AEP Amos FGD Landfill Well Install	Project No.	WV015976.0012	Arcadis Staff	Allan Gillespie
Site Location	Winfield, WV			Date	8/21/2018

Base of Top Packer (ft bgs/ft amsl)	48.0	Surface Elevation (ft amsl)	N/A
Top of Bottom Packer (ft bgs/ft amsl)	58.0	Distance from Gauge to Ground Surface (ft)	8.6
Depth to Water Prior to Install (ft bgs/ft amsl)	35.1	Diameter of Boring (inches)	3.0
Depth to Water After Install (ft bgs/ft amsl)	35.1	used reading from 8/14, no data recorded for 8/13	

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	146.80	0	N/A
1	146.80	0.000	N/A
2	146.90	0.050	N/A
3	147.00	0.067	N/A
4	147.10	0.075	N/A
5	147.15	0.070	N/A
10	148.00	0.120	N/A
15	149.00	0.147	N/A
20	149.60	0.140	N/A
25	150.50	0.148	N/A
30			

Test 2

Constant Pressure (psi)

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0			
1			
2			
3			
4			
5			
10			
15			
20			
25			
30			

Pre-Test 1

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

Test 1

Q =	3.3E-04	ft^3/s
h1 =	43.7	ft
h2 =	138.4	ft
H =	182.1	ft
r =	0.1	ft
A =	10.0	ft
A/r =	80.5	unitless
Cs =~	110	unitless
K =	4.0E-06	cm/s

Zone 3
Method 2

$$K = \frac{Q}{C_s r H}$$

Test 2

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Q= flow rate
H = h1+h2 = effective head
Cs = conductivity coefficient
h1 = distance between gage and water table
r = radius of test hole
h2 = applied pressure at gage
A = length of test section

Reference
US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

BEDROCK INJECTION PACKER TESTING LOG

Boring No.	MW-1802	Contractor	AEP	Page	1 of 1
Project	AEP Amos FGD Landfill Well Install	Project No.	WV015976.0012	Arcadis Staff	Allan Gillespie
Site Location	Winfield, WV			Date	8/21/2018

Base of Top Packer (ft bgs/ft amsl)	65.0	Surface Elevation (ft amsl)	N/A
Top of Bottom Packer (ft bgs/ft amsl)	75.0	Distance from Gauge to Ground Surface (ft)	6.6
Depth to Water Prior to Install (ft bgs/ft amsl)	35.1	Diameter of Boring (inches)	3.0
Depth to Water After Install (ft bgs/ft amsl)	35.1		

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	140.05	0	
1	140.05	0.000	
2	140.05	0.000	
3	140.05	0.000	
4	140.05	0.000	
5	140.05	0.000	
10	140.05	0.000	
15	140.05	0.000	
20			
25			
30			

Test 2

Constant Pressure (psi) 100

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	140.10	0	
1	140.10	0.000	
2	140.10	0.000	
3	140.10	0.000	
4	140.10	0.000	
5	140.10	0.000	
10	140.10	0.000	
15	140.10	0.000	
20			
25			
30			

Test 1

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Test 2

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Q= flow rate

H = h1+h2 = effective head

Cs = conductivity coefficient

h1 = distance between gage and water table

r = radius of test hole

h2 = applied pressure at gage

A = length of test section

Reference

US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

Pre-Test 1

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration _____ (mins) Pressure _____ (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

BEDROCK INJECTION PACKER TESTING LOG

Boring No. MW-1802 Contractor AEP Page 1 of 1

Project AEP Amos FGD Landfill Well Install Project No. WV015976.0012 Arcadis Staff Allan Gillespie

Site Location Winfield, WV Date 8/21/2018

Base of Top Packer (ft bgs/ft amsl) 89.0 Surface Elevation (ft amsl) N/A

Top of Bottom Packer (ft bgs/ft amsl) 99.0 Distance from Gauge to Ground Surface (ft) 7.6

Depth to Water Prior to Install (ft bgs/ft amsl) 35.1 Diameter of Boring (inches) 3.0

Depth to Water After Install (ft bgs/ft amsl) 35.1

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	75.90	0	
1	75.90	0.000	
2	75.90	0.000	
3	75.90	0.000	
4	75.90	0.000	
5	75.90	0.000	
10	75.90	0.000	
15	75.90	0.000	
20			
25			
30			

Test 2

Constant Pressure (psi) 100

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	79.00	0.0	
1	79.50	0.5	
2	80.00	0.5	
3	80.50	0.5	
4	81.00	0.5	
5	82.00	0.6	
10	93.50	1.5	
15	106.50	1.8	
20	118.90	2.0	
25	129.60	2.0	
30			

Pre-Test 1

Duration (mins) Pressure (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration (mins) Pressure (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

Test 1

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Zone 3
Method 2

$$K = \frac{Q}{C_s r H}$$

Test 2

Q =	4.5E-03	ft^3/s
h1 =	42.7	ft
h2 =	230.7	ft
H =	273.4	ft
r =	0.1	ft
A =	10.0	ft
A/r =	80.5	unitless
Cs =~	110	unitless
K =	3.7E-05	cm/s

Q= flow rate

h1 = distance between gage and water table

h2 = applied pressure at gage

H = h1+h2 = effective head

r = radius of test hole

A = length of test section

Cs = conductivity coefficient

Reference

US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

BEDROCK INJECTION PACKER TESTING LOG

Boring No. MW-1802 Contractor AEP Page 1 of 1

Project AEP Amos FGD Landfill Well Install Project No. WV015976.0012 Arcadis Staff Allan Gillespie

Site Location Winfield, WV Date 8/21/2018

Base of Top Packer (ft bgs/ft amsl) 99.0 Surface Elevation (ft amsl) N/A

Top of Bottom Packer (ft bgs/ft amsl) 109.0 Distance from Gauge to Ground Surface (ft) 7.6

Depth to Water Prior to Install (ft bgs/ft amsl) 35.1 Diameter of Boring (inches) 3.0

Depth to Water After Install (ft bgs/ft amsl) 35.1

Test 1

Constant Pressure (psi) 60

Elapsed Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	73.20	0	
1	73.20	0.000	
2	73.20	0.000	
3	73.20	0.000	
4	73.20	0.000	
5	73.20	0.000	
10	73.20	0.000	
15	73.20	0.000	
20			
25			
30			

Test 2

Constant Pressure (psi) 100

Time (mins)	Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)
0	73.50	0	
1	73.50	0.000	
2	73.50	0.000	
3	73.50	0.000	
4	73.50	0.000	
5	73.50	0.000	
10	73.50	0.000	
15	73.50	0.000	
20			
25			
30			

Pre-Test 1

Duration (mins) Pressure (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Pre-Test 2

Duration (mins) Pressure (psi)

Flow Totalizer Readings (gallons)	Flow Rate (gpm)	Borehole Water Level (ft)

Notes:
ft bgs- feet below ground surface
gpm - gallons per minute
cm/s - centimeters per second
psi - pounds per square inch
ft amls - feet above mean sea level
NA - not available
N/A - not applicable
NR - not recorded

Test 1

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Test 2

Q =		ft^3/s
h1 =		ft
h2 =		ft
H =		ft
r =		ft
A =		ft
A/r =		unitless
Cs =~		unitless
K =	N/A	cm/s

Q= flow rate

H = h1+h2 = effective head

Cs = conductivity coefficient

h1 = distance between gage and water table

r = radius of test hole

h2 = applied pressure at gage

A = length of test section

Reference

US Department of Interior, Ground Water Manual, 1977, Packer Test Solution

ARCADIS

Well Yield Tests

Field Logs

Well Yield - Pumping Drawdown/Recovery Log

Project No. WV015976.0012 | Well ID MW-1801 | Date 9/12/2018

Project Name/Location AEP Amos Plant - FGD Landfill | Weather Cloudy, 66°F

Measuring Pt. Description: TOC | Screen Setting (ft-bmp): NR | Casing Diameter (in.): 2 | Well Material: X PVC, SS

Static Water Level (ft-bmp): 36.33 | Total Depth (ft-bmp): 78.5 | Water Column: 42.17 | Gallons in Well: 6.75

MP Elevation: NA | Pump Intake (ft-bmp): 75

Pump On/Off: 10:45/13:45 | Volumes Purged: 3 | Purge Method: Pump; Centrifugal; Submersible: X; Other

Transducer SN: NR | Observation Wells: None

Transducer Depth: ~71 feet | Completed by: A. Gillespie

Time	Min Elapsed	Rate (gpm) **(mL/min)**	Total Gallons Purged	Depth to Water (ft)	pH (s.u.)	Cond. (mMhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox (mV)	Comments
10:45	0	NR	NA	36.33	NR	NR	NR	NR	NR	NR	
10:50	5	300	0	36.76	8.63	0.895	>1,000	8.32	21.63	63.1	Very turbid, no odors
10:55	10	300	1	38.59	8.76	0.826	>1,000	5.32	18.28	43.1	
11:05	20	300	2	39.85	8.85	0.822	>1,000	2.64	18.76	25.7	Very turbid, no odors
11:17	32	300	3	41.18	8.88	0.821	859	2.33	18.98	23.2	Turbidity decrease, no odors
11:25	40	300	3	43.08	8.86	0.820	663	2.42	18.70	23.6	
11:35	50	300	4	43.41	8.80	0.814	410	1.86	18.24	25.8	
11:45	60	NR	NA	NR	NR	NR	NR	NR	NR	NR	Loss of power to controller
11:48	63	NR	NA	NR	NR	NR	NR	NR	NR	NR	
11:52	67	450	6	46.62	8.78	0.813	280	1.90	17.29	28.6	
12:00	75	450	7	48.71	8.72	0.805	238	1.08	16.98	30.0	Moderately turbid, no odors
12:10	85	450	8	50.71	8.80	0.806	232	1.17	17.50	23.7	Moderately turbid, no odors
12:20	95	450	9	52.13	8.83	0.807	261	1.12	17.88	22.1	Moderately turbid, no odors
12:30	105	450	11	53.61	8.80	0.805	192	1.01	17.48	23.4	Turbidity decrease, no odors
12:40	115	450	12	55.14	8.82	0.806	172	1.01	17.55	21.7	
12:50	125	450	13	56.25	8.83	0.807	180	0.97	17.80	20.6	Moderately turbid, no odors
12:55	130	NR	NA	NR	NR	NR	NR	NR	NR	NR	
13:00	135	700	15	58.88	8.80	0.806	160	1.00	17.05	21.6	Moderately turbid, no odors
13:10	145	700	17	60.42	8.77	0.812	164	0.92	16.94	20.8	
13:25	160	700	19	63.21	8.77	0.829	152	0.93	17.05	19.2	No odors
13:30	165	700	20	64.00	8.84	0.830	156	0.89	17.30	15.3	Moderately turbid, no odors
13:32	167	NR	NA	NR	NR	NR	NR	NR	NR	NR	
13:36	171	NR	NA	62.61	NR	NR	NR	NR	NR	NR	
13:40	175	NR	NA	62.05	NR	NR	NR	NR	NR	NR	
13:45	180	NR	NA	61.45	NR	NR	NR	NR	NR	NR	

Well Casing Volumes (gallon/feet)

1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units	ORP	Oxidation-Reduction Potential
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride	mV	millivolts
ft	feet	msl	mean sea-level	s.u.	Standard units	NA	Not Available
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter	NR	Not Recorded
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds		

Well Yield - Pumping Drawdown/Recovery Log

Project No. WV015976.0012 | Well ID MW-1802 | Date 9/11/2018

Project Name/Location AEP Amos Plant - FGD Landfill | Weather Cloudy, cool, 68°F

Measuring Pt. Description: TOC | Screen Setting (ft-bmp): NR | Casing Diameter (in.): 2 | Well Material: X PVC, SS

Static Water Level (ft-bmp): 51.84 | Total Depth (ft-bmp): 76.4 | Water Column: 24.56

MP Elevation: NA | Pump Intake (ft-bmp): 71 | Gallons in Well: 4

Pump On/Off: NR | Volumes Purged: 7 | Purge Method: Pump; Centrifugal; Submersible: x; Other

Transducer SN: NR | Observation Wells: None

Transducer Depth: ~68 feet | Completed by: A. Gillespie

Time	Min Elapsed	Rate (gpm) **(mL/min)**	Total Gallons Purged	Depth to Water (ft)	pH (s.u.)	Cond. (mMhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox (mV)	Comments
13:30	0	NR	NA	51.84	NR	NR	NR	NR	NR	NR	
13:35	5	650	1	NR	NR	NR	NR	NR	NR	NR	
13:40	10	300	1	54.31	8.97	NR	>500	NR	NR	NR	No odors, high turbidity
13:50	20	350	2	54.54	8.81	0.770	160	6.21	16.78	81.1	Moderately turbid, rust color
14:00	32	350	3	54.63	8.71	0.757	145	4.05	16.65	43.4	Turbidity decrease, no odors
14:10	40	350	4	54.81	8.85	0.754	133	2.15	16.19	14.6	
14:20	50	350	5	54.98	8.95	0.754	120	0.94	16.27	-8.5	Turbidity decrease, no odors
14:35	60	350	6	55.44	8.89	0.752	120	0.58	16.19	-16.1	
14:38	63	NR	NA	NR	NR	NR	NR	NR	NR	NR	
14:40	67	700	8	56.13	9.01	0.757	118	2.43	16.87	-17.9	
14:50	75	700	10	56.40	8.94	0.752	159	1.14	15.86	-12.8	
15:00	85	700	11	57.51	8.92	0.750	175	1.31	15.48	-9.4	
15:10	95	700	13	57.91	8.97	0.749	170	1.50	15.47	-10.5	
15:20	105	700	15	58.72	8.96	0.753	168	1.52	15.00	-9.2	Moderately turbid, rust color
15:35	115	700	17	59.42	8.99	0.756	178	1.38	15.03	-11.8	
15:40	125	NR	NA	60.12	NR	NR	NR	NR	NR	NR	
15:45	130	1100	21	61.21	8.97	0.759	122	0.72	14.38	-12.4	Moderately turbid, rust color
15:50	135	1100	23	62.01	8.95	0.759	124	0.50	14.30	-13.5	
16:00	145	1000	25	63.41	8.99	0.764	192	0.53	14.50	-19.1	
16:05	160	1000	29	64.03	9.00	0.765	191	1.04	14.46	17.7	
16:06	165	NR	NA	NR	NR	NR	NR	NR	NR	NR	
16:10	167	NR	NA	61.50	NR	NR	NR	NR	NR	NR	
16:15	171	NR	NA	60.15	NR	NR	NR	NR	NR	NR	
16:20	175	NR	NA	58.56	NR	NR	NR	NR	NR	NR	

Well Casing Volumes (gallon/feet)

1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units	ORP	Oxidation-Reduction Potential
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride	mV	millivolts
ft	feet	msl	mean sea-level	s.u.	Standard units	NA	Not Available
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter	NR	Not Recorded
mg/L	Miligrams per liter	NM	Not Measured	VOC	Volatile Organic Compounds		

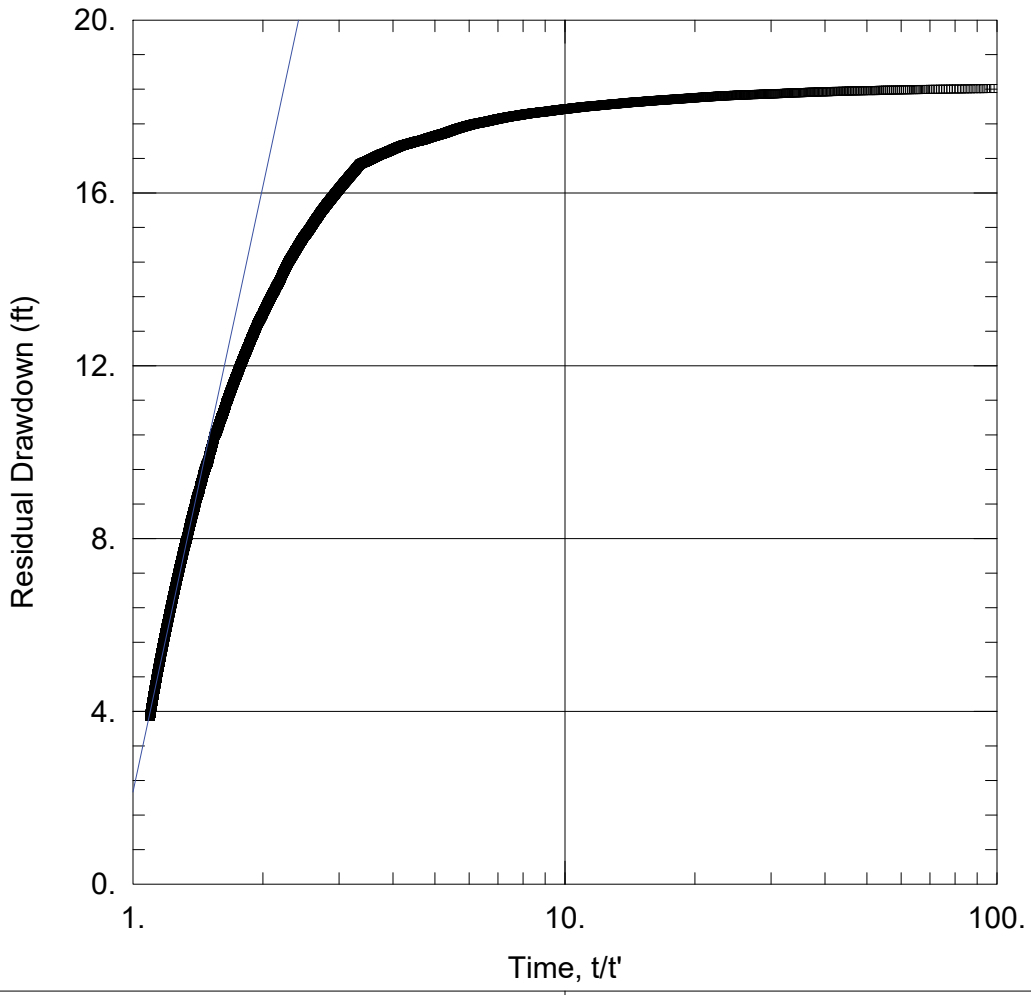
ARCADIS

Well Yield Tests

AQTESOLV Plots

MW-1801 Recovery

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
WV015976.0012	Winfield, WV



SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 0.14 ft^2/day S/S' = 0.9

AQUIFER DATA

Saturated Thickness: 42.17 ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW-1801	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW-1801	0	0

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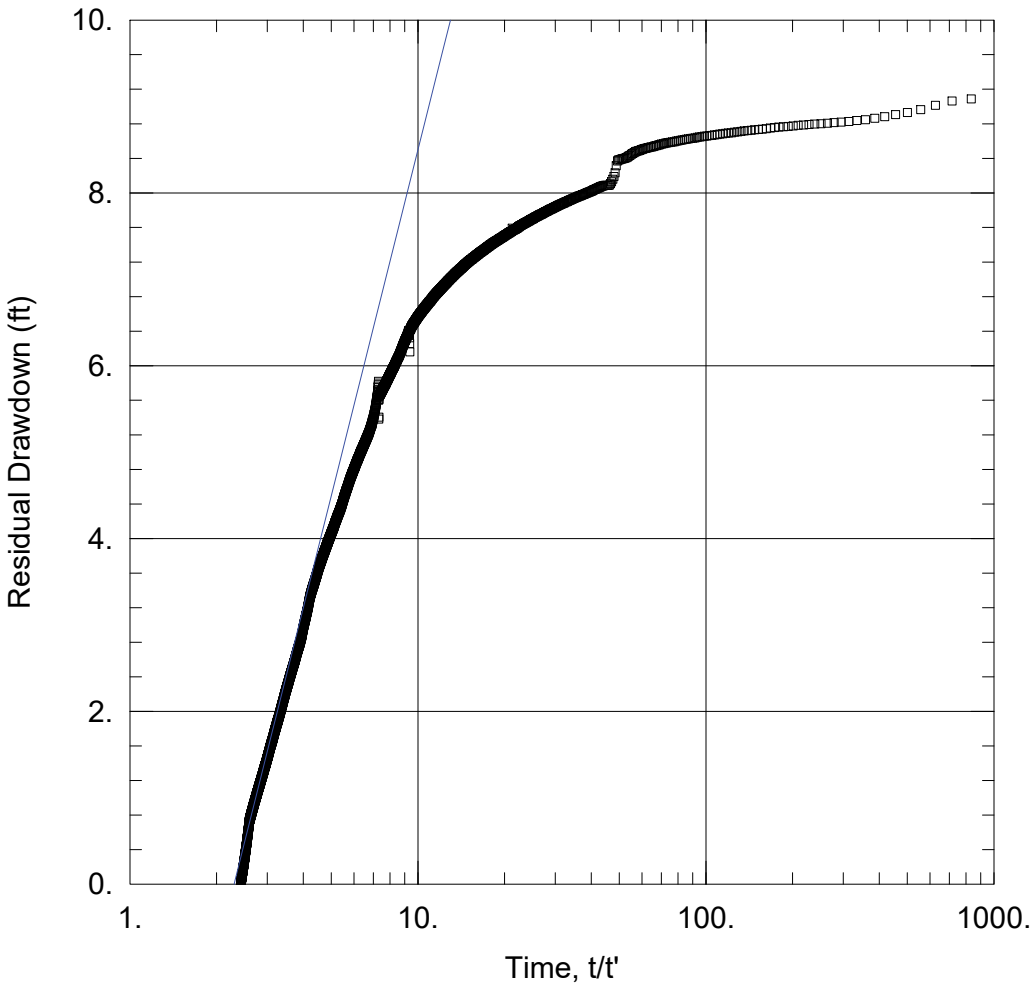
MW-1802 Recovery

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
WV015976.0012	Winfield, WV



SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 0.7 ft^2/day S/S' = 2.3

AQUIFER DATA

Saturated Thickness: 24.5

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW-1802	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW-1802	0	0

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High-Resolution Water Level Monitoring Evaluation

HIGH-RESOLUTION WATER LEVEL MONITORING EVALUATION

INTRODUCTION

Arcadis U.S., Inc. (Arcadis) completed a high-resolution water level monitoring field event from May 7 to August 11, 2018 at the American Electric Power Service Corporation (AEP) Generating Plant (Plant) FGD Landfill located in Winfield, West Virginia. The objectives of the monitoring and evaluation were to better characterize hydrogeologic conditions and permeability within the stress relief fracture system (SRF) and shallow alluvium.

HIGH-RESOLUTION WATER LEVEL MONITORING

Introduction and Methods

Continuous water levels collected in high-resolution in the SRF and shallow alluvial zone monitoring wells were collected from May 7 through August 11, 2018 by installation of Solinst® Levelogger® Junior Edge (model 3001 M5/F15) absolute (non-vented) pressure transducers at each hydraulic monitoring location. Other information collected included Site barometric pressure with a barometric pressure logger. The pressure transducers were set to a 5-minute linear logging interval for background monitoring. The barometric pressure logger was set in the outer casing of MW-5 and also set to a 5-minute linear logging interval. Pressure transducers were installed at each of the seven hydraulic monitoring locations (**Table D-1** and **Figure D-1**) that included three SRF monitoring wells located upgradient on ridges in the north valley (MW-8, MW-9 and MW-10), two downgradient SRF monitoring wells with one in the south valley (MW-2) and north valley (MW-4), and two downgradient shallow alluvium monitoring wells with one in the south valley (MW-1) and one north valley (MW-5). Note that pressure transducers within wells MW-1 and MW-2 were installed at a later date on June 20, 2019. Precipitation data was also obtained from www.ncdc.noaa.gov from the closest weather station to the Site (US1WVKN0021) located approximately 9 miles southeast of the Site to aid in the evaluation.

Pressure transducer and barometric pressure data were downloaded by AEP personnel on a bi-weekly basis in May 2018 and then monthly during June through August 2018. In addition, a manual groundwater level measurement to the top of casing survey point was obtained during each download event. After data collection, raw files were transferred and checked for quality control.

After downloading the data, the groundwater levels were processed and corrected for barometric pressure influences. Groundwater levels exhibit fluctuations due to a variety of influences, making hydrographs a good tool for understanding long-, mid- and short-term trends at any study site. Typical influences can include for example: recharge from precipitation events and/or bank storage, local or regional pumping, seasonal or long-term trends, barometric pressure fluctuations, surface water fluctuations, and ocean and/or earth tides. Of these external hydraulic influences, the following were observed at the Site during the monitoring period: precipitation events, barometric pressure fluctuations, and responses to groundwater sampling. Post-processing of the water level data included barometric compensation of the absolute data to obtain true water column, shift correction due to manual movement of pressure transducers that may occur when accessed, elevation calibration, and barometric correction

using a set estimated barometric efficiency. The elevation calibration involved converting the water column data to groundwater elevations by comparison to manual measurements from the surveyed reference point.

Following elevation calibration, a correction factor for barometric efficiency (BE) was estimated for each hydrograph to remove barometric effects on water levels. The BE is defined as the water-level change caused by a barometric-pressure change divided by that barometric pressure change (Clark 1967). The BE was determined using both a visual corrected and a graphical elliptical method (Gonthier 2007). Barometric efficiency varies between 0 and 1 where low values typically indicates unconfined groundwater zones while higher values typically indicates confined groundwater zones. All BE values were low ranging from 0.05 to 0.2 that indicate a level of confinement for the SRF. In the north valley, shallow alluvium well MW-5 did not have an observed barometric effect (unconfined shallow water table) and a correction was not applied; whereas, in the south valley, shallow alluvium well MW-1 did have observed barometric effects and a correction was applied with a BE of 0.2, which is likely due to the finer grained nature of the deposits at MW-1 within the vadose zone compared to coarser grained deposits at MW-5.

Hydrographs

Long-term groundwater hydrographs were competed that depict observations in water level changes in **Figures D-2** through **D-8**. Recharge occurs when precipitation infiltrates the unsaturated zones and reaches the capillary fringe in shallow groundwater systems. Deeper groundwater systems receive recharge via shallower groundwater zones and upgradient areas over longer periods of time. The presence of low permeability materials such as clay within the unsaturated zone can retard the rate of recharge and time lags occur depending on the thickness and vertical hydraulic conductivity (Fetter 2001). Additionally, the observed water level elevations confirm a vertical sequence separating the shallow alluvium and SRF indicating a level of hydraulic separation of the two zones (e.g. MW-1/MW-2 [south valley **Figures D-2** and **D-3**] and MW-4/5 [north valley **Figures D-4** and **D-5**]).

Several of the monitoring wells responded to precipitation events resulting in water level increases including MW-2, MW-4, MW-5 as well as MW-9, to a lesser extent. Sudden drops followed by recovery in water levels due to groundwater sampling were also observed in wells MW-5, MW-8, MW-9, and MW-10. The largest precipitation event that occurred during the monitoring period was on June 22, 2018 with almost 2 inches of rainfall in a 24-hour period. Monitoring well MW-5 had the highest magnitude of increase in response to precipitation of approximately 2-feet during this event. Following groundwater sampling events and an anomalous water level drop at MW-1, several wells had a recovery response that was more rapid at MW-5, MW-8, and MW-9 while other wells took several days or weeks to return to pre-pumping levels (MW-1, MW-10). The more rapid recharge response is reflective of a higher permeability of the materials at the respective locations.

SUMMARY

Continuous water level data in the SRF and shallow alluvial zone was collected in May through August 2018 in order to better characterize hydrogeologic conditions and permeability within the SRF system and shallow alluvium at the FGD Landfill. Pressure transducers were installed at each of the seven hydraulic monitoring locations that included three SRF monitoring wells located upgradient on ridges in the north

valley (MW-8, MW-9 and MW-10), two downgradient SRF monitoring wells with one in the south valley (MW-2) and north valley (MW-4), and two downgradient shallow alluvium monitoring wells with one in the south valley (MW-1) and one north valley (MW-5).

The following external hydraulic influences were observed at the FGD Landfill during the monitoring period: precipitation events, barometric pressure fluctuations and responses to groundwater sampling. Water-levels were post-processed that included barometric compensation, shift correction, water-level elevation and barometric correction. Barometric efficiency was estimated for each monitoring well and varied from 0.05 to 0.2 and indicates a level of confinement for the SRF. In the north valley, shallow alluvium well MW-5 did not have a barometric effect reflecting unconfined shallow water table conditions. Shallow alluvium well MW-1 did have a barometric effect with a resulting barometric efficiency of 0.2, which is likely due to shallower finer grained material in the vadose zone compare to coarser deposits observed at MW-5. Additionally, the observed water level elevations confirm a vertical sequence separating the shallow alluvium and SRF indicating a level of hydraulic separation of the two zones (e.g. MW-1/MW-2 [south valley **Figures D-2** and **D-3**] and MW-4/5 [north valley **Figures D-4** and **D-5**]).

Several of the monitoring wells responded to precipitation events resulting in water level increases including MW-2, MW-4, MW-5 as well as MW-9, to a lesser extent. Sudden declines followed by recovery in water levels due to groundwater sampling were also observed in wells MW-5, MW-8, MW-9, and MW-10. Following groundwater sampling events and an anomalous decrease at MW-1, several wells showed a more rapid recharge such as MW-5, MW-8, and MW-9 (see **Figure D-7**) while other wells took several days or weeks to return to pre-pumping levels such as MW-10 (see **Figure D-8**). The more rapid recharge response is reflective of a higher permeability of the materials at the respective locations.

LIMITATIONS

Arcadis is not responsible for the independent conclusions, opinions, or recommendations made by others based on the data presented in this report. This report includes a limited set of data within the project site. The conclusions drawn from this investigation are considered reliable; however, there may exist localized variations in the subsurface conditions that have not been completely defined at this time. It should be noted that subsurface conditions may be better delineated with additional subsurface exploration and laboratory testing.

REFERENCES

Clark, W.E. 1967. Computing the barometric efficiency of a well. *Journal of the Hydraulics Division*, *93*(4), pp.93-98.

Fetter, C.W. 2001. Applied Hydrogeology. 4th Edition, Prentice Hall, Upper Saddle River.

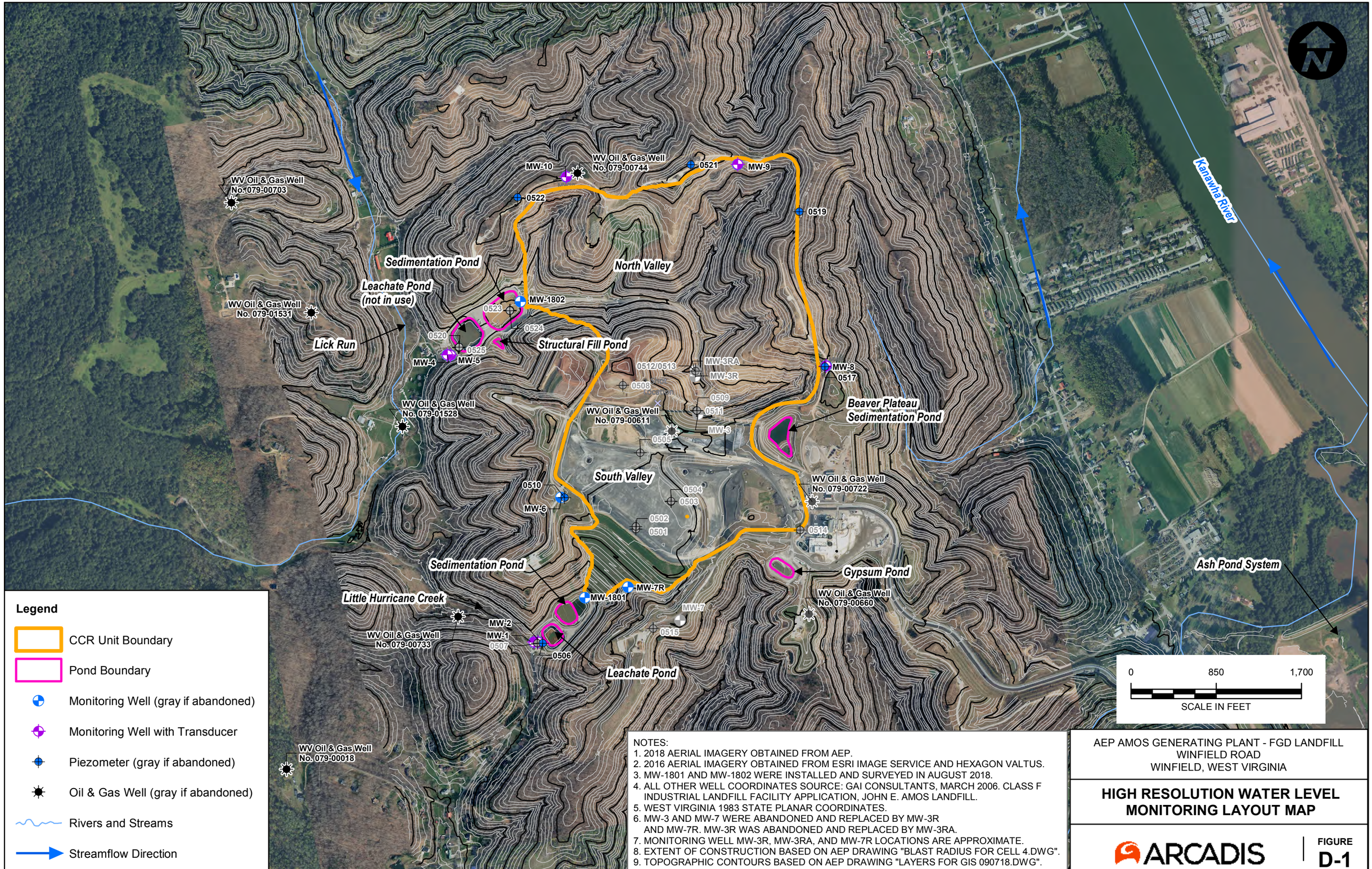
Gonthier, G.J. 2007. A graphical method for estimation of barometric efficiency from continuous data–concepts and application to a site in the Piedmont. *Air Force Plant*, *6*.

Table D-1
High-Resolution Water Level Monitoring Well Construction Details
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Well ID	Location Description to CCR Unit	Northing [a]	Easting [a]	Ground Surface Elevation ft amsl	Top of Casing Elevation ft amsl	Borehole Depth ft bls	Date Installed	Screen Material	Well Diameter inches	Top of Filter Pack		Bottom of Filter Pack		Top of Screen		Bottom of Screen	
										Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl	Depth ft bls	Elevation ft amsl
Monitor Wells																	
Downgradient																	
MW-1 [b]	Southwest	539438.68	1722490.93	709.57	711.57	19.0	7/12/2005	screened PVC	2.00	6.0	703.57	19.0	690.57	8.0	701.57	18.0	691.57
MW-2 [b]	Southwest	539438.31	1722530.69	709.41	711.41	62.5	7/12/2005	screened PVC	2.00	37.0	672.41	62.5	646.91	42.0	667.41	62.0	647.41
MW-4 [b]	West	542302.52	1721626.94	674.76	676.76	78.5	7/7/2005	screened PVC	2.00	53.0	621.76	78.5	596.26	58.0	616.76	78.0	596.76
MW-5 [b]	West	542299.18	1721658.72	674.84	676.84	10.2	7/7/2005	screened PVC	2.00	4.0	670.84	10.2	664.64	5.0	669.84	10.0	664.84
MW-8 [b]	East	542193.80	1725402.80	945.01	947.01	60.5	7/11/2005	screened PVC	2.00	30.0	915.01	60.5	884.51	40.0	905.01	60.0	885.01
MW-9 [b]	Northeast	544204.89	1724522.80	933.39	935.39	62.5	6/30/2005	screened PVC	2.00	37.0	896.39	62.5	870.89	42.0	891.39	62.0	871.39
MW-10 [b]	Northwest	544079.05	1722812.23	909.43	911.43	157.0	7/6/2005	screened PVC	2.00	85.0	824.43	157.0	752.43	133.0	776.43	153.0	756.43

NOTES:
Elevation in feet above mean sea level
a. 1983 West Virginia State Planar Coordinates
b. Source: GAI Consultants. March 2006. Class F Industrial Landfill Facility Application, John E. Amos Landfill, Volume 1, Appendix K - Monitor Well Construction Diagrams.
amsl = above mean sea level
bls = Below land surface
ft = feet

DRAFT
PRIVILEGED AND CONFIDENTIAL



Legend

- CCR Unit Boundary
- Pond Boundary
- Monitoring Well (gray if abandoned)
- Monitoring Well with Transducer
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Rivers and Streams
- Streamflow Direction

NOTES:
1. 2018 AERIAL IMAGERY OBTAINED FROM AEP.
2. 2016 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE AND HEXAGON VALTUS.
3. MW-1801 AND MW-1802 WERE INSTALLED AND SURVEYED IN AUGUST 2018.
4. ALL OTHER WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
5. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
6. MW-3 AND MW-7 WERE ABANDONED AND REPLACED BY MW-3R AND MW-7R. MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
7. MONITORING WELL MW-3R, MW-3RA, AND MW-7R LOCATIONS ARE APPROXIMATE.
8. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
9. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

HIGH RESOLUTION WATER LEVEL MONITORING LAYOUT MAP

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FIGURE
D-1

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: webb
OH015976.0009.00001 (Mountaineer Ash Pond)
Z:\GISProjects_ENV\AEP\Amos\mxd\Landfill Report\May2019\F_D1_FGDLandfill_aerial_v2.mxd 4/23/2020 10:08:45 AM

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/13/2018
Prepared by: CB
Checked by: TF

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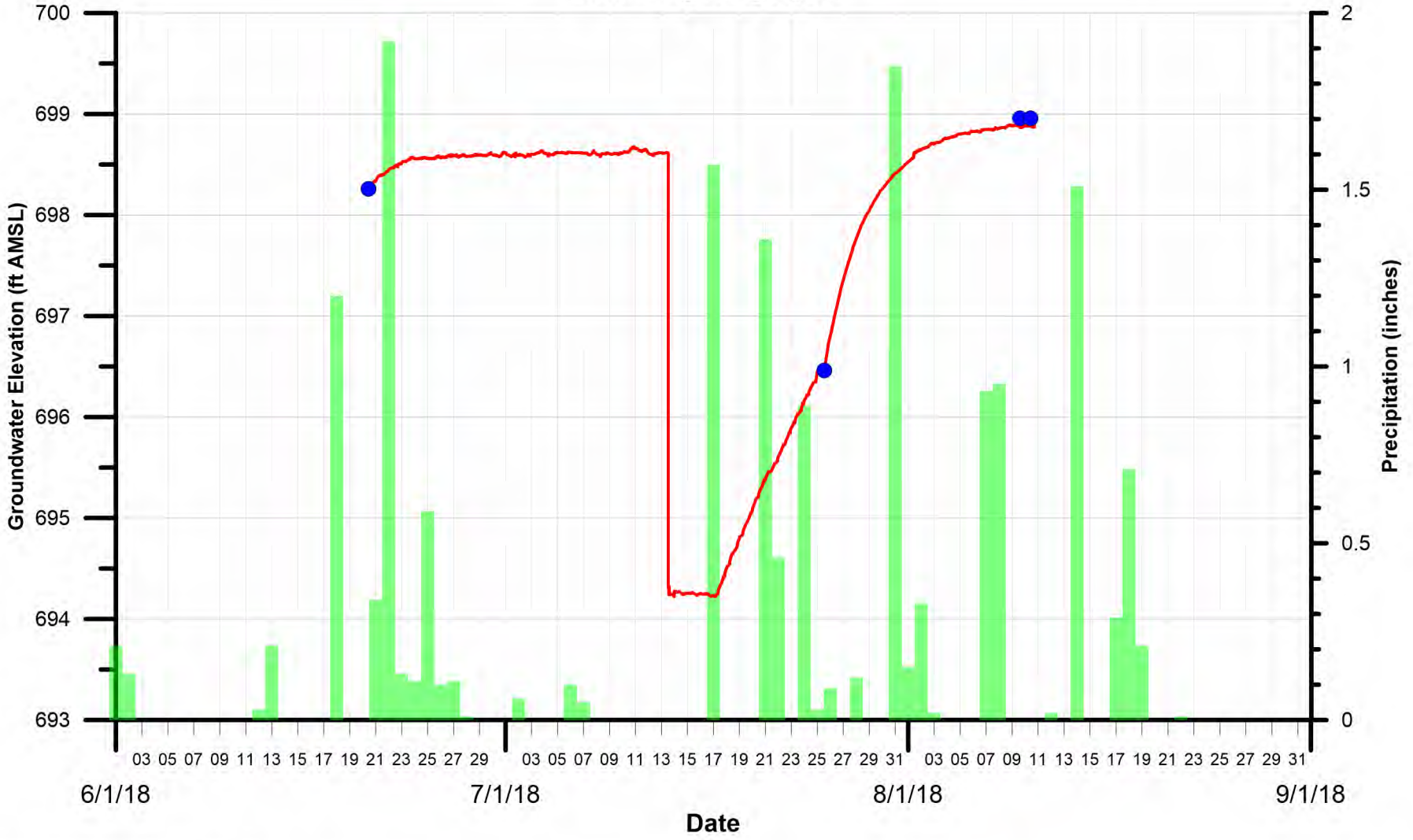
Figure D-2:
MW-1 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 8-18 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.2.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/13/2018
Prepared by: CB
Checked by: TF

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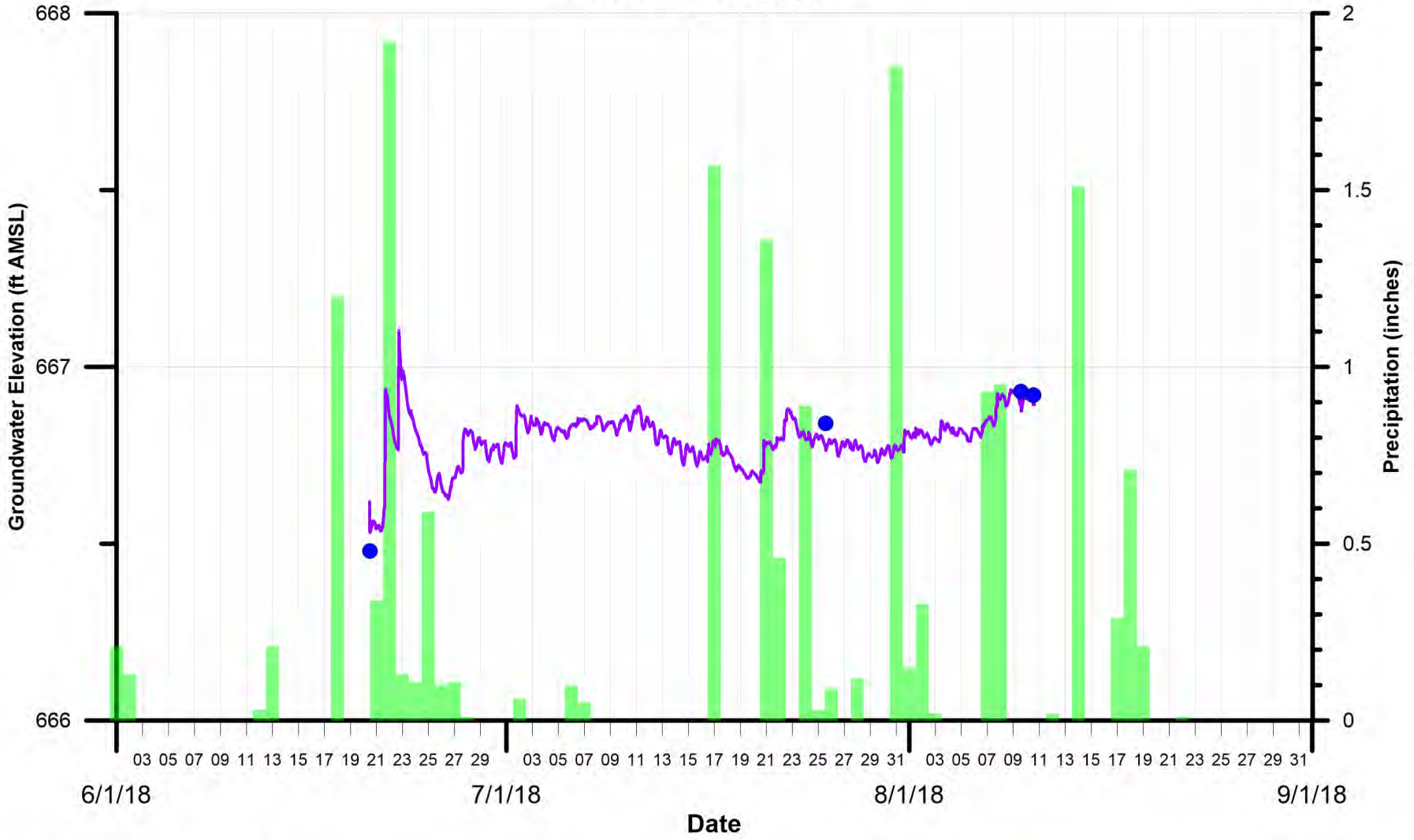
Figure D-3:
MW-2 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 42-62 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.2.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/13/2018
Prepared by: CB
Checked by: TF

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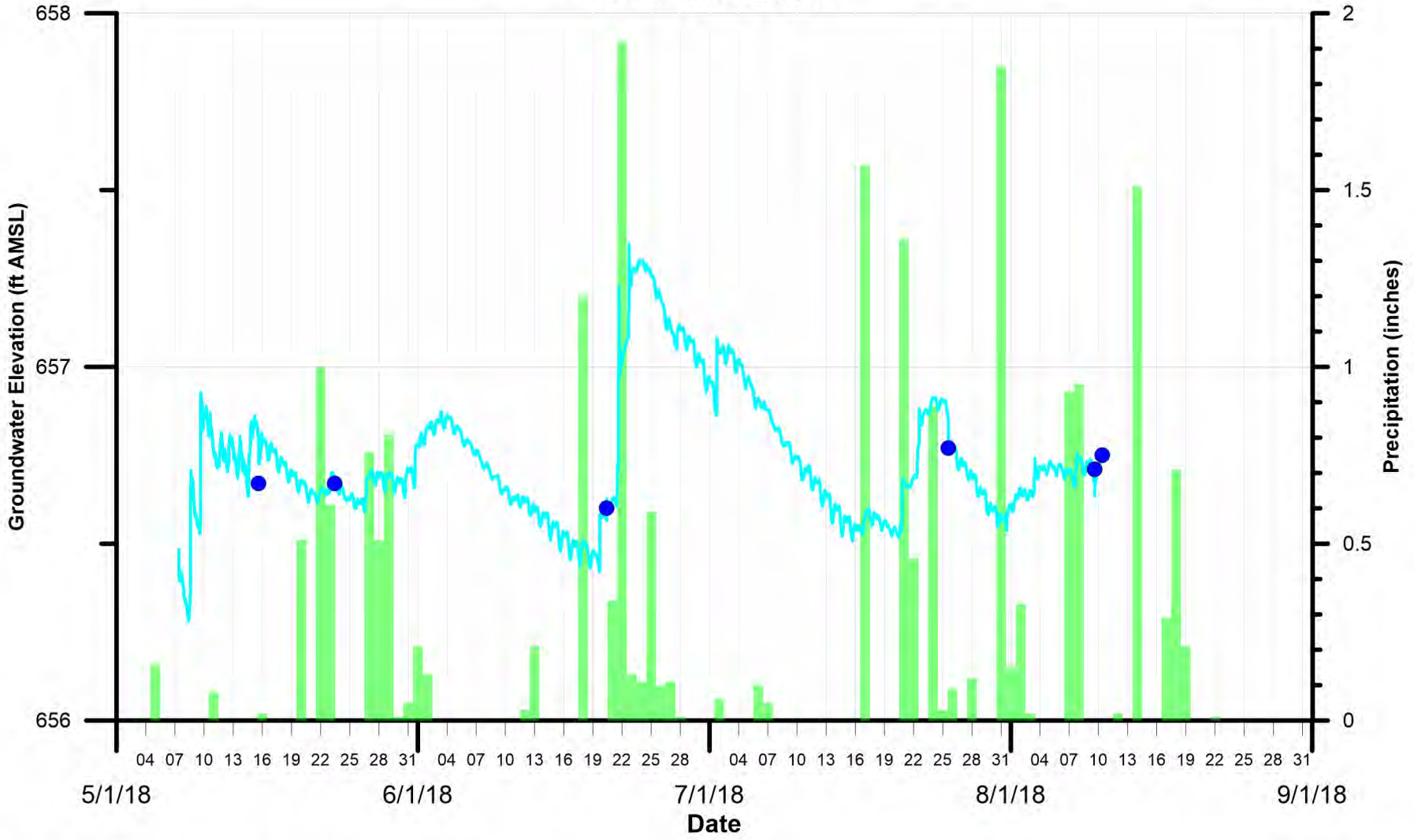
Figure D-4:
MW-4 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 58-78 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.2.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/20/2018
Prepared by: CB
Checked by: TF

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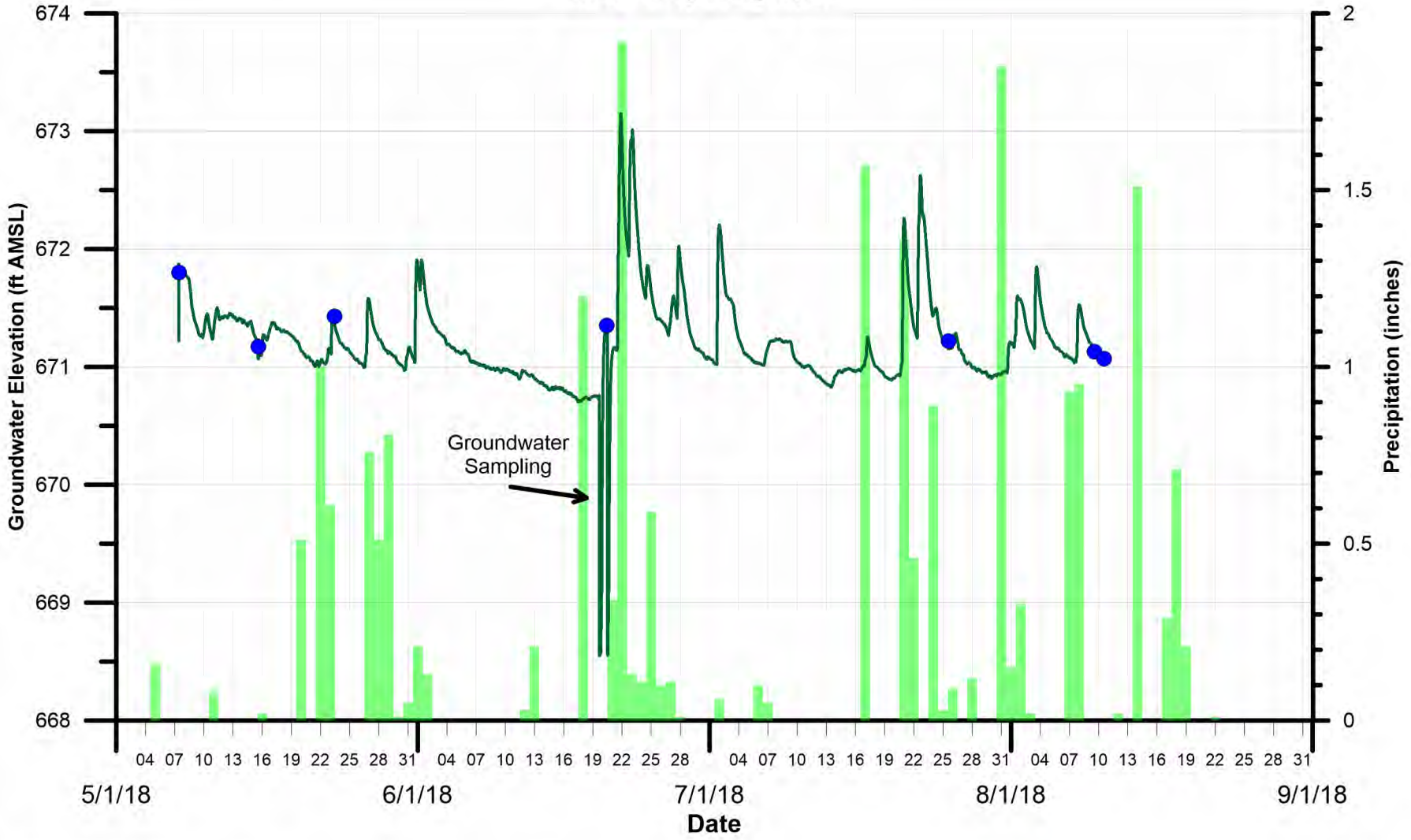
Figure D-5:
MW-5 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 5-10 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has not been applied.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/20/2018
Prepared by: CB
Checked by: TF

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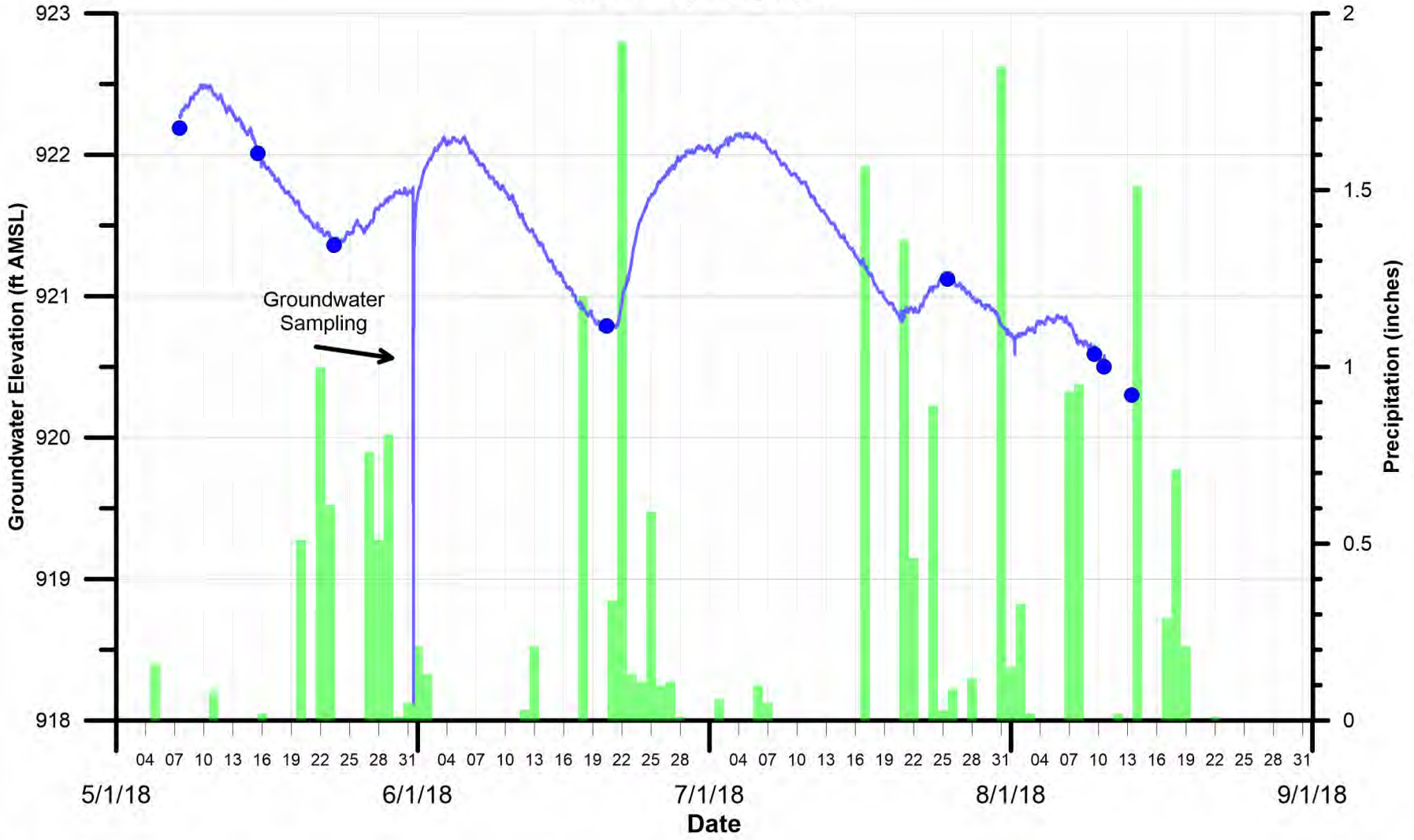
Figure D-6:
MW-8 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 40-60 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.2.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/20/2018
Prepared by: CB
Checked by: TF

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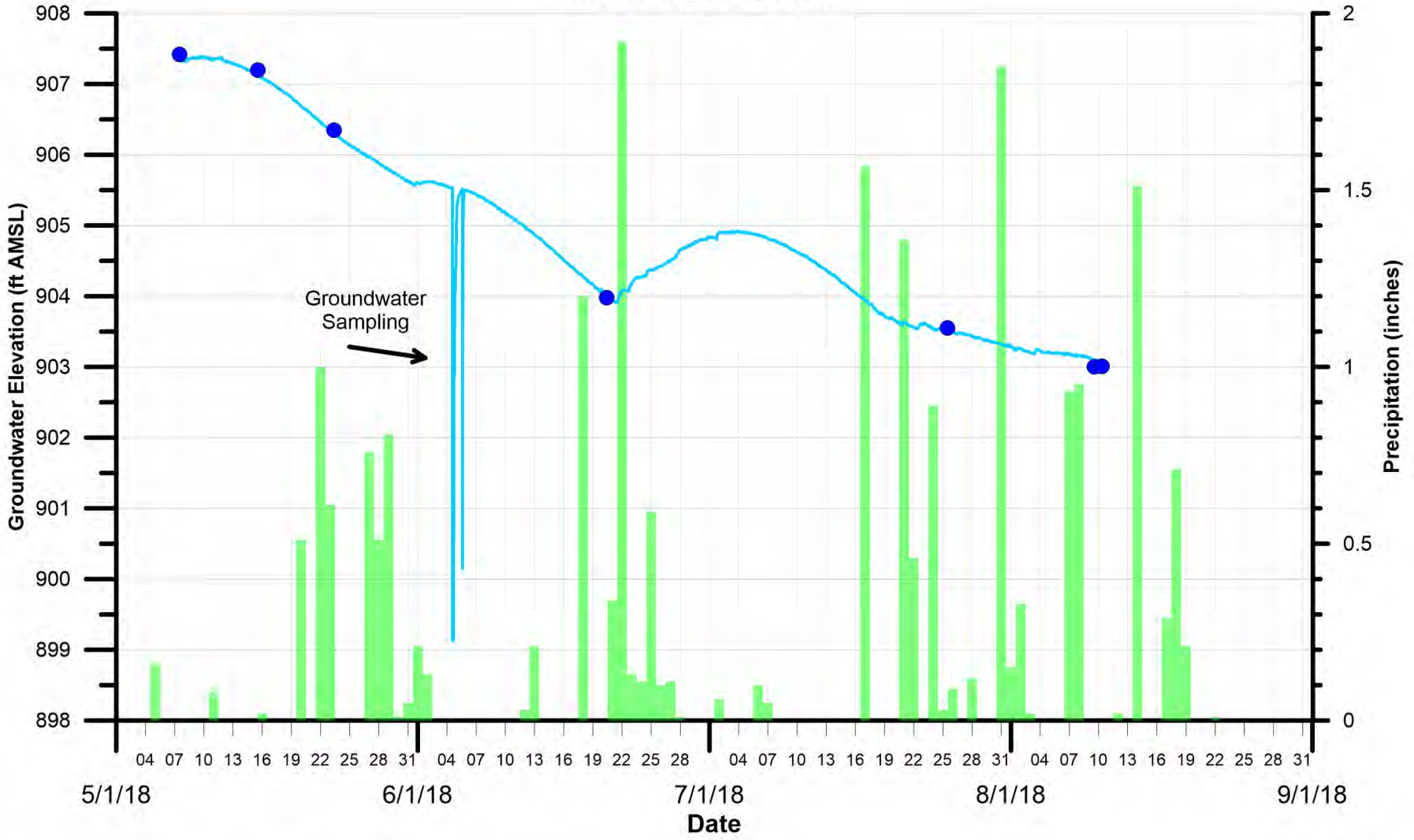
Figure D-7:
MW-9 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 42-62 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.1.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)

AEP Amos Landfill
Winfield, WV
Data Graph Prepared: 09/20/2018
Prepared by: CB
Checked by: TF

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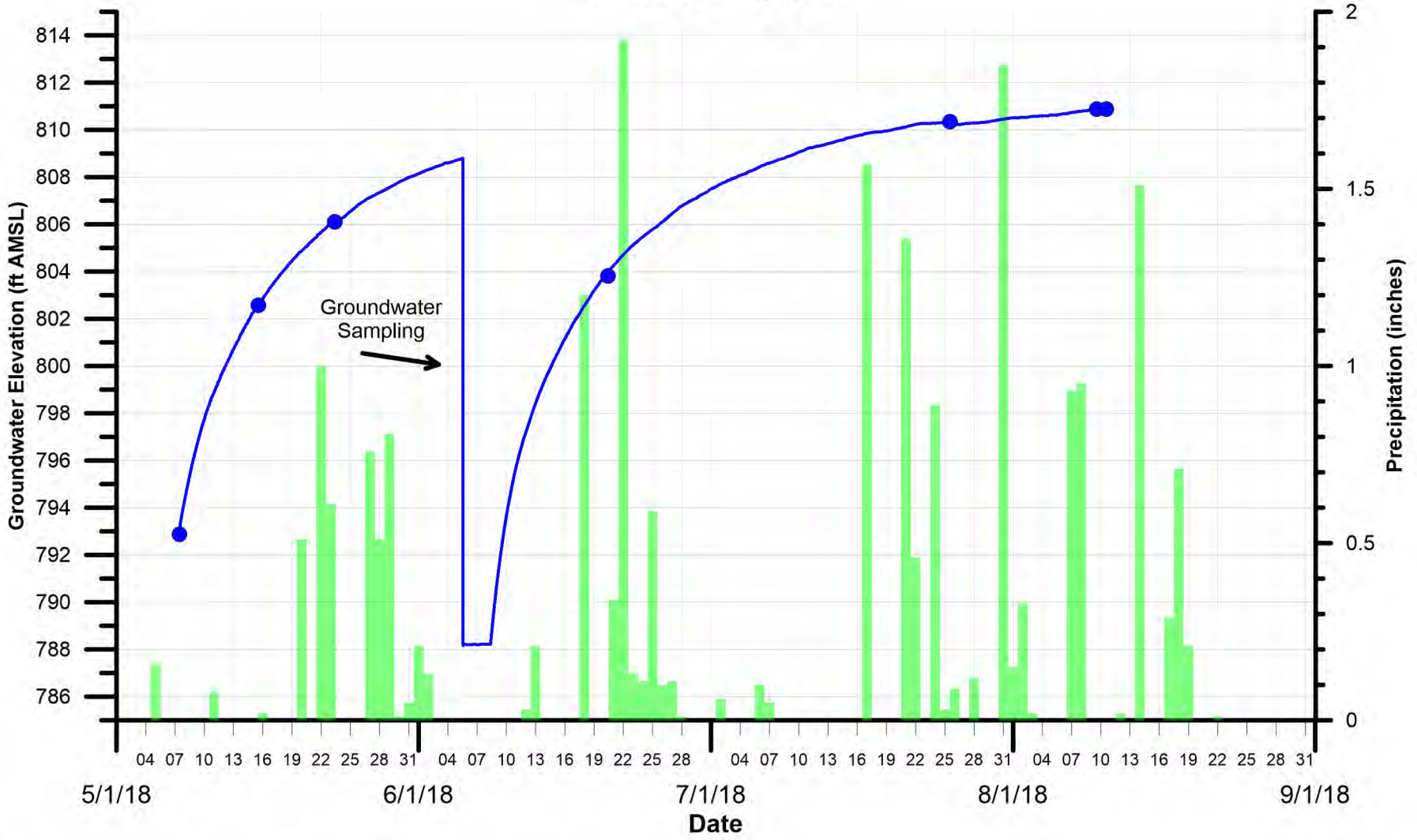
Figure D-8:
MW-10 Hydrograph



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 133-153 feet bgs.
-Precipitation data collected from nearest weather station from www.ncdc.noaa.gov.
-Barometric efficiency has been applied. BE = 0.05.
-AMSL = above mean sea level

Groundwater Elevation (ft AMSL)
Manual Groundwater Measurements (ft AMSL)
Precipitation (inches)