ATTACHMENT 30
Influence of Fracture Zones on the Infiltration and Movement of Water and Groundwater
Special Waste Landfill Permit
Big Sandy Plant – Ash Pond Closure
Lawrence County, Kentucky

Additional information may be found in the Hydrogeologic Site Investigation Report (HSI) included in this attachment. The occurrence of groundwater on site is controlled by localized geologic conditions. Most of the site is underlain by shale or shale interbedded with thin layers of various sedimentary rock. Groundwater is found in the weathered/fractured rock or top-of rock environment, relatively close to the ground surface, determined in the HSI to be within 40 feet.

In general, the direction of groundwater flow follows the surface topography. The rate of the groundwater movement in the uppermost aquifer is dependent on local conditions, dominated by movement through the fractures and weathered zones. The uppermost aquifer groundwater flow is best characterized by the gradient measured between MW-1202, MW-1203, and MW-1204.

FINAL REPORT
Hydrogeologic Site Investigation

AEP BIG SANDY
HORSEFORD CREEK

Prepared for:

American Electric Power
1 Riverside Plaza
Columbus, OH 43215

Prepared by:

URS

525 Vine St.
Suite 1800
Cincinnati, OH 45202
(513) 651-3440

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1.0 INTRODUCTION

American Electric Power, Co., Inc. (AEP) operates a coal combustion power plant (Big Sandy) adjacent to the Big Sandy River in Lawrence County, Kentucky approximately 4.5 miles (7.2 kilometers) north-northwest of Louisa, Kentucky. The coal combustion products (CCPs) generated at Big Sandy are sluiced to a reservoir constructed at the nearby Horseford Creek site (Figure 2.1). On behalf of AEP, URS Corporation (URS) conducted a hydrogeologic site investigation (HSI) in preparation for closure of the Horseford Creek site (pond closure).

1.1 Site History

The Big Sandy Plant is a 1,097 megawatt (MW) coal combustion power generation facility located on the Kentucky side of the Big Sandy River. All coal burned by the Big Sandy power plant is delivered by railcar as the river does not support commercial traffic. The plant began operation of Unit 1 in 1963 with Unit 2 being brought on line in 1969. CCPs generated by the plant are currently transported by wet sluicing methods to the 130-acre reservoir located approximately 3,000 feet northwest of the Big Sandy power plant entrance. The reservoir, which is retained by a 152-feet tall earthen embankment (crest elevation approximately 692 feet, mean sea level [msl]) began receiving CCPs in 1970.

2.0 FACILITY SETTING

The following section provides a summary of physical characteristics of the site including location, land uses, climate, soil, geology, and hydrogeology.

2.1 Location and Description

As noted above, the Horseford Creek site is a reservoir created by damming the valley of Horseford Creek. The valley is relatively steeply incised and has three distinct segments trending in different directions. Starting in the upstream portion, the valley trend is first to the southeast, then east, and finally north as it contributes to the larger Blaine Creek valley. The central, east-trending portion of the valley/reservoir receives the sluiced CCPs, leaving open water in the main upstream and the downstream segments as well as in a small contributory branch to the east-southeast where there is a second retention dam.

The current length of the reservoir centerline from the crest of the earthen embankment to the upstream end of the upper pool is approximately 7,800 feet. The reservoir, as currently configured, covers approximately 130 acres consisting of approximately 30 acres of open water and 100 acres of exposed or vegetated ash.

The upstream surface water pool elevation is roughly 685 feet, msl, whereas the downstream pool elevation is roughly 670 feet, msl. The depth of the water within the open water portions of the reservoir was reported up to 42 feet deep with ash deposits documented up to approximately 130 feet in the borings advanced within the pond footprint. The vegetated ash portions of the reservoir range in elevation from approximately 670 to 685 feet, msl.

2.2 Surrounding Land Use

The property surrounding the Horseford Creek site is owned by AEP and is generally undeveloped with the exception of dirt or gravel access roads. Nearby facilities include an asphalt manufacturing facility located south of the site in the adjacent Burke Branch valley and the Big Sandy power plant located roughly 3,000 feet to the southeast of the east edge of the reservoir.

2.3 Climate

According to United States Geological Survey [USGS] (Lloyd and Lyke, 1995), the average mean temperature for the site vicinity is approximately 55 degrees Fahrenheit (°F). The warmest month generally occurs in July with average highs in the mid to upper 80s with the coolest month generally occurring in January with average highs in the low to mid 40s. The average annual precipitation is approximately 44 inches. The monthly average precipitation is approximately 3.7 inches with monthly totals averaging between approximately 3.0 inches in October and January to approximately 5.5 inches in July.

2.4 Physiography

The site is mapped within the Cumberland Plateau section of the Appalachian Plateaus physiographic province (Davis, 1924). The Cumberland Plateau is described as an area of intricately dissected rocks of Pennsylvanian age in eastern Kentucky. The Cumberland Plateau is bounded to the west by the Pottsville (or Cumberland) Escarpment formed by resistant beds of sandstone and conglomerate in the lower part of the Pennsylvanian strata. The mountain slopes are carved by ravines eroded through thick, flat-lying sequences of (Pennsylvanian age) coal-bearing units.

The major rivers in the region include the Big Sandy, Licking, Kentucky, and Cumberland. Locally, the major river valleys may widen to a mile or more with most human habitation situated on the flood plains and low terraces. The terrain in this region generally consists of ridgetops with commonly steep slopes that grade into smaller flatlands on valley bottoms at lower elevations. Whether the local topographic relief of this region spans as little as 200 feet or in excess of 2,000 feet, the landforms are generally similar in geometry. Cliffs of resistant sandstone cap many ridges

and spurs. Scenic erosion remnants including pinnacles, shallow eaves, and arches or natural bridges have also been reported in the region.

2.5 Soils

A study of the soils at the site was performed to assess borrow area potential for future construction. The study included the advancement of 10 soil borings and 21 test pits within the site. Some of the soil borings were completed as monitoring wells for HSI objectives. The results of the borrow study were augmented with the results of published regional information and previous investigations of the site and nearby areas including Burke Branch and Fullers Branch.

The composition of the soils at the site, excluding shallow weathered bedrock and a fill area in the adjacent Burke Branch, were generally described as sandy lean clay to clayey sand depending on location. The thickness of the deposits averaged between 4.3 and 8.1 feet with maximum documented thickness up to 29 feet. Additional information on the soil characteristics of the site is provided in the *Draft Soil Borrow Study for the Proposed Fly Ash Bond Closure* prepared for AEP, Big Sandy Plant – Louisa Kentucky, dated September 21, 2012.

2.6 Geology

The site is mapped within the Kentucky Geological Survey (KGS) geologic quadrangle map for Fallsburg, Kentucky-West Virginia (GQ-584). This map and the accompanying stratigraphic column serve as the primary resource for regional geology and as a resource for local geology to be compared to site-specific information acquired for this evaluation.

2.6.1 Regional Geology

The regional geology consists of relatively flat-lying Pennsylvanian-age bedrock underlying the upland areas, with relatively thin deposits of Quaternary-age alluvium filling in portions of the deeper stream valleys (Lloyd and Lyke, 1995). The alluvium in the region typically consists of unconsolidated deposits of silt, sand, and gravel derived from present-day stream processes. The alluvium deposits may be up to 50 feet thick, with the greatest thicknesses present in the major stream valleys with generally lesser amounts present in the tributary valleys. A relatively thin layer of residual soils generally consisting of clay derived from the weathering of underlying bedrock is typically present at higher elevations (Figure 2.6). Deeply weathered soils are generally uncommon in the region but have been reported on nearly level ridge crests and on the perimeter of portions of valley bottoms or other similar landforms where downslope movement such as landslides, creep or sheet wash soil accumulation may have occurred.

2.6.2 Local Geology

Pennsylvanian bedrock consisting of siltstones, sandstones, shales, and coal measures of the Monongahela, Conemaugh, and Breathitt formations comprise the bedrock stratigraphy within the confines of the site.

- The Monongahela consists of more than 140 feet of sandstones, siltstones, and clay shales, but only the lowest sandstone member is present on site as a resistant cap on the highest ridge lines, roughly above 910 feet, msl.

- The Conemaugh may locally consist of over 450 feet of sandstone, siltstone, and shale units with some limestone and coal units that are locally used to demarcate upper, middle, and lower portions of the formation. On site, the Conemaugh comprises an upper unit and a lower unit, separated by the Brush Creek Limestone member, which is a 3- to 4-foot thick resistant limestone unit. The Conemaugh occupies the upper portions of the site's hillsides from approximate elevation 920 to 700 feet, msl, with the Brush Creek creating occasional outcrops at approximately 780 feet, msl.

- The Breathitt similarly consists of an assemblage of sandstone, siltstone, and shale units with some limestone, but it also includes a number of mapped coal beds identified as the Princess Coals. The Princess No. 7 is mapped as having been exposed in the Horseford Creek valley at an elevation of roughly 610 to 620 feet, msl prior to creation of the reservoir.

2.7 Hydrogeology

The following section summarizes the regional and local hydrogeologic characteristics based upon published sources site-specific data collected for this investigation.

2.7.1 Regional Hydrogeology

The primary source of groundwater in the region is identified as the Appalachian Plateaus aquifer system (Lloyd and Lyke, 1995). The lithology of this aquifer is described as primarily shale associated with the Conemaugh Formation grading with increasing occurrences of sandstone, siltstone, and some coal measures associated with the Breathitt Formation. Groundwater occurrence within the Pennsylvanian aquifer is primarily encountered from fractures recharged by precipitation. Coal seam underclays and other low permeability lithologic units may serve as barriers to downward migration of groundwater. As a result, groundwater in the area will travel laterally on top of these units until commonly expressed as groundwater fed streams, springs, and seeps at locations where these lower permeability lithologic units are expressed at or near the ground surface.

In contrast, the uppermost groundwater in the region generally occurs relatively near the ground surface (generally within the upper 15 to 50 feet) in the porosity of the residual soil, the weathered bedrock, and/or the somewhat deeper fractured bedrock, depending on the local dynamics of groundwater recharge and discharge. Groundwater in this environment generally flows in a direction parallel to the topographic slope toward the valley bottoms, and may be observed at ground surface as surface seeps or small springs where resistant beds push it laterally to the surface.

2.7.2 Local Hydrogeology

The local hydrogeology closely matches regional expectations with uppermost groundwater encountered at the unconsolidated soil/bedrock interface or within the fractured bedrock below this interface. Movement of uppermost groundwater at the site is generally toward the lower topographic elevations where the reservoir is located. The rate and volume of uppermost groundwater flow moving through a given location is primarily governed by the orientation and connectivity of the fractures present. Surface expressions of groundwater flow within fractured bedrock were not observed with the exception of some small ephemeral seeps that flow for a period of time after rain events.

Within the valley bottom environment, groundwater may be found in the weathered/fractured bedrock, but it may also occur in the alluvial deposits if they are porous and thick enough. Groundwater in the valley bottom environment is anticipated to generally follow flow in the downstream direction.

2.8 Surface Water

The surface water in the area is primarily the result of the precipitation runoff within each valley. The Horseford Creek watershed extends from the top of the ridges draining toward the valley bottom.

2.8.1 Natural Features

Natural surface water features on site include the upstream remnants of Horseford Creek above an elevation of approximately 685 feet, msl. The remnants consist of stream branches, which are generally small and intermittent. Historical USGS topographic maps for the site do not suggest at what elevation the creek transitioned from intermittent to perennial (before creation of the reservoir), but based on the local geologic conditions, it is expected that the elevation may have been on the order of 600 to 560 feet, msl. Horseford Creek drains to Blaine Creek, which drains to the Big Sandy River. Modest waterfall features were identified on the far west portion of the Horseford Creek site in the vicinity of MW-1201.

2.7.2 Constructed Features

The ponds and vegetated ash follow the contour of Horseford Creek valley up to an earthen embankment constructed at the northeast end of the valley, the base of which is approximately 300 feet south of where Horseford Creek historically drained to Blaine Creek. Blaine Creek remains generally unhindered by constructed features and drains to the Big Sandy River that is mapped approximately 1.25 miles to the east. A smaller earthen embankment was also constructed immediately South of monitoring well MW-1009 on the far east side of the site to close off the valley.

3.0 METHODS

Investigation activities included both non-intrusive and intrusive methods to acquire sufficient data to characterize hydrogeologic conditions at the site. The methodology undertaken is described in the following subsections and includes reconnaissance, drilling, well installation, hydraulic testing, and groundwater sampling for laboratory analysis.

3.1 Visual Reconnaissance

Preliminary reconnaissance of the site was conducted by the URS Ecological Resources team to identify/map wetlands, streams, and other surface features located within the site boundaries. Two seeps, designated SP-1 and SP-2, and numerous intermittent streams were identified. Additional reconnaissance was conducted by a URS Professional Geologist registered in the Commonwealth of Kentucky supported by additional URS staff. The reconnaissance included inspection of select outcrops around the perimeter of the site, and natural overhangs located at the western end of the site near MW-1201.

Further evaluation of site-specific bedrock exposures (outcrops) was conducted by URS geologists on April 4 and 5, 2013. The observed features were described for lithologic and structural characteristics. Figure 3.1 presents the results of the geologic mapping combined with boring log information, overlain on the context of the KGS Fallsburg geologic quadrangle interpretation (GQ-584).

3.2 Drilling

Twenty borings were advanced between April 10, and April 26, 2012 to evaluate the geologic and hydrogeologic setting and to evaluate the geotechnical character of the site soils. The locations of these borings are illustrated on Figure 3.2. The borings were advanced simultaneously by Penn Drilling, Frontz Drilling, Inc. (Frontz), and a drill crew from AEP Civil Laboratory Services. A URS geologist or engineer accompanied each drilling crew during all drilling and well installation

operations to record subsurface conditions and to observe all subcontractor activities. All borings were logged in general accordance with the terminology of the Unified Soil Classification System (USCS) classification system. Soil samples from representative intervals of the unconsolidated alluvial deposits underlying the pond were submitted to the RJ Lee Group in Monroeville, Pennsylvania for cation exchange capacity (CEC) and clay mineral composition by x-ray diffraction (XRD). A summary of the results of these analyses is provided in Section 4.1.2.

The boring logs for the seven borings completed as monitoring wells are provided as Appendix A. The boring logs for the remaining 13 borings are discussed in detail in a separate geotechnical report.

Borings advanced for the investigation were drilled using hollow-stem augers (HSAs) through the unconsolidated deposits to competent bedrock except in the case of borings for MW-1206 and MW-1207, which were advanced through CCP deposits using a rotosonic drill rig (without vibration). Competent bedrock was drilled using HQ wire line core barrel with either a 5-inch or a 6-inch outer diameter (OD) drive bit. Selected undisturbed soil samples (Shelby Tubes) were obtained and sent for geotechnical analysis (as reported under separate cover).

3.3 Well Installation and Development

As noted above, seven of the 20 borings were drilled for monitoring well installation. The borings were drilled and the wells installed between April 9 and April 24, 2012. These wells, identified as MW-1201 through MW-1207, were installed in accordance with 401 Kentucky Administrative Regulation (KAR) 45:160 Section 3 requirements for monitoring well construction, except that prior approval and oversight of the Kentucky Energy and Environment Cabinet (KEEC) was not sought. Consequently, use of any of these wells for post-HSI monitoring will require written approval from the KEEC.

The seven borings were drilled and monitoring wells installed by a driller licensed in the Commonwealth of Kentucky employed by Frontz. The wells were constructed using 2-inch inner diameter (ID) Schedule 40 polyvinyl chloride (PVC) casing with 10-foot long 0.010-inch machine-slotted screened intervals. The screened interval was set to a depth below ground surface (bgs) to intercept the uppermost aquifer or other targeted groundwater zone based on geologic conditions observed at each boring location. Solid casing was threaded to the top of the screen to approximately 2 feet above ground surface. Well construction continued by the introduction of a sand filter pack into the boring annulus to roughly 2 feet above the top of the screened interval. A bentonite seal was formed by the addition of 2 to 3 feet of bentonite pellets placed above the sand and hydrated with potable water. In accordance with manufacturer's specifications, the bentonite was allowed to hydrate a minimum of one hour prior to introduction of grout. A cement/bentonite

grout mixture was then introduced to the borehole by tremmie pipe methods from the top of the bentonite seal to within one foot of ground surface. Above-grade surface completions were installed for all monitoring wells including a steel procasing around the PVC riser, a 4-foot by 4-foot concrete pad around the procasing, and four steel bollards around the pad (except at MW-1204, which is adjacent to a cut bank and can only be approached from one direction).

Well development was conducted by Frontz between April 25 and 26, 2012 and documented by a URS field supervisor. Development was conducted using either a bailer or submersible pump until at least five well volumes of water were removed or the well was purged dry three times. A summary of the volume of water removed and field parameter measurements recorded at the end of the development for each well is provided as Table 3.3.

The location of all the borings and wells advanced during this investigation was determined by a URS survey team in May 2012. Horizontal coordinates were surveyed to the nearest 0.1 foot with ground surface elevations and top of inner casings (where applicable) surveyed to the nearest 0.01 foot above msl.

3.4 Hydraulic Testing

Hydraulic testing of the new monitoring wells was conducted in May 2012. In-Situ® Level Troll 700 pressure sensor/water level transducers were installed at each of the seven wells on May 11, 2012 to monitor background water levels. Field geologists returned to the site on May 14, 2012 to download the background data from the transducers and begin a series of hydraulic tests.

The testing consisted of the drawdown of each well by single-use dedicated bailer or by Grundfos Rediflo II submersible pump. The method for drawdown at each well was selected based on the recovery rates observed during well development completed a few weeks earlier. The water in each well was drawn down to generally stable conditions in excess of 10 feet below baseline conditions or until near dry depending on the available water column for each well. The drawdown was monitored by transducer and confirmed periodically by manual measurement with a Solinist electronic depth-to-water indicator. Purging was discontinued once an adequate drawdown was achieved and the well was left undisturbed to recover. The depth-to-water during the recovery period was recorded by the dedicated transducer and periodically confirmed by manual measurement. The recovery times varied from roughly 2 hours (MW-1202) to in excess of 24 hours (MW-1201).

The recovery data for each test was plotted on a semi-log scale and the curves were matched using the Aqtesolv® software developed by HydroSOLVE. The Hvorslev or Bouwer-Rice methods for estimating hydraulic conductivity were selected for this site depending on the well construction

specifics, the hydrogeologic setting, and character of the recovery data. Well construction data, static depth-to-water, maximum drawdown, and transducer recovery data were entered into the program. The plotted data were then evaluated to estimate hydraulic conductivity.

The hydraulic conductivity of each well was estimated using recovery data during the initial stages of recovery at six of the seven wells tested. The exception to this method occurred at MW-1206, which is situated within the footprint of the reservoir with a screened interval set within the underlying alluvial deposits near the top of bedrock. Baseline water levels in this well suggest a "leaky" connection between the well and the overlying saturated CCPs. In this case, the resulting hydraulic conductivity is believed to be represented in the later stages of recovery when the difference between the baseline water level and drawdown water level is less pronounced. Estimating the hydraulic conductivity at the lower stress conditions occurring slightly later in the test is believed to be a more representative of the conditions at this location.

3.5 Water Level Gauging

Depth-to-groundwater was measured at the wells in accordance with United States Environmental Protection Agency (U.S. EPA) Region 4 Guidance SESDPROC-105-R1. Water levels were measured using an electronic water level indicator from the surveyed top-of-inner casing reference point at each location with an accuracy of +/- 0.01 foot. All measurements were recorded on a well development, water level data sheet or well sampling form depending on the task being conducted at the time the measurement was collected.

Measurements were recorded by URS prior to well development on April 25-26, 2012, after development on May 4, 2012, and at the start of the first sampling event on May 11, 2012. Additional gauging events were completed by AEP during subsequent sampling events in July and October 2012. The results of these gauging events are provided as Table 4.2 with discussion in Section 4.2. Maps illustrating the data from each of these events are provided as Figures 4.2a-c.

3.6 Groundwater and Surface Water Sampling

Three sampling events were conducted to evaluate baseline groundwater conditions at the site. The location of the monitoring wells, surface waters, and seeps sampled is provided on Figure 3-2. The first sampling event was conducted between May 15 and 17, 2012. This event was limited to sampling of the MW-1201 through MW-1207 monitoring wells installed in April 2012 to evaluate the potential use of the site as a landfill. The decision was made in June 2012 to convert the program to a pond closure. This change expanded the investigation area to include data from additional monitoring wells (MW-1007 through MW-1012). The MW-1000 series monitoring wells were installed by AEP in 2010 to monitor groundwater quality at locations generally downgradient of the

ash pond. The screened intervals selected for monitoring wells are longer and generally deeper than the MW-1200 series that were constructed in general accordance with 401 KAR 45:160 specifications for long-term monitoring. With the decision to transition from special waste landfill to pond closure these wells were believed to be suitable for inclusion in the evaluation. The well identified as MW-1012 was not included in the pond assessment because it is located outside of the watershed of Horseford Creek.

The second groundwater sampling event was conducted by AEP between July 23 and 25, 2012. This event included the gauging of 12 wells (MW-1007-MW-1011 and MW-1201-MW-1207), and sampling of 11 wells, two surface water locations (SW-1, SW-2) and two seep locations (SP-1, SP-2). MW-1206 was not sampled during the July event due to an inoperable submerged pump. The third event was conducted between October 15 and 17, 2012, and consisted of the gauging and sampling of the same 11 wells and surface water locations (SW-1, SW-2) sampled in July 2012 plus MW-1206.

Field data were recorded in either a field logbook and/or on well sampling forms. Recorded data included at a minimum the sampler's name, well number, date and time, depth-to-water below top of inner casing, and other observations. All wells were purged using a dedicated pump, decontaminated submersible pump, or disposable bailer depending on specific well characteristics. Field measurements of pH, specific conductance, temperature, oxidation-reduction potential (ORP), and turbidity were recorded in the field logbook and/or on the well sampling form during purging. Monitoring wells MW-1007 through MW-1011 are equipped with dedicated bladder pumps and were purged by a modified low-flow method. Monitoring wells MW-1201 through MW-1207 were purged by disposable bailer or submersible pump till a minimum of three well volumes had been removed or the well purged dry, whichever came first. The field parameters were monitored for each monitoring well, regardless of purge method, until pH, temperature, and specific conductance were within +/- 10 percent between measurements. Monitoring well sampling was completed by the decanting of samples from the purging device directly into the appropriate laboratory-supplied bottles based on the analysis to be performed.

Surface water sample field data, including field parameters, were recorded on the same well sample forms used for the monitoring well sampling. Where possible, sampling of surface water was completed by lowering each laboratory-supplied sample bottle roughly one foot below the top of water and removing the cap to fill. This was done to avoid inclusion of debris that may be floating on the water surface. Seep water samples collected in July 2012 were not monitored for field parameters. These samples were collected by excavating a small area immediately downstream of the seep, then filling each bottle directly with the opening facing upstream to avoid

introduction of temporarily suspended sediment stirred up by the excavation and/or bottle placement.

Preservatives, if necessary based on the analysis to be performed, were supplied by the laboratory. Once filled, the bottles were preserved as required by the analytical method, then labeled and secured in a laboratory-supplied cooler chilled to approximately 4 degrees Celsius (°C) with wet ice. The sample identification, date/time, and analysis was then recorded on a laboratory-supplied chain-of-custody form. Laboratory coolers containing the samples and wet ice were shipped by overnight courier to the analytical laboratory under chain-of-custody procedures.

3.7 Sample Analysis

Samples collected for this site investigation were submitted for analysis of all parameters listed in 401 KAR 45:160 Section 7 (2). This regulation lists the minimum groundwater monitoring parameters necessary for baseline groundwater characterization for a special waste landfill used solely for the disposal of coal combustion by-products. This list of parameters was maintained after transitioning to pond closure.

Analysis of the May 2012 samples was completed by ESC Laboratories (ESC) in Mt. Juliet, Tennessee. The analysis of the samples collected in July and October 2012 was completed by AEP's Dolan Analytical Laboratory in Groveport, Ohio. A copy of the laboratory analytical reports generated for each sampling event is provided as Appendix C.

4.0 RESULTS

The following sections discuss the results of the site-specific surficial soils, geologic, potentiometric, and chemical analyses conducted for this investigation.

4.1 Site Geology

Geologic conditions observed through reconnaissance and drilling activities at the site closely agree with published data from the KGS as reported in Section 2.6.2 above. Cross-sections A to A' through D to D', provided as Figures 4.1a through 4.1d, graphically illustrate the geologic contacts both encountered in borings advanced for this investigation and inferred from KGS mapping of the area (GQ-584). Details of the site soil and bedrock geology are discussed below.

4.1.1 Soil

The soil at the site was evaluated for composition, density, permeability, and other engineering parameters for a separate borrow study. The study, the results of which will be reported under separate cover, concluded that the composition of the soil at the site is primarily that of clayey sand to sandy clay with occasional manganese concretions and rock remnants. Soil borings at the site reported soil thicknesses between 1.5 and 29 feet prior to reaching top of bedrock as defined by drilling and/or sampler refusal.

4.1.2 Alluvium

Approximately 13 feet of alluvial material was encountered below the ash-filled portion of the reservoir at an elevation of approximately 584.5 to 569 feet, msl in the borings drilled for installation of MW-1206 and MW-1207. The alluvium consists of a sandy lean clay overlying shale bedrock. Similar alluvium is expected to be present at this and deeper elevations in the Horseford Creek valley within the site. Soil samples representative of the alluvium from beneath the pond (PB-1 through PB-6) identified a CEC potential between 2.3 and 9.9 $cmol_c/Kg$ (or milliequivalents per 100 grams of soil). The clay composition of the soils analyzed, as determined by XRD, is primarily Kaolinite and Illite with a minor Quartz contribution and trace Vermiculite. A summary of the CEC and XRD results is provided as Table 4.1.

4.1.3 Bedrock

As noted in Section 2.6.2 above, Pennsylvanian-age bedrock consisting of siltstones, sandstones, shales, and coal beds of the Monongahela, Conemaugh, and Breathitt formations comprise the bedrock stratigraphy within the confines of the site. The KGS Fallsburg Geologic Quadrangle (GQ-584) interpretation of the site geology is provided as Figure 2.6. Site-specific observations of surface exposures and boring log stratigraphy are illustrated on Figure 3.1 in the context of KGS' most recent digitized version of GQ-584. In general these site observations agree with those of KGS except as noted below.

4.1.3.1 Monongahela

The Monongahela is present on site as a 10- to 20-foot thick, cross-bedded sandstone unit that forms a resistant cap on the ridge line that forms the southern limit of the Horseford Creek watershed, roughly above elevation of 910 feet, msl. Surface expressions of the Monongahela were observed as Outcrops 7 through 10 on the southwest portion of the site. KGS identifies this unit as the "Monongahela Formation and upper part of Conemaugh Formation" (lPmc symbol on the map), but because of the limited area of this site-specific investigation, these resistant beds are designated here simply as the Monongahela.

4.1.3.2 Conemaugh Formation

The Conemaugh (lPc) consists of shale, siltstones, sandstones, and mudstones. Outcrop and boring observations indicated the presence of several distinct sandstone and shale units within the Conemaugh; however, their lateral continuity was limited, presumably because of the channelized nature of the depositional environment. One relatively continuous sandstone unit is observable near the base of the Conemaugh. This unit outcrops at the Horseford Creek Dam and extends on the east and west sides of the valley southward to the low dam site at Outcrop 19 and further south to Outcrop 4. However there, is no clear correlation to outcrops or boring observations on the south side of the creek or areas to the west of the bend in the valley.

Within the vicinity of the subject site, KGS divides the Conemaugh (lPc) below the Pmc into two units separated by the Brush Creek Limestone Member at an elevation of approximately 780 feet msl. A 2- to 3-foot, resistant limestone unit fitting the description of this limestone member was observed at an elevation of approximately 775 feet msl in Outcrops 6 and 11a-c at the upstream (western) end of the Horseford Creek valley, and evidence of limestone was also observed at similar elevations in the streambeds in close proximity to SP-2 and SP-4. No such limestone units were identified in outcrops or boring logs outside of the northwest portion of the site as illustrated on Figure 3.1, although the KGS map suggests that the member should be present at that elevation throughout the site.

At Outcrop 11, the Brush Creek Limestone Member was underlain by 5 to 8 feet of black shale, followed by a 1.5 to 2 feet of coal. It is not clear whether this should be identified as the Brush Creek coal bed as described by KGS elsewhere in the Fallsburg quadrangle.

4.1.3.3 Breathitt Formation

The Breathitt Formation is identified by KGS as a series of limestone, coal, underclay, siltstone, and sandstone units underlying the Conemaugh, starting at an elevation of approximately 700 feet msl. Coal units within the Fallsburg quadrangle area include the Princess Numbers 5 through 8.

On site, the borings for MW-1011 and MW-1009, and Outcrops 3 and 19 suggest that the uppermost Breathitt may consist of shale with a resistant sandstone unit near elevation 680 feet msl. The Breathitt Formation was penetrated in this investigation by the boring for MW-1207. The boring was drilled through CCP deposits in the valley, penetrated the alluvial material described in Section 4.1.2 above, and encountered bedrock presumed to be the Breathitt at an elevation of approximately 571 feet, msl. The first 10 feet of coring (two runs) resulted in no recovery, likely due to the highly weathered character of the bedrock. The core recovered in subsequent 5-foot runs consisted mostly of fissile shale with occasional thin layers of sandstone, resulting in very low

rock quality designation. A sandstone unit at least 5-feet thick was encountered at elevation 526 feet, msl.

None of the Princess coal units was encountered in MW-1207. The Princess No. 7 is mapped as having been exposed in the Horseford Creek valley at an elevation of roughly 610 to 620 feet, msl prior to creation of the reservoir. Review of the boring logs for MW-1008 and MW-1009 previously advanced by AEP in 2010, suggests the Princess #7 Coal may have been encountered on the east side of the subject site in borings for monitoring wells MW-1008 and MW-1009 at elevations of 616 and 618 feet, msl respectively. Outcrop 13, mapped northeast of MW-1008, contains a roughly 2-foot thick coal seam at this approximate elevation.

4.1.3.4 Bedrock Structure

The bedrock units described above were observed to be generally flat-lying within the limits of the site. All inclined bedding surfaces were attributable to either gravity slumping of the outcrop or to the channelized character of the depositional environment. The most laterally consistent bedrock unit was the Brush Creek Limestone Member in the northwest portion of the site. No consistent bedding plane strike and dip was discernible through the mapping effort.

Fractures and joints in the bedrock were best observed in the resistant sandstone and limestone units and some siltstone/mudstone units as well. Measurements of joint/fracture orientation are illustrated on Figure 3.1. Most of these features were oriented vertically or near-vertical; some were planar but many were irregular or curved; starting and stopping with no significant lateral continuity. Most were trending northeast or northwest in roughly conjugate sets and none appeared to be trending either north-south or east-west. The irregular character of the joints/fractures suggests that the local character of the bedrock likely controls the character of the fracturing and that it is unlikely that fractures can be correlated laterally between outcrops or vertically through the stratigraphy.

4.2 Site Hydrogeology

Details of the occurrence, hydraulic characteristics, and flow of groundwater in the various environments on site, as identified through the installation and testing of seven new monitoring wells and the gauging of five previously existing wells, are discussed below.

The occurrence of groundwater on site is controlled by localized geologic conditions. As noted in Section 4.1.3 above, most of the site is underlain by shale, sandstone, siltstone, mudstone, and limestone units that may grade laterally and vertically into one another. Except for the sandstone units, most of the bedrock has relatively little primary porosity. As a result, uppermost groundwater is found relatively near the ground surface (less than 40 feet) in the overburden/weathered bedrock

environment or slightly deeper in fractured bedrock or sandstone. At greater depths, the shales tend to be relatively unweathered and therefore sufficiently impermeable to prevent development of a viable groundwater monitoring well. Where the shales are interrupted by one of the more substantial sandstone units, a significant coal unit, or the Brush Creek Limestone, there is the potential for primary porosity or more significant fracturing to result in deeper groundwater. These units were preferentially targeted for monitoring well installation but did not always yield significant water, potentially because of the lateral discontinuity of the bedrock units. The conceptual uppermost groundwater zone relative to ground surface across the site is illustrated in the geologic cross-sections (provided previously as Figures 4.1a through 4.1d).

The results of hydraulic testing of the seven new monitoring wells are summarized on Table 3.4 with the backup documentation presented in Appendix B.

- Three wells completed in sandstone units (MW-1201, -1204, and -1205) yielded very little water and resulted in a calculated hydraulic conductivity on the order of 10^{-7} centimeters per second (cm/sec). These wells were each screened in sandstone units, but with only one fracture identified within the screened interval.

- The well installed in the sandy clay alluvium at the former base of the Horseford Creek valley (MW-1206) tested on the order of 10^{-6} cm/sec.

- The three remaining wells (MW-1202, -1203, and -1207) yielded the highest hydraulic conductivity values (on the order of 10^{-3} and 10^{-5} cm/sec). These three wells were installed in sandstone units with multiple fractures identified within the screened interval of each. MW-1202 is located relatively high on the hillside above the reservoir (elevation 852 feet, msl), MW-1203 is located mid-slope above the reservoir (731 feet, msl), and MW-1207 is located within the reservoir and screened below the pre-reservoir bottom of the valley (530-540 feet, msl screened interval).

Depth-to-water measurements taken during the May, July, and October 2012 sampling events are summarized on Table 4.2. Because of the steep slope of the ground surface relative to the shallow depth of the uppermost groundwater bearing zone, the direction of groundwater flow is in the general downhill direction. This is supported by triangulation of data at select locations as illustrated on Figures 4.2a through 4.2c. Possible exceptions to this pattern of flow are suggested by data at MW-1205, which is a very poorly yielding well that may be hydraulically isolated. Wells MW-1007, -1008, and -1009 are generally downgradient of the reservoir. Additionally, bedrock well MW-1207 in the center of the reservoir is hydraulically downgradient, having a lower potentiometric head than the overlying alluvial well MW-1206, which has a water level that is believed to approximate the level of water in the reservoir.

Potentiometric gradients from MW-1202 to MW-1203, MW-1202 to MW-1204, and MW-1010 to MW-1011 were calculated using the depth-to-water measurements collected for the July and October 2012 events. The graphs and corresponding slope calculations are provided in

Appendix D. The analysis determined a potentiometric gradient of 0.17 to 0.12 from MW-1202 toward MW-1204 and MW-1202 toward MW-1203 respectively. The gradient from wells MW-1010 to MW-1011 was roughly 0.01.

The rate of groundwater movement in the uppermost aquifer will be highly dependent on local rock/soil conditions because flow is dominated by movement through secondary porosity features (fractures, weathered zones), which are well-developed in some areas and less so in others. However, general uppermost aquifer groundwater flow is likely to be best characterized by the gradient measured between MW-1202, MW-1203, and MW-1204 (approximately 0.145) and the hydraulic conductivity measured in MW-1203 (approximately 10^{-5} cm/sec). Effective porosity will also vary greatly depending on the degree of weathering, but is assumed to average on the order of 25 percent where secondary porosity in the rock is the baseline flow environment. The resultant rate of groundwater flow in this environment is calculated based on the equation: rate = hydraulic conductivity x gradient ÷ effective porosity. This suggests a rate on the order of 0.036 feet per day.

4.3 Groundwater and Surface Water Quality

Samples of groundwater and surface water were collected over three events in 2012 and submitted for all constituents prescribed in 401 KAR 45:160 Section 7 (2). Summaries of the laboratory results are provided in Tables 4.3a through 4.3d and the full laboratory documentation reports are included as Appendix C

4.3.1 Analysis of General Chemistry

The general chemistry of the groundwater and surface water samples was evaluated through the use of a Piper diagram presented in Figure 4.3a. This method of analysis illustrates differences in the chemical character of waters by plotting the relative strength of dominant cations and anions. The water samples fall into four general categories: sodium + carbonate waters, calcium + carbonate waters, calcium + sulfate waters, sodium + chloride, and mixtures thereof, as detailed below:

- Sodium + carbonate waters include samples from wells MW-1010, -1201, -1205, and -1207. With the exception of MW-1207, these wells monitor very low permeability units. The dominance of these ions is likely attributable to their high residence time in contact with the host rock, (i.e. they hydraulically isolated such that they receive no direct recharge from meteoric water, and communicate only minimally with surrounding groundwater and consequently take on higher concentrations of the rock components).

- Calcium + carbonate waters include samples from wells MW-1008, -1011, -1202, -1203, and -1204. These wells are the relatively high-yielding wells on site. Their waters are similar to the first group in the dominance of carbonates owing to contact with the bedrock, but their sodium levels are lower because of greater flow-through from recharge to discharge.

- Calcium + sulfate waters include samples from both seeps (SP-1 and -2) and both pond sample locations (SW-1 and -2). Although similar in general chemistry, it appears that the seeps are not related to the pond contents as they are substantially higher in elevation and relatively remote to any waste placement. The pond samples are somewhat differentiated from the seep samples by a higher proportion of chloride.

- Mixed waters include samples from wells MW-1007, MW-1009, and MW-1206.

    - MW-1007 varies between sampling events, suggesting a mixing of calcium + carbonate and calcium + sulfate waters.

    - MW-1009 varies between sampling events suggesting a mixing of calcium + carbonate and sodium + carbonate waters.

    - MW-1206 is solidly between the calcium + carbonate and sodium + carbonate waters, suggesting a mixture of the low-yielding and high-yielding bedrock waters.

A binary mixing model analysis was also performed using chloride, sulfate, and total dissolved solids (TDS) as the conservative solutes. The model was constructed with the end members being surface water from the fly ash pond and groundwater from MW-1202 using analytical data collected in July and October 2012. Based on the species concentrations, the groundwater at MW-1202 was assumed to represent an end-member groundwater composition with the surface water in the fly ash pond at sampling locations SW-1 and SW-2 representing the other end member. The groundwater at MW-1206, MW-1007, MW-1008, and MW-1009 was assumed to represent mixtures of those two end members. This analysis assumes surface water moves into the bedrock aquifer and mixes with groundwater by processes of dispersion. The analysis identified the greatest estimated proportion of potential admixture of surface water, based on July and October 2012 data, was found at MW-1007 with the estimated percentage of surface water ranging from a low of 30% (July 2012) to a high of 100% (October 2012). The lowest estimated surface water percentages were estimated at wells MW-1008 (2 to 5%) and MW-1206 (8 to 11%). The binary mixing model calculation procedures and application for the analyzed constituents is provided in Appendix E.

The distribution of sulfate for the July and October 2012 sampling events is provided as Figure 4.3b. The highest sulfate concentrations were reported in SP-2 (1,750 milligrams per liter [mg/L]) and the two pond sampling locations (417 to 855 mg/L). SP-2 is a seep located approximately 35 feet above the pond at an elevation of approximately 720 feet, msl on the north bank of the pond northeast of MW-1204. Another seep, identified as SP-1, located on the south side of the pond near MW-1203 at a similar elevation roughly 720 feet, msl was also sampled. The concentration of sulfate in the water from SP-1 was reported at 63.5 mg/L. Sulfate in the upgradient groundwater was detected at up to 201 mg/L (MW-1202), but typically ranged between 33.1 (MW-1203) to 98.9 (MW-1010). Concentrations in the downgradient wells reported between 76.1 mg/L (MW-1008)

and 406 mg/L (MW-1009). Sulfate concentrations in the two monitoring wells installed beneath the pond (MW-1206 and MW-1207) were the lowest reported during the July and October 2012 sampling events ranging between a low 1.1 to a high of 6.4 mg/L.

4.3.3 Analysis if Dissolved Metals

All water samples were submitted for analysis of a dissolved metals list meeting or exceeding the baseline metals list as described in 401 KAR 45:160 Section 7 (2). As reported on Tables 4.3a through 4.3d, arsenic was the only dissolved metal with reported concentrations above the MCL in groundwater during each the three sampling events. This metal was detected in upgradient monitoring wells MW-1010 and MW-1011, and in MW-1206 (screened in the alluvial deposits underlying the reservoir). Arsenic was also detected above its maximum contaminant level (MCL) in one sample collected from SW-1 in July 2012, but at a concentration lower than what was reported upgradient.

The other metal detected above its respective MCL in groundwater was mercury during the July 2012 sampling event. Surface and groundwater samples submitted for mercury analysis in the events prior to and after the July 2012 sampling event did not report mercury above the reporting limit and no potential explanation for the detections was identified from a thorough review of field and laboratory procedures. As such, the mercury detections reported from the July 2012 sampling event are regarded as anomalous

Surface water samples from the pond reported dissolved metals concentrations greater than MCLs for antimony and thallium during both the July and October 2012 events. Neither of these dissolved metals was detected above their respective MCL in groundwater.

5.0 REFERENCES

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URS, 2012. Proposed Fly Ash Pond Closure; American Electric Power Big Sandy Plant, Louisa Kentucky, dated September 21, 2012.

TABLE 3.3

WELL DEVELOPMENT SUMMARY
MONITORING WELLS MW-1201 THROUGH MW-1207

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Well ID	AKGWA	Date Start	Date Finish	Total Depth* (feet)	Initial DTW* (feet)	Initial Water Column (feet)	Total Volume Purged (gallons)	Sustained Flow Rate (gpm)	Temperature (F)**	Specific Conductance (µS/cm)**	pH (SU)**	Turbidity (NTU)**
MW-1201	8006-5304	4/25/12	4/27/12	42.67	51.85	9.18	5.25	Pumped/Bailed Dry	58.5	602.2	7.7	Over Range
MW-1202	8006-5305	4/25/12	4/25/12	31.75	44.9	13.15	24	1.0	56.3	948.8	6.77	24.9
MW-1203	8006-5303	4/25/12	4/25/12	25.42	50.02	24.6	36	1.0	56.7	456.8	6.65	548
MW-1204	8006-5307	4/25/12	4/26/12	26.04	34.64	8.6	9	Pumped/Bailed Dry	58.6	894.4	8.15	518
MW-1205	8006-5306	4/25/12	4/27/12	14.67	52.55	37.88	13.25	Pumped/Bailed Dry	58.6	542.3	7.56	Over Range
MW-1206	8006-5302	4/26/12	4/26/12	10.55	125.5	114.95	104	1.1	59.9	361.3	6.86	73.6
MW-1207	8006-5301	4/26/12	4/26/12	86.2	165.5	79.3	68.5	0.3 to 0.5	66.9	413.8	8.28	60.2

* Measured from top of casing
** Last recorded measurement
DTW = Depth to water
gpm = Gallons per minute
F = Fahrenheit
µS/cm = MicroSeimens/centimeter
SU = Standard units
NTU = Nephalometric Turbidity Units
Development conducted by Frontz Drilling

TABLE 3.4

HYDRAULIC TESTING SUMMARY

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Well ID	AKGWA	Elevation (ft, msl)	Background Date	Test Start Date	Test Start Time	Test Stop Date	Test Stop Time	Hydraulic Conductivity K (cm/sec)
MW-1201	8006-5304	801.82	5/11/12	5/15/2012	1205	5/17/2012	1243	5.57E-07
MW-1202	8006-5305	852.24	5/11/12	5/16/2012	1215	5/16/2012	1500	1.55E-03
MW-1203	8006-5303	731.14	5/11/12	5/15/2012	1010	5/16/2012	1030	2.20E-05
MW-1204	8006-5307	723.88	5/11/12	5/14/2012	1440	5/17/2012	0806	7.90E-07
MW-1205	8006-5306	716.71	5/11/12	5/15/2012	1601	5/17/2012	1330	5.61E-07
MW-1206	8006-5302	697.21	5/11/12	5/16/2012	0935	5/17/2012	1055	2.19E-06
MW-1207	8006-5301	697.61	5/11/12	5/15/2012	0840	5/15/2012	1611	5.00E-05

ft.msl = Feet, mean sea level
cm/sec = Centimeters per second

TABLE 4.1

ANALYSIS SUMMARY
CATION EXCHANGE CAPACITY (CEC) AND X-RAY DIFFRACTION (XRF) RESULTS

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Parameter	PB-1 (50-52) 4/18/12	PB-3 (75-76) 4/10/12	PB-4 (87-89) 4/13/12	PB-4 (97.5-98.5) 4/13/12	PB-4 (102-104) 4/13/12	PB-5 (42-42.75) 4/16/12	PB-5 (47.5-49) 4/16/12	PB-6 (78-80) Top 4/2/12	PB-6 (78-80) Bottom 4/2/12
Cation Exchange Capacity (CEC)									
CEC ($cmol_c$/Kg soil)*	2.7	2.7	2.3	7.8	9.9	2.2	0.37	5.0	4.3
Aluminum (mg/L)	<0.0200	0.110	2.06	4.79	0.0574	2.56	2.05	<0.0200	0.122
Calcium (mg/L)	36.2	33.9	26.5	118	168	26.6	3.71	71.3	57.1
Magnesium (mg/L)	8.21	11.0	10.00	20.6	15.7	7.67	1.48	11.5	12.5
Potassium (mg/L)	6.60	5.26	6.57	7.78	8.22	7.61	2.42	19.4	16.7
X-Ray Diffraction (XRD) for Clay Identification**									
Kaolinite - $Al_2Si_2O_5(OH)_4$	Major/Minor	NA	Major/Minor	NA	NA	NA	NA	Major/Minor	Major/Minor
Illite - $(K_2H_3O)Al_2(Si_3Al)O_{10}(OH) \cdot xH_2O$	Major/Minor	NA	Major/Minor	NA	NA	NA	NA	Major/Minor	Major/Minor
Quartz - SiO_2	Minor	NA	Minor	NA	NA	NA	NA	Minor	Minor
Vermiculite - $Mg_3Si_4O_{10}(OH)_2$	Trace	NA	Trace	NA	NA	NA	NA	Trace	Trace
Sepiolite - $(Mg,Fe)_4Si_6O_{15}(OH)_2 \cdot 6H_2O$	Not Detected	NA	Trace/Possible	NA	NA	NA	NA	Trace/Possible	Trace/Possible
Attapulgite (Palygorskite) - $(Mg,Al)_2Si_4O_{10}(OH) \cdot 4H_2O$	Trace/Possible	NA	Trace/Possible	NA	NA	NA	NA	Not Detected	Not Detected

Samples collected by URS April 2012
Analysis by RJ Lee Group, Monroeville, PA.
CEC report dated March 29, 2013
XRD report dated April 18, 2013

* = The CEC of a soil is expressed in cmolc/kg (centimol positive charge per kg of soil) or meq/100 g (milli-equivalents per 100 grams of soil). Both expressions are numerically identical (10 cmolc/kg = 10 meq/100 g)
** = Relative proportion of a specific clay in relation to other clays detected in the sample
NA = Not Analyzed

TABLE 4.2

WATER LEVEL MEASUREMENT SUMMARY

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Well ID	AKGWA	Reference Elevation (ft, msl)	Date	Time	DTW	TD	Water Column (ft)	Elevation (ft, msl)
Well Development								
MW-1201	8006-5304	801.82	4/25/12	930	42.67	51.85	9.18	759.15
MW-1202	8006-5305	852.24	4/25/12	1125	31.75	44.9	13.15	820.49
MW-1203	8006-5303	731.14	4/25/12	1313	25.42	50.02	24.6	705.72
MW-1204	8006-5307	723.88	4/25/12	1445	26.04	34.64	8.6	697.84
MW-1205	8006-5306	716.71	4/25/12	1545	14.67	52.55	37.88	702.04
MW-1206	8006-5302	697.21	4/26/12	1055	10.55	125.5	114.95	686.66
MW-1207	8006-5301	697.61	4/26/12	1430	86.2	165.5	79.3	611.41
Post Development								
MW-1201	8006-5304	801.82	5/4/12	1010	50.88	51.85	0.97	750.94
MW-1202	8006-5305	852.24	5/4/12	NM	NM	NM	NM	NM
MW-1203	8006-5303	731.14	5/4/12	1037	25.96	50.02	24.06	705.18
MW-1204	8006-5307	723.88	5/4/12	1045	25.25	34.64	9.39	698.63
MW-1205	8006-5306	716.71	5/4/12	1100	51.04	52.55	1.51	665.67
MW-1206	8006-5302	697.21	5/4/12	1056	11.35	125.5	114.15	685.86
MW-1207	8006-5301	697.61	5/4/12	1053	88.74	165.5	76.76	608.87
May 2012 Sampling								
MW-1201	8006-5304	801.82	5/11/12	1225	51.31	52.39	1.08	750.51
MW-1202	8006-5305	852.24	5/11/12	1320	38.38	45.1	6.72	813.86
MW-1203	8006-5303	731.14	5/11/12	1345	25.64	50.04	24.4	705.5
MW-1204	8006-5307	723.88	5/11/12	1430	24.87	34.89	10.02	699.01
MW-1205	8006-5306	716.71	5/11/12	1505	51.33	53.2	1.87	665.38
MW-1206	8006-5302	697.21	5/11/12	1520	11.14	125.63	114.49	686.07
MW-1207	8006-5301	697.61	5/11/12	1512	88.69	165.5	76.81	608.92
July 2012 Sampling*								
MW-1201	8006-5304	801.82	7/23/12	1317	50.62	52.18	1.56	751.2
MW-1202	8006-5305	852.24	7/23/12	1227	33.1	45.1	12	819.14
MW-1203	8006-5303	731.14	7/23/12	1000	27.22	47	19.78	703.92

TABLE 4.2 (Continued)

Well ID	AKGWA	Elevation (ft, msl)	Date	Time	DTW	TD	Water Column (ft)	Elevation (ft, msl)
July 2012 Sampling* (Continued)								
MW-1204	8006-5307	723.88	7/24/12	950	25.7	34.76	9.06	698.18
MW-1205	8006-5306	716.71	7/24/12	1505	46.82	52.76	5.94	669.89
MW-1206	8006-5302	697.21	7/24/12	1520	11.47	123.5	112.03	685.74
MW-1207	8006-5301	697.61	7/24/12	1210	89.03	168.5	79.47	608.58
MW-1007		711.31	7/25/12		41.93	75.12	33.19	669.38
MW-1008		721.6	7/25/12		83.9	99	15.1	637.7
MW-1009		713.01	7/25/12		59.13	83.5	24.37	653.88
MW-1010		849.04	7/25/12		162.81	202	39.19	686.23
MW-1011		718.78	7/25/12		35.8	71.85	36.05	682.98
October 2012*								
MW-1201	8006-5304	801.82	10/15/12	1030	50.5	52.18	1.68	751.32
MW-1202	8006-5305	852.24	10/15/12	1034	33.76	45.1	11.34	818.48
MW-1203	8006-5303	731.14	10/15/12	1043	27.00	47	20	704.14
MW-1204	8006-5307	723.88	10/15/12	1047	26.97	34.76	7.79	696.91
MW-1205	8006-5306	716.71	10/15/12	1505	45.66	52.76	7.1	671.05
MW-1206	8006-5302	697.21	10/15/12	1520	11.43	123.5	112.07	685.78
MW-1207	8006-5301	697.61	10/15/12	1210	89.08	168.5	79.42	608.53
MW-1007		711.31	10/15/12	1122	42.87	75.12	32.25	668.44
MW-1008		721.6	10/15/12	1132	83.70	99	15.3	637.9
MW-1009		713.01	10/15/12	1115	59.42	83.5	24.08	653.59
MW-1010		849.04	10/15/12	NR	162.78	202	39.22	686.26
MW-1011		718.78	10/15/12	1111	35.79	71.85	36.06	682.99

ft., msl = Feet, mean sea level
* = Measurements provided by AEP
TD = Total depth of well below top of casing (feet)
DTW = Depth to water below top of casing (feet)
NR = Not reported

TABLE 4.3a

ANALYTICAL SUMMARY
APRIL 2012 SAMPLING EVENT

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Parameters	MCL	Well ID/Date				
		MW-1007 4/18/12	MW-1008 4/18/12	MW-1009 4/18/12	MW-1010 4/17/12	MW-1011 4/18/12
Field Parameters						
pH (Standard units)		7.02	7.61	6.71	8.10	7.11
Specific conductivity (µmhos/cm)		664	731	1,530	1,080	639
Temperature (degrees Fahrenheit)		57.5	56.0	57.5	58.0	54.1
Dissolved Oxygen (mg/L)		0.87	12.73*	0.59	1.67	0.88
Oxidation Reduction Potential (mV)		8	110	-17	3	-57
Turbidity (NTU)		1	56	0	39.6	7.2
Metals, µg/L (dissolved)						
Antimony, Sb	6	1.03	0.69	< 0.05	1.86	0.47
Arsenic, As	10	2.91	0.76	0.54	**49.5**	**34.5**
Barium, Ba	1000	65	74	21	31	58
Beryllium, Be	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Boron, B		0.08	0.103	0.177	0.093	0.117
Cadmium, Cd	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Calcium, Ca		79500	72300	237000	12300	82300
Chromium, Cr	100	< 2.0	2.6	< 2.0	< 2.0	< 2.0
Copper, Cu	1300	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron, Fe		0.087	< 0.010	2.45	< 0.010	0.872
Lead, Pb	15	< 10	< 10	< 10	< 10	< 10
Magnesium, Mg		29000	47200	59600	2850	18800
Manganese, Mn		16.7	1.7	321	24.3	406
Molybdenum, Mo		9.8	4.8	< 2.0	< 2.0	3.8
Potassium, K		3710	3990	6190	3780	4800
Selenium, Se	50	0.6	4.8	< 0.5	< 0.5	< 0.5
Silver, Ag		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Sodium, Na		13500	20900	32800	265000	26400
Thallium, Tl	0.5	< 0.05	< 0.05	< 0.05	0.16	0.05
Mercury, Hg	2	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00
Other Parameters, mg/L						
Total Alkalinity, as CaCO3		199	298	472	499	252
Bicarbonate	1	198	297	471	494	252
Bromide, Br		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chemical Oxygen Demand, COD		< 5	< 5	< 5	< 5	< 5
Chloride, Cl		8.4	5.8	13.4	1.9	2.5
Nitrate-Nitrite, NO3-NO2, as N		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Silica, SiO2 (Dissolved)		9.88	16.2	17.6	9.79	15.2
Sulfate, SO4		116	105	398	99	68.3
Total Dissolved Solids, TDS		407	466	1110	701	378
Total Organic Carbon, TOC		2.16	0.883	1.89	1.19	1.13

Samples collected by AEP
NTU = Nephalometric Turbidity Units
MCL = USEPA Maximum Contaminant Level
* = Bubbles in discharge line

TABLE 4.3b

ANALYTICAL SUMMARY
MAY 2012 SAMPLING EVENT

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

		Well ID/Date							
Parameter	**MCL**	**MW-1201 5/17/12**	**MW-1202 5/16/12**	**MW-1203 5/16/12**	**MW-1204 5/16/12**	**MW-1205 5/17/12**	**MW-1206 5/16/12**	**MW-100 Dup of MW-1206 5/16/12**	**MW-1207 5/15/12**
Field Parameters									
pH (Standard units)		NM	6.97	6.71	6.76	NC	6.91	NA	7.85
Specific conductivity (µmhos/cm)		NM	907.1	446.4	796.5	NC	326.8	NA	423.4
Temperature (degrees Fahrenheit)		NM	56.7	57.3	65.1	NC	59.6	NA	65.2
Oxidation-Reduction Potential		NM	81	-13	162	NC	-103	NA	-36
Turbidity (Nephalometric Turbidity Units)		NM	2.54	31.0	416	NC	57.5	NA	14.8
Metals, µg/L (dissolved)									
Arsenic, As	10	NC	**<20**	**<20**	**<20**	**<20**	**29**	**29**	**<20**
Cadmium, Cd	5	NC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Calcium, Ca		NC	130,000	60,000	100,000	29,000	24,000	25,000	2,800
Copper, Cu	1300	NC	<20	<20	<20	<20	<20	<20	<20
Iron, Fe		NC	<100	1,900	<100	<100	6,000	6,500	<100
Lead, Pb	15	NC	12	5.0	8.4	<5.0	<5.0	<5.0	<5.0
Magnesium, Mg		NC	40,000	14,000	42,000	7,300	8,200	8,600	760
Nickel, Ni		NC	<20	<20	<20	<20	<20	<20	<20
Potassium, K		NC	4,700	4,100	4,700	7,500	3,000	3,100	3,200
Selenium, Se	50	NC	<20	<20	<20	<20	<20	<20	<20
Sodium, Na		NC	23,000	15,000	17,000	110,000	30,000	30,000	100,000
Zinc, Zn		NC	<30	<30	<30	<30	<30	<30	<30
Mercury, Hg	2	NC	<0.20	<0.20	<0.20	NC	<0.20	<0.20	<0.20
Other Parameters, mg/L									
Alkalinity, carbonate		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Alkalinity, bicarbonate		220	300	180	250	250	150	150	210
Chemical Oxygen Demand, COD		NC	< 10	< 10	62	NC	12	13	< 10
Chloride, Cl		38	4.1	6	11	9.1	6.4	2.4	1.7
Sulfate, SO4		120	200	39	170	56.0	6.9	6.8	< 5
Total Dissolved Solids, TDS		NC	640	250	570	NC	190	180	260
Total Organic Carbon, TOC		NC	< 1	< 1	3.2	NC	2.5	2.1	1.6

NM = Not measured (Insufficient Volume)
NC = Not collected (Insufficient Volume)
NA = Not analyzed
MCL = U.S. Environmental Protection Agency Maximum Contaminant Level

TABLE 4.3c

ANALYTICAL SUMMARY
JULY 2012 SAMPLING EVENT

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Parameter	MCL	Well ID/Date														Surface Water Sample/Date			
		MW-1201 7/23/12	MW-1202 7/23/12	MW-1203 7/23/12	MW-1204 7/25/12	MW-1205 7/24/12	MW-1205 7/24/12 Duplicate 1	MW-1206 NS	MW-1207 7/25/12	MW-1207 7/25/12 Duplicate 2	MW-1007 7/25/12	MW-1008 7/25/12	MW-1009 7/25/12	MW-1010 7/25/12	MW-1011 7/25/12	SW-1 7/23/12	SW-2 7/23/12	SP-1 7/23/12	SP-2 7/23/12
Field Parameters																			
pH (Standard units)		7.91	6.58	6.28	6.77	7.66	NM	NM	7.66	NM	7.54	8.19	7.33	8.58	7.85	7.56	7.03	NC	NC
Specific conductivity (µmhos/cm)		795	986	475	735	714	NM	NM	453	NM	983	736	1,580	1,170	618	1,970	1,360	NC	NC
Temperature (degrees Fahrenheit)		67.3	60.1	58.9	59.7	61.8	NM	NM	63.1	NM	58.5	58.0	58.9	57.5	56.3	86.4	76.5	NC	NC
Dissolved Oxygen (mg/L)		5.58	4.52	2.10	6.45	2.88	NM	NM	1.01	NM	0.44	13.46*	1.09	1.58	0.92	6.77	7.33	NC	NC
Oxidation Reduction Potential (mV)		1	172	32	223	54	NM	NM	-57	NM	-33	58	-55	14	-77	220	170	NC	NC
Turbidity (Nephalometric Turbidity Units)		0	3.5	2.4	817	1,000	NM	NM	69.4	NM	4.3	57.5	0	1.4	6.6	11.1	9.4	NC	NC
Metals, µg/L (dissolved)																			
Antimony, Sb	6	0.56	0.11	0.12	0.56	5.83	5.51	NS	0.61	1.4	0.55	0.63	< 0.05	1.65	0.36	**17.9**	**16.9**	0.08	0.24
Arsenic, As	10	1.54	0.62	0.32	0.51	2.21	2.19	NS	4	4.51	2.5	1.32	1.02	**37.4**	**23.3**	**16.1**	6.8	0.42	3.4
Barium, Ba	2000	24.9	18.7	93.4	48.9	89.2	93.3	NS	188	154	97.8	69.6	17.8	30.1	49.6	141	154	34.6	137
Beryllium, Be	4	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.020	NS	< 0.02	< 0.020	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.2	0.193	< 0.02	< 0.02
Cadmium, Cd	5	< 0.05	< 0.05	< 0.05	0.42	< 0.05	< 0.05	NS	< 0.05	< 0.05	0.07	< 0.05	< 0.05	< 0.05	< 0.05	1.8	1.49	< 0.05	< 0.05
Chromium, Cr	100	0.3	0.3	< 0.2	0.4	0.2	< 0.2	NS	0.3	< 0.2	< 0.2	3.4	< 0.2	< 0.2	< 0.2	1.1	0.7	0.3	0.3
Copper, Cu	1300	0.71	0.37	0.08	1.42	1.61	1.05	NS	1.15	0.36	0.99	2.11	0.22	0.38	1.12	30	10.1	1.02	0.4
Lead, Pb	15	0.121	0.015	< 0.01	0.065	0.036	0.06	NS	0.022	0.02	0.07	0.354	0.012	0.022	0.015	0.087	0.064	0.03	0.088
Molybdenum, Mo		21.2	0.54	0.2	1.28	26	26.4	NS	11.4	12.5	12.4	4.61	0.26	2.98	3.4	205	187	0.58	1.39
Mercury, Hg	2	**8.77**	**18.54**	< 2	**3.96**	< 2	**14.87**	NS	< 2	**6.53**	< 2	< 2	< 2	< 2	< 0.01	< 2	< 2	**2.31**	< 0.01
Nickel, Ni		1.18	0.78	0.8	2.88	1.07	1.03	NS	6.75	2.99	1.87	1.85	0.71	0.62	5.13	43.6	34	0.65	3.53
Selenium, Se	50	< 0.5	1.9	< 0.5	0.7	2.5	2.3	NS	< 0.5	< 0.5	< 0.5	5	< 0.5	< 0.5	< 0.5	8.8	5.8	< 0.5	0.6
Silver, Ag		< 0.01	< 0.01	< 0.01	0.024	< 0.01	0.017	NS	< 0.01	< 0.010	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.017	0.019	< 0.01	< 0.01
Thallium, Tl	0.5	< 0.05	< 0.05	< 0.05	0.06	0.08	0.08	NS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.15	< 0.05	**12.9**	**9.68**	0.06	< 0.05
Zinc, Zn		4.4	3.5	1.7	7.7	4.9	3.2	NS	4.5	2.6	2.4	8.8	1.4	1.2	2.9	29.5	30.4	2.9	1.6
Boron, B		188	59	95	34	284	269	NS	210	221	295	98	181	111	137	1240	1030	25	136
Calcium, Ca		9460	138000	61300	69300	23100	24100	NS	3750	3520	98300	70500	231000	10700	76800	148000	96800	23700	338000
Iron, Fe		<10	<10	2880	<10	<10	<10	NS	14	<10	44	<10	2420	<10	689	<10	17	10	32
Magnesium, Mg		2190	41700	13900	29400	5790	5990	NS	782	777	36300	46400	58200	2340	17900	70100	41600	7400	225000
Manganese, Mn		97.1	14.3	1050	22.6	19.5	23	NS	7.5	6.3	50.7	1.2	325	20.6	277	175	423	2.2	484
Potassium, K		3280	4620	3710	2660	5460	5590	NS	3320	3270	4860	4120	6210	2690	5240	19500	14800	1450	14600
Sodium, Na		192000	23600	14000	10700	145000	140000	NS	104000	104000	44400	20700	34500	265000	27800	168000	90200	5180	159000
Other Parameters, mg/L																			
Total Alkalinity, as CaCO3		359	356	208	196	350	350	NS	226	231	213	314	470	499	240	45	21	42	350
Bicarbonate		356	356	208	196	346	346	NS	221	227	213	312	470	494	240	45	21	42	348
Bromide, Br		< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	NS	< 0.4	< 0.4	0.5	< 0.4	< 0.4	< 1	< 0.05	1.9	1	< 0.4	< 0.05
Chemical Oxygen Demand, COD		NR	< 5	< 5	10	10	7	NS	8	8	16	7	10	10	< 0.05	9	9	7	< 0.05
Chloride, Cl		13.5	3.8	5.3	2.7	5	5.2	NS	2.5	3.1	34.6	6.6	14.4	1.4	2	106	53	1.9	11.5
Nitrate-Nitrite, NO3-NO2, as N	1	NR	0.74	< 0.2	0.5	1.22	1.43	NS	0.44	0.27	0.3	< 0.2	< 0.2	< 0.2	< 0.01	1.99	1.52	0.51	< 0.01
Silica, SiO2 (Dissolved)		8.88	14	8.94	9.95	11.8	11.8	NS	8.35	8.09	10.1	16.6	17.5	9.61	14.2	10.1	8.18	10.2	13.1
Sulfate, SO4		69.5	198	33.1	101	39.3	40.1	NS	4.9	6.4	260	124	406	98.9	69.9	855	535	63.5	1750
Residue, Filterable, TDS		517	665	265	375	460	461	NS	270	269	631	494	1140	703	364	1390	856	154	2810
Total Organic Carbon, TOC		NR	0.905	0.564	1.56	2.96	2.83	NS	1.7	1.63	2.69	0.847	1.62	1.02	0.928	2.5	1.59	1.65	7.49

Samples collected by AEP
NM = Not measured (Insufficient Volume)
NC = Not collected (Insufficient Volume)
NS = Not Sampled (Well Inoperable)
MCL = USEPA Maximum Contaminant Level
* = Bubbles in discharge line

TABLE 4.3d

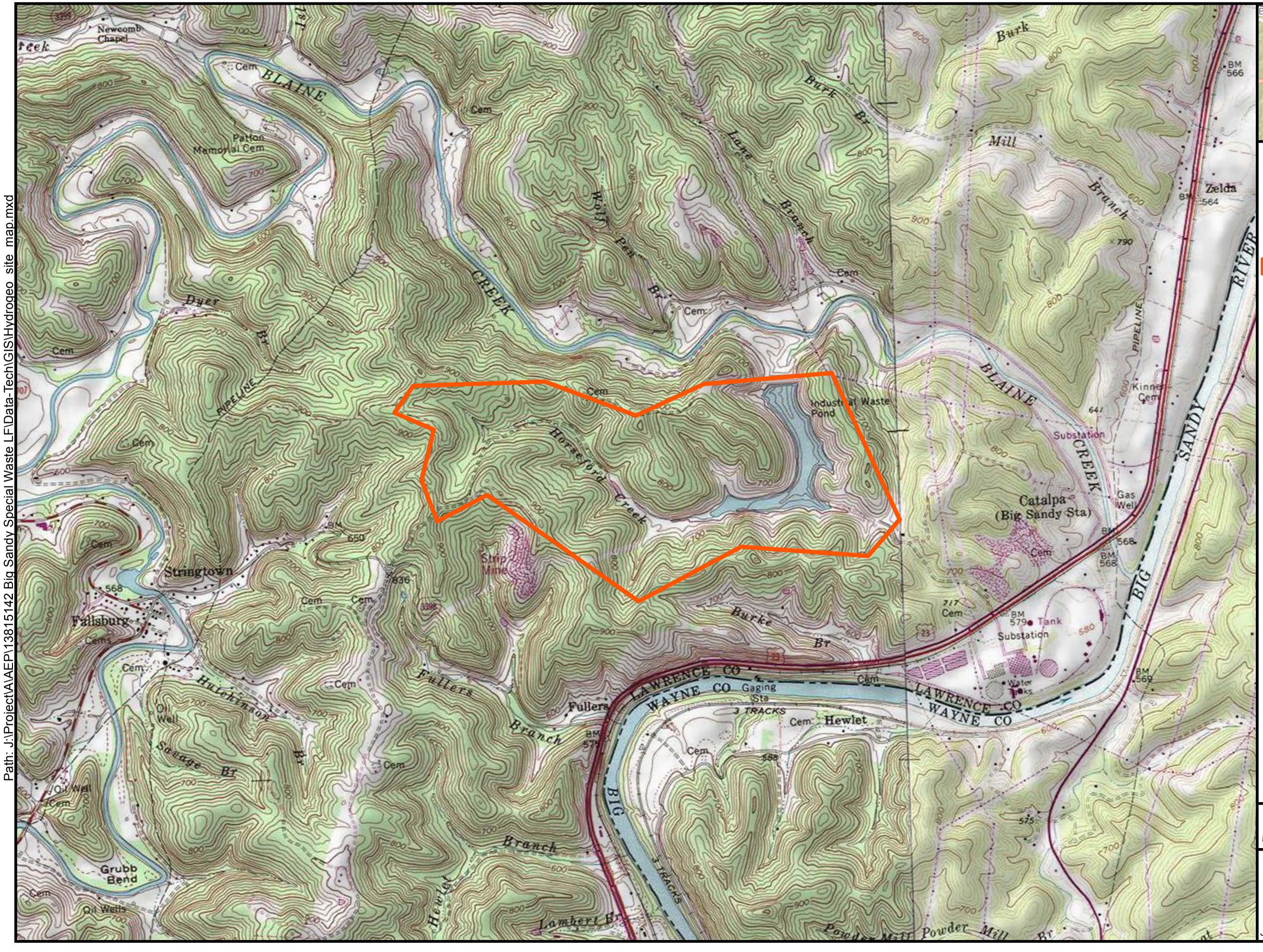
ANALYTICAL SUMMARY
OCTOBER 2012 SAMPLING EVENT

HYDROGEOLOGIC SITE INVESTIGATION
AEP BIG SANDY

Parameter	MCL	Well ID/Date														Surface Water Sample/Date	
		MW-1201 10/16/12	MW-1202 10/18/12	MW-1203 10/18/12	MW-1204 10/18/12	MW-1205 10/16/12	MW-1206 10/16/12	MW-1207 10/16/12	MW-1207 10/16/12 DUP #2	MW-1007 10/15/12	MW-1008 10/15/12	MW-1009 10/15/12	MW-1010 10/15/12	MW-1011 10/15/12	MW-1011 10/15/12 DUP #1	SW-1 10/18/12	SW-2 10/16/12
Field Parameters																	
pH (Standard units)		7.44	6.94	6.78	7.03	8.25	6.63	8.51	NC	6.83	7.52	6.60	8.04	6.98	NC	NC	NC
Specific conductivity (µmhos/cm)		902	989	462	648	775	420	420	NC	1,153	662	1,490	1,110	583	NC	NC	NC
Temperature (degrees Fahrenheit)		56.6	56.5	57.2	60.5	52.8	62.8	60.8	NC	58.5	57.5	58.9	55.2	55.4	NC	NC	NC
Dissolved Oxygen (mg/L)		2.71	0.72	0.40	6.87	8.62	3.10	0.19	NC	0.13	15.11*	0.10	0.38	0.13	NC	NC	NC
Oxidation Reduction Potential (mV)		110	182	96	155	162	-88	-70	NC	55	183	155	155	34	NC	NC	NC
Turbidity (Nephalometric Turbidity Units)		2000	12.8	42.4	2000	500	45.1	453.0	NC	0.0	87.7	15.9	16.7	24.4	NC	NC	NC
Metals, µg/L (dissolved)																	
Antimony, Sb	6	0.17	0.06	0.14	0.16	4.64	<0.05	0.17	0.15	0.42	0.62	<0.05	1.48	0.34	0.37	**7.69**	**8.42**
Arsenic, As	10	<10	0.54	0.26	0.44	<10	**30**	<10	<10	1.63	1.05	1.32	**32.2**	**21.4**	**21.5**	4.88	<10
Barium, Ba	2000	24.9	19.7	91.7	50.0	129	323	71.0	75.1	100	66.9	16.0	28.9	50.4	51.4	90.5	105
Beryllium, Be	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium, Cd	5	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	0.10	0.08	<0.05	<0.05	<0.05	<0.05	0.60	0.73
Chromium, Cr	100	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	0.3	<0.2
Copper, Cu	1300	0.56	0.20	0.13	0.40	1.10	0.20	0.14	0.13	0.54	1.38	0.07	0.62	0.09	0.09	4.83	6.22
Lead, Pb	15	0.046	0.015	<0.010	<0.010	0.043	0.018	0.129	0.175	0.688	0.026	0.011	0.022	0.027	<0.010	0.090	0.011
Molybdenum, Mo		21.9	0.28	<0.10	1.09	20.9	2.15	10.7	10.6	17.4	2.83	<0.10	1.74	2.29	2.28	108	98.8
Mercury, Hg	2	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Nickel, Ni		1.27	0.91	1.14	0.69	0.86	0.96	<0.20	<0.20	3.24	1.97	1.08	0.91	5.18	5.13	19.4	20.7
Selenium, Se	50	<0.5	1.7	<0.5	0.6	1.8	<0.5	<0.5	<0.5	<0.5	5.1	<0.5	<0.5	<0.5	<0.5	4.7	2.2
Silver, Ag		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010
Thallium, Tl	0.5	<0.05	0.08	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	0.06	0.06	**4.77**	**5.01**
Zinc, Zn		2.3	2.2	3.5	1.1	3.1	1.3	<0.5	<0.5	0.9	3.7	<0.5	2.6	0.8	0.7	11.3	19.1
Boron, B		219	147	164	103	294	74	200	206	574	181	253	107	278	273	780	684
Calcium, Ca		8420	143000	60500	77500	24400	32200	1390	1420	126000	69500	104000	10500	78300	79400	93500	84600
Iron, Fe		75	<10	1950	<10	<10	23800	<10	<10	26	<10	1030	<10	717	723	29	25
Magnesium, Mg		1890	44200	14200	33800	5800	12000	366	381	46500	46400	26000	2290	18000	18300	46400	38600
Manganese, Mn		NA	12.3	1290	17.4	NA	NA	NA	NA	285	<0.5	156	19	258	261	173	NA
Potassium, K		2490	4770	3770	2940	5260	3000	2510	2590	5770	4070	4380	2790	5330	5390	12400	12100
Sodium, Na		210000	27200	14400	11300	154000	30000	102000	103000	62900	20200	183000	269000	27100	27200	87600	73700
Other Parameters, mg/L																	
Total Alkalinity, as CaCO3		429	348	203	229	350	176	223	227	154	283	459	503	243	240	66	43
Bicarbonate		422	348	203	229	347	176	217	221	154	281	459	498	243	240	66	43
Bromide, Br		<0.2	<0.2	<0.2	<0.2	<0.4	<0.4	<0.4	<0.2	0.9	<0.4	<0.4	<0.4	<0.4	<0.4	1.0	0.8
Chemical Oxygen Demand, COD		29	<10	<10	<10	11	170	<10	<10	<10	<10	<10	<10	<10	<10	14	13
Chloride, Cl		8.7	3.7	5.0	2.7	4.8	8.1	1.2	1.2	44.8	3.7	12.9	1.4	1.6	1.6	54.0	43.4
Nitrite, NO2 as N		NA	NA	NA	NA	NA	NA	NA	NA	<0.10	<0.10	<0.10	<0.10	< 0.10	<0.10	NA	NA
Nitrate, NO3 as N		NA	NA	NA	NA	NA	NA	NA	NA	<0.10	0.10	<0.10	<0.10	< 0.10	<0.10	NA	NA
Nitrate-Nitrite, NO3-NO2 as N	1	<0.20	0.29	<0.20	0.29	**2.34**	<0.20	<0.20	<0.20	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	**2.92**	**1.74**
Silica, SiO2 (Dissolved)		8.67	14.2	8.94	12.5	12.7	13.4	8.29	8.29	11.6	17.1	17.4	10.2	14.6	14.9	7.31	6.81
Sulfate, SO4		39.9	201	31.8	105	43.1	1.1	1.5	1.5	372	76.1	389	94.5	63.9	63.5	420	417
Residue, Filterable, TDS		556	687	268	404	473	283	258	261	826	412	1130	707	360	363	823	717
Total Organic Carbon, TOC		9.31	1.63	1.46	2.07	3.62	79.9	2.06	1.89	2.83	2.38	2.55	1.78	1.48	1.56	3.29	3.03

Samples collected by AEP
NM = Not measured (Insufficient Volume)
NC = Not collected
NA = Not Analyzed
MCL = USEPA Maximum Contaminant Level
* = Bubbles in discharge line

Path: J:\Project\AEP\13815142 Big Sandy Special Waste LF\Data-Tech\GIS\Hydrogeo site map.mxd



N

LEGEND:

Limit of Hydrogeologic Site Investigation

0 1,600 3,200
Scale in Feet

0 520 1,040
Scale in Meters

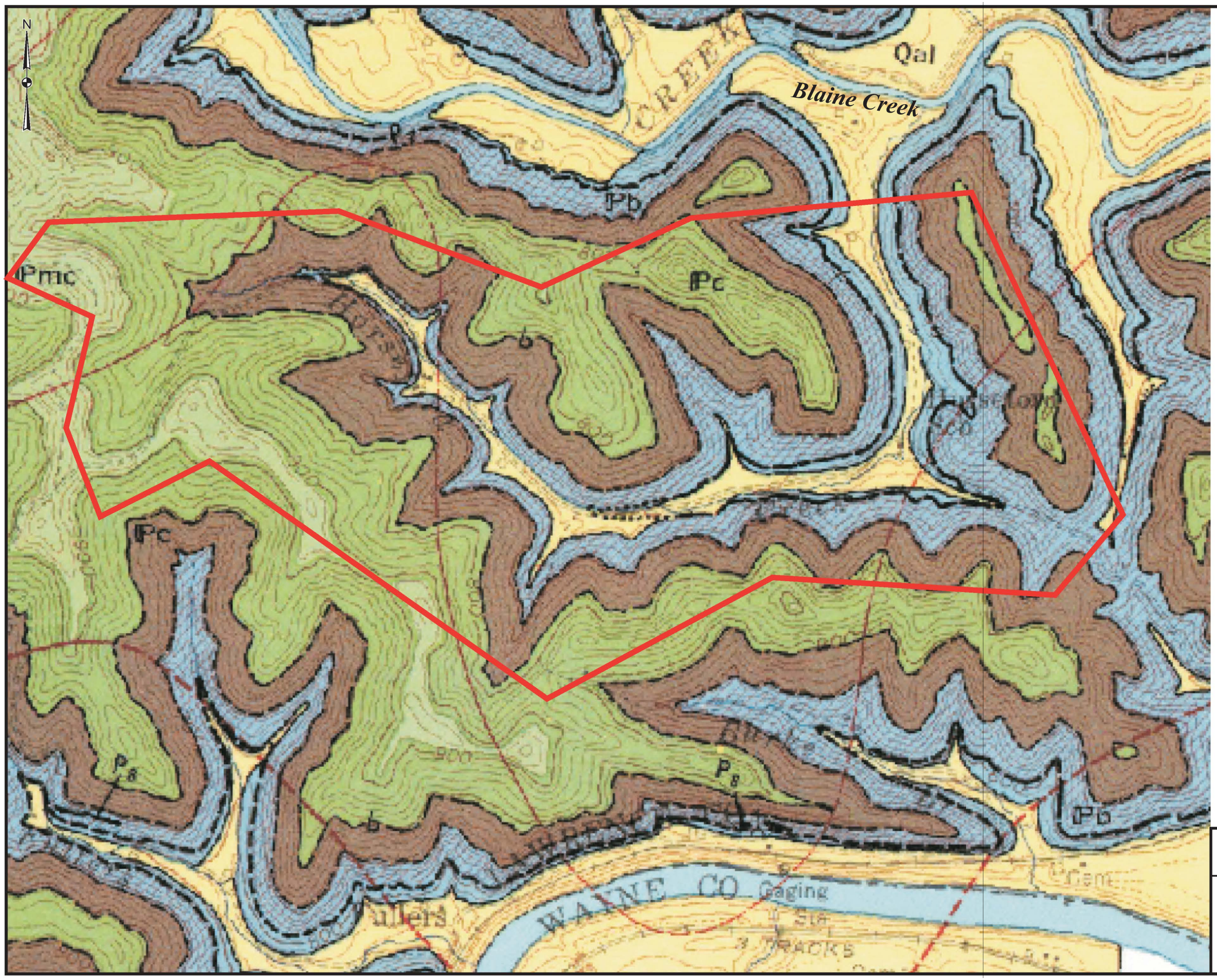
BASE MAP SOURCE:
USGS Topographic Quadrangles:
Fallsburg, KY/WV (1978) and
Prichard, WV/KY (1977)

Big Sandy Hydrogeologic Site Investigation

FIGURE 2.1
SITE MAP

JOB NO. 13815142

URS



LEGEND:

Limit of Hydrogeologic Site Investigation

EXPLANATION

Qal — Alluvium

QUATERNARY

PENNSYLVANIAN

CARBONIFEROUS

Upper Pennsylvanian

Monongahela and Conemaugh Formations

Pmc, *Monongahela Formation and upper part of Conemaugh Formation*

Pc, *Conemaugh Formation*

a, *Ames Limestone Member*

c, *unnamed coal bed*

b, *Brush Creek Limestone Member*

bc, *Brush Creek coal bed*

Lower and Middle Pennsylvanian

Breathitt Formation

Ps, *Princess No. 8 coal bed*

P7, *Princess No. 7 coal bed*

P6, *Princess No. 6 coal bed*

P5, *Princess No. 5 coal bed*

Only the upper part (Middle Pennsylvanian) of the Breathitt Formation is exposed in this area

Contact

Dashed where approximately located; short dashed where inferred; dotted where concealed

Coal bed

Dashed where approximately located; short dashed where inferred; dotted where concealed

800

Structure contours

Drawn on top of Brush Creek Limestone Member of Conemaugh Formation. Long dashed where control less accurate. Short dashed where datum is above land surface. Contour interval 20 feet

Geologic Quadrangle Map of Fallsburg Quadrangle, Kentucky-West Virginia, and the Pritchard, Quadrangle in Kentucky, (GQ-584) Joseph A. Sharpe, 1987.

0 700 1,400

APPROXIMATE SCALE IN FEET

AEP

Big Sandy
Hydrogeologic Site Investigation

FIGURE 2.6
REGIONAL GEOLOGIC MAP

JOB NO. 13815152

URS

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Outcrop 12

Remnant Block

Outcrop 11a

Outcrop 18

Outcrop 7

Outcrop 10

Outcrop 5

Boyd Co.
Ashland
Prichard
Kentucky
West Virginia
Lawrence Co.
Wayne Co.
Fort Gay
Yatesville

LEGEND

- Property Boundary
- Outcrop
- Well / Boring Location
- Survey Features 4-8-2013
- Cemetery
- 10-Foot Contour

Observed Exposures and Projected Boring Logs

- Coal
- Shale
- Limestone
- Sandstone

USGS Geologic Units*

Explanation

- QaL - Alluvium
- IPmc - Monongahela and upper Conemaugh
- IPc - Conemaugh
- IPc - Conemaugh, Brush Creek coal bed
- IPb - Breathitt

Fracture/ Joint Orientation and Frequency

*Geologic Units Digitized from the: *GEOLOGIC QUADRANGLE MAP FALLSBURG AND PRICHARD QUADRANGLES, KY.-W.VA.* By Joseph A. Sharpe 1967

0 350 700
Scale in Feet
N

Big Sandy Pond Closure

FIGURE 3.1
RESULTS
GEOLOGICAL MAPPING
APRIL 2013 SURVEY

JOB NO. 13815142

URS

Last Saved: 6/14/2013

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A
WEST

B
SOUTHWEST

C
NORTHWEST

D
NORTH

B'
NORTHEAST

A'
EAST

C'
SOUTHEAST

D'
SOUTH

MW-1201
MW-1202
MW-1203
MW-1204
MW-1205
MW-1206
MW-1207
MW-1007
MW-1008
MW-1009
MW-1010
MW-1011
SB-3
SB-4
SB-6
SB-7
SB-8
PB-1
PB-2
PB-3
PB-4
PB-5
PB-6
PB-7
PB-8
SP-1
SP-2
SW-1
SW-2
EXISTING ROAD

0 600 1,200
APPROXIMATE SCALE IN FEET

LEGEND:

- Limit of Hydrogeologic Site Investigation
- Boring Location
- PB — Pond Boring
- SB — Soil Boring
- HB — Hydrogeologic Boring
- MW — Monitoring Well
- Seep Sampling Location
- Surface Water Sampling Location
- A — A' Cross-Section Transect

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 3.2
BORING AND WELL LOCATIONS

JOB NO. 13815152

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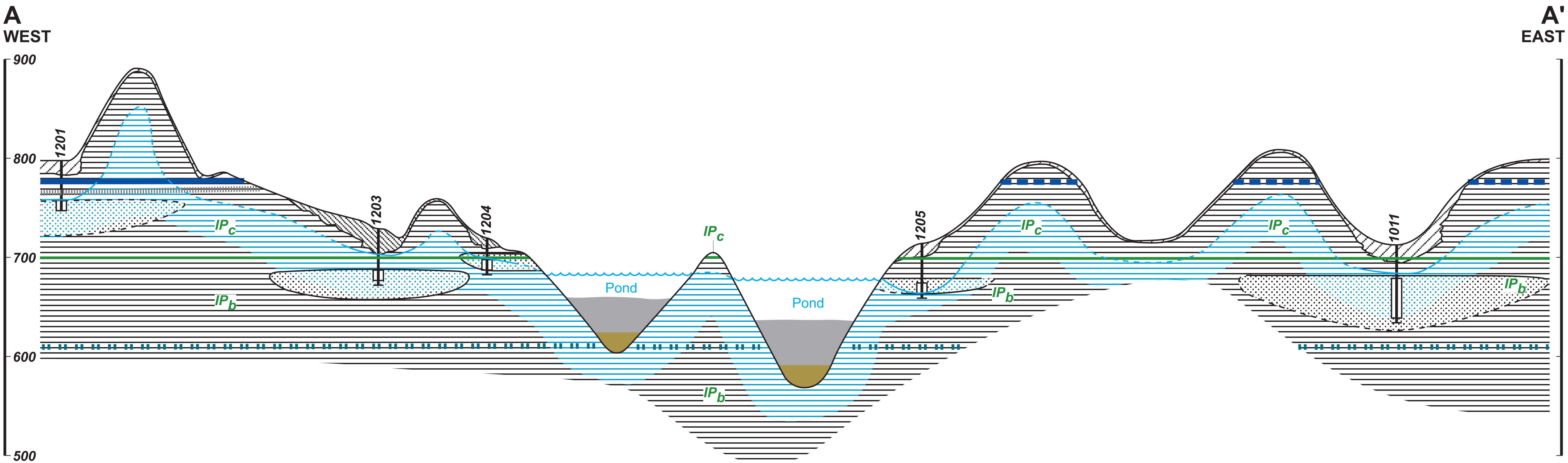

LEGEND:

- Brush Creek Limestone (Observed) (Dashed Where Inferred)
- 8" Coal Seam
- 1203 — Well ID
- Well
- Well Screen
- Water Level (Measured October 15, 2012) (Dashed Where Inferred)

GQ-584 — Geologic Quadrangle Map of Fallsburg Quadrangle, Kentucky-West Virginia, and the Pritchard, Quadrangle in Kentucky, (GQ-584) Joseph A. Sharpe, 1987.

- IPc — Conemaugh Formation (Inferred from GQ-584)
- IPb — Breathitt Formation (Inferred from GQ-584)
- Princess Coal #7 (Inferred from GQ-584)

CL	Clay	
SC	Sandy Clay	
SS	Sandstone	
SH	Shale, Interbedded Shale, Siltstone, Sandstone, Mudstone	
	Alluvium	
	Ash	
	Uppermost Groundwater Zone	

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Big Sandy Hydrogeologic Site Investigation

FIGURE 4.1a
CROSS SECTION A-A'

JOB NO. 13815152

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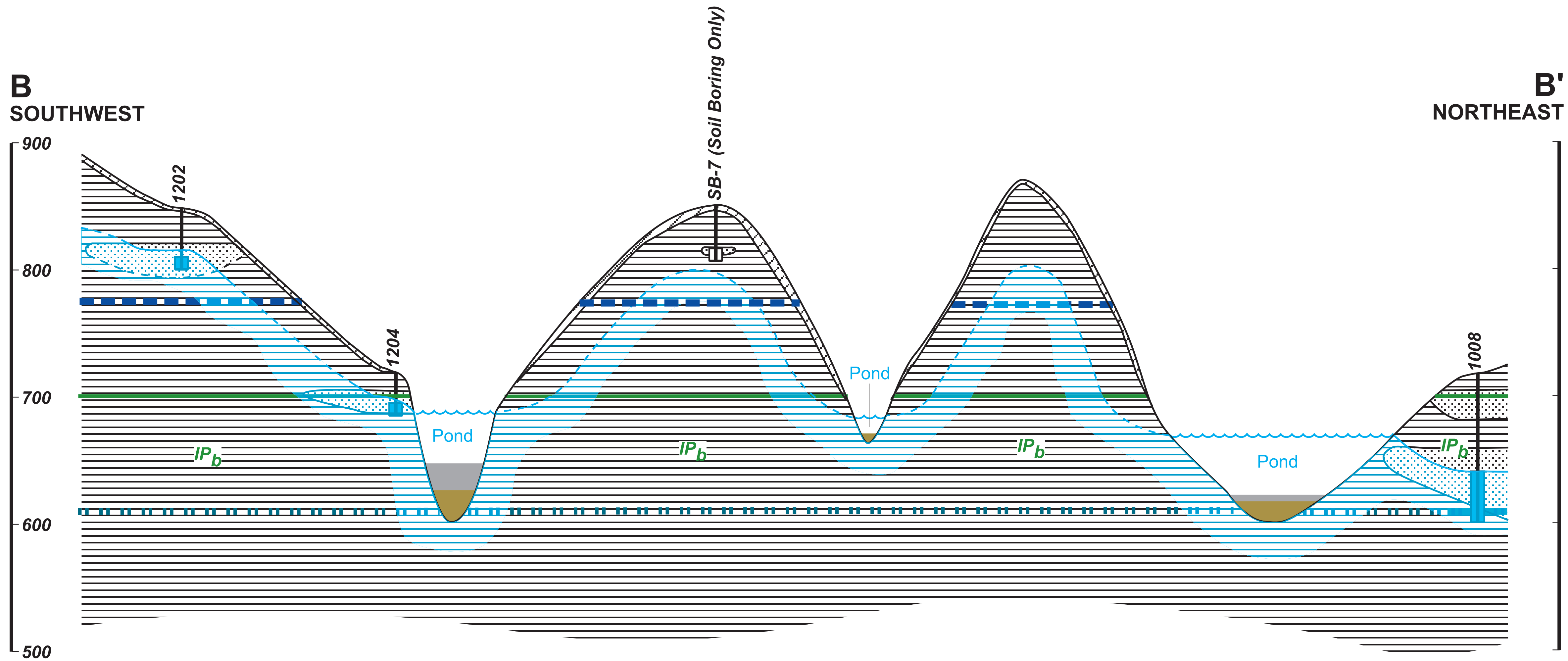

LEGEND:

- Brush Creek Limestone (Inferred from GQ-584)
- 1202 — Well ID
- Well
- Well Screen
- Water Level (Measured October 15, 2012) (Dashed Where Inferred)

GQ-584 — Geologic Quadrangle Map of Fallsburg Quadrangle, Kentucky-West Virginia, and the Pritchard, Quadrangle in Kentucky, (GQ-584) Joseph A. Sharpe, 1987.

IP_c — Conemaugh Formation (Inferred from GQ-584)

IP_b — Breathitt Formation (Inferred from GQ-584)

Princess Coal #7 (Inferred from GQ-584)

CL	Clay	
SC	Sandy Clay	
SS	Sandstone	
SH	Shale, Interbedded Shale, Siltstone, Sandstone, Mudstone	
	Alluvium	
	Ash	
	Uppermost Groundwater Zone	

100
0
0 600
SCALE IN FEET
VERTICAL EXAGGERATION = 6x

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.1b
CROSS SECTION B-B'

JOB NO. 13815152

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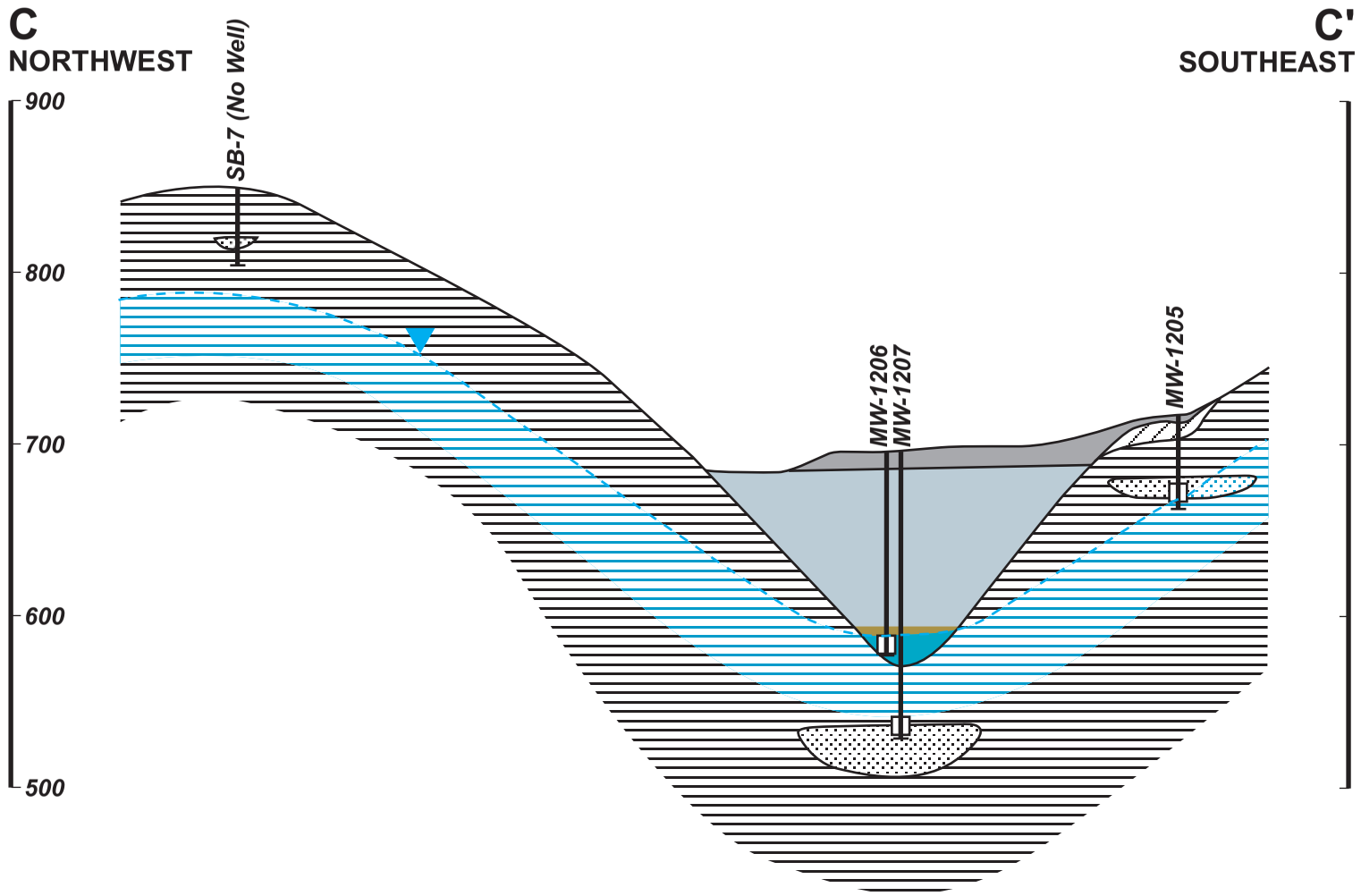

LEGEND:

SB-7 — Well ID

Well

Well Screen

Water Level (Measured October 15, 2012) (Dashed Where Inferred)

CL	Clay
SC	Sandy Clay
SH	Shale, Interbedded Shale, Siltstone, Sandstone, Mudstone
	Alluvium
	Ash
	Wet Ash
	Uppermost Groundwater Zone

100
0
0
300
SCALE IN FEET
VERTICAL EXAGGERATION = 3x

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.1c
CROSS SECTION C-C'

JOB NO. 13815152

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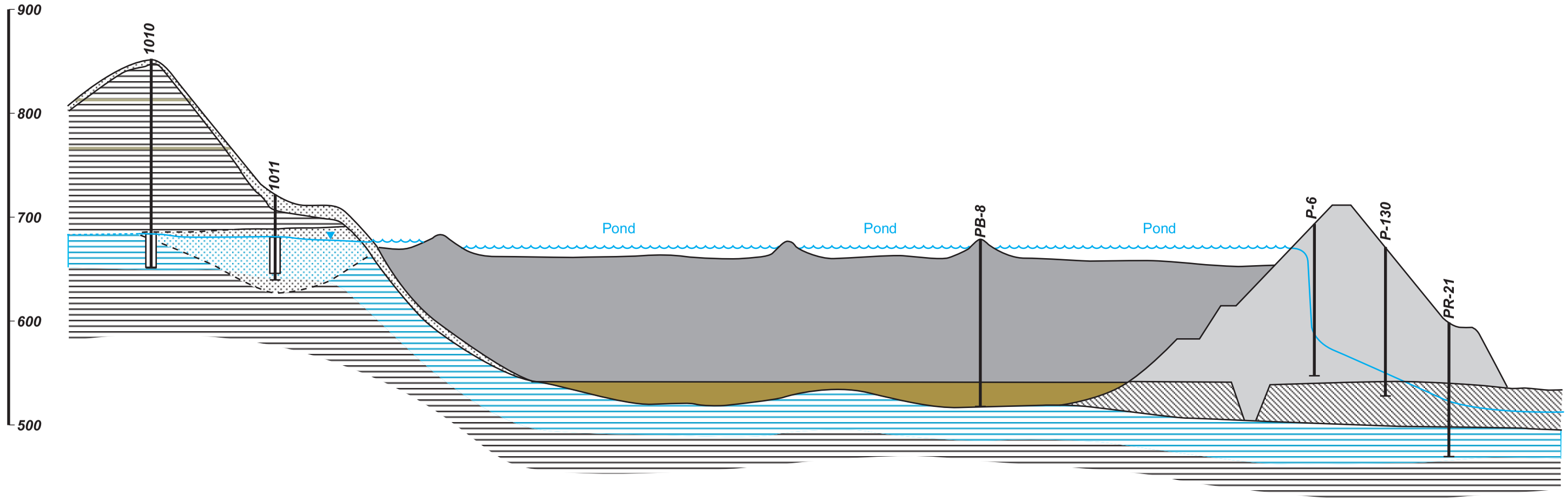
D
SOUTH

D'
NORTH



LEGEND:

- Coal Seam
- 1011 — Well ID
- Well
- Well Screen
- Water Level (Measured October 15, 2012) (Dashed Where Inferred)

- SC — Sandy Clay
- SS — Sandstone
- SH — Shale, Interbedded Shale, Siltstone, Sandstone, Mudstone
- Alluvium
- Ash
- Uppermost Groundwater Zone

100
0
0 600
SCALE IN FEET
VERTICAL EXAGGERATION = 6x

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.1d
CROSS SECTION D-D'

JOB NO. 13815152

URS

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MW–1008
NM

MW–1007
NM

SB–3

EXISTING ROAD

PB–8

MW–1201
750.51

PB–1

MW–1203
705.72

PB–2

MW–1204
697.84

SB–4

MW–1202
820.49

700

750

800

SB–6

SB–7

PB–3

PB–6

PB–4

PB–5

SB–8

PB–7

MW–1206
686.07

MW–1207
608.92

MW–1205
665.38

MW–1011
NM

MW–1010
NM

MW–100
NM

0 600 1,200

APPROXIMATE SCALE IN FEET

LEGEND:

	Limit of Hydrogeologic Site Investigation	MW	Monitoring Well
	Boring Location		Potentiometric Line (Dashed Where Inferred)
PB	Pond Boring		Inferred Flow Direction
SB	Soil Boring	NM	Not Measured
HB	Hydrogeologic Boring	820.49	Groundwater Elevation (Feet, msl)

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.2a
GROUNDWATER ELEVATIONS
MAY 11, 2012

JOB NO. 13815152

URS

MW–1008
637.70

MW–1007
669.38

GAUGE
671.23

SB–3

EXISTING ROAD

PB–8

MW–1201
751.20

PB–1

MW–1203
703.97

PB–2

MW–1204
698.18

SB–4

MW–1202
819.14

700

750

800

SB–6

SB–7

PB–3

PB–6

PB–4

PB–5

SB–8

PB–7

MW–1206
685.58

MW–1207
608.58

MW–1205
669.89

MW–100
653.88

MW–1011
682.98

MW–1010
686.23

0 600 1,200

APPROXIMATE SCALE IN FEET

LEGEND:

Limit of Hydrogeologic Site Investigation	MW — Monitoring Well
Boring Location	Potentiometric Line (Dashed Where Inferred)
PB — Pond Boring	Inferred Flow Direction
SB — Soil Boring	NM — Not Measured
HB — Hydrogeologic Boring	819.14 — Groundwater Elevation (Feet, msl)

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.3b
GROUNDWATER ELEVATIONS
JULY 23-25, 2012

JOB NO. 13815152

URS

MW–1008
637.90

MW–1007
668.44

GAUGE
669.85

SB–3

EXISTING ROAD

PB–8

MW–1201
751.32

PB–1

MW–1203
704.14

PB–2

MW–1204
696.91

SB–4

MW–1202
818.48

SB–7

PB–7

MW–1206
685.78

MW–1207
608.53

MW–1009
653.59

PB–3

PB–6

PB–4

PB–5

SB–8

SB–6

MW–1205
671.05

MW–1011
682.99

MW–1010
686.26

700

750

800

0 600 1,200

APPROXIMATE SCALE IN FEET

LEGEND:

Limit of Hydrogeologic Site Investigation	
Boring Location	
PB	Pond Boring
SB	Soil Boring
HB	Hydrogeologic Boring
MW	Monitoring Well
	Potentiometric Line (Dashed Where Inferred)
	Inferred Flow Direction
NM	Not Measured
818.48	Groundwater Elevation (Feet, msl)

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.2c
GROUNDWATER ELEVATIONS
OCTOBER 15, 2012

JOB NO. 13815152

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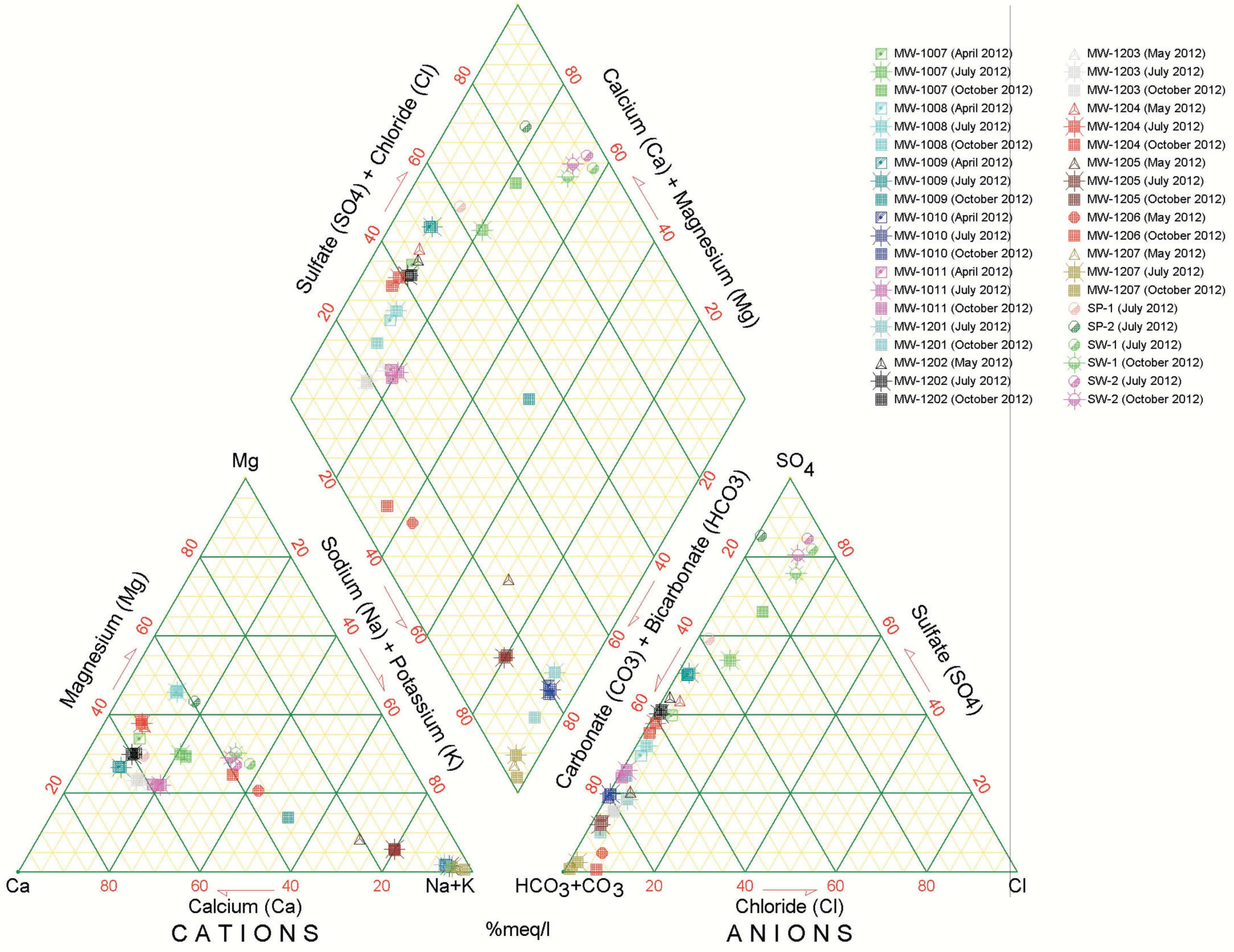

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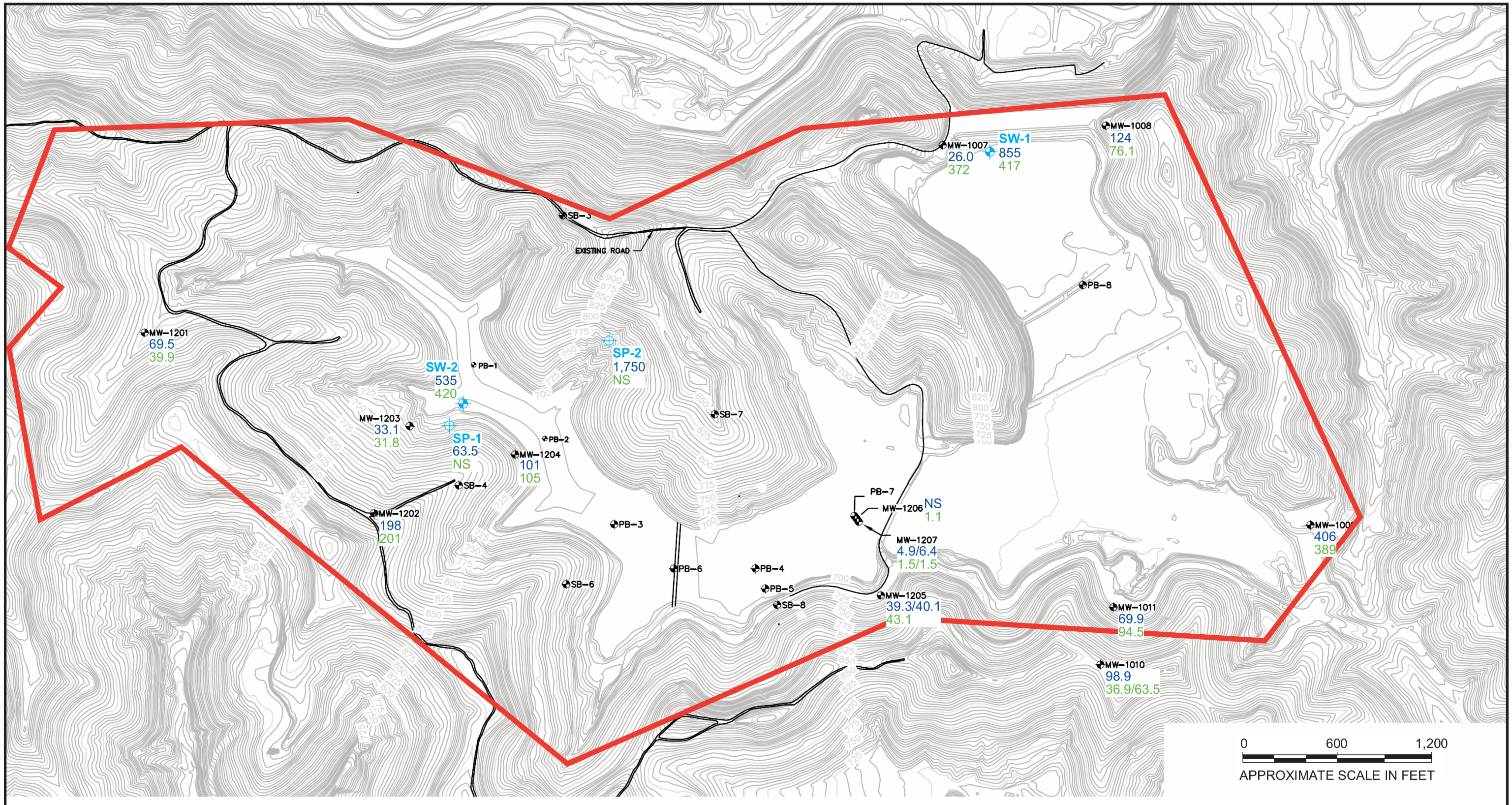
Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.3a
PIPER DIAGRAM
APRIL–OCTOBER 2012 EVENTS

JOB NO. 13815152



LEGEND:

Limit of Hydrogeologic Site Investigation	
Boring Location	
PB	Pond Boring
SB	Soil Boring
HB	Hydrogeologic Boring
MW	Monitoring Well
	Seep Sampling Location
	Surface Water Sampling Location
101	Sulfate Concentration (July 2012)
105	Sulfate Concentration (October 2012)
NS	Not Sampled

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Big Sandy
Hydrogeologic Site Investigation

FIGURE 4.3b
SULFATE DISTRIBUTION

JOB NO. 13815152

URS

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APPENDIX A

BORING/WELL CONSTRUCTION LOGS

2012 LOGS

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Key to Log of Boring/Rock Core

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer, tsf	Graphic Log	MATERIAL DESCRIPTION		Well Graphic	REMARKS AND OTHER DETAILS
1	2	3	4	5	6	7	8	9		10	11	12

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler each 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop.

6 **Recovery:** Percentage of driven sample length actually recovered.

7 **Pocket Penetrometer:** Pocket penetrometer field consistency measurement in tons per square foot (tsf).

8 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

9 **Material Description:** Description of material encountered; may include color, moisture, grain size, and density/consistency.

10 **Water Content** Water content of soil sample measured in laboratory, expressed as percent of dry weight of sample.

11 **Well Graphic:** Diagram of well installation

12 **Remarks and Other Details:** Comments and observations regarding drilling or sampling made by driller or field personnel. Also includes well details and laboratory testing results.

TYPICAL MATERIAL GRAPHIC SYMBOLS

BOTTOM ASH
FLY ASH
FILL
SEDIMENTS
TOPSOIL
WATER
PEAT (PT)
Fat Organic CLAY (OH)
Lean Organic CLAY (OL)
Lean CLAY (CL)
Fat CLAY (CH)
SILT (ML)
Clayey SAND (SC)
Silty SAND (SM)
Poorly-graded SAND (SP)
Poorly-graded SAND (SP-SM)
Clayey GRAVEL (GC)
Silty GRAVEL (GM)
Clayey GRAVEL (GC)
COAL
LIMESTONE
SANDSTONE
SHALE

TYPICAL WELL GRAPHIC SYMBOLS

Filter Sand
Natural fill
PVC Pipe in Bentonite Seal
PVC Pipe in Bentonite Grout
Bentonite Plug
PVC Pipe in Filter Sand
Slotted PVC Pipe in Filter Sand

OTHER GRAPHIC SYMBOLS

First water encountered at time of drilling and sampling (ATD)

Water level at time indicated on log

Minor change in material properties within a lithologic stratum

---- Inferred or gradational lithologic contact

ATD At Time of Drilling
NR Not Recorded
NA Not Applicable

TYPICAL SAMPLER GRAPHIC SYMBOLS

Split-spoon
Core Barrel
Shelby-tube
Piston Tube
Core

MINOR SOIL TYPE(s)

"trace" When the soil type's percentage is estimated, using visual/manual procedures, to be between 1 and 15 percent of the total sample.

"with" When the soil type's percentage is estimated, using visual/manual procedures, to be greater than 15 percent and less than 30 percent of the total sample.

"y" When the soil type's percentage is estimated, using visual/manual procedures, to be greater than 30 percent of the total sample.

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

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KEY TO DESCRIPTIVE TERMS USED ON CORE LOGS

DISCONTINUITY DESCRIPTORS

a Dip of discontinuity, measured relative to a plane normal to the core axis.

b **Discontinuity Type:**

- F - Fault
- J - Joint
- Sh - Shear
- Fo - Foliation
- V - Vein
- B - Bedding

c **Aperture (inches):**

- W - Wide (0.5-2.0)
- MW - Moderately Wide (0.1-0.5)
- N - Narrow (0.05-0.1)
- VN - Very Narrow (<0.05)
- T - Tight (0)

d **Type of Infilling:**

- Cl - Clay
- Ca - Calcite
- Ch - Chlorite
- Fe - Iron Oxide
- Gy - Gypsum
- H - Healed
- Mn - Manganese Oxide
- No - None
- Py - Pyrite
- Qz - Quartz
- Sd - Sand

e **Amount of Infilling:**

- Su - Surface Stain
- Sp - Spotty
- Pa - Partially Filled
- Fi - Filled
- No - None

f **Surface Shape of Joint:**

- Pl - Planar
- Wa - Wavy
- St - Stepped
- Ir - Irregular

g **Roughness of Surface:**

- Slk - Slickensided [surface has smooth, glassy finish with visual evidence of striations]
- S - Smooth [surface appears smooth and feels so to the touch]
- SR - Slightly Rough [asperities on the discontinuity surfaces are distinguishable and can be felt]
- R - Rough [some ridges and side-angle steps are evident; asperities are clearly visible, and discontinuity surface feels very abrasive]
- VR - Very Rough [near-vertical steps and ridges occur on the discontinuity surface]

h **Discontinuity Spacing (feet):**

- EW - Extremely Wide (>6)
- W - Wide (2-6)
- M - Moderate (0.7-2)
- C - Close (0.2-0.7)
- VC - Very Close (<0.2)

ROCK WEATHERING / ALTERATION

Description	Recognition
Residual Soil	Original minerals of rock have been entirely decomposed to secondary minerals, and original rock fabric is not apparent; material can be easily broken by hand
Completely Weathered/Altered	Original minerals of rock have been almost entirely decomposed to secondary minerals, although original fabric may be intact; material can be granulated by hand
Highly Weathered/Altered	More than half of the rock is decomposed; rock is weakened so that a minimum 2-inch-diameter sample can be broken readily by hand across rock fabric
Moderately Weathered/Altered	Rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 2-inch-diameter sample cannot be broken readily by hand across rock fabric
Slightly Weathered/Altered	Rock is slightly discolored, but not noticeably lower in strength than fresh rock
Fresh/Unweathered	Rock shows no discoloration, loss of strength, or other effect of weathering/alteration

ROCK STRENGTH

Description	Recognition	Approximate Uniaxial Compressive Strength (psi)
Extremely Weak Rock	Can be indented by thumbnail	35 - 150
Very Weak Rock	Can be peeled by pocket knife	150 - 700
Weak Rock	Can be peeled with difficulty by pocket knife	700 - 3,500
Medium Strong Rock	Can be indented 5 mm with sharp end of pick	3,500 - 7,200
Strong Rock	Requires one hammer blow to fracture	7,200 - 14,500
Very Strong Rock	Requires many hammer blows to fracture	14,500 - 35,000
Extremely Strong Rock	Can only be chipped with hammer blows	> 35,000

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-1 (MW-1201)

Date(s) Drilled	**4/10/12**	Logged By	**S. Becker**	Checked By	**J. Lach**
Drilling Method	**HSA, HQ Wireline Core**	Drill Bit Size/Type	**6 1/4" HSA/6" OD bit with HQ core**	Total Depth of Borehole	**49.5 ft**
Drill Rig Type	**CME 55**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**799.4 ft above msl**
Borehole Backfill	**Borehole finished as monitoring well MW-1201**	Sampling Method(s)	**Split-spoon, HQ Wireline**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 252,798.0 E 2,099,724.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0									
				WOH		1.0		Stiff, moist, brown to reddish brown lean CLAY (CL), trace silt and sand		Grout
	1	SS	SS-1	2	50	2.0				
				2		2.0		Stiff to very stiff, moist, brown to reddish brown, very fine sandy lean CLAY (CL) [RESIDUUM]		SCH 40 PVC 2" diameter riser
				3		3.25				
	2							becomes very stiff to hard		
		SS	SS-2	5	50	3.5				
	3			5		4.5			17.7	*PL=17 LL=35 PI=18 %F=67.9*
				5		3.5				
				7		4.5				
	4									
795				2		1.75		becomes mottled reddish brown and light gray		
	5	SS	SS-3	2	63	3.0				
				5		4.0				
				7		3.0				
	6									
				7				Medium dense, moist, dark reddish brown fine to medium clayey SAND (SC) with trace oxidized sandstone gravel, with tan and light gray mottling [RESIDUUM]		
	7	SS	SS-4	10	100	3.5				
				11		4.5				
				11		4.25				
	8									
				3		3.5		Very stiff to hard, moist, light gray to light tan, fat CLAY (CH), trace sand [RESIDUUM]		
	9	SS	SS-5	6	92	>4.5		1/4" dark red-brown, highly weathered shale seam		
790				7		3.5				
				9		>4.5				
	10									
				2		3.75				
	11	SS	SS-6	5	92	4.0				
				9		4.25				
				15		4.25				
	12	SS	SS-7	50/5"	8	>4.5		becomes gray to light gray		
								Quartz SANDSTONE, gray, slight to no weathering, very strong, slight to moderate HCL reaction (4.5"-6"), grading more flaggy and micaceous at 9"		*Auger/spoon refusal at 12.5 ft bgs*
	13		R1	24%	50					
								Fracture #1: 0, B, N, None ,None, Ir, SR, M		
785	14									
	15									
	16									
								SHALE, gray, slight to moderately weathered, very weak		
	17		R2	30%	50			Fracture #2: 0, B, 0, None, None, PI, SR, VC		
	18									
	19									
780										
	20		R3	27%	77					

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-1 (MW-1201)

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20							becomes dark gray and slightly fossiliferous		*Brush creek limestone*
	21							Microcrystalline LIMESTONE, gray, slight to no weathering, very strong, fossiliferous		**SCH 40 PVC 2" diameter riser**
	22		R3	27%	77			SHALE, dark gray, slight to moderate weathering, very weak, slightly fossiliferous		
	23							Microcrystalline LIMESTONE, light gray to gray, slight to moderate weathering, strong		*Brush creek limestone*
								Fracture #3: 0, B, N to MW, None, None, Ir, R, EW		
	24							SHALE, dark gray, slight to moderate weathering, very weak		
775								becomes gray		
	25									
	26							becomes green, slight to no weathering, strong with trace brown clay in bedding planes		
	27		R4	13%	30			COAL, black, slight to no weathering, very weak		
	28							MUDSTONE, black to dark gray, slight to moderate weathering, medium strong		
	29							becomes gray		
770										
	30									
	31									
	32		R5	68%	87					
	33									
	34									
765										
	35							becomes with sand, trace mica (muscovite)		**Bentonite seal**
	36							becomes slightly fissile		
	37		R6	45%	100			2-inch gray sandstone seam		
								becomes wavy bedding		
	38							becomes without wavy bedding, without muscovite		**Filter sand**
	39									
760								becomes with sand, semi-fissile		
	40									**SCH 40 PVC 2" diameter 0.01" slotted screen**
	41									
			R7	52%	92					
	42							Quartz SANDSTONE with biotite and muscovite, slight weathering, medium strong, ~15° dip, cross bedded		
								Fracture #4: 15%, B, T, Ca, Pa, Pl, SR, VC		
	43									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-1 (MW-1201)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44		R7	52%	92						Filter sand
755	45										
	46										
	47		R8	85%	100						
	48										
	49										
750	50							End of Boring at 49.5´ bgs			
	51										
	52										
	53										
	54										
745	55										
	56										
	57										
	58										
	59										
740	60										
	61										
	62										
	63										
	64										
735	65										
	66										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-2/SB-1 (MW-1202)

Date(s) Drilled	**4/13/12**	Logged By	**S. Becker**	Checked By	**J. Lach/V. Gautam**
Drilling Method	**HSA, HQ Wireline Core**	Drill Bit Size/Type	**6 1/4" HSA/6" OD bit with HQ core**	Total Depth of Borehole	**44.5 ft**
Drill Rig Type	**CME 55**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**849.6 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1202**	Sampling Method(s)	**Split-spoon, HQ Wireline**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 254,651.6 E 2,101,180.0**	Groundwater Level(s)	**Water level @ 28.85 ft bgs**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0			2		1.5		Loose, moist, brown, sandy CLAY (SC), trace gravel (topsoil)			Grout
	1	SS	SS-1	3 3 3	100	3.5 2.0 1.5		Loose, moist, brown sandy CLAY (SC), trace gravel [RESIDUUM] becomes mottled brown and gray			SCH 40 PVC 2" diameter riser
	2			3		2.5		Stiff to very stiff, moist, tannish brown and gray mottled lean CLAY (CL), trace sand, trace gravel [RESIDUUM]			
	3	SS	SS-2	4 5 5	83	2.5 2.75 2.5		becomes reddish brown and gray mottled			
	4							becomes with weathered brown shale fragments			
845	5	SS	SS-3	2 4 5 6	21						
	6							becomes without shale fragments, hard			
	7	SS	SS-4	4 6 8 9	13	3.25					
	8							becomes gray and tan mottled, without sand, dry to moist, without gravel			
	9	SS	SS-5	3 6 9 12	58	3.0 4.5 4.5 3.5			17.7		*PL=21 LL=45 PI=24 %F=91*
840	10							becomes light gray			
	11	SS	SS-6	3 5 8 11	79	4.25 3.0 2.5					
	12							becomes brownish red			
	13	SS	SS-7	6 10 13 12	63	4.0 4.5 4.5		becomes gray to light gray, without silt			
	14										
835	15	SS	SS-8	6 16 16 24	75	>4.5		SHALE, greenish gray, highly weathered, very to extremely weak			
	16							becomes brownish gray, dry			
	17	SS	SS-9	24 49 50/4"	75			becomes greenish gray			
	18										
	19										*18 to 20 ft bgs - No Split Spoon Collected*
830	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-2/SB-1 (MW-1202)

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20	SS	SS-10	9 12 15 16	96					SCH 40 PVC 2" diameter riser
	22	SS	SS-11	50/4"	63					
	23									
	24									*Augered 24-25 ft bgs to begin setup for wireline coring*
825	25							22.4 to 25 ft, bgs - No Recovery - HSA Only becomes with 1-2" weathered limestone 25 ft, bgs - Begin HQ Rock Coring		
	26							becomes with iron-stained lamina, slightly to moderately weathered, strong to very strong		
	27	RC	R1	41%	48					*Dry run* *No water*
	28									Bentonite seal
	29									
820	30							Quartz SANDSTONE, gray, slightly to moderately weathered, strong, micaceous (muscovite), with iron-staining, thinly bedded		*Dry run* *No water*
	31							becomes with biotite Fracture #1: 0, B, T-N, Fe, Su, Ir, SR, M		Filter sand
	32	RC	R2	27%	70			Fracture #2: 0, B, T, Fe, Su, Ir, SR, VC		SCH 40 PVC 2" diameter 0.01" slotted screen
	33									
	34							becomes wet		
815	35									*Water used*
	36							becomes without iron staining, no weathering, very strong to strong Fracture #3: 0, B, T-VN, --, No, Pl-Wa, SR, VC		
	37	RC	R3	98%	103			Fracture #4: 0, B, MW-W, Fe, Su, Pl-Wa, R, M		
	38									
	39									
810	40									
	41									
	42	RC	R4	68%	98			SHALE, greenish gray, no weathering, very weak		
	43							Fracture #5: 0, B, T, Cl-No, Su -No, Pl, S-SR, VC		

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Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-2/SB-1 (MW-1202)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44	R4	68%	98						Filter sand
805	45						End of Boring at 44.5´ bgs			
	46									
	47									
	48									
	49									
800	50									
	51									
	52									
	53									
	54									
795	55									
	56									
	57									
	58									
	59									
790	60									
	61									
	62									
	63									
	64									
785	65									
	66									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-7/SB-2 (MW-1203)

Date(s) Drilled	**4/16/12**	Logged By	**S. Becker**	Checked By	**J. Lach**
Drilling Method	**HSA, HQ Wireline Coring**	Drill Bit Size/Type	**6 1/4" HSA/6" OD bit with HQ core**	Total Depth of Borehole	**54.5 ft**
Drill Rig Type	**CME 55**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**728.7 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1203**	Sampling Method(s)	**Split-spoon/Wireline**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 252,205.1 E 2,101,406.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0			3				Loose, moist, brown clayey SAND (SC), trace sandstone gravel [FILL]			**Grout**
	1	SS	SS-1	2 2 4	50	0.75 1.5			16.4		*PL=18 LL=31 PI=13 %G=8.3 %S=44.5 %F=47.2*
	2			4		3.5		Stiff to very stiff, moist, reddish brown, lean CLAY (CL) [FILL]			**SCH 40 PVC 2" diameter riser**
	3	SS	SS-2	4 5	71	3.0		1" red-brown medium sand seam 2" medium reddish brown sand seam with sandstone fragments			
725	4			6		3.0					
	5	SS	SS-3	3 4 7 7	83	3.5 4.5 4.5 3.5		becomes with sandstone fragments (gravel) with red-brown sand iron-staining	16.7		*PL=17 LL=31 PI=15*
	6			14		4.5		Dense, dry to moist, red to brown, clayey SAND (SC) with gravel [ALLUVIUM]			*Iron staining on sand and gravel*
	7	SS	SS-4	15 17 20	92	4.5 >4.5 >4.5					
	8			7		4.0		becomes mottled brown and orange			
720	9	SS	SS-5	12 13 16	100	4.0 4.5 4.0			10.4		*%G=19.3 %S=49.8 %F=30.9*
	10			5							
	11	SS	SS-6	13 14 12	100			becomes increasing sand and gravel content			
	12			11		3.5		Very stiff to hard, moist red-brown fat CLAY (CH) trace sand and gravel [ALLUVIUM]			
	13	SS	SS-7	17 27	92	3.25 3.5			17.6		
715	14			17		>4.5		4" reddish brown sand layer with trace clay			
	15	SS	SS-8	3 6 10 8	100	1.0 2.0 3.0		Medium stiff to stiff, moist, red-brown silty, clayey SAND (SC-SM) with weathered sandstone gravel [ALLUVIUM]			
	16			23		1.0					
	17	SS	SS-9	15 13 12	83	3.0 2.5 3.5		2" sandstone fragment in spoon	12.2		*PL=15 LL=20 PI=5 %G=16.6 %S=53.6 %F=29.8*
	18			4				Loose, moist to wet, red-brown clayey SAND (SC), trace sandstone gravel [ALLUVIUM]			
710	19	SS	SS-10	3 6 6	63						
	20										

Project: AEP Big Sandy Landfill Investigation
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Log of Boring/Rock Core
HB-7/SB-2 (MW-1203)

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20			9				becomes brown		Grout
	21	SS	SS-11	4 5 24	58				13.9	SCH 40 PVC 2" diameter riser
	22			11				becomes medium dense		
	23	SS	SS-12	10 12	100					
705	24			9						
	25	SS	SS-13	4 8 10 17	83	3.5 4.5 >4.5 >4.5		Hard, moist, tan and brown mottled lean CLAY (CL), trace sand [RESIDUUM]		
	26	SS	SS-14	40 50/4"	40			SHALE, greenish tan, moderately weathered, extremely weak		
	27									
	28	SS	SS-15	50/4"	50			becomes greenish gray, slightly-moderately weathered		
700	29									
	30							Fracture#1: 0, B, T, Cl-No, Su-No, Ir, S-SR, VC		
	31							becomes brown		
	32	R	R1	44%	78			becomes mottled gray, light brown and red Fracture#2: 38, Sh, T, Cl, Su, Pl, S, VC		Bentonite seal
	33							Fracture#3: 30, Sh, N, Cl, Su, Pl, S, VC		
695	34									
	35							becomes greenish gray		Filter sand
	36									
	37	R	R2	58%	85			SANDSTONE, gray with very light black banding, slightly weathered, strong, micaceous (muscovite and biotite)		SCH 40 PVC 2" diameter 0.01" slotted screen
	38							Fracture#4: 0, B, MW, No, No, St, SR-S, C		
690	39									
	40							Fracture#5: 0, B, T, No-Sd, Sp, Pl, S-SR, VC		
	41	R	R3		100					
	42							Fracture#6: 25, Sh, T, Fe, Su, Pl-Wa, SR, VC		
	43							7" area Fe staining		

Project: AEP Big Sandy Landfill Investigation
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Log of Boring/Rock Core
HB-7/SB-2 (MW-1203)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
685	44		R3		100			Fracture#7: 25, Sh, T, Cl, Pa, Pl, SR, VC 5" Fe staining 12" Fe staining			SCH 40 PVC 2" diameter 0.01" slotted screen
	45										
	46							Fracture#8: 0-15, B, T, Fe, Su, Pl, SR, VC			
	47		R4	70%	100			Fe staining			Filter sand
	48										
680	49										
	50										
	51										
	52		R5	92%	92						
	53										
675	54										
	55							End of Boring at 54.5´ bgs			
	56										
	57										
	58										
670	59										
	60										
	61										
	62										
	63										
665	64										
	65										
	66										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-4/SB-5 (MW-1204)

Date(s) Drilled	**4/18/12**	Logged By	**J. Lach**	Checked By	**V. Gautam**
Drilling Method	**HSA, HQ Wireline Coring**	Drill Bit Size/Type	**6 1/4" HSA, 6" OD bit with HQ core**	Total Depth of Borehole	**35.0 ft**
Drill Rig Type	**CME 550 Truck**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**721.3 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1204**	Sampling Method(s)	**Split-spoon, HQ Wireline**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 252,025.3 E 2,102,075.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0			6				Light brown, heavily weathered sandstone (access road)		2.5 ft stickup
				22						Grout 20% mix ~30 gallons used
	1			42	86	>4.5		Hard, dry, light brown, lean CLAY (CL) [RESIDUUM OR FILL]		
720				50/3						
	2							Heavily weathered SANDSTONE, light brown, with some lean clay, dry (Auger Cuttings)		SCH 40 PVC 2" diameter riser
	3									*No recovery - HSA cuttings consist of mixture of lean clay and heavily weathered sandstone fragments - all dry*
	4									
	5							Fine to medium grained SANDSTONE, brown, moderately weathered, strong		*Auger refusal at 5.0 ft bgs*
	6							MUDSTONE, greenish brown, moderately weathered, weak Fracture #1: 0, B, No, W, VN, Pl, SR		
715	7		R1	18%	70			Fracture #2: 0, B, No, W, VN, Pl, SR		
	8									
	9							2" brown lean clay seam Fracture #3: 0, B, No, W, VN, Pl, SR		
	10							becomes lightly weathered, extremely weak, micaceous, with iron staining		
	11									
710	12		R2	22%	23					*Driller reported constant down pressure. Little to no H20 loss*
	13									
	14							Micaceous SANDSTONE, greenish gray, strong		
								becomes brown, moderately weathered (14.5 to 14.6 ft)		
	15							becomes greenish gray, very strong		
								becomes brown, slightly weathered		Bentonite Hydrated
	16									
705								becomes greenish gray, micaceous, cross-bedded, very weak		
	17							Fracture #4: 0, B, No, W, VN, Pl, SR		
	18		R3	85%	90					#5 filter sand
								becomes mottled with partial brown iron staining and greenish gray, strong in brown stained portions		
	19									
	20							becomes greenish gray, weak, with iron staining		

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-4/SB-5 (MW-1204)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20							becomes greenish gray, micaceous, weak		SCH 40 PVC 2" diameter 0.1" slotted screen
	21									
700								Fracture #5: 0, B, No, W, VN, Pl, SR		
	22							becomes brown, coarse, very strong, micaceous		#5 filter sand
			R4	65%	82			becomes greenish gray, strong, very micaceous, wet, coarse grained		
	23									
								becomes brown, coarse, very strong		
	24							becomes dark brown, moderately weathered, strong		
								becomes light gray, coarse, very strong with some sections of slight weathering, brown		
	25									
	26									
695										
	27							becomes gray, coarse-grained, micaceous, weak with stained sections (strong where stained)		
			R5	80%	100					
	28									
	29							Fracture #6: 90, J, Su, W, VN, Ir, VR		
	30							Fracture #7: 0, B, No, W, VN, Pl, SR		2" diameter sump
	31							SHALE, gray, fissile, strong		
690								MUDSTONE, gray, very weak, slightly fissile		
	32									
			R6	75%	88			becomes with decreasing fissility		
	33							SHALE, gray, fissile, weak		
								becomes with brown staining		
	34							MUDSTONE, gray, very weak, not fissile		
	35							End of Boring at 35´ bgs		
	36									
685										
	37									
	38									
	39									
	40									
	41									
680										
	42									
	43									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring/Rock Core
HB-5 (MW-1205)

Sheet 1 of 3

Date(s) Drilled	**4/19/12**	Logged By	**S. Becker**	Checked By	**J. Lach**
Drilling Method	**HSA, HQ Wireline Coring**	Drill Bit Size/Type	**6 1/4" HSA/6" OD bit with HQ core**	Total Depth of Borehole	**54.5 ft**
Drill Rig Type	**CME 55**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**714.3 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1205**	Sampling Method(s)	**Split-spoon, HQ Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,131.0 E 2,104,397.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0										
		SS	SS-1	2, 1, 2, 1	100			Very loose, moist, black bottom ash, trace gravel [BOTTOM ASH]			**Bentonite grout**
	1										**SCH 40 PVC 2" diameter riser**
	2										
		SS	SS-2	2, 1, 3, 4	33	2.0		Medium stiff to very stiff, moist, brown to tan lean CLAY (CL) with sand and trace gravel [RESIDUUM]			
	3										
	4										
710		SS	SS-3	9, 5, 8, 8	100	2.75, 1.0, 2.75, 1.5		3" red sand seam	15.8		*PL=17 LL=33 PI=16 %F=47.6 Shelby tube sample 5-7' bgs Down pressure (psi) = 200-600 psi*
	5										
	6							becomes stiff to very stiff, reddish-brown, trace sand			
		SS	SS-4	9, 6, 7, 8	83	2.0, 1.75, 3.5, >4.5		becomes with trace tan-brown shale fragments	16.1		*PL=16 LL=32 PI=16 %F=49.5*
	7										
	8							SHALE, tan, moderate to highly weathered, weak to extremely weak, dry to moist			
		SS	SS-5	8, 15, 12, 12	75						
705	9										
	10							becomes dry			
		SS	SS-6	4, 17, 23, 19	100						
	11										
	12										
		SS	SS-7	21, 28, 29, 35	83						
	13										
	14										
700		SS	SS-8	11, 20, 21, 20	100			becomes white/gray			
	15										
	16	SS	SS-9	50/3"	100			becomes greenish gray			*Outside of spoon wet*
	17										
	18										
	19										
695		R	R1	17%	37			becomes gray, slight weathering, very weak to extremely weak			*Auger to 19.5 ft to begin coring.*
	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-5 (MW-1205)

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20									
	21									SCH 40 PVC 2" diameter riser
	22		R1	17%	37					
	23									Bentonite grout
	24									
690								becomes red		
	25									
	26							becomes black and red		
	27		R2	47%	70					
	28							becomes gray		
	29									
685										
	30							Fracture #1: 0, B, T, Cl-No, Su-No, Pl, S, M-W		
	31									
	32		R3	35%	57					
	33									
	34									
680										
	35									
	36							becomes sandy		Bentonite chips
	37		R4	0%	100			SANDSTONE, gray, moderately to highly weathered, weak to medium strong, micaceous, thinly bedded, with numerous bedding plane fractures		
	38							Fracture #2: 0, B, T, Cl-No, Su-No, Pl, S, M		Filter sand
	39									
675										
	40									SCH 40 PVC 2" diameter 0.01 slotted screen
	41									
	42		R5	42%	100			becomes slightly-moderately weathered		
	43									

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
HB-5 (MW-1205)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
670	44		R5	42%	100					
	45									
	46									SCH 40 PVC 2" diameter 0.01 slotted screen
	47		R6	55%	93					
	48									
665	49									
	50									Filter sand
	51									
	52		R7		100			Sandy SHALE, gray, moderately weathered, moderately strong to weak		
	53							becomes less sandy		
	54							coal seam, 2" coal seam, 3"		
660								End of Boring at 54.5´ bgs		
	55									
	56									
	57									
	58									
	59									
655	60									
	61									
	62									
	63									
	64									
650	65									
	66									

Report: GEO_CR_WELL; File K:\PROJECTS\A\AEP\13815141_BSLF\DOCS\LOGS\AEPBORINGS-6-10-13.GPJ; 6/10/2013 11:23:20 AM

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-3 (MW-1206)

Date(s) Drilled	**4/23/12**	Logged By	**S. Becker**	Checked By	**J. Lach**
Drilling Method	**Rotosonic (No vibration), Wireline**	Drill Bit Size/Type	**8.0" ID steel casing, 4.0" ID core barrel**	Total Depth of Borehole	**124.5 ft**
Drill Rig Type	**Versa-Sonic**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**695.4 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1206**	Sampling Method(s)	**Rotosonic Core Barrel**	Hammer Data	**Not Applicable**
Boring Location	**N 251,617.9 E 2,104,243.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES: Type Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
695	0						See log for PB-7 from 0-111 ft bgs			Bentonite chips
	1									
	2									
	3									SCH 40 PVC 2" diameter riser
	4									
690	5									
	6									
	7									
	8									
	9									
685	10									
	11									
	12									
	13									
	14									
680	15									
	16									
	17									
	18									
	19									
	20									

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Project Location: Louisa, KY
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Log of Boring
HB-3 (MW-1206)

Elevation, feet	Depth, feet	SAMPLES: Type Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
675	20									
	21									Bentonite chips
	22									
	23									SCH 40 PVC 2" diameter riser
	24									
	25									
670	26									
	27									
	28									
	29									
	30									
665	31									
	32									
	33									
	34									
	35									
660	36									
	37									
	38									
	39									
	40									
655	41									
	42									
	43									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-3 (MW-1206)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	44								
	45								Bentonite chips
650	46								
	47								SCH 40 PVC 2" diameter riser
	48								
	49								
	50								
645	51								
	52								
	53								
	54								
	55								
640	56								
	57								
	58								
	59								
	60								
635	61								
	62								
	63								
	64								
	65								
630	66								

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-3 (MW-1206)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	67									Bentonite chips
	68									
	69									SCH 40 PVC 2" diameter riser
	70									
625	71									
	72									
	73									
	74									
	75									
620	76									
	77									
	78									
	79									
	80									
615	81									
	82									
	83									
	84									
	85									
610	86									
	87									
	88									
	89									
	90									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-3 (MW-1206)

Elevation, feet	Depth, feet	SAMPLES Type Number	SAMPLES Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES Recovery, %	SAMPLES Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
605	91								Bentonite chips
	92								
	93								SCH 40 PVC 2" diameter riser
	94								
	95								
600	96								
	97								
	98								
	99								
	100								
595	101								
	102								
	103								
	104								
	105								
590	106								
	107								
	108								
	109								Bentonite seal
	110								
585	111				0.5		Soft, moist to wet, dark gray to dark greenish gray, sandy lean CLAY (CL) [ALLUVIUM]		# 5 filter sand
	112	CB-1		90	0.5				
	113						becomes greenish gray, trace oxidized red and gray		

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-3 (MW-1206)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	114					2.5		becomes very stiff with sand seams		SCH 40 PVC 2" diameter 0.01" slotted screen
						2.5				
	115							becomes with trace gray to dark gray sandstone fragments		
580						2.75				
	116									
						2.25				
	117	CB	CB-1		90					
						3.0				
	118									
						2.5				
	119									# 5 filter sand
						2.5				
	120							becomes greenish brown		
575						4.5				
	121									
						1.5		becomes brownish gray, intermittent sandy clay seams		
	122									
						2.0		becomes with trace sandy shale and sandstone cobbles and gravel		
	123	CB	CB-2		95					*Install MW-1206 at 123.5 ft on 4/24/2012*
						1.25		becomes stiff, grayish brown		*Clay expansion to 123.6 ft overnight*
	124									
								End of Boring at 124.5´ bgs		*Core barrel refusal at 124.5 ft bgs*
	125									
570										
	126									
	127									
	128									
	129									
	130									
565										
	131									
	132									
	133									
	134									
	135									
560										
	136									

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
HB-6 (MW-1207)

Date(s) Drilled	**4/24/12**	Logged By	**S. Becker**	Checked By	**J. Lach**
Drilling Method	**Rotosonic (No vibration), Wireline HQ**	Drill Bit Size/Type	**8" ID steel casing, 6" OD bit HQ Wireline**	Total Depth of Borehole	**166.0 ft**
Drill Rig Type	**Vibra-Sonic**	Drilling Contractor	**Frontz Drilling**	Surface Elevation	**695.0 ft above msl**
Borehole Backfill	**Finished as monitoring well MW-1207**	Sampling Method(s)	**HQ Wireline**	Hammer Data	**Not applicable**
Boring Location	**N 251,598.3 E 2,104,256.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
695	0							See log for boring PB-7			**Bentonite grout**
	1										**SCH 40 PVC 2" diameter riser**
	2										*Augered to 126 ft without sampling*
	3										
	4										
690	5										
	6										
	7										
	8										
	9										
685	10										
	11										
	12										
	13										
	14										
680	15										
	16										
	17										
	18										
	19										
675	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
675	20									
	21									SCH 40 PVC 2" diameter riser
	22									Bentonite grout
	23									
	24									
670	25									
	26									
	27									
	28									
	29									
665	30									
	31									
	32									
	33									
	34									
660	35									
	36									
	37									
	38									
	39									
655	40									
	41									
	42									
	43									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44									SCH 40 PVC 2" diameter riser
650	45									
	46									Bentonite grout
	47									
	48									
	49									
645	50									
	51									
	52									
	53									
	54									
640	55									
	56									
	57									
	58									
	59									
635	60									
	61									
	62									
	63									
	64									
630	65									
	66									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	67									SCH 40 PVC 2" diameter riser
	68									
	69									Bentonite grout
625	70									
	71									
	72									
	73									
	74									
620	75									
	76									
	77									
	78									
	79									
615	80									
	81									
	82									
	83									
	84									
610	85									
	86									
	87									
	88									
	89									
605	90									

Project: AEP Big Sandy Landfill Investigation
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Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	91									SCH 40 PVC 2" diameter riser
	92									
	93									Bentonite grout
	94									
600	95									
	96									
	97									
	98									
	99									
595	100									
	101									
	102									
	103									
	104									
590	105									
	106									
	107									
	108									
	109									
585	110									
	111									
	112									
	113									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	114									SCH 40 PVC 2" diameter riser
580	115									Bentonite grout
	116									
	117									
	118									
	119									
575	120									
	121									
	122									
	123									
	124									
570	125									
	126							No recovery 126-131. Driller notes "softer material"		
	127									
	128	HQ	HQ1	0%	0					
	129									
565	130									
	131							No recovery 131-136. Shale cuttings		
	132									
	133									
	134	HQ	HQ2	0%	0					
560	135									
	136									
		HQ	HQ3	18%	80			SHALE, light gray to gray, moderately weathered, very to extremely weak		

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Project Location: Louisa, KY
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Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	137							Fracture #1: 0, B, N-T, Cl, SP, Pl, S-SR, VC-M		SCH 40 PVC 2" diameter riser
	138									
	139	HQ3		18%	80					Bentonite grout
555	140							becomes with trace gray sandstone layers (occasional), up to 1/4"		
	141									
	142									
	143	HQ4		0%	50					
	144									
550	145							becomes dark gray to greenish gray, without sandstone seams		
	146									
	147							becomes dark gray to black		
	148							becomes light gray		
	149	HQ5		38%	38					
545	150									Bentonite seal
	151							3" layer of light gray, moist clay, with shale fragments		
	152									
	153							becomes interbedded with gray micaceous sandstone layers up to 1/4"		#5 filter sand
	154	HQ6		37%	83					
540	155									SCH 40 PVC 2" diameter 0.01" slotted screen
	156							6" sandstone, gray, slightly weathered, strong, thinly bedded to shaly		
	157							becomes extremely weak, highly fractured		
	158	HQ7		25%	73					
	159							interbedded sandstone up to 1/4"		
535	160							becomes dark gray, with thin light gray clay deposits on bedding		

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
HB-6 (MW-1207)

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
			HQ7	25%	73						
	161							SANDSTONE, gray, moderately weathered medium strong to very strong, flaggy, with thinly interbedded shale, micaceous			**SCH 40 PVC 2" diameter 0.01" slotted screen**
	162										
	163							Fracture #2: 0, B, T-VN, Cl, SP, Pl, S-SR, VC-M			**#5 filter sand**
			HQ8	42%	100						
	164										
530	165										
	166							End of Boring at 166´ bgs			
	167										
	168										
	169										
525	170										
	171										
	172										
	173										
	174										
520	175										
	176										
	177										
	178										
	179										
515	180										
	181										
	182										
	183										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-1

Date(s) Drilled	**4/18/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**Rotary/Water**	Drill Bit Size/Type	**4"**	Total Depth of Borehole	**57.0 ft**
Drill Rig Type	**Acker**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**Top of water el. 695.1 ft above msl**
Borehole Backfill	**Cement Bentonite Grout**	Sampling Method(s)	**Piston tube/Split-spoon**	Hammer Data	**140#/30" Manual drop**
Boring Location	**38°10'57.4" N 83°38'41.3" W**	Groundwater Level(s)	**0' bgs**		

Elevation, feet	Depth, feet	SAMPLES: Type Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
695	0						Water ▽			*Barge drilling- water @ 695.1.*
	1									
	2									
	3									
	4									
690	5									
	6									
	7									
	8									
	9									
685	10									
	11									
	12									
	13									
	14									
680	15									
	16									
	17									
	18									
	19									
	20									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-1

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
675	20										
	21										
	22										
	23							Soft sediments			*Top of sediment @ 22.5 ft. Casing sank to 27.5 ft.*
	24										
670	25										
	26										
	27							Loose, wet fly ash as silty sand (SM) [FLY ASH]			
	28	SS	SS-1	1 WH 0 0	38						
	29										
665	30										
	31	P	P-1		91						
	32										
	33										
	34										
660	35										
	36	P	P-2		77						
	37										
	38	SS	SS-2	3 6 8 5	100						
	39										
655	40										*Rods sank to 42'*
	41										
	42							12" loose, wet, fly ash as silt (ML), trace fine sand [FLY ASH]			
	43					<0.5					

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-1

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44					2.0		Soft, moist, dark gray, lean CLAY (CL) [ALLUVIUM]			
								becomes stiff, yellow, some sand, trace gravel			
650	45							becomes very stiff, yellow brown with orange iron staining, with sand, trace gravel			
	46	SS-3		3 3 4 5	38	2.5					
	47										
	48										
	49										
645	50							becomes stiff to very stiff, sandy, trace gravel			
	51	SS-4		6 7 12 12	33	1.0 2.5					
	52										
	53										
	54							Shale, gray, dry, crushed			*Drilling change encountered @ 53.5 ft bgs*
640	55										
	56	SS-5		45 50/2"	33						
	57							End of Boring at 57´ bgs			
	58										
	59										
635	60										
	61										
	62										
	63										
	64										
630	65										
	66										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
PB-2

Date(s) Drilled	**4/17/12-4/18/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**Rotary/Water**	Drill Bit Size/Type	**4"**	Total Depth of Borehole	**77.0 ft**
Drill Rig Type	**Acker**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**Top of water el. 695.1 ft above msl**
Borehole Backfill	**Bentonite chips**	Sampling Method(s)	**Piston/Split-spoon/Shelby-tube**	Hammer Data	**140#/30" Manual drop**
Boring Location	**38°10'52.5" N 83°33'35.2" W**	Groundwater Level(s)	**0 ft bgs**		

Elevation, feet	Depth, feet	SAMPLES: Type Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
695	0						Water			*Pond elevation - 695.1 ft*
	1									
	2									
	3									
	4									
690	5									
	6									
	7									
	8									
	9									
685	10									
	11									
	12									
	13									
	14									
680	15									
	16									
	17									
	18									
	19									
	20									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
675	20										
	21										
	22										
	23							Soft sediments			*Pond bottom @ 23' bgs*
	24										
670	25										*Casing sank to 25'*
	26		SS-1	2 1 2 3	17			Very loose, wet, gray bottom ash as medium to fine SAND (SP-SM) with some gravel and shale fragments, trace plant fragments [BOTTOM ASH]			
	27										
	28										
	29										
665	30							Loose, wet, fly ash as silty SAND (SM), light and dark laminations [FLY ASH]			
	31		P-1		0						
	32										*1 blow for 24 inches*
	33		SS-2	1 0 0 0	0						
	34										
660	35										
	36										
	37										
	38		P-2		91						
	39										
655	40		SS-3	2 1 1 2	27						
	41										
	42										
	43										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-2

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44										
650	45										*Push to 45' bgs - casing sank to 46' bgs*
	46							becomes gray, with silty sand			
	47	SS-4		1 0 0 0							
	48										
	49										
645	50	P-3			99						
	51							becomes with silt and some fine black sand			
	52	SS-5		WH 0 0 0	100	>1.0		Very soft to stiff, moist, dark gray, lean CLAY (CL) [ALLUVIUM]			
	53										
	54										
640	55							becomes yellow			
	56	P-4									
	57							becomes soft, moist, grey/yellow, some silt, trace gravel, sand at base - root			
	58	SS-6		3 3 6 14	75	0.5 1.0		becomes stiff	20.6		*PL=16 LL=27 PI=12*
	59										
635	60										
	61	ST-1			50						
	62							becomes stiff, yellow brown with orange mottles, with gravel and trace sand			
	63	SS-7		7 8 9 5	25	1.5 2.0					
	64										
630	65										
	66	SS-8		3 WR WR	33	0.5		Loose, moist, orange brown with gray mottles, sandy CLAY (SC), trace gravel [ALLUVIUM]			

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	67			6							*End at 67' 4/17/12* *Start on 4/18/12* *Begin by drilling to 70'*
	68										
	69							Very stiff, moist, yellow brown with gray mottles, silty CLAY (CL), some sand and gravel [RESIDUUM]			
625	70			5							
	71		SS-9	7 13 11	38	2.5 3.0			16.8		*PL=17 LL=24 PI=7*
	72										
	73										
	74							Shale, light gray, moderately weathered, dry			
620	75										
	76		SS-10	50/3"	13						
	77							End of Boring at 77´ bgs			
	78										
	79										
615	80										
	81										
	82										
	83										
	84										
610	85										
	86										
	87										
	88										
	89										
	90										

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Log of Boring PB-3

Sheet 1 of 5

Date(s) Drilled	**4/9/12-4/10/12**	Logged By	**T. George**	Checked By	**V. Gautam**
Drilling Method	**HSA, Mud rotary with recirculated mud**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricore mud-rotary**	Total Depth of Borehole	**93.0 ft**
Drill Rig Type	**CME 55 Track Mounted and ATV-remote control**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**698.3 ft above msl**
Borehole Backfill	**Finished as 2" PVC riser pipe set w/ grout**	Sampling Method(s)	**Split-spoon/Piston/Shelby-tube**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,582.4 E 2,102,704.0**	Groundwater Level(s)	**4' ATD**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0							Bottom ash access road [BOTTOM ASH]		2.5' stickup; Grout
	1									SCH 40 PVC 2" diameter riser
	2									
	3									*Augered to 6' without sampling*
695	4									
	5									
	6	SS	SS-1	1 2 WOH 1	63			Very loose, wet, fly ash as interbedded light and dark sandy SILT (ML) and silty SAND (SM), trace root fibers [FLY ASH]		
	7									
690	8	SS	SS-2	1 2 1 1						
	9									
	10									
	11									
	12									
	13	SS	SS-3	WOH 0 0 0	79			becomes without root fibers		
685	14									
	15									
	16									
	17									
	18	SS	SS-4	WOR 0 0 1	75					
680	19									
	20									

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-3

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20									
	21	P	P-1		71					
	22									
	23									
675	24	SS	SS-5	WOH 0 0 0	0					
	25									
	26									
	27							Medium dense, moist, dark gray trace brown, bottom ash as medium to fine sand (SM), trace coal gravel [BOTTOM ASH]		*Increased drilling resistance @ 27' bgs*
	28	SS	SS-6	7 13 13 14	67					
670	29									
	30							Wet, light to dark gray, fly ash as silty SAND (SM) to silt (ML) [FLY ASH]		
	31									
	32									
	33	P	P-2		0			Very loose, wet, black, bottom ash and coal fragments as coarse SAND (SP-SM) with gravel [BOTTOM ASH]		
665	34									
	35									
	36									
	37									
	38	P	P-3		0					
660	39									
	40							becomes black and gray, medium to coarse, with gravel		
	41	SS	SS-7	1 1 1 2	100					
	42							becomes gravelly		*coal gravel up to 7/8"*
	43	SS	SS-8	1	8					
655										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-3

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	44	SS	8	0 1 0	8					
	45									
	46									
	47									
650	48	SS	9	1 0 0 0	0					*Sample @ 47.5-49.5' bgs was driven to 50.5' bgs with 1 blow*
	49									
	50									
	51									
	52									
	53	SS	10	WOH 0 1 1	0			becomes coarse to fine		
645	54									
	55									
	56							Very loose, wet, light gray, fly ash as sandy SILT (ML) with interbedded fine sand [FLY ASH]		
	57									
	58	P	4		67					
640	59									
	60									
	61									
	62									
	63	SS	11	1 1 1 3	92			becomes with minor interbedded silty sand-laminations		
635	64									
	65									
	66									

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-3

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	67									
	68	P	5		83					
630	69									
	70									
	71									
	72									
	73									
625	74							Loose, moist, brown and black, clayey SAND (SC) with decayed plant matter (topsoil)		
	75	SS	12	4 5 5 7	58	1.75 <0.5 1.25		becomes sandy silty clay (CL-ML), trace reddish brown root fibers Soft to stiff, moist, brown with gray mottling sandy lean CLAY (CL) [ALLUVIUM]		
	76									
	77									
	78	ST	1	4 5 5 7	79			Medium dense, moist, variably brown with dark gray and gray mottling, gravelly clayey SAND (SC) [ALLUVIUM]		
620	79									*1 5/8" sandstone on bottom of tube*
	80	SS	13	18 6 6 9	33					
	81									
	82									
	83	SS	14	8 11 17 20	50			Medium dense, moist, variably brown with gray mottling, oxidation staining, clayey GRAVEL (GC), as completely to highly weathered sandstone, horizontal bedding [RESIDUUM]		
615	84									
	85									
	86							Medium dense, moist, variably brown with gray mottling, clayey SAND (SC), with gravel as completely weathered sandstone [RESIDUUM]		
	87									
	88	SS	15	4 6 12 15	100					
610	89									
	90									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring
PB-3

Elevation, feet	Depth, feet	SAMPLES Type Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	91						Sandy silty shale, gray with oxidation staining, moderately weathered, weak		
	92								
	93	SS-16	50/4.5"	100					
605	93						End of Boring at 93´ bgs		*Set PVC casing at 93' bgs. Cement-bentonite grout placed using tremie pipe*
	94								
	95								
	96								
	97								
600	98								
	99								
	100								
	101								
	102								
	103								
595	104								
	105								
	106								
	107								
	108								
590	109								
	110								
	111								
	112								
	113								
585									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-4

Sheet 1 of 5

Date(s) Drilled	**4/11/12-4/13/12**	Logged By	**T. George**	Checked By	**V. Gautam**
Drilling Method	**HSA, Mud rotary**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricone bit**	Total Depth of Borehole	**112.2 ft**
Drill Rig Type	**CME 55 Rubber Track ATV, Remote control**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**700.0 ft above msl**
Borehole Backfill	**2" PVC riser pipe set with grout**	Sampling Method(s)	**Piston/Split-spoon/Shelby-tube**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,302.5 E 2,103,601.0**	Groundwater Level(s)	**Encountered at 7.6' bgs ATD**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
700	0									2.5' stickup
										Grout
	1									*Bottom ash access road*
	2									
	3									
	4									
695	5									
	6	SS	SS-1	2 2 2 2	83			Very loose, moist, dark gray bottom ash as coarse to fine SAND (SP-SM), trace gravel [BOTTOM ASH]		
	7									
	8	SS	SS-2	2 2 2 1	33			Very loose, wet, light gray to dark gray fly ash as silty SAND (SM) with minor interbedded sandy silt (ML) trace cat-tail roots [FLY ASH]		
	9									
690	10									
	11									
	12									
	13	SS	SS-3	2 1 1 1	75			becomes without cat-tails		
	14							becomes horizontally bedded		
685	15									
	16									
	17									
	18	P	P-1		98					*@ 18' bgs begin open hole mud rotary*
	19									
680	20									

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Project Location: Louisa, KY
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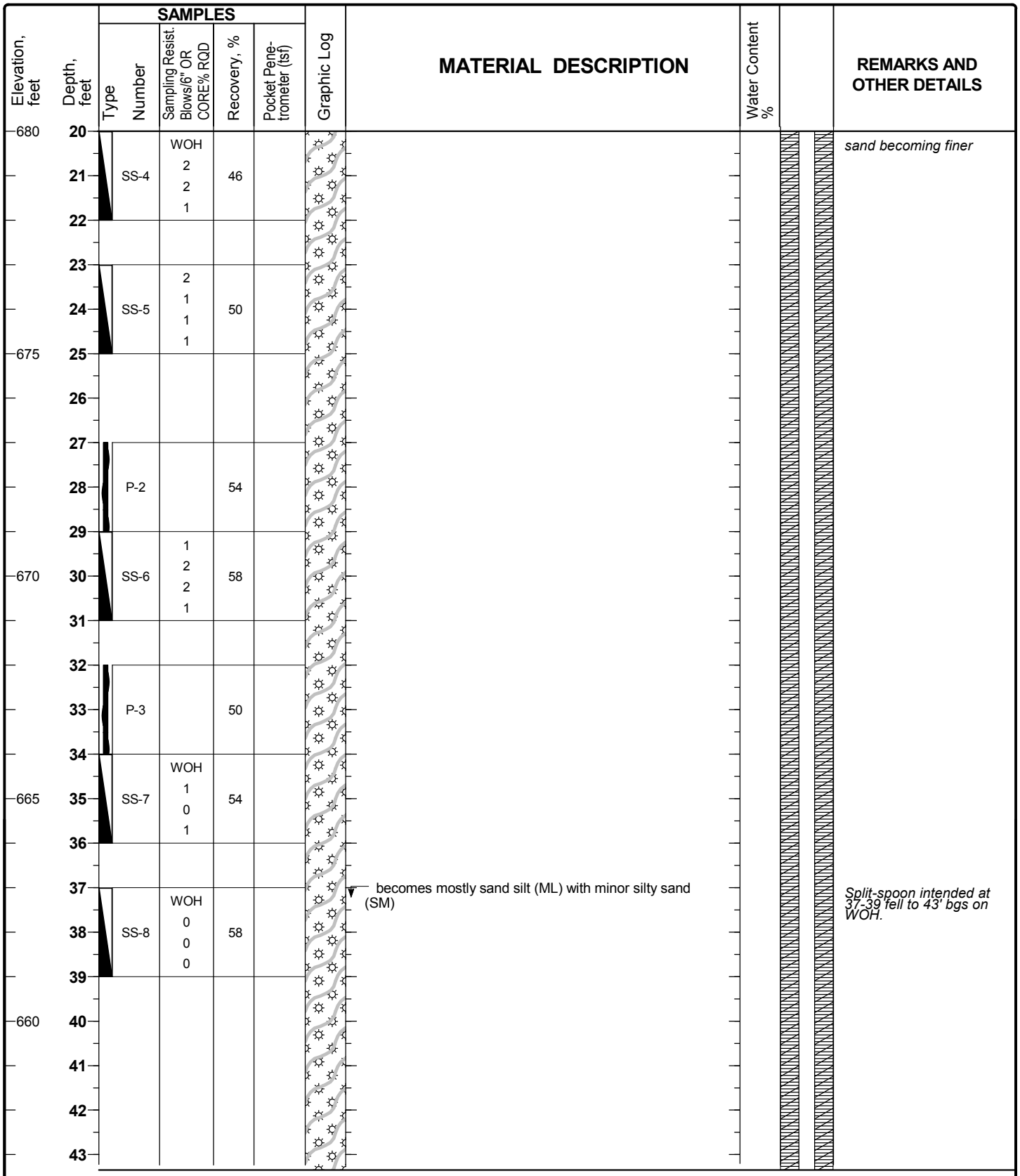
Log of Boring PB-4



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Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-4

Elevation, feet	Depth, feet	SAMPLES Type Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	44								
655	45								
	46								
	47								
	48	P-4		50					
	49								
650	50	SS-9	WOH 0 0 1	67					
	51								
	52								
	53								
	54								
645	55						Loose, wet, variably gray, trace brown bottom ash as medium fine SAND (SP-SM), trace gravel, with interbedded minor fly ash as sandy silt (ML), mostly laminated [BOTTOM ASH]		
	56								
	57								
	58	SS-10	3 4 4 4	71					
	59								
640	60								
	61						Very loose, wet, gray, fly ash as fine silty SAND (SP-SM), with minor interbedded sandy silt [FLY ASH]		
	62								
	63	P-5		98					
	64								
635	65	SS-11	WOH 0 1 0	63					
	66								

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-4

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	67									
	68									
	69							becomes mostly sandy SILT (ML), with minor interbedded silty sand (SM) [FLY ASH]		
630	70									
	71									
	72			1						
	73		SS-12	0 0 0	75					*1 blow for 6 ft when attempting to sample @ 72-74' bgs. Driven to 78' bgs*
	74									
625	75									
	76									
	77									
	78									
	79									
620	80									
	81							Loose, wet, mostly dark gray with interbedded light gray, bottom ash as medium fine SAND (SP-SM), with interbedded fly ash as fine silty sand to sandy silt [BOTTOM ASH]		*Drilling resistance increases @ 80.5'*
	82			4						
	83		SS-13	4 5 3	58					
	84									
615	85									
	86							Stiff, moist, brown and red sandy lean CLAY (CL), trace gravel as sandstone gravel [ALLUVIUM]		
	87			2		2.0				*Topsoil in slough of sample @ 87-89' bgs.*
	88		SS-14	7 10 11	83	1.5 1.25 2.0		becomes orange-brown		
	89									
			ST-1		100					*400 to 600 psi down pressure*
610	90									

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Log of Boring PB-4

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	91	ST-1			100	2.5		becomes very stiff		
	92							Medium dense, moist, variably orange-brown with trace black and gray mottling, clayey SAND (SC) to sandy lean clay (CL), trace weathered sandstone gravel, trace coal particles [ALLUVIUM]		
	93	SS-15		10 7 7 12	63	2.0 0.75 1.0				
	94									
605	95									
	96									
	97							becomes brownish-gray		
	98	SS-16		WOH 0 14 5	100	0.75 0.75 0.5		Medium stiff, moist, gray with black peat particles, organic CLAY (OH), trace sand seams [ALLUVIUM]		
	99							Medium stiff, moist, dark brownish-gray fibrous PEAT (PT) with interbedded clayey SAND (SC), trace undecayed stems [ALLUVIUM]		
600	100	ST-2			100	0.5				*150 to 300 psi down pressure*
	101									
	102							Medium stiff, moist, brown, organic lean CLAY (OL) with greenish-gray sand seams, trace peat particles [ALLUVIUM]		
	103	SS-17		WOH 0 3 7	83	0.75 0.75 0.75				
	104									
595	105									
	106							Medium dense, moist, greenish-gray with brown oxidation staining, clayey SAND (SC) with horizontally bedded sandstone gravel [RESIDUUM]		*Increased drilling resistance @ 106' bgs.*
	107									
	108	SS-18		11 11 9 11	38				12.0	*PL=15 LL=25 PI=10 %G=24.8 %S=35.3 %F=39.9*
	109									
590	110									
	111							Sandstone, medium to fine, gray, slightly weathered, medium strong		*Increased drilling resistance @ 111' bgs.*
	112	SS-19		50/1/2"	100			End of Boring at 112.15´ bgs		*Set PVC casing at 112' Cement-bentonite grout placed using tremie pipe.*
	113									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring
PB-5

Sheet 1 of 3

Date(s) Drilled	**4/13/12,4/16/12**	Logged By	**T. George**	Checked By	**V. Gautam**
Drilling Method	**HSA, Mud rotary**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricone bit**	Total Depth of Borehole	**57.1 ft**
Drill Rig Type	**CME 55 Rubber Track ATV, Remote control**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**700.9 ft above msl**
Borehole Backfill	**2" SCH 40 PVC riser grouted in place**	Sampling Method(s)	**Piston/Split-spoon**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,174.1 E 2,103,663.0**	Groundwater Level(s)	**Encountered 8' bgs ATD, W.L. @ 10.5' bgs on 4/16/12**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0							Very loose, moist, dark gray bottom ash as coarse to fine sand (SP-SM to SM), trace gravel [BOTTOM ASH]			**Grout**
700	1										**SCH 40 PVC 2" diameter riser**
	2										*Bottom ash access road material to 10.5 ft*
	3										*Auger to 7 ft without sampling.*
	4										
	5										
695	6										
	7										
	8		SS-1	2 1 1 1	92			becomes wet	▽		
	9										
	10										
690	11							Very loose, wet, light and dark gray fly ash as interbedded fine silty SAND (SM) and sandy SILT (ML) [FLY ASH]			
	12										
	13		SS-2	3 2 1 1	71						
	14										
	15										
685	16										
	17							becomes all fine silty sand, mostly light gray			
	18		SS-3	WOR 0 WOH 0	42						
	19										
	20										

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-5

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20									
680	21									
	22									*Pushed piston tube in offset borehole 22.5-24.5 ft bgs. 17% recovery*
	23	SS	SS-4	WOH 0 0 1	17			becomes interbedded with sandy silt (ML)		
	24									
	25							becomes fine sand in bottom of tube		
675	26									
	27									
	28	P	P-1		0					
	29							becomes mostly fine silty sand, with minor interbedded sandy silt		
	30	SS	SS-5	WOH 1 1 2	79					
670	31									
	32									
	33									
	34									
	35									
665	36									
	37							Loose, moist, brown with gray mottling, silty, clayey SAND (SC-SM), trace sandstone gravel [ALLUVIUM]		*No fly ash in tube*
	38	P	P-2		17					
	39									
	40	SS	SS-6	5 3 3 3	50				20.2	*PL=16 LL=23 PI=7 %G=7.7 %S=55.6 %F=36.7*
660	41									
	42									
	43	SS	SS-7	3	54			Dense, moist, light brown with oxidation staining, medium		

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Log of Boring PB-5

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	44		SS-7	5 25 22	54			to fine SAND (SP-SM), with completely weathered sandstone gravel [ALLUVIUM]		
	45									
655	46									*Lose mud return between 42-47' bgs*
	47							Loose, moist, dark brown, clayey SAND (SC) to sandy lean CLAY (CL) with decayed plant matter [ALLUVIUM]		
	48		SS-8	3 4 5 10	75			Loose, moist, light brown, medium to fine SAND (SP-SM) with gravel as completely weathered sandstone [ALLUVIUM]		
	49									
	50									
650	51							Very dense, moist, brown with gray mottling, oxidation staining, silty SAND (SM) as completely to highly weathered sandstone [RESIDUUM]		
	52									
	53		SS-9	22 38 46 50/2"	85					*%G=4.0 %S=56.6 %F=39.4*
	54									
	55							Sandstone, fine to medium, gray, slightly weathered to fresh, medium strong		
645	56									
	57		SS-10	50/1/4"	100			End of Boring at 57.1´ bgs		*Set PVC casing at 57' bgs. Cement-bentonite grout placed using tremie pipe*
	58									
	59									
	60									
640	61									
	62									
	63									
	64									
	65									
635	66									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-6

Sheet 1 of 5

Date(s) Drilled	**4/2/12**	Logged By	**T. George**	Checked By	**V. Gautam**
Drilling Method	**HSA, Mud rotary**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricone bit**	Total Depth of Borehole	**100.0 ft**
Drill Rig Type	**CME 55 Track Mounted Remote-control**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**698.6 ft above msl**
Borehole Backfill	**2" SCH 40 PVC riser grouted in place**	Sampling Method(s)	**Piston/Split-spoon/Shelby-tube**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,301.0 E 2,103,083.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0							Bottom ash access road [BOTTOM ASH]		2.6' stickup; Grout
	1									*Drilled without sampling to 13' bgs.*
	2									
	3									2" SCH 40 PVC riser pipe
695	4									
	5									
	6									
	7									
	8									
690	9									
	10									
	11									
	12									
	13							Very loose, wet, gray with dark gray streaks fly ash as fine silty SAND (SM) [FLY ASH]		
685	14	SS-1		1 2 1 2	25					
	15									
	16									
	17	P-1			75					
	18									
680	19									
	20									

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Project Location: Louisa, KY
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Log of Boring PB-6

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20									
	21									
	22									
	23							becomes interbedded light and dark gray		*At 23' bgs ~2' heave remove with open end 4" casing*
675	24	SS	SS-2	WOH 1 0 0						
	25									
	26	P	P-2		95					
	27									
	28									
670	29									
	30									
	31									
	32									
	33							becomes mostly gray		
665	34	SS	SS-3	WOH 0 0 1	17					
	35									
	36	P	P-3		0					
	37									
	38									*Drill to 38' to attempt 2nd piston sample ~2' heave @ 36' bgs - no attempt*
660	39									
	40									
	41									
	42									
	43	P	P-4		0					

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring PB-6

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
655	44	P-4			0			Very loose, wet, dark gray and black sandy coal as GRAVEL (GM)		
	45									
	46	P-5			88			Loose, wet, light and dark gray fly ash as fine silty SAND (SM) [FLY ASH]		
	47							becomes mostly sandy silt (ML) with interbedded silty clay (CL-ML) [FLY ASH]		
	48	SS-4		3 3 4 3	33					
650	49									
	50									
	51									
	52									
	53									
645	54	P-6			73					
	55									
	56	SS-5		WOH 0 0 0	0			becomes mostly silty SAND (SM), trace decayed root fibers [FLY ASH]		
	57							3/4" brown and gray mottled/layered lean clay (CL)		
	58	SS-6		WOH 1 2 3	92			becoming coarser ash particles		
640	59									
	60									
	61									
	62									
	63							becomes light gray		
635	64	P-7			96					
	65							12" loose, wet, gray fly ash as sandy silt		
	66	SS-7		2 3 5	100			becomes light and dark gray		

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Project Number: 13815141.10000

Log of Boring PB-6

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	67			6						
	68									
630	69									
	70									
	71									*tube bent*
	72									
	73	P	P-8		100			Wet, brown, silty GRAVEL (GM), as sandstone fragments [ALLUVIUM]		*Fly ash mixed with gravel*
625	74									
	75									
	76									
	77							Stiff, moist, brown with oxidation staining, sandy lean CLAY (CL) to clayey sand (SC), trace gravel, trace root fibers [ALLUVIUM]		*Drilling resistance change @ 76.5' bgs*
	78			4		1.75				
620	79	S	SS-8	7 7 17	54	1.5 1.5				
	80									
	81	S	ST-1		50			Medium dense, moist, variably brown with oxidation staining, medium to fine SAND (SP-SM), trace gravel as sandstone fragments [ALLUVIUM]		*Shelby tube sample: 250 to 750 psi down pressure*
	82			7						
	83	S	SS-9	6 9 9	4				14.4	
615	84									
	85									
	86							Stiff to very stiff, moist, grayish-green, trace oxidation staining, lean CLAY (CL), with sand, trace shale particles [ALLUVIUM]		
	87									
	88			3		1.25		1" clayey sand seam		
610	89	S	SS-10	6 10 10	63	1.5 2.5				
	90									

Project: AEP Big Sandy Landfill Investigation
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Log of Boring
PB-6

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	91									
	92							Loose, moist, greenish-grayish brown to brown with oxidation staining, fine to medium clayey SAND (SC), with interbedded lean clay seams, trace sandstone gravel [ALLUVIUM]		
	93									
605	94	SS	11	5 3 3 5	50	<0.5				
	95									
	96									
	97							Stiff, moist, grayish-brown, sandy lean CLAY (CL), trace peat [ALLUVIUM]		
	98									
600	99	SS	12	WOR 12 50/3"	100	1.0 1.0 1.25			21.8	*PL=17 LL=31 PI=14 %F=60.7*
	100							Sandstone, fine, gray with oxidation staining, moderately weathered, very weak to weak		
	101							End of Boring at 100´ bgs		*Set PVC casing @ 100' bgs. Cement-bentonite grout placed using tremie pipe.*
	102									
	103									
595	104									
	105									
	106									
	107									
	108									
590	109									
	110									
	111									
	112									
	113									

Project: AEP Big Sandy Landfill Investigation
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Project Number: 13815141.10000

Log of Boring PB-7

Sheet 1 of 6

Date(s) Drilled	**4/17/12-4/19/12**	Logged By	**T. George**	Checked By	**V. Gautam**
Drilling Method	**HSA, Mud rotary**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricore mud-rotary**	Total Depth of Borehole	**127.0 ft**
Drill Rig Type	**CME 55 Tracked ATV**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**695.3 ft above msl**
Borehole Backfill	**2" SCH 40 PVC riser grouted in place**	Sampling Method(s)	**Piston/Split-spoon**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,635.0 E 2,104,228.0**	Groundwater Level(s)	**Encountered 8' ATD**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
695	0							Bottom ash access road [BOTTOM ASH]		2.5' stickup; Grout
	1									
	2									*Augered to 8' without sampling.*
	3									
	4									2" SCH 40 PVC riser pipe
690	5									
	6									
	7									
	8	SS	SS-1	2, 1, 1, 1	58			Very loose, wet, light gray with interbedded dark gray fly ash as mostly fine SAND (SP-SM to SM) with interbedded minor sandy SILT (ML) [FLY ASH]		
	9									
685	10									
	11									
	12									
	13							becomes mostly sandy silt (ML)		
	14	SS	SS-2	1, 0, 0, 0	67					
	15									
680	16									
	17									
	18									
	19	SS	SS-3	1, 0, 1, 1	58					
	20									

Project: AEP Big Sandy Landfill Investigation
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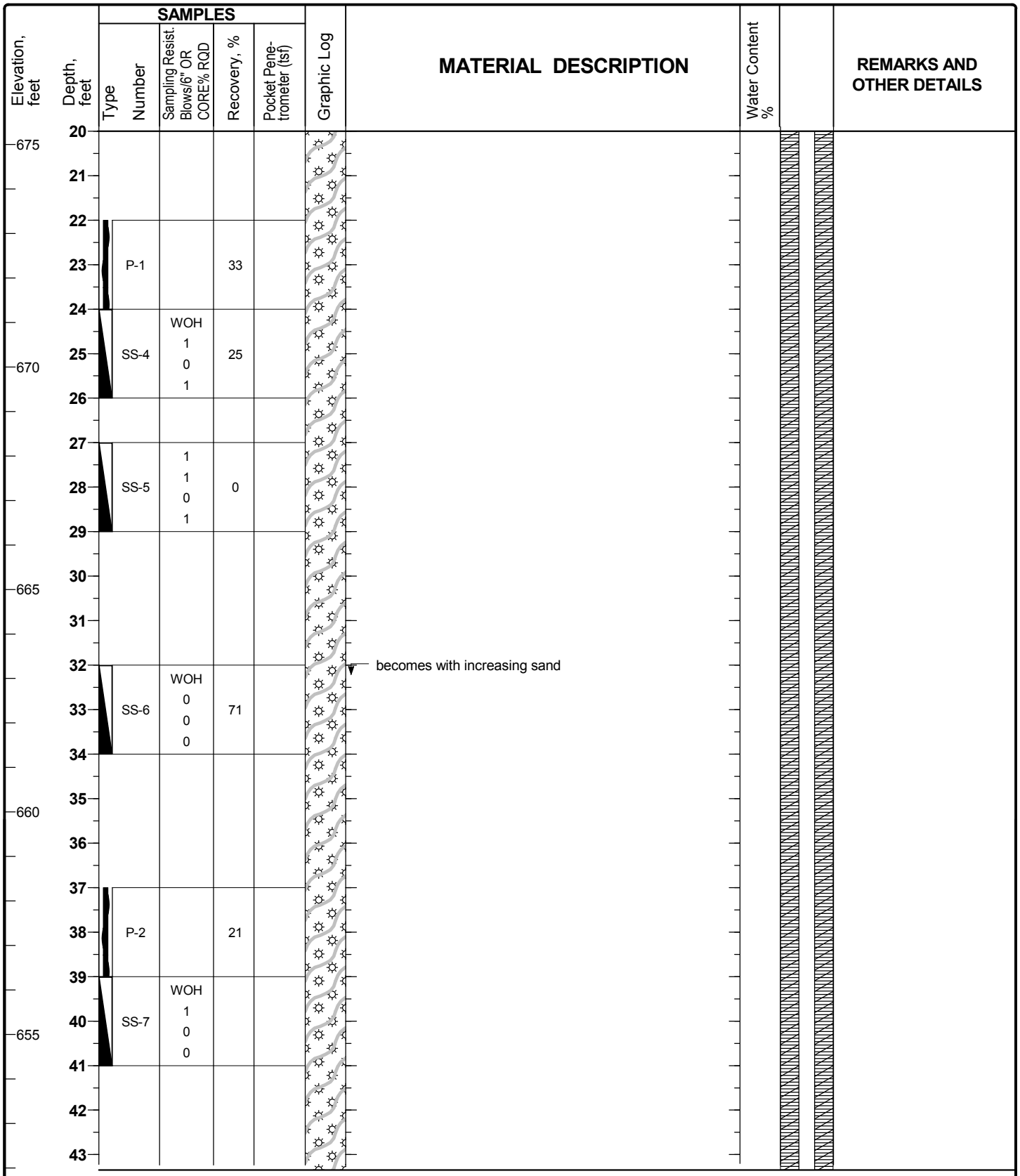
Log of Boring PB-7



Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-7

Elevation, feet	Depth, feet	SAMPLES Type Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	44								
	45								
650	46								
	47	P-3		31			becomes with trace root fibers		*Piston tube bent.*
	48								
	49								
	50								
645	51								
	52	P-4		75			becomes without root fibers		
	53								
	54	SS-8	1 2 2 3	67			becomes mostly sand (SP-SM to SM) with minor sandy silt and occasional seams of bottom ash		
640	55								
	56								
	57	P-5		56			becomes mostly silt (ML) with interbedded silty sand (SM)		
	58								
	59								
	60								
635	61								
	62	P-6		96					
	63								
	64	SS-9	1 0 0 0	0					*Split-spoon @ 64-66' bgs driven 4 ft with 1 blow*
630	65								
	66								

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-7

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	67									
	68									
	69									
625	70									
	71									
	72									
	73		P-7		92					
	74									
	75		SS-10	2 1 3 6	92			becomes interbedded SM/SP/ML with light brown lean clay laminae		
620	76									
	77									
	78		P-8		75			becomes light brown and gray SILT (ML) with interbedded sand (SP-SM to SM), trace grass		
	79									
	80		SS-11	1 1 1 2	0					
615	81									
	82									
	83		P-9		92					
	84							becomes mostly sandy silt (ML)		
	85		SS-12	2 2 2 4	83			becomes mostly fine silty sand (SM)		
610	86									
	87									
	88		P-10		75					
	89							becomes mostly fine silty sand (SM) with minor interbedded sandy silt (ML)		
	90		SS-13	WOR 0	100					*Sample at 89-91' bgs fell to 96' bgs under weight of rods*

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-7

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
605	90									
	91	SS	13	0 0	100					
	92									
	93									
	94									
	95									
600	96									
	97	SS	14	WOR 0 0 0	0					*Split-spoon @ 97-99' bgs fell to 101.5' bgs*
	98									
	99									
	100									
595	101									
	102	SS	15	4 6 6 10	25			Medium dense, wet to moist, tan to brown with black staining and oxidation staining, clayey GRAVEL (GC), trace root fibers [ALLUVIUM]		*Gravel is sandstone fragments up to 1/2" diameter*
	103									
	104									
	105									
590	106							Loose, wet, brown with oxidation staining, medium to fine SAND (SP-SM), trace interbedded lean clay [ALLUVIUM]		*Lean clay layers are <1" thick*
	107	SS	16	3 4 3 2	71				23.7	*%G=0.0 %S=72.5 %F=27.5*
	108									
	109									
	110									
585	111							Medium dense, moist, brown with oxidation staining, gray and greenish gray, trace white, clayey SAND (SC) interbedded with silty sand (SM), trace sandstone gravel [ALLUVIUM]		
	112	SS	17	10 9 5	25					
	113									

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Log of Boring PB-7

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	114	SS	SS-17	4	25					
	115									
580	116									
	117							becomes all clayey sand (SC) with sandstone gravel		
	118	SS	SS-18	12 11 11 11	54			Very stiff, moist, gray to dark brown and greenish gray lean CLAY (CL) with sand, trace sandstone gravel [ALLUVIUM]	15.1	*%G=11.8 %S=53.3 %F=34.9*
	119									
	120							Very dense, moist, variably brown with gray mottling, with oxidation staining, medium to fine SAND (SP-SM), with gravel as sandstone fragments [RESIDUUM]		
575	121									
	122									
	123	SS	SS-19	10 30 33 50/1½"	71				14.1	*%G=11.1 %S=67.8 %F=21.1*
	124							Gray and dark gray shale, moderately weathered, weak		*Hard drilling 124-127' bgs*
	125									
570	126									
	127	SS	SS-20	50/½"	100			becomes silty, dark gray, fresh, medium strong End of Boring at 127´ bgs		*Set PVC casing at 127' bgs. Cement-bentonite grout placed using tremie pipe.*
	128									
	129									
565	130									
	131									
	132									
	133									
	134									
	135									
560	136									

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Log of Boring
PB-8

Sheet 1 of 7

Date(s) Drilled	**4/20/12,4/23/12-4/25/12**	Logged By	**T. George**	Checked By	
Drilling Method	**HSA, Mud rotary**	Drill Bit Size/Type	**4 1/4" ID/8" OD HSA, 4" tricore mud-rotary**	Total Depth of Borehole	**153.0 ft**
Drill Rig Type	**CME 55 Rubber Track ATV, Remote control**	Drilling Contractor	**Pennsylvania Drilling**	Surface Elevation	**674.0 ft above msl**
Borehole Backfill	**2" SCH 40 PVC riser grouted in place**	Sampling Method(s)	**Piston/Split-spoon**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 253,100.3 E 2,105,679.0**	Groundwater Level(s)	**3.1 ft ATD**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0							Bottom ash splitter dike [BOTTOM ASH]		3.0' stickup Grout
	1									SCH 40 PVC 2" diameter riser
	2									
	3								▽	*Drilled to 13' bgs without sampling*
670	4									
	5									
	6									
	7									
	8									
665	9									
	10									
	11									
	12									
	13									
660	14		SS-1	1 0 0 0	100			Very loose, wet, dark gray, bottom ash as coarse to fine SAND (SP-SM) trace gravel [BOTTOM ASH]		*Split-spoon @ 13' driven with 1 blow to 16'* *Bottom ash splitter dike*
	15									
	16									
	17									
	18									*~6" heave noted*
655	19		SS-2	1 0 1 0	100					
	20									

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Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	20									
	21									
	22							becomes loose		
	23	SS	SS-3	5 5 3 1	75					
650	24							Very loose, wet, gray fly ash as fine silty SAND (SM) [FLY ASH]		*Bottom of splitter dike @ 23.5' bgs*
	25									
	26									
	27	SS	SS-4	1 0 1 1						*Sample @ 27-29' fell 6" to 29.5' bgs*
645	29									
	30									
	31									
	32									
	33	P	P-1		88			becomes very loose, wet, gray, SILT (ML) with fine sand		
640	34	SS	SS-5	WOR 0 0 0	0					*Split-spoon @ 34'-36' WOR from 34'-41' bgs*
	36									
	37									
	38									
635	39									
	40									
	41									
	42	SS	SS-6	1 0 0	8			becomes light gray, interbedded with minor silty sand (SM)		*Split-spoon @ 42-44' 1 blow drives spoon 4 ft to 46' bgs*
	43									

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
630	44	SS-6	0	8					
	45								
	46								
	47						becomes mostly silty sand (SM) with interbedded sandy silt (ML)		*At 47-49' bgs rods fell 13' from 47-60' bgs*
	48	SS-7	WOR 0 0 0	100					
625	49								
	50								
	51								
	52								
	53								
620	54								
	55								
	56								
	57								
	58								
615	59								
	60								
	61								
	62								
	63	P-2		92					
610	64								*Split-spoon @ 64-66' fell to 67' bgs*
	65	SS-8	WOR 0 0 0	100					
	66								

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	67									*Roller bit to 67'*
	68	SS	SS-9	WOH 0 0 0	33					
605	69									
	70							Very loose, wet, dark gray bottom ash as coarse to medium SAND (SP-SM), trace gravel [BOTTOM ASH]		
	71									
	72									
	73	SS	SS-10	1 1 1 1	33			Very loose, wet, gray fly ash as fine silty SAND (SM) [FLY ASH]		
600	74									
	75									*Drill rods clogged. Remove and flush.*
	76									
	77									*Bottom of piston tube is fly ash as sandy silt (ML)*
	78	P	P-3		88					
595	79									
	80	SS	SS-11	WOR 0 0 0	0					
	81									
	82									
	83									
590	84									
	85									
	86									
	87									
	88	P	P-4		88					
585	89									*Split-spoon @ 89-91' fell to 91.5' bgs*
	90	SS	SS-12	WOR 0	0					

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	91	SS	SS-12	0 0	0					
	92									
	93									
580	94									
	95									
	96									
	97	P	P-5		96					*Bottom of piston tube is fly ash as silty sand (SM)*
	98									
575	99							becomes loose, interbedded light and dark gray, medium to fine SAND (SP-SM) to silty SAND (SM), with minor interbedded sandy silt [FLY ASH]		
	100	SS	SS-13	2 2 3 2	63					
	101									
	102									
	103									
570	104							becomes very loose, mostly sandy SILT (ML) to silty SAND (SM) with minor interbedded (SP-SM)		
	105									
	106									
	107									
	108	SS	SS-14	1 0 0 1	79					
565	109									
	110									
	111									
	112							becomes mostly silty sand (SM) with minor interbedded sandy silt (ML)		
	113	SS	SS-15	2 1 0	58					

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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
560	114	SS-15	1	58					
	115								
	116								
	117								
	118	P-6		96					
555	119						becomes mostly sandy silt (ML)		
	120	SS-16	WOR 0 0 0	13					
	121								
	122								
	123								
550	124								
	125								
	126						becomes light gray with interbedded grayish brown mostly sandy SILT (ML) with minor interbedded silty sand, trace decayed plant stems		
	127								*Split-spoon at 127-129' fell to 131' bgs*
	128	SS-17	WOR 0 0 0	88					
545	129								
	130								
	131								*Roller bit dropped to 132' when reinserted at 127'*
	132								
	133						Dense, wet, dark gray, medium to fine silty SAND (SM) with brown sandstone gravel [ALLUVIUM]		*Material is possibly a fill*
540	134								
	135								
	136								

Project: AEP Big Sandy Landfill Investigation
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Log of Boring PB-8

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	137									
	138	SS	SS-18	20 17 18 21	79					
535	139									
	140							becomes moist, variably brown with gray mottling, trace greenish-gray, trace brownish-red		
	141									
	142									
	143	SS	SS-19	19 17 26 31	79					
530	144									
	145									
	146									
	147									
	148	SS	SS-20	21 2 1 11	25			No material in sampler representative of blow counts @ 147.5-149	14.3	*Split-spoon at 147': 6" recovery appears the same as sample @ 142'. Blow counts may not be representative of material.* *%G=31.4 %S=49.3 %F=19.3*
525	149									
	150									*Drill change at 150'*
	151							becomes with trace decayed vegetation		
	152	SS	SS-21	15 50/1"	100					
	153							Micaceous, silty sandstone, light gray, slightly weathered, weak to medium strong End of Boring at 153´ bgs		*Set PVC casing @ 152.5 ft bgs. Cement-bentonite grout placed using tremie pipe.*
520	154									
	155									
	156									
	157									
	158									
515	159									
	160									

Project: AEP Big Sandy Landfill Investigation
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Log of Boring/Rock Core
SB-3

Date(s) Drilled	**4/11/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**HSA/NX Core**	Drill Bit Size/Type	**3 1/4" HSA/2" Core**	Total Depth of Borehole	**54.0 ft**
Drill Rig Type	**D-120**	Drilling Contractor	**AEP**	Surface Elevation	**845.7 ft above msl**
Borehole Backfill	**Bentonite grout**	Sampling Method(s)	**Split-spoon/NX Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 253,542.1 E 2,102,379.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
845	0		SS-1	50/4"	100			Dense, moist, medium to fine grained SAND (SP) [FILL]			*Road material as weathered sandstone*
	1										
	2										
	3		SS-2	50/5"	100						
	4										
	5		SS-3	50/4"	100						
840	6										
	7										
	8										
	9										
	10										*Shale in cuttings*
835	11							Shale, gray brown, highly to completely weathered			
	12		SS-4	18 31 50/4"	75						
	13										
	14		SS-5	20 50/5"	100						
	15										
830	16										
	17		SS-6	21 36 50/4"	88						
	18										
	19		SS-7	36 50/4"	80			becomes light brown			*Vertical filled fracture noted*
	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring/Rock Core
SB-3

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	20										
825	21										
	22	SS	SS-8	35 50/4"	100						
	23										
	24	SS	SS-9	35 50/5"	91						
	25										
820	26	SS	SS-10	50/3"	100						
	27										
	28	SS	SS-11	50/5"	100						
	29							becomes gray			
	30							Dark grey, fine sandstone			*Auger refusal @ 30' bgs*
815	31										
	32							Sandstone, light green, moderately weathered, weak rock - iron staining on fractures Fracture #1: 0, B, Vn, Fe, None, PL, R			
	33							Shale, light gray, moderately weathered, extremely weak			
	34	R	R1	92.4%	87			Sandstone, light gray with iron staining (red), moderately weathered, strong rock			
	35							Shale, light brown, moderately weathered, extremely weak rock becomes dark gray, weak			
810	36							3" sandstone, pebbly, strong			
	37							becomes light brown			
	38							Fracture #2: 90, J, VN, Fe, Sp, IR, R			
	39							Fracture #2			
	40							becomes sandy, gray Fracture #2 Fracture #3: 60, J, VN, Fe, Sp, IR, R Fracture #3			
805	41	R	R2	88.3%	100						
	42										
	43										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
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Log of Boring/Rock Core
SB-3

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44										
	45							Sandstone, gray, moderately weathered, weak, medium grained			
800	46		R2	88.3%	100						
	47							← Fracture #4: 45, J, None, None, None, IR, R			
	48										
	49							Light gray shale, extremely weak becomes with sandy laminae			
795	50										
	51		R3	83.3%	80						
	52										
	53										
	54							End of Boring at 54´ bgs			
	55										
790	56										
	57										
	58										
	59										
	60										
785	61										
	62										
	63										
	64										
	65										
780	66										

Report: GEO_CR_WELL; File K:\PROJECTS\AAEP\13815141_BSLF\DOCS\LOGS\AEPBORINGS-6-10-13.GPJ; 6/10/2013 11:23:49 AM

URS

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-4

Date(s) Drilled	**4/10/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**HSA**	Drill Bit Size/Type	**3 1/4" HSA/NX Core**	Total Depth of Borehole	**30.0 ft**
Drill Rig Type	**D-120**	Drilling Contractor	**AEP**	Surface Elevation	**794.0 ft above msl**
Borehole Backfill	**Bentonite grout**	Sampling Method(s)	**Split-spoon/NX Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,829.7 E 2,101,718.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0							Stiff, moist, light brown with gray mottling lean CLAY (CL) [RESIDUUM]			
	1	SS-1		3 4 5 9	21				23.8		
	2							becomes very stiff with no mottling			
	3	SS-2		4 6 10 22	67				20.2		*PL=23 LL=45 PI=22 %F=96.5*
790	4										
	5							becomes with gray mottling			
	6	SS-3		5 15 26 50/1"	89			becomes buff to tan, sandy	12.6		
	7							Sandstone, light brown to tan, moderately weathered, strong, mica on split surfaces			
	8	R1		84.7%	100			Fracture #1: 0, B, VN, CL, Sn, Wa, S, C			
785	9							Shale, brown, extremely weak			
	10							Fracture #2: 90, J, VN, Fe, Fi becomes orange-stained			
	11							1" sandstone, strong becomes with iron staining, orange to gray, extremely weak			
	12	R2		50%	60			Sandstone, dark brown, strong, quartz crystal lined, iron stained			
	13							Fracture #1 Fracture #3: 90, B, VN, Fe, Pa, Ir			
780	14										
	15							becomes fine-grained, iron staining			
	16							Fracture #1 Fracture #3			
	17	R3		56.7%	61			Fracture #3			
	18							Shale, gray to black, extremely weak			
775	19										
	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-4

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	20										
	21										
	22		R3	56.7%	61						
	23										
770	24										
	25							becomes moderately weathered, extremely weak to very weak			
	26										
	27		R4	85%	100			Fracture #4: 90, J, T, None, None, Wa, S			
	28							becomes sandy, weak to very weak, slightly weathered, no fractures			
765	29										
	30							End of Boring at 30´ bgs			
	31										
	32										
	33										
760	34										
	35										
	36										
	37										
	38										
755	39										
	40										
	41										
	42										
	43										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-6

Date(s) Drilled	**4/12/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**HSA/NX Core**	Drill Bit Size/Type	**3 1/4" HSA/2" Core**	Total Depth of Borehole	**39.3 ft**
Drill Rig Type	**D-120**	Drilling Contractor	**AEP**	Surface Elevation	**768.8 ft above msl**
Borehole Backfill	**Bentonite grout**	Sampling Method(s)	**Split-spoon/NX Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,202.5 E 2,102,399.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %	REMARKS AND OTHER DETAILS
	0							1" dark brown topsoil		
	1	SS	SS-1	4 3 7 6	38	2.25		Stiff, moist, light brown with trace dark brown mottling, fat CLAY (CH) [RESIDUUM]		
	2							2" sandstone gravel		
	3	SS	SS-2	2 3 5 11	58	2.25 to 3.25		becomes stiff to very stiff, with brown mottles	26.3	*PL=23 LL=62 PI=37 %F=89.6*
765	4							2" cemented shale with red/orange iron stains		
	5							becomes hard		
	6	SS	SS-3	3 5 9 22	83	>4.5		becomes black	29.5	*PL=30 LL=59 PI=29*
	7									
	8	SS	SS-4	19 25 21 38	96	>4.5		9" coal seam		
760	9							becomes with coal		
	10									
	11	SS	SS-5	12 21 27 50/3"	100	2.5		5 1/2" coal seam becomes stiff, black and gray 2 1/2" coal seam becomes with black coal		
	12									
	13	SS	SS-6	30 50/5"	100			3" coal seam		
755	14							3" shale, light gray, very weathered 3" coal seam Shale, gray with some black partings		
	15	SS	SS-7	49 50/3"	100					
	16									
	17									*Back of spoon wet* *Auger refusal @ 17.2' bgs*
	18							becomes light gray, moderately weathered, weak		
750	19	R	R1	70.7%	97			Fracture #1: 60, V, N, Cl, Fi, Wa, R		
	20									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-6

Elevation, feet	Depth, feet	SAMPLES: Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	20							Fracture #2: 90, V, N, Cl, Fi, Wa, R			
	21										
	22	R	1	70.7%	97			becomes sandy shale			*Interbedded sandy shale and shale interbeds with sand are 3" to 1/8"; shale beds are 1/8 to 1 1/2" thick*
	23										
745	24										
	25										
	26							Fracture #3: 30 to 90, J, N, None, None, Ir, Vr Fracture #3			
	27										
	28										
740	29	R	2	61.6%	98			Sandstone, light gray, some lamination, some iron staining, slightly weathered, strong rock			
	30										
	31										
	32										
	33										
735	34										
	35							Shale, gray, moderately weathered, weak rock			
	36										
	37	R	3	100%				Sandy shale, light gray, slightly weathered, strong rock, interbeds of sandy shale and shale			
	38										
730	39										
	40							End of Boring at 39.3´ bgs			
	41										
	42										
	43										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-7

Date(s) Drilled	**4/10/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**HSA/Core**	Drill Bit Size/Type	**3 1/4" HSA/3" Core**	Total Depth of Borehole	**29.7 ft**
Drill Rig Type	**D-120**	Drilling Contractor	**AEP**	Surface Elevation	**850.4 ft above msl**
Borehole Backfill	**Bentonite grout**	Sampling Method(s)	**Split-spoon/NX Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 252,280.4 E 2,103,342.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
850	0							Medium stiff, moist, brown, lean CLAY (CL) (topsoil)			
	1		SS-1	4 3 3 8	38	1 2.0		becomes stiff, trace brown mottles [RESIDUUM]			
	2										
	3		SS-2	3 5 8 15	42	3.5 to 4.5		becomes very stiff to hard, light brown with red mottles			
	4										
	5										
845	6		SS-3	10 22 40 50/3"	86	3.5 >4.0		becomes dark red becomes with red mottles	10.4		*PL=19 LL=39 PI=20 %F=71.7*
	7							Shale, sandy, light brown, moderately weathered, weak			
	8										
	9							becomes very weak			
840	10										
	11		R1	15%	29						
	12										
	13										
	14										
	15							becomes shale fragments, moderately weathered, very weak with iron-staining			
835	16										
	17		R2	0%	18						
	18							8" sandstone fragments, brown with iron staining, strong, but fractured vertically and horizontal			
	19										
	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-7

Elevation, feet	Depth, feet	SAMPLES: Type / Number	SAMPLES: Sampling Resist. Blows/6" OR CORE% RQD	SAMPLES: Recovery, %	SAMPLES: Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
830	20									
	21									*Shale is mechanically broken-- no fractures observable*
	22	R2	0%	18						
	23									
	24									
	25						becomes brown shale, moderately weathered, weak			*25-27' bgs: shale is soft--mechanically broken No fractures observable*
825	26									
	27	R3	20%	20						
	28									
	29									
	30						End of Boring at 29.7´ bgs			
820	31									
	32									
	33									
	34									
	35									
815	36									
	37									
	38									
	39									
	40									
810	41									
	42									
	43									

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-8

Date(s) Drilled	**4/12/12**	Logged By	**J. Ristow**	Checked By	**V. Gautam**
Drilling Method	**HSA**	Drill Bit Size/Type	**3 1/4" HSA/NX Core**	Total Depth of Borehole	**49.3 ft**
Drill Rig Type	**D-120**	Drilling Contractor	**AEP**	Surface Elevation	**711.3 ft above msl**
Borehole Backfill	**Bentonite grout**	Sampling Method(s)	**Split-spoon/NX Core**	Hammer Data	**140#/30" Drop Auto**
Boring Location	**N 251,071.0 E 2,103,738.0**	Groundwater Level(s)	**Not encountered**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Pene-trometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	0							3" Bottom ash (road fill)			
		SS	SS-1	4 3 5 15	58	3.25 to 3.5		Very stiff, moist, light yellow/brown, lean CLAY (CL) [RESIDUUM]			
710	1							Shale, light yellow brown, with orange red iron oxidation staining, completely to moderately weathered			
	2										
	3	SS	SS-2	9 6 8 13	13						
	4										
	5										
	6	SS	SS-3	9 19 31 34	96						
705	7										
	8	SS	SS-4	11 21 32 50	58			becomes light gray, without iron oxidation			
	9										
	10							becomes with red mottle staining			
	11	SS	SS-5	10 18 47 50/3"	76			becomes red with gray mottles			
700	12										
	13	SS	SS-6	21 49 50/3"	80			2" crushed chert nodules becomes gray with red mottles to light gray			
	14										
	15							becomes gray with some red mottles			
	16	SS	SS-7	15 18 50/3"	80						
695	17										
	18	SS	SS-8	12 50/5"	100			becomes with some orange mottles			
	19										
	20										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-8

Elevation, feet	Depth, feet	SAMPLES: Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	20										
				18				becomes with orange staining			
	21	SS	SS-9	31	100						
690				50/5"							
	22										
		SS	SS-10	50/3"	100			becomes without orange staining, crushed			
	23										
	24										
	25	SS	SS-11	50/5"	100			1" sandstone, gray, crushed			
	26										
685											
	27										
	28										
	29							Sandstone, gray with zones of iron staining, moderately weathered, medium strong, fine-grained Fracture #1: 10, J, VN, Fe, Su, PL, SR			*Auger refusal @ 28.4' bgs*
	30							Fracture #1			
	31	R	R1	85.7%	95			Fracture #1			
680											
	32										
	33										
	34										
	35							becomes with shale fragments			
	36							becomes sandstone massive with orange Fe staining			
675											
	37							Fracture #1			
	38							shale, orange concretion			
	39	R	R2	93.3%	100			becomes gray, slightly weathered, strong, no fractures			
	40										
	41										
670											
	42							becomes slightly weathered to fresh, strong, medium-grained			
	43										

Project: AEP Big Sandy Landfill Investigation
Project Location: Louisa, KY
Project Number: 13815141.10000

Log of Boring/Rock Core
SB-8

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resist. Blows/6" OR CORE% RQD	Recovery, %	Pocket Penetrometer (tsf)	Graphic Log	MATERIAL DESCRIPTION	Water Content %		REMARKS AND OTHER DETAILS
	44		R2	93.3%	100			becomes with orange staining			*No natural fractures*
	45										
	46										
665	47		R3	100%	100						
	48										
	49										
								End of Boring at 49.3´ bgs			
	50										
	51										
660	52										
	53										
	54										
	55										
	56										
655	57										
	58										
	59										
	60										
	61										
650	62										
	63										
	64										
	65										
	66										
645											

2010 LOGS

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1007

Date: 11/19/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Reitz
Surface Elevation: 692'
Total Depth: 90' **Diameter:**
Comments:

Project: Big Sandy
Location:
Driller:
Drilling Method: Air Rotary
Top of Casing Elevation:
Sampling Method:

Depth (feet)	REC / RQD	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
10.0				Yellow brown Sandstone
20.0		S1		
30.0		S2		
		S3		
40.0		S4		
		S5		Yellow brown fine to coarse sandstone, minor limonite (added water when groundwater encountered at approximatley 49' bgs)
50.0		S6		color to light gray
		S7		color to yellow brown
60.0		S8		
		S9		color to light gray
70.0		S10		
		S11		
80.0		S12		Gray Shale and Coal (black sheen in return water)
90.0				
100.0				
110.0				
120.0				
130.0				
140.0				
150.0				

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1007

Date: 11/23/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Retz
Surface Elevation:
Total Depth: 200' **Diameter:** 6"-15"
Comments:

Project: Big Sandy
Location: Louiza, Ky
Driller:
Drilling Method: Sonic/HQ core
Top of Casing Elevation:
Sampling Method:

Depth (feet)	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
160.0			Medium gray medium to very coarse Sandstone
170.0			
180.0			
190.0			
200.0			
210.0			
220.0			
230.0			

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

MONITORING WELL CONSTRUCTION

JOB NUMBER BS-CL-2133

COMPANY Frontz Drilling, Inc.

PROJECT Big Sandy Plant

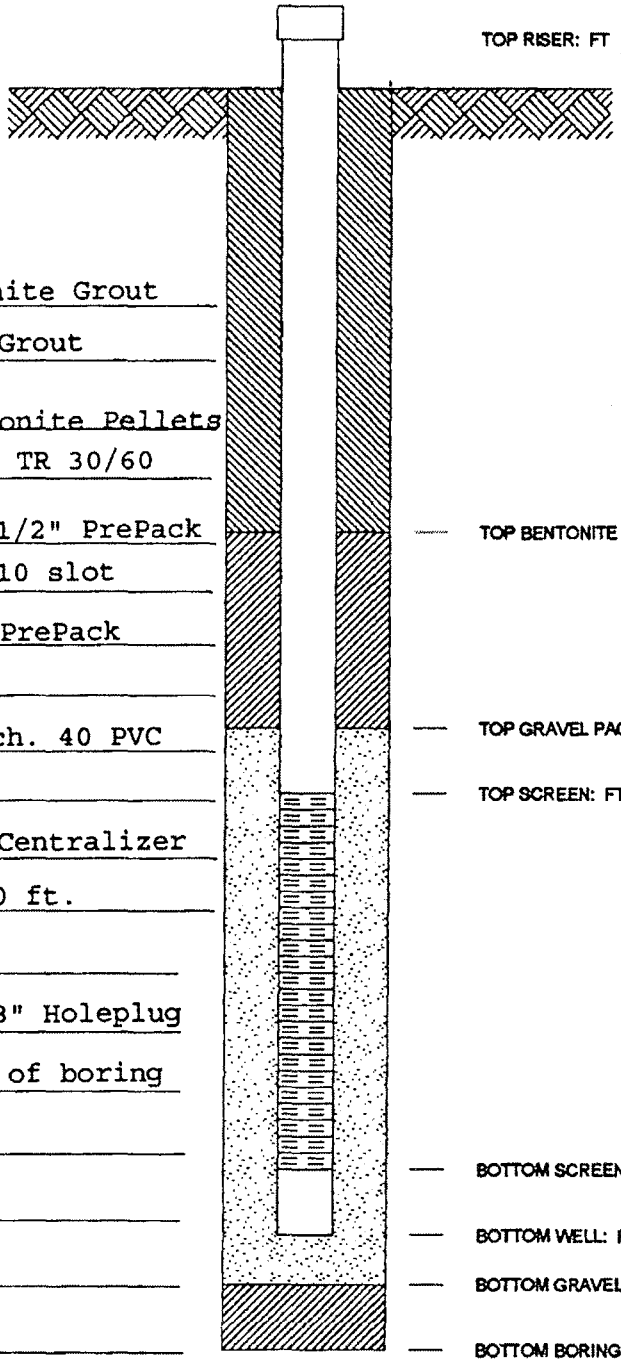
COORDINATES 38.18628 N -82.63430 W

SYSTEM GPS

WELL No KY6555 BORING No. MW-1007 INSTALLED 12-7-10

GROUND ELEVATION FT 692

AEP supplied



TOP RISER: FT 2

GROUT SEAL: Bentonite Grout

Bariod Quick-Grout

BENTONITE SEAL: Bentonite Pellets

3/8" Pel Plug TR 30/60

SCREEN: dia., 2"x3-1/2" PrePack

PVC .007 & .010 slot

GRAVEL PACK: #7 in PrePack

#4 Borehole

RISER PIPE:, dia., 2" Sch. 40 PVC

SPACERS, DEPTH: PVC Centralizer

77 ft. and 40 ft.

TOP BENTONITE SEAL: FT 40

TOP GRAVEL PACK: FT 45

TOP SCREEN: FT 47

BOTTOM SCREEN: FT 77

BOTTOM WELL: FT 77

BOTTOM GRAVEL PACK: FT 78

BOTTOM BORING: FT 86

Notes:

Bentonite 3/8" Holeplug

Bottom 8 ft. of boring

BLANK_MONT_WELL_LOG CIVIL LAB.GPJ AEP.GDT 11/24/09

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1008

Date: 11/17/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Reitz
Surface Elevation:
Total Depth: 120' **Diameter:**
Comments:

Project: Big Sandy
Location:
Driller:
Drilling Method: Air Rotary
Top of Casing Elevation:
Sampling Method:

Depth (feet)	REC / RQD	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
		S1		Yellow brown silty Clay
		S2		color to yellow gray
10.0		S3		
		S4		color to yellow brown Sandstone
20.0		S5		Groundwater encountered at approximately 25' bgs
		S6		
30.0		S7		
		S8		Medium gray Shale
40.0		S9		
		S10		
50.0		S11		Same as above with fine sand
		S12		
60.0		S13		Medium gray Sandstone
		S14		
70.0		S15		
		S16		
80.0		S17		
		S18		
90.0		S19		
		S20		color to light gray Sandstone
100.0		S21		Medium gray Shale
		S22		Possible coal (black sheen in return water)
110.0		S23		
120.0				
130.0				
140.0				
150.0				

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1008

Date: 11/23/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Retz
Surface Elevation:
Total Depth: 200' **Diameter:** 6"-15"
Comments:

Project: Big Sandy
Location: Louiza, Ky
Driller:
Drilling Method: Sonic/HQ core
Top of Casing Elevation:
Sampling Method:

Depth (feet)		Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
160.0				Medium gray medium to very coarse Sandstone
170.0				
180.0				
190.0				
200.0				
210.0				
220.0				
230.0				

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

MONITORING WELL CONSTRUCTION

JOB NUMBER BS-CL-2133

COMPANY Frontz Drilling, Inc.

PROJECT Big Sandy Plant

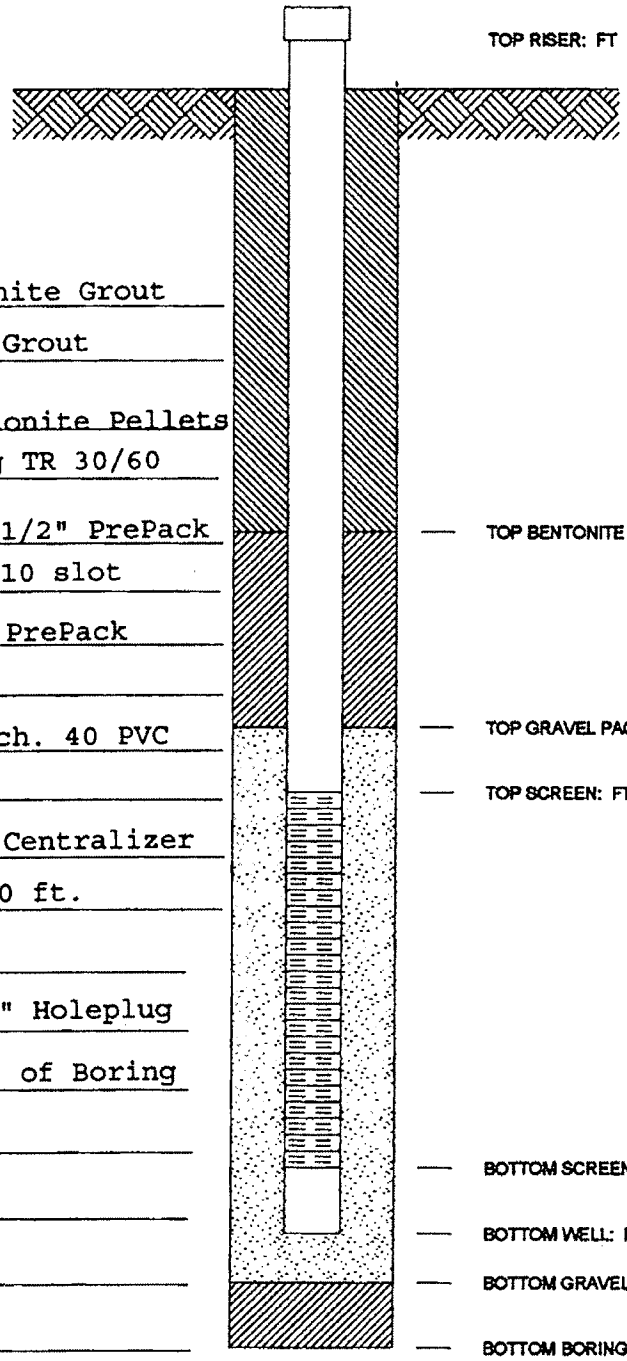
COORDINATES 38.18657 N -82.63066 W

SYSTEM GPS

WELL No KY6556 BORING No. MW-1008 INSTALLED 12-7-10

GROUND ELEVATION FT 725

AEP supplied



TOP RISER: FT 2

GROUT SEAL: Bentonite Grout

Bariod Quick-Grout

BENTONITE SEAL: Bentonite Pellets

3/8" Pel Plug TR 30/60

SCREEN: dia.,, 2"x3-1/2" PrePack

PVC .007 & .010 slot

GRAVEL PACK: #7 in PrePack

#4 Borehole

RISER PIPE: , dia., 2" Sch. 40 PVC

SPACERS, DEPTH: PVC Centralizer

100 ft. and 50 ft.

TOP BENTONITE SEAL: FT. 53

TOP GRAVEL PACK: FT. 58

TOP SCREEN: FT. 60

BOTTOM SCREEN: FT 100

BOTTOM WELL: FT. 100

BOTTOM GRAVEL PACK: FT. 102

BOTTOM BORING: FT 113

Notes:

Bentonite 3/8" Holeplug

Bottom 11 ft. of Boring

BLANK_MONT_WELL_LOG CIVIL LAB.GPJ AEP.GDT 1/2/409

FRONTZ DRILLING
WOOSTER, OHIO

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1009

Date: 11/18/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Reitz
Surface Elevation:
Total Depth: 124' **Diameter:**
Comments:

Project: Big Sandy
Location:
Driller:
Drilling Method: Air Rotary
Top of Casing Elevation:
Sampling Method:

Depth (feet)	REC / RQD	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
10.0		S1		Yellow brown Sandstone
20.0		S2		
		S3		
30.0		S4		
		S5		
40.0		S6		Gray Shale
		S7		Yellow brown Sandstone
50.0		S8		Gray Shale
		S9		
60.0		S10		
		S11		Water encountered at approximately 68' bgs; (added water, black sheen in return)
70.0		S12		Possible coal
		S13		
80.0		S14		Light gray Sandstone
		S15		
90.0		S16		Color grades to medium gray
		S17		Possible coal
100.0		S18		Medium gray Shale
		S19		
110.0		S20		
		S21		
120.0		S22		
130.0				
140.0				
150.0				

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1009

Date: 11/23/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Retz
Surface Elevation:
Total Depth: 200' **Diameter:** 6"-15"
Comments:

Project: Big Sandy
Location: Louiza, Ky
Driller:
Drilling Method: Sonic/HQ core
Top of Casing Elevation:
Sampling Method:

Depth (feet)		Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
80.0				Medium gray medium to very coarse Sandstone

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

MONITORING WELL CONSTRUCTION

JOB NUMBER BS-CL-2133

COMPANY Frontz Drilling, Inc.

PROJECT Big Sandy Plant

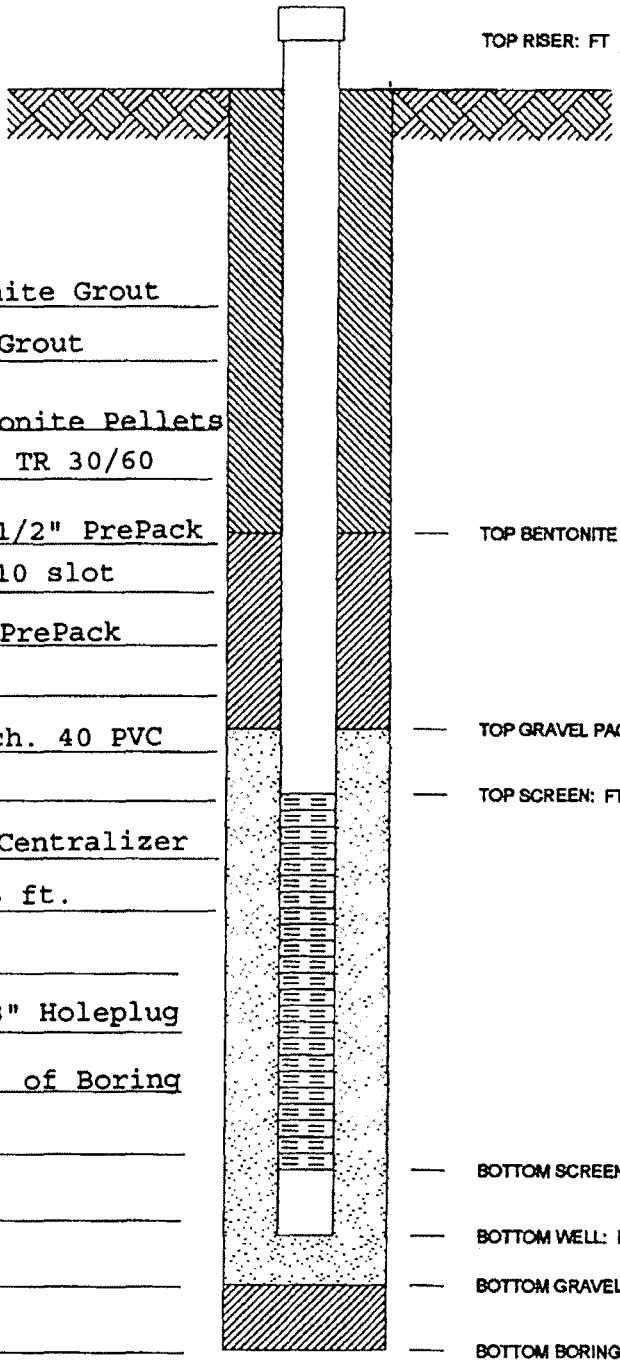
COORDINATES 38.17955 N -82.62633 W

SYSTEM GPS

WELL No KY6557 BORING No. MW-1009 INSTALLED 12-7-10

GROUND ELEVATION FT 733

AEP supplied



TOP RISER: FT 2

GROUT SEAL: Bentonite Grout

Bariod Quick-Grout

BENTONITE SEAL: Bentonite Pellets

3/8" Pel Plug TR 30/60

SCREEN: dia., 2"x3-1/2" PrePack

PVC .007 & .010 slot

GRAVEL PACK: #7 in PrePack

#4 Borehole

RISER PIPE: , dia , 2" Sch. 40 PVC

SPACERS, DEPTH: PVC Centralizer

85 ft. and 55 ft.

TOP BENTONITE SEAL: FT 58

TOP GRAVEL PACK: FT 63

TOP SCREEN: FT 65

BOTTOM SCREEN: FT 85

BOTTOM WELL: FT 85

BOTTOM GRAVEL PACK: FT 87

BOTTOM BORING: FT 124

Notes:

Bentonite 3/8" Holeplug

Bottom 37 ft. of Boring

BLANK_MONT_WELL_LOG CIVIL LAB.GPJ AEP.GDT 1/2/09

FRONTZ DRILLING
WOOSTER, OHIO

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1010

Date:
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Reitz
Surface Elevation:
Total Depth: 200'
Proj. No.: E10028
Diameter:
Comments:

Project: Big Sandy
Location:
Driller:
Drilling Method: Air Rotary
Top of Casing Elevation:
Sampling Method:

Depth (feet)	REC / RQD	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
10.0		S1		Red gray Sandstone
		S2		
20.0		S3		
		S4		
30.0		S5		Medium gray Shale
		S6		Coal
40.0		S7		Medium gray Shale
		S8		
50.0		S9		
		S10		
60.0		S11		
		S12		
70.0		S13		
		S14		
80.0		S15		Coal with carbonaceous Shale
		S16		Medium gray Shale
90.0		S17		
		S18		
100.0		S19		Same as above with some sand
		S20		
110.0		S21		
		S22		
120.0		S23		
		S24		
130.0		S25		
		S26		
140.0		S27		Medium gray Shale
		S28		
150.0				

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: B-1010

Date: _____ **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Retz
Surface Elevation: _____
Total Depth: 200' **Diameter:** _____
Comments:

Project: Big Sandy
Location: Louiza, Ky
Driller: _____
Drilling Method: Air Rotary
Top of Casing Elevation: _____
Sampling Method: _____

Depth (feet)	Sample #	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)
	S29		
	S30		
160.0			
	S31		
	S32		Gray Sandstone
170.0			
			Gray Shale
	S33		
	S34		
180.0			
	S35		
	S36		
190.0			
	S37		Same as above with some sand
	S38		
200.0			
210.0			

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

JOB NUMBER BS-CL-2133
COMPANY Frontz Drilling, Inc.
PROJECT Big Sandy Plant
COORDINATES 38.17721 N -82.63093 W
SYSTEM GPS

WELL No KY6558 BORING No. MW-1010 INSTALLED 12-6-10

GROUND ELEVATION FT 849
AEP supplied

TOP RISER: FT 2

GROUT SEAL: Bentonite Grout
Bariod Quick-Grout

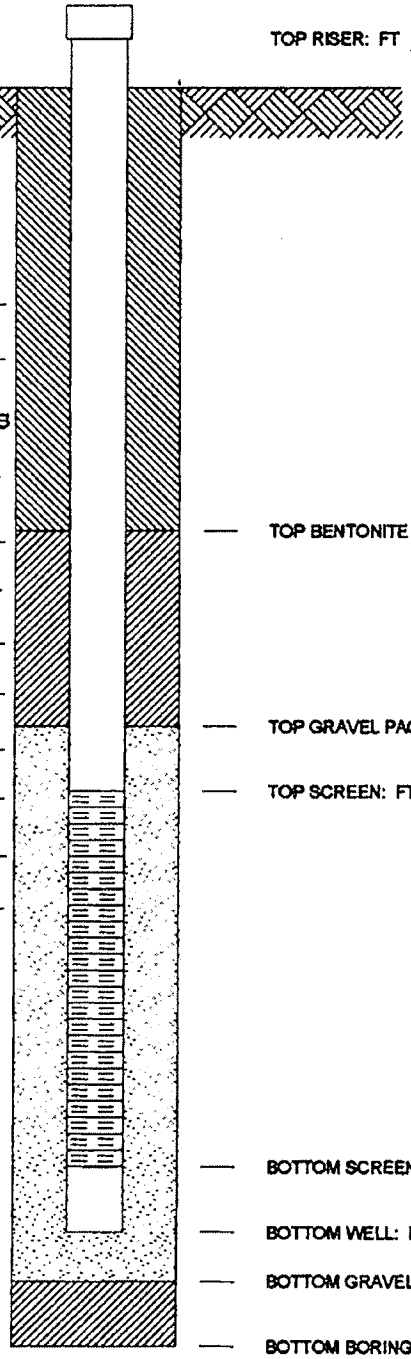
BENTONITE SEAL: Bentonite Pellets
3/8" Pel Plug TR 30/60

SCREEN: dia., 2"x3-1/2" PrePack
PVC .007 & .010 slot

GRAVEL PACK: #7 in PrePack
#4 Borehole

RISER PIPE: , dia., 2" Sch. 40 PVC

SPACERS, DEPTH: PVC Centralizer
100 ft, 160 ft, 200 ft



TOP BENTONITE SEAL: FT. 163
TOP GRAVEL PACK: FT 168
TOP SCREEN: FT. 170
BOTTOM SCREEN: FT. 200
BOTTOM WELL: FT. 200
BOTTOM GRAVEL PACK: FT 201
BOTTOM BORING: FT. 245

Notes:

Bentonite 3/8" Holeplug
Bottom 44 ft. of boring

BLANK_MONT_WELL_LOG CIVIL LAB.GPJ AEP.GDT 11/24/09

FRONTZ DRILLING
WOOSTER, OHIO

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: 1011

Date: 11/16 to 11/18 2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Reitz
Surface Elevation: 685'
Total Depth: 80' **Diameter:**
Comments:

Project: Big Sandy
Location: Ash pond (south)
Driller:
Drilling Method: Sonic/HQ core
Top of Casing Elevation:
Sampling Method:

Depth (feet)	REC / RQD	Well Construction	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)	Sample Number
				Fill	
				Mottled very light gray and red Clay	
5.0				mottled medium red brown and light gray weathered Shale	
				Light gray Clay with limonite stains and yellow brown very fine sand, silty	
10.0				Gray brown very fine Sand, some yellow brown clay	
				Light yellow brown silty Clay; medium gray shale with limonite beds	
15.0	1' / 0%			Dark gray green Shale pieces	
20.0				Dark gray green wethered Shale	
25.0	8' / 50%				
30.0				Grades to medium gray medium to coarse Sandstone	
35.0	8.8' / 51%				
40.0				Same as above with limonite staining	
45.0	8.4' / 78%				
50.0					
55.0	10' / 71%			Medium gray fine to coarse Sandstone; fine interbedded medium gray shale and medium to coarse sandstone	
60.0				Meduim gray coarse to very coarse Sandstone Carbonaceous lens at 62.6 to 63.1	
65.0	9.9' / 53%			Medium gray medium to coarse Sandstone, grades to very coarse Sandstone	
70.0					
75.0	9.7' / 47%			Dark gray Shale lens	

Frontz Drilling, Inc.
2031 Millersburg Road
Wooster, Ohio 44691
330-263-5301

Soil Boring Log

Boring No: 1011

Date: 11/23/2010 **Proj. No.:** E10028
Client: AEP
Drilling Company: Frontz Drilling, Inc.
Logged By: Larry Retz
Surface Elevation:
Total Depth: 200' **Diameter:** 6"-15"
Comments:

Project: Big Sandy
Location: Louiza, Ky
Driller:
Drilling Method: Sonic/HQ core
Top of Casing Elevation:
Sampling Method:

Depth (feet)		Well Construction	Lithology	Description/Soil Classification (Color, Texture, Moisture, Structures)	Sample Number
80.0	9.7' / 47%			Medium gray medium to very coarse Sandstone	

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

MONITORING WELL CONSTRUCTION

JOB NUMBER BS-CL-2133

COMPANY Frontz Drilling, Inc.

PROJECT Big Sandy Plant

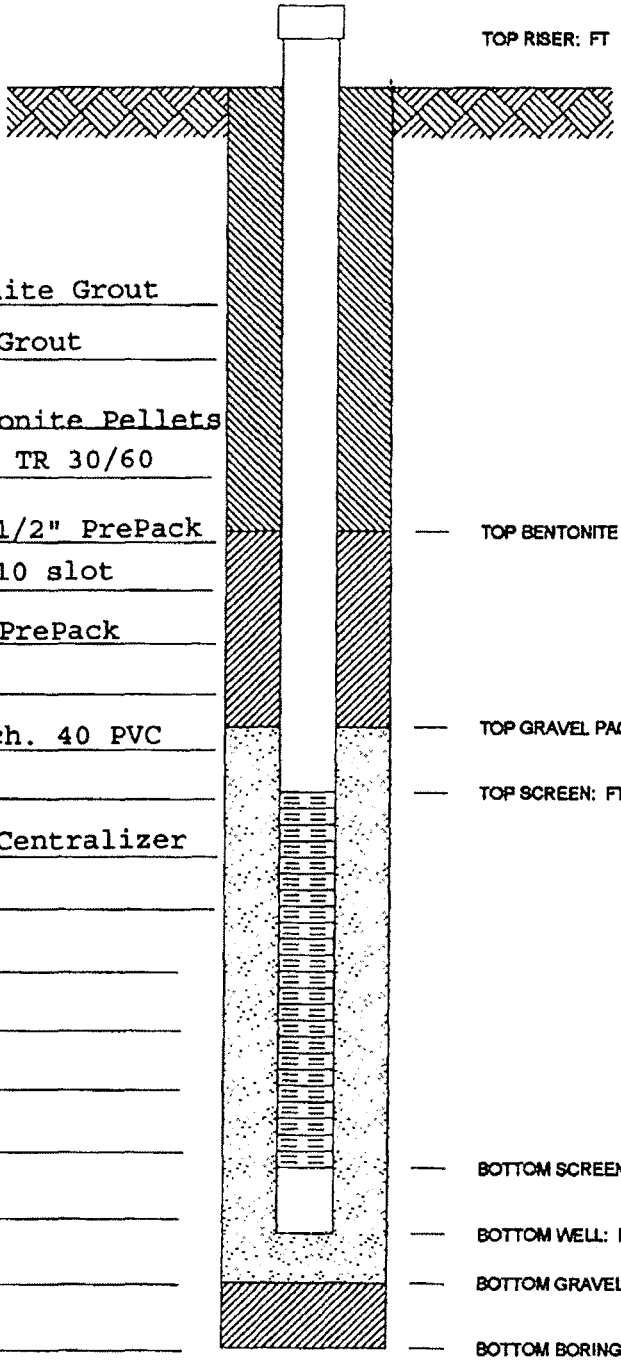
COORDINATES 38.17819 N -82.63071 W

SYSTEM GPS

WELL No KY6559 BORING No. MW1011 INSTALLED 12-8-10

GROUND ELEVATION FT. 685

AEP supplied



TOP RISER: FT 2

GROUT SEAL: Bentonite Grout

Bariod Quick-Grout

BENTONITE SEAL: Bentonite Pellets

3/8" Pel Plug TR 30/60

SCREEN: dia., 2"x3-1/2" PrePack

PVC .007 & .010 slot

GRAVEL PACK: #7 in PrePack

#4 Borehole

RISER PIPE: , dia., 2" Sch. 40 PVC

SPACERS, DEPTH: PVC Centralizer

75 ft

TOP BENTONITE SEAL: FT. 28

TOP GRAVEL PACK: FT. 33

TOP SCREEN: FT. 35

BOTTOM SCREEN: FT. 75

BOTTOM WELL: FT. 75

BOTTOM GRAVEL PACK: FT. 81

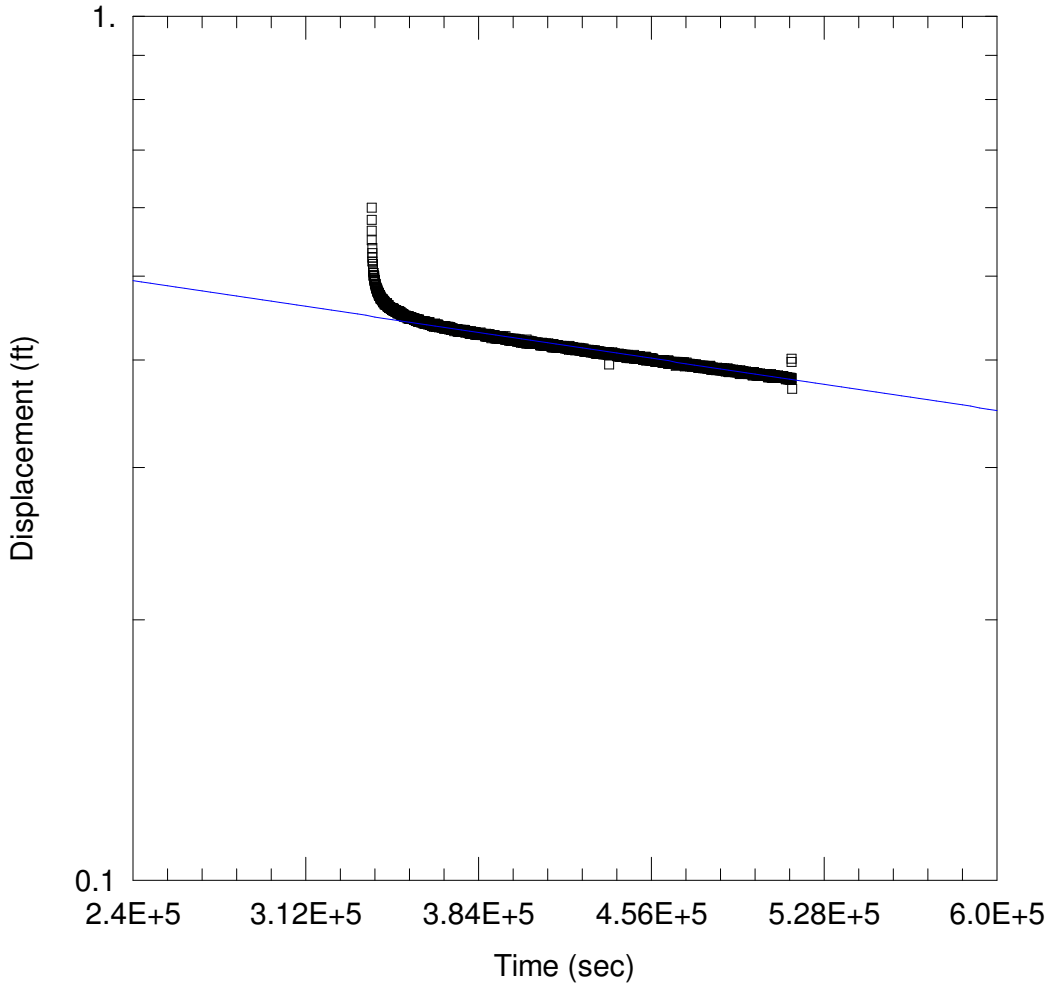
BOTTOM BORING: FT. 81

Notes:

BLANK_MONT_WELL_LOG CIVIL LAB.GPJ AEP.GDT 11/24/09

APPENDIX B

HYDRAULIC TESTING WELL RECOVERY CURVES



WELL TEST ANALYSIS

Data Set: J:\...\MW-1201_Slug.aqt
Date: 05/31/12 Time: 15:38:06

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1201
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 0.96 ft Anisotropy Ratio (Kz/Kr): 1.

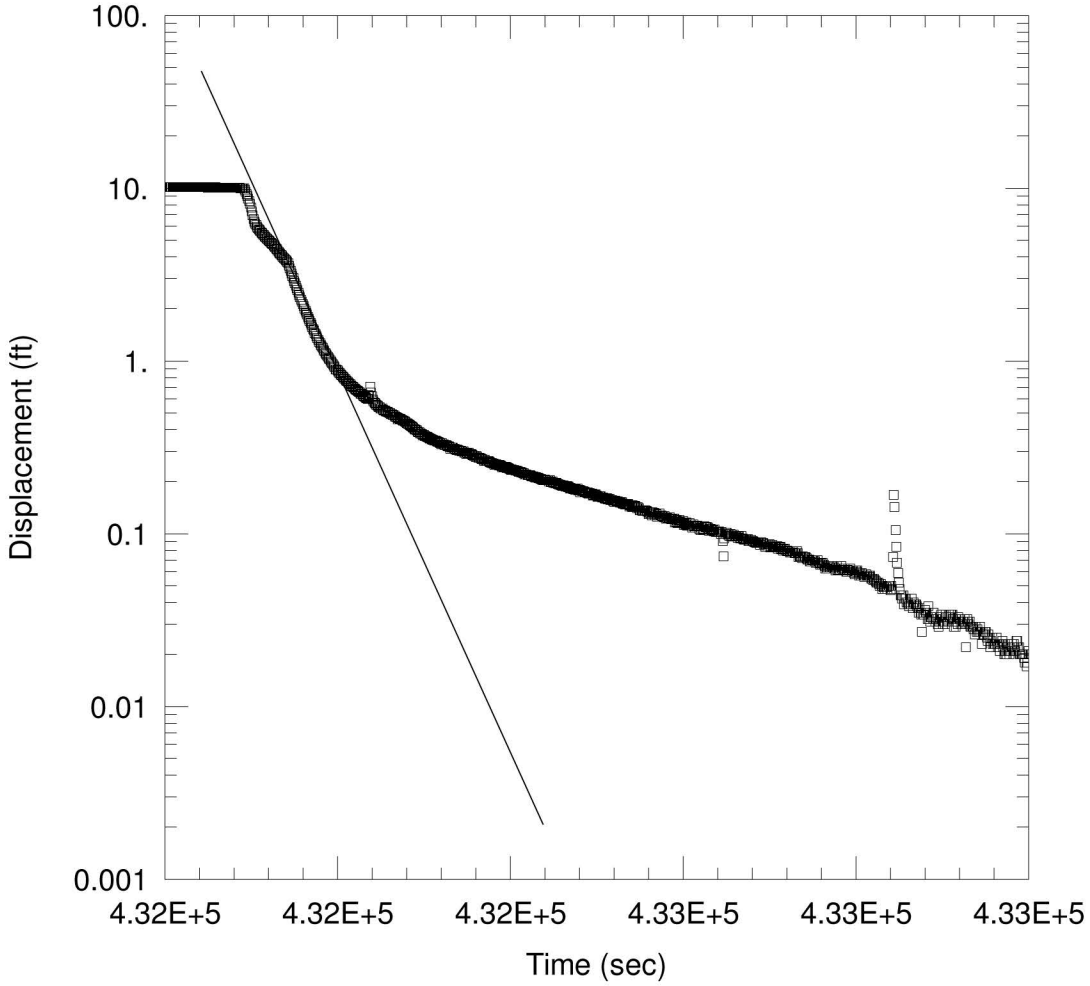
WELL DATA (MW-1201)

Initial Displacement: 0.7 ft
Total Well Penetration Depth: 52.18 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.96 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.569E-7 cm/sec y0 = 0.6224 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1202_Slug.aqt
Date: 05/31/12 Time: 15:39:08

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1202
Test Date: May 2012

AQUIFER DATA

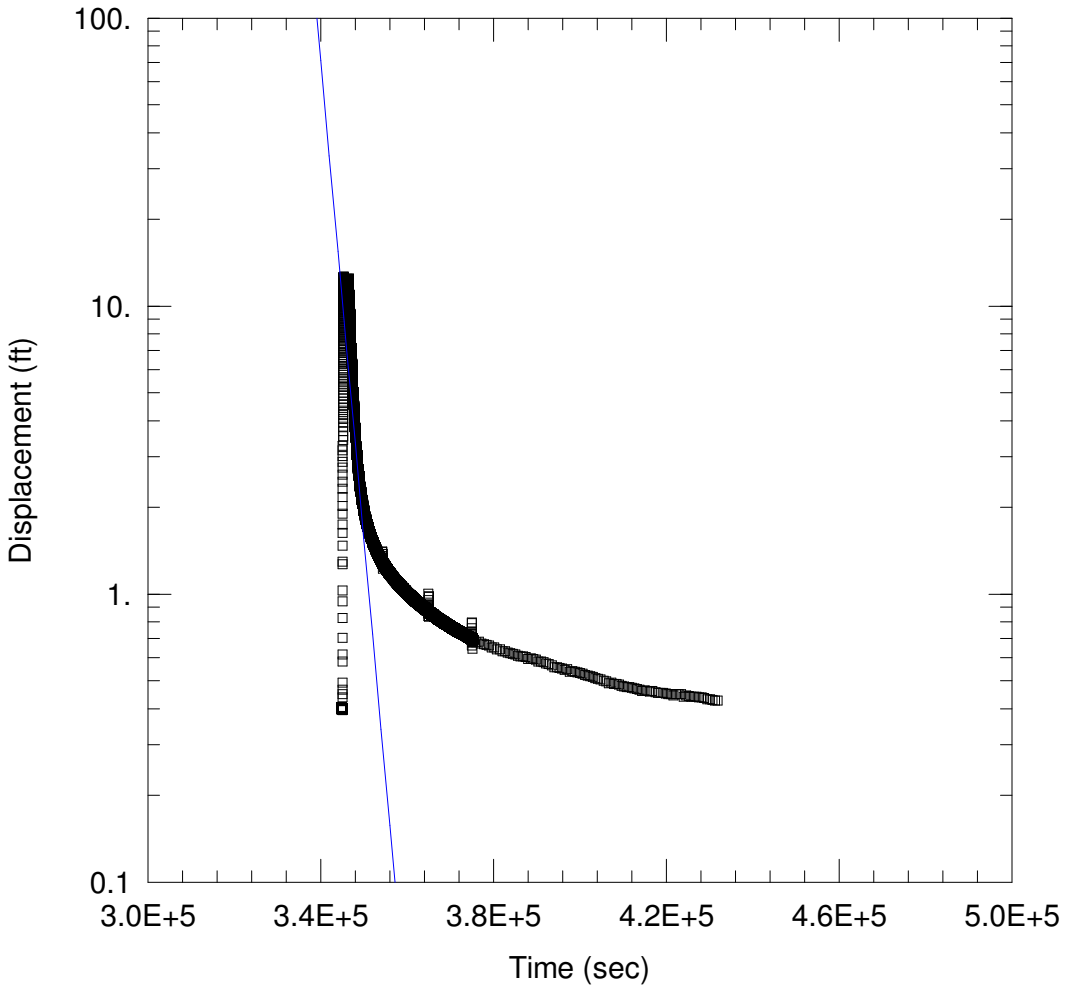
Saturated Thickness: 13.86 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1202)

Initial Displacement: 13.8 ft
Total Well Penetration Depth: 13.86 ft
Casing Radius: 0.083 ft
Static Water Column Height: 13.86 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.001554 cm/sec
y0 = 1.0E+308 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1203_Slug.aqt
Date: 05/31/12 Time: 15:40:27

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1203
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 24.05 ft Anisotropy Ratio (Kz/Kr): 1.

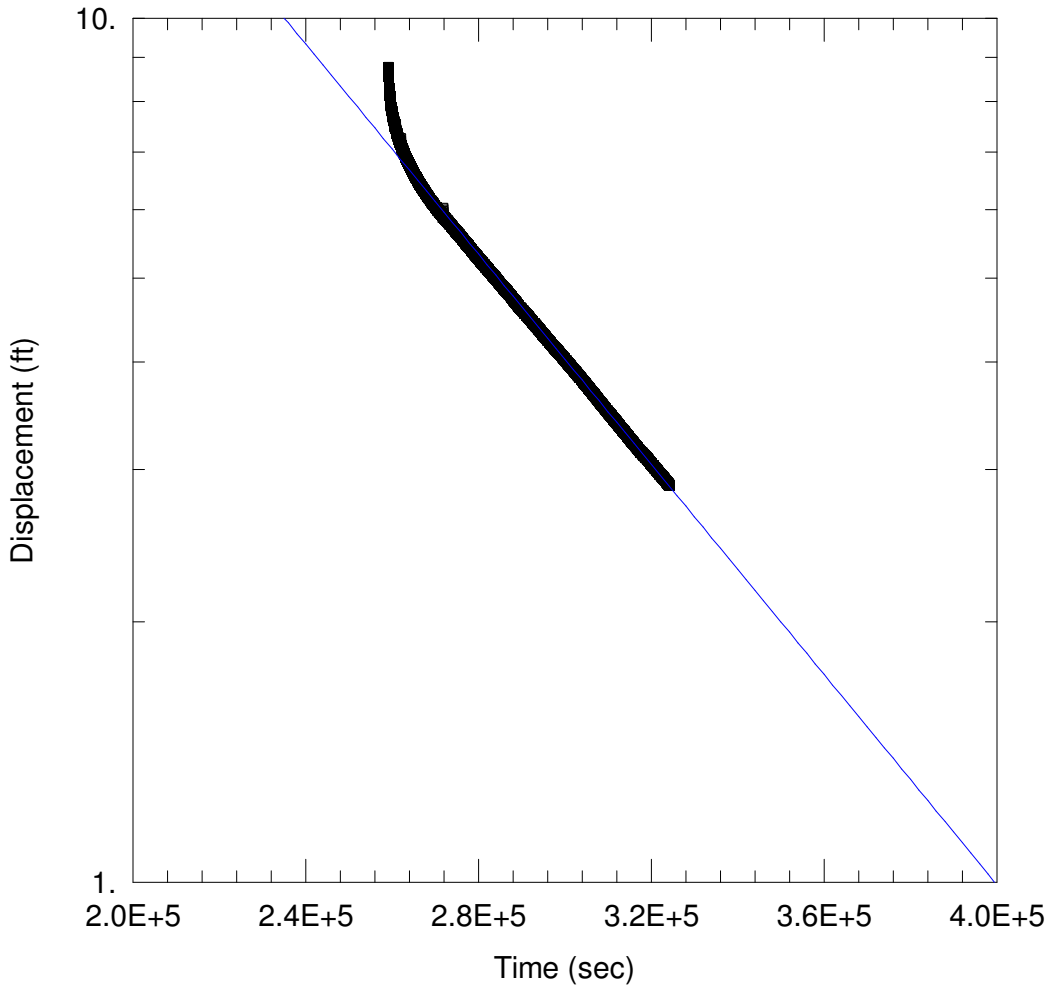
WELL DATA (MW-1203)

Initial Displacement: 12.7 ft
Total Well Penetration Depth: 24.05 ft
Casing Radius: 0.083 ft
Static Water Column Height: 21.47 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 2.201E-5 cm/sec y0 = 1.914E+58 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1204_Slug.aqt
Date: 05/31/12 Time: 15:41:28

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1204
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 9.86 ft Anisotropy Ratio (Kz/Kr): 1.

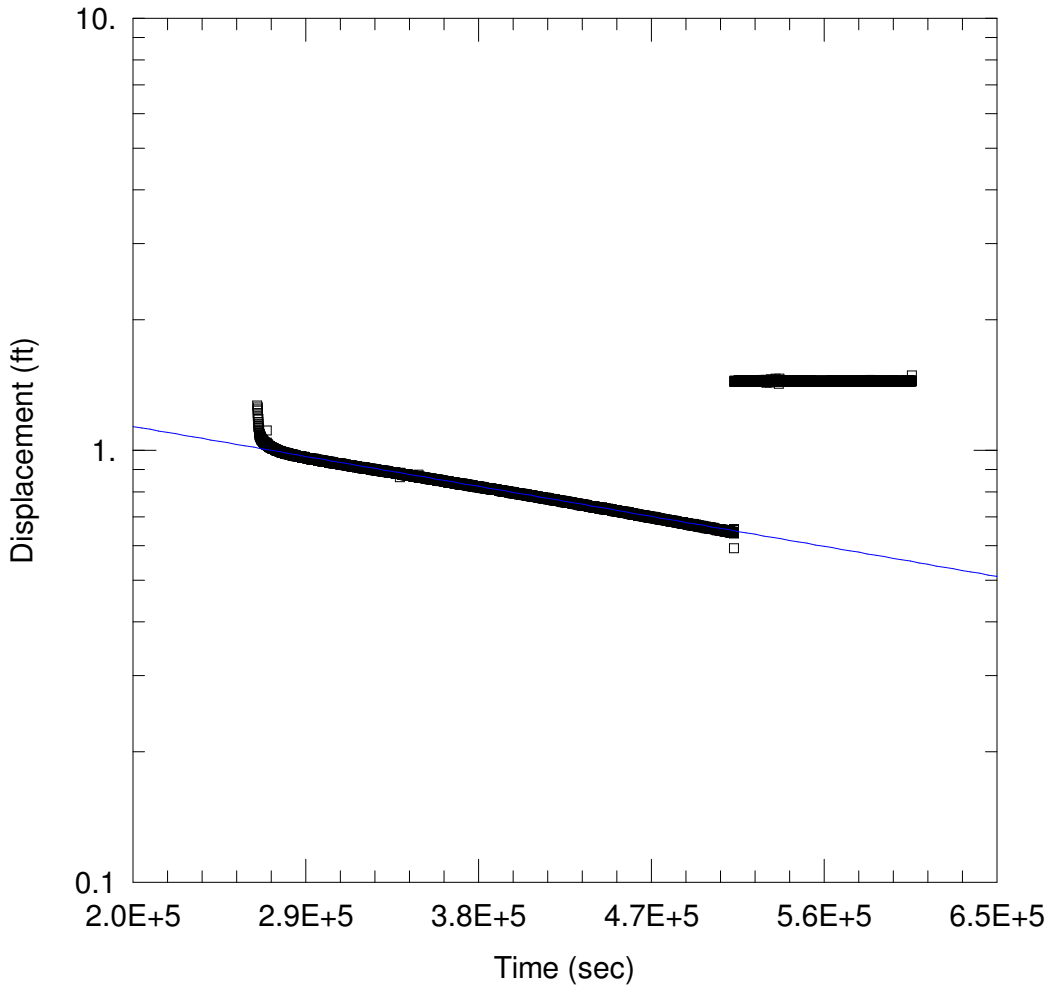
WELL DATA (MW-1204)

Initial Displacement: 8.83 ft
Total Well Penetration Depth: 34.76 ft
Casing Radius: 0.083 ft
Static Water Column Height: 9.86 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 7.9E-7 cm/sec y0 = 268.9 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1205_Slug.aqt
Date: 05/31/12 Time: 15:42:27

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1205
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 1.76 ft Anisotropy Ratio (Kz/Kr): 1.

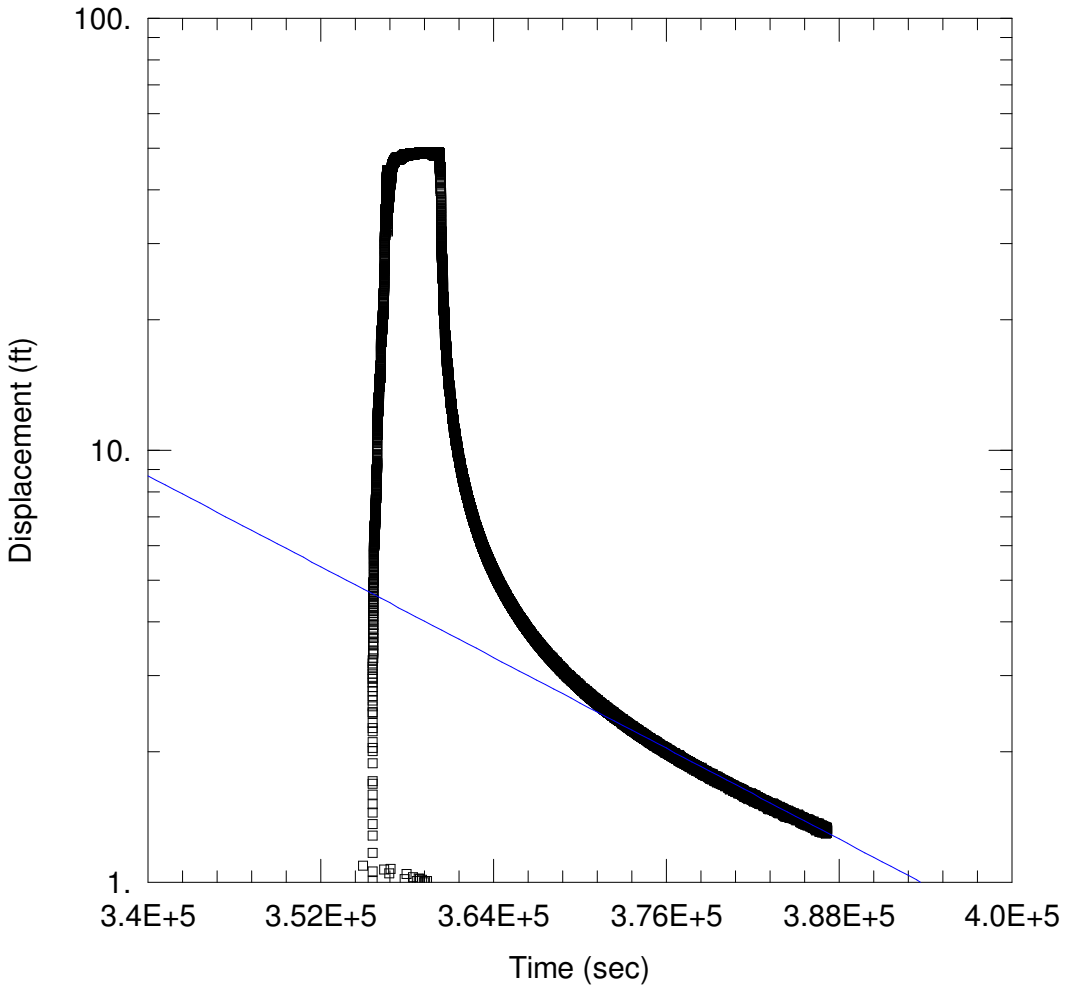
WELL DATA (MW-1205)

Initial Displacement: 1.39 ft
Total Well Penetration Depth: 52.76 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.76 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.612E-7 cm/sec y0 = 1.617 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1206_Slug.aqt
Date: 05/31/12 Time: 15:44:41

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1206
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 112.5 ft Anisotropy Ratio (Kz/Kr): 1.

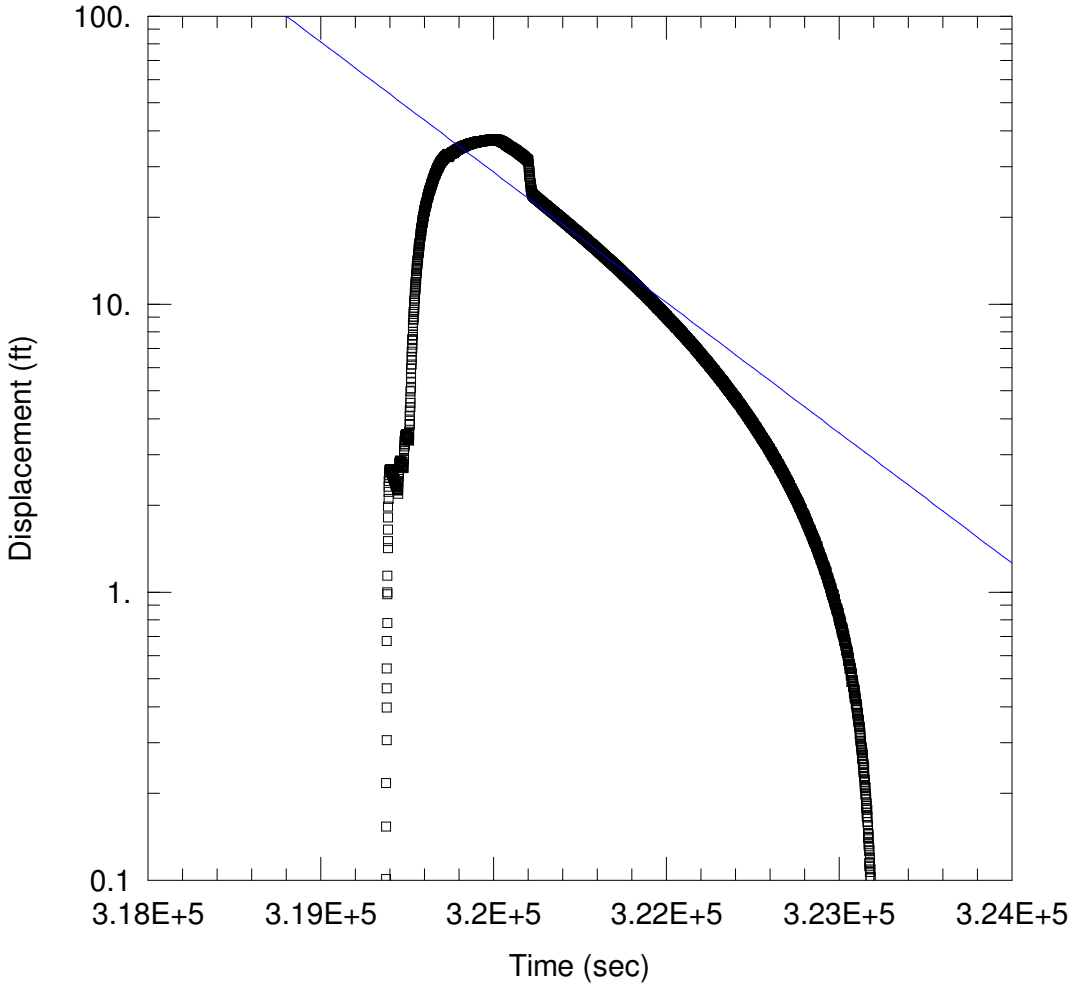
WELL DATA (MW-1206)

Initial Displacement: 48.7 ft
Total Well Penetration Depth: 112.5 ft
Casing Radius: 0.083 ft
Static Water Column Height: 112.5 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.188E-6 cm/sec y0 = 7.895E+6 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW-1207_Slug.aqt
Date: 05/31/12 Time: 15:45:55

PROJECT INFORMATION

Company: URS CORPORATION
Client: AEP
Project: 13815142
Location: AEP Big Sandy
Test Well: MW-1207
Test Date: May 2012

AQUIFER DATA

Saturated Thickness: 79.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1207)

Initial Displacement: 12.7 ft
Total Well Penetration Depth: 79.36 ft
Casing Radius: 0.083 ft
Static Water Column Height: 68.59 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 4.999E-5 cm/sec y0 = 1.821E+122 ft

APPENDIX C

ANALYTICAL REPORTS

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 6/7/2012***

Monitoring Well #001 **Total Dissolved Metals Reported.**

Sample Number: 121729-001 **Date Collected: 04/17/2012 13:48** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.08	ug/L	0.05	0.01	DPC	04/26/2012 13:06	EPA 200.8
Arsenic, As	0.86	ug/L	0.1	0.03	DPC	04/26/2012 13:06	EPA 200.8
Barium, Ba	40	ug/L	10	2	DAM	04/26/2012 16:08	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:08	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:08	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:08	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:08	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:08	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:08	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:06	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:08	EPA 200.7
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	04/26/2012 13:06	EPA 200.8
Silica, SiO2 (Dissolved)	8.34	mg/L	0.02	0.004	DAM	05/24/2012 18:02	EPA 200.7
Boron, B	0.052	mg/L	0.01	0.002	DAM	04/26/2012 16:08	EPA 200.7
Calcium, Ca	36.8	mg/L	0.02	0.004	DAM	04/26/2012 16:08	EPA 200.7
Iron, Fe	3.11	mg/L	0.01	0.002	DAM	04/26/2012 16:08	EPA 200.7
Magnesium, Mg	20.6	mg/L	0.05	0.01	DAM	04/26/2012 16:08	EPA 200.7
Manganese, Mn	2.30	mg/L	0.0005	0.0001	DAM	04/26/2012 16:08	EPA 200.7
Potassium, K	3.24	mg/L	0.05	0.01	DAM	04/26/2012 16:07	EPA 200.7
Sodium, Na	18.8	mg/L	0.05	0.01	DAM	04/26/2012 16:07	EPA 200.7
Alkalinity, as CaCO3	154	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	169	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/08/2012	SM20 5220D
Chloride, Cl	6.1	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	252	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	61.1	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.06	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #002 **Total Dissolved Metals Reported.**

Sample Number: 121729-002 **Date Collected: 04/17/2012 14:36** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	04/26/2012 13:11	EPA 200.8
Arsenic, As	0.27	ug/L	0.1	0.03	DPC	04/26/2012 13:11	EPA 200.8
Barium, Ba	161	ug/L	10	2	DAM	04/26/2012 16:10	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:10	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:10	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:10	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:10	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:10	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:10	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:11	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:10	EPA 200.7
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	04/26/2012 13:11	EPA 200.8
Silica, SiO2 (Dissolved)	14.9	mg/L	0.02	0.004	DAM	05/24/2012 18:06	EPA 200.7
Boron, B	0.054	mg/L	0.01	0.002	DAM	04/26/2012 16:10	EPA 200.7
Calcium, Ca	90.0	mg/L	0.02	0.004	DAM	04/26/2012 16:10	EPA 200.7
Iron, Fe	2.18	mg/L	0.01	0.002	DAM	04/26/2012 16:10	EPA 200.7
Magnesium, Mg	40.0	mg/L	0.05	0.01	DAM	04/26/2012 16:10	EPA 200.7
Manganese, Mn	2.29	mg/L	0.0005	0.0001	DAM	04/26/2012 16:10	EPA 200.7
Potassium, K	6.16	mg/L	0.05	0.01	DAM	04/26/2012 16:09	EPA 200.7
Sodium, Na	15.8	mg/L	0.05	0.01	DAM	04/26/2012 16:09	EPA 200.7
Alkalinity, as CaCO3	364	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	364	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	9	mg/L	5	1	WKE	05/08/2012	SM20 5220D
Chloride, Cl	4.6	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	456	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	57.9	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	3.85	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #003 **Total Dissolved Metals Reported.**

Sample Number: 121729-003 **Date Collected: 04/17/2012 14:36** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	0.05	0.01	DPC	04/26/2012 13:16	EPA 200.8
Arsenic, As	0.30	ug/L	0.1	0.03	DPC	04/26/2012 13:16	EPA 200.8
Barium, Ba	17	ug/L	10	2	DAM	04/26/2012 16:14	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:14	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:14	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:14	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:14	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:14	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:14	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:16	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:14	EPA 200.7
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	04/26/2012 13:16	EPA 200.8
Silica, SiO2 (Dissolved)	19.9	mg/L	0.02	0.004	DAM	05/24/2012 18:09	EPA 200.7
Boron, B	0.016	mg/L	0.01	0.002	DAM	04/26/2012 16:14	EPA 200.7
Calcium, Ca	109	mg/L	0.02	0.004	DAM	04/26/2012 16:14	EPA 200.7
Iron, Fe	0.053	mg/L	0.01	0.002	DAM	04/26/2012 16:14	EPA 200.7
Magnesium, Mg	61.7	mg/L	0.05	0.01	DAM	04/26/2012 16:14	EPA 200.7
Manganese, Mn	3.93	mg/L	0.0005	0.0001	DAM	04/26/2012 16:14	EPA 200.7
Potassium, K	4.31	mg/L	0.05	0.01	DAM	04/26/2012 16:13	EPA 200.7
Sodium, Na	15.9	mg/L	0.05	0.01	DAM	04/26/2012 16:13	EPA 200.7
Alkalinity, as CaCO3	231	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	231	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/08/2012	SM20 5220D
Chloride, Cl	5.0	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	725	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	301	mg/L	10	2	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	2.35	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #004 **Total Dissolved Metals Reported.**

Sample Number: 121729-004 **Date Collected: 04/17/2012 11:52** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Arsenic, As	0.69	ug/L	0.1	0.03	DPC	04/26/2012 13:20	EPA 200.8
Barium, Ba	16	ug/L	10	2	DAM	04/26/2012 16:18	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:18	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:18	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:18	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:18	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:18	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:18	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:20	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:18	EPA 200.7
Thallium, Tl	0.14	ug/L	0.05	0.01	DPC	04/26/2012 13:20	EPA 200.8
Silica, SiO2 (Dissolved)	7.48	mg/L	0.02	0.004	DAM	05/24/2012 18:13	EPA 200.7
Boron, B	0.135	mg/L	0.01	0.002	DAM	04/26/2012 16:18	EPA 200.7
Calcium, Ca	303	mg/L	0.02	0.004	DAM	04/26/2012 16:18	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	04/26/2012 16:18	EPA 200.7
Magnesium, Mg	126	mg/L	0.05	0.01	DAM	04/26/2012 16:18	EPA 200.7
Manganese, Mn	0.0496	mg/L	0.0005	0.0001	DAM	04/26/2012 16:18	EPA 200.7
Potassium, K	20.7	mg/L	0.05	0.01	DAM	04/26/2012 16:16	EPA 200.7
Sodium, Na	53.3	mg/L	0.05	0.01	DAM	04/26/2012 16:16	EPA 200.7
Alkalinity, as CaCO3	395	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	395	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/08/2012	SM20 5220D
Chloride, Cl	3.4	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.21	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1770	mg/L	40	10	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	887	mg/L	10	2	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	3.49	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #1010 **Total Dissolved Metals Reported.**

Sample Number: 121729-005 **Date Collected: 04/17/2012 15:44** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.86	ug/L	0.05	0.01	DPC	04/26/2012 13:35	EPA 200.8
Arsenic, As	49.5	ug/L	0.1	0.03	DPC	04/26/2012 13:35	EPA 200.8
Barium, Ba	31	ug/L	10	2	DAM	04/26/2012 16:22	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:22	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:22	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:22	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:22	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:22	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:22	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:35	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:22	EPA 200.7
Thallium, Tl	0.16	ug/L	0.05	0.01	DPC	04/26/2012 13:35	EPA 200.8
Silica, SiO2 (Dissolved)	9.79	mg/L	0.02	0.004	DAM	05/24/2012 18:17	EPA 200.7
Boron, B	0.093	mg/L	0.01	0.002	DAM	04/26/2012 16:22	EPA 200.7
Calcium, Ca	12.3	mg/L	0.02	0.004	DAM	04/26/2012 16:21	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	04/26/2012 16:22	EPA 200.7
Magnesium, Mg	2.85	mg/L	0.05	0.01	DAM	04/26/2012 16:22	EPA 200.7
Manganese, Mn	0.0243	mg/L	0.0005	0.0001	DAM	04/26/2012 16:22	EPA 200.7
Potassium, K	3.78	mg/L	0.05	0.01	DAM	04/26/2012 16:20	EPA 200.7
Sodium, Na	265	mg/L	0.05	0.01	DAM	04/26/2012 16:20	EPA 200.7
Alkalinity, as CaCO3	499	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	494	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/08/2012	SM20 5220D
Chloride, Cl	1.9	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	701	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	99.0	mg/L	10	2	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.19	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #1012 **Total Dissolved Metals Reported.**

Sample Number: 121729-006 **Date Collected: 04/17/2012 10:30** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.88	ug/L	0.05	0.01	DPC	04/26/2012 13:54	EPA 200.8
Arsenic, As	193	ug/L	0.1	0.03	DPC	04/26/2012 13:54	EPA 200.8
Barium, Ba	29	ug/L	10	2	DAM	04/26/2012 16:25	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:25	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:26	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:26	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:25	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:26	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	6.7	ug/L	2	0.5	DAM	04/26/2012 16:26	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:54	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:25	EPA 200.7
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	04/26/2012 13:54	EPA 200.8
Silica, SiO2 (Dissolved)	5.96	mg/L	0.02	0.004	DAM	05/24/2012 18:21	EPA 200.7
Boron, B	0.171	mg/L	0.01	0.002	DAM	04/26/2012 16:25	EPA 200.7
Calcium, Ca	2.65	mg/L	0.02	0.004	DAM	04/26/2012 16:25	EPA 200.7
Iron, Fe	0.413	mg/L	0.01	0.002	DAM	04/26/2012 16:25	EPA 200.7
Magnesium, Mg	1.03	mg/L	0.05	0.01	DAM	04/26/2012 16:25	EPA 200.7
Manganese, Mn	0.0143	mg/L	0.0005	0.0001	DAM	04/26/2012 16:25	EPA 200.7
Potassium, K	1.69	mg/L	0.05	0.01	DAM	04/26/2012 16:24	EPA 200.7
Sodium, Na	220	mg/L	0.05	0.01	DAM	04/26/2012 16:24	EPA 200.7
Alkalinity, as CaCO3	424	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	395	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	4.1	mg/L	0.4	0.02	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	531	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	47.6	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.43	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well Duplicate **Total Dissolved Metals Reported.**

Sample Number: 121729-007 **Date Collected: 04/17/2012** **Date Received: 4/18/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.10	ug/L	0.05	0.01	DPC	04/26/2012 13:59	EPA 200.8
Arsenic, As	1.07	ug/L	0.1	0.03	DPC	04/26/2012 13:59	EPA 200.8
Barium, Ba	40	ug/L	10	2	DAM	04/26/2012 16:44	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:44	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/26/2012 16:45	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/26/2012 16:45	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/26/2012 16:44	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/26/2012 16:45	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/26/2012 16:45	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	04/26/2012 13:59	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/26/2012 16:44	EPA 200.7
Thallium, Tl	0.07	ug/L	0.05	0.01	DPC	04/26/2012 13:59	EPA 200.8
Silica, SiO2 (Dissolved)	8.36	mg/L	0.02	0.004	DAM	05/24/2012 18:24	EPA 200.7
Boron, B	0.055	mg/L	0.01	0.002	DAM	04/26/2012 16:44	EPA 200.7
Calcium, Ca	37.7	mg/L	0.02	0.004	DAM	04/26/2012 16:44	EPA 200.7
Iron, Fe	3.16	mg/L	0.01	0.002	DAM	04/26/2012 16:44	EPA 200.7
Magnesium, Mg	20.7	mg/L	0.05	0.01	DAM	04/26/2012 16:44	EPA 200.7
Manganese, Mn	2.34	mg/L	0.0005	0.0001	DAM	04/26/2012 16:44	EPA 200.7
Potassium, K	3.29	mg/L	0.05	0.01	DAM	04/26/2012 16:43	EPA 200.7
Sodium, Na	19.1	mg/L	0.05	0.01	DAM	04/26/2012 16:43	EPA 200.7
Alkalinity, as CaCO3	154	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	154	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.1	CRJ	04/30/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	5.8	mg/L	1	0.05	CRJ	04/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/19/2012	SM20 4500NO3 H
Residue, Filterable, TDS	249	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	58.6	mg/L	2	0.3	CRJ	04/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.15	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 6/1/2012***

Monitoring Well #1011 **Total Dissolved Metals Reported.**

Sample Number: 121752-001 **Date Collected: 04/18/2012 09:29** **Date Received: 4/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.47	ug/L	0.05	0.01	DPC	05/01/2012 11:15	EPA 200.8
Arsenic, As	34.5	ug/L	0.1	0.03	DPC	05/01/2012 11:15	EPA 200.8
Barium, Ba	58	ug/L	10	2	DAM	04/27/2012 09:59	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 09:59	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 09:59	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/27/2012 09:59	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/27/2012 09:59	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/27/2012 09:59	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	3.8	ug/L	2	0.5	DAM	04/27/2012 09:59	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	05/01/2012 11:15	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/27/2012 09:59	EPA 200.7
Thallium, Tl	0.05	ug/L	0.05	0.01	DPC	05/01/2012 11:15	EPA 200.8
Silica, SiO2 (Dissolved)	15.2	mg/L	0.02	0.004	DAM	05/24/2012 18:28	EPA 200.7
Boron, B	0.117	mg/L	0.01	0.002	DAM	04/27/2012 09:59	EPA 200.7
Calcium, Ca	82.3	mg/L	0.02	0.004	DAM	04/27/2012 09:59	EPA 200.7
Iron, Fe	0.872	mg/L	0.01	0.002	DAM	04/27/2012 09:59	EPA 200.7
Magnesium, Mg	18.8	mg/L	0.05	0.01	DAM	04/27/2012 09:59	EPA 200.7
Manganese, Mn	0.406	mg/L	0.0005	0.0001	DAM	04/27/2012 09:59	EPA 200.7
Potassium, K	4.80	mg/L	0.05	0.01	DAM	04/27/2012 09:58	EPA 200.7
Sodium, Na	26.4	mg/L	0.05	0.01	DAM	04/27/2012 09:58	EPA 200.7
Alkalinity, as CaCO3	252	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	252	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.2	KLG	05/01/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	2.5	mg/L	0.2	0.05	KLG	05/01/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/23/2012	SM20 4500NO3 H
Residue, Filterable, TDS	378	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	68.3	mg/L	1	0.3	KLG	05/01/2012	EPA 300.1
Total Organic Carbon, TOC	1.13	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #1009 **Total Dissolved Metals Reported.**

Sample Number: 121752-002 **Date Collected: 04/18/2012 10:12** **Date Received: 4/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	05/01/2012 11:20	EPA 200.8
Arsenic, As	0.54	ug/L	0.1	0.03	DPC	05/01/2012 11:20	EPA 200.8
Barium, Ba	21	ug/L	10	2	DAM	04/27/2012 10:01	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:01	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:02	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/27/2012 10:02	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/27/2012 10:01	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/27/2012 10:02	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	< 2.0	ug/L	2	0.5	DAM	04/27/2012 10:02	EPA 200.7
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	05/01/2012 11:20	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/27/2012 10:01	EPA 200.7
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	05/01/2012 11:20	EPA 200.8
Silica, SiO2 (Dissolved)	17.6	mg/L	0.02	0.004	DAM	05/24/2012 18:32	EPA 200.7
Boron, B	0.177	mg/L	0.01	0.002	DAM	04/27/2012 10:01	EPA 200.7
Calcium, Ca	237	mg/L	0.02	0.004	DAM	04/27/2012 10:01	EPA 200.7
Iron, Fe	2.45	mg/L	0.01	0.002	DAM	04/27/2012 10:01	EPA 200.7
Magnesium, Mg	59.6	mg/L	0.05	0.01	DAM	04/27/2012 10:01	EPA 200.7
Manganese, Mn	0.321	mg/L	0.0005	0.0001	DAM	04/27/2012 10:01	EPA 200.7
Potassium, K	6.19	mg/L	0.05	0.01	DAM	04/27/2012 10:00	EPA 200.7
Sodium, Na	32.8	mg/L	0.05	0.01	DAM	04/27/2012 10:00	EPA 200.7
Alkalinity, as CaCO3	472	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	471	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.2	KLG	05/01/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	13.4	mg/L	0.2	0.05	KLG	05/01/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/23/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1110	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	398	mg/L	5	2	KLG	05/01/2012	EPA 300.1
Total Organic Carbon, TOC	1.89	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #1007 **Total Dissolved Metals Reported.**

Sample Number: 121752-003 **Date Collected: 04/18/2012 13:13** **Date Received: 4/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.03	ug/L	0.05	0.01	DPC	05/01/2012 11:24	EPA 200.8
Arsenic, As	2.91	ug/L	0.1	0.03	DPC	05/01/2012 11:24	EPA 200.8
Barium, Ba	65	ug/L	10	2	DAM	04/27/2012 10:05	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:05	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:05	EPA 200.7
Chromium, Cr	< 2.0	ug/L	2	0.4	DAM	04/27/2012 10:05	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/27/2012 10:05	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/27/2012 10:05	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	9.8	ug/L	2	0.5	DAM	04/27/2012 10:05	EPA 200.7
Selenium, Se	0.6	ug/L	0.5	0.1	DPC	05/01/2012 11:24	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/27/2012 10:05	EPA 200.7
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	05/01/2012 11:24	EPA 200.8
Silica, SiO2 (Dissolved)	9.88	mg/L	0.02	0.004	DAM	05/24/2012 18:47	EPA 200.7
Boron, B	0.080	mg/L	0.01	0.002	DAM	04/27/2012 10:05	EPA 200.7
Calcium, Ca	79.5	mg/L	0.02	0.004	DAM	04/27/2012 10:05	EPA 200.7
Iron, Fe	0.087	mg/L	0.01	0.002	DAM	04/27/2012 10:05	EPA 200.7
Magnesium, Mg	29.0	mg/L	0.05	0.01	DAM	04/27/2012 10:05	EPA 200.7
Manganese, Mn	0.0167	mg/L	0.0005	0.0001	DAM	04/27/2012 10:05	EPA 200.7
Potassium, K	3.71	mg/L	0.05	0.01	DAM	04/27/2012 10:04	EPA 200.7
Sodium, Na	13.5	mg/L	0.05	0.01	DAM	04/27/2012 10:04	EPA 200.7
Alkalinity, as CaCO3	199	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	198	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.2	KLG	05/01/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	8.4	mg/L	0.2	0.05	KLG	05/01/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/23/2012	SM20 4500NO3 H
Residue, Filterable, TDS	407	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	116	mg/L	2	0.6	KLG	05/01/2012	EPA 300.1
Total Organic Carbon, TOC	2.16	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Monitoring Well #1008 **Total Dissolved Metals Reported.**

Sample Number: 121752-004 **Date Collected:** 04/18/2012 11:51 **Date Received:** 4/19/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.69	ug/L	0.05	0.01	DPC	05/01/2012 11:29	EPA 200.8
Arsenic, As	0.76	ug/L	0.1	0.03	DPC	05/01/2012 11:29	EPA 200.8
Barium, Ba	74	ug/L	10	2	DAM	04/27/2012 10:09	EPA 200.7
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:09	EPA 200.7
Cadmium, Cd	< 0.5	ug/L	0.5	0.1	DAM	04/27/2012 10:09	EPA 200.7
Chromium, Cr	2.6	ug/L	2	0.4	DAM	04/27/2012 10:09	EPA 200.7
Copper, Cu	< 5.0	ug/L	5	1	DAM	04/27/2012 10:09	EPA 200.7
Lead, Pb	< 10	ug/L	10	2	DAM	04/27/2012 10:09	EPA 200.7
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	04/24/2012	EPA 245.2
Molybdenum, Mo	4.8	ug/L	2	0.5	DAM	04/27/2012 10:09	EPA 200.7
Selenium, Se	4.8	ug/L	0.5	0.1	DPC	05/01/2012 11:29	EPA 200.8
Silver, Ag	< 5.0	ug/L	5	1	DAM	04/27/2012 10:09	EPA 200.7
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	05/01/2012 11:29	EPA 200.8
Silica, SiO2 (Dissolved)	16.2	mg/L	0.02	0.004	DAM	05/24/2012 18:50	EPA 200.7
Boron, B	0.103	mg/L	0.01	0.002	DAM	04/27/2012 10:09	EPA 200.7
Calcium, Ca	72.3	mg/L	0.02	0.004	DAM	04/27/2012 10:09	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	04/27/2012 10:09	EPA 200.7
Magnesium, Mg	47.2	mg/L	0.05	0.01	DAM	04/27/2012 10:09	EPA 200.7
Manganese, Mn	0.0017	mg/L	0.0005	0.0001	DAM	04/27/2012 10:09	EPA 200.7
Potassium, K	3.99	mg/L	0.05	0.01	DAM	04/27/2012 10:08	EPA 200.7
Sodium, Na	20.9	mg/L	0.05	0.01	DAM	04/27/2012 10:07	EPA 200.7
Alkalinity, as CaCO3	298	mg/L	5	1	WKE	04/25/2012	SM20 2320B
Bicarbonate Alkalinity	297	mg/L	5	2	WKE	04/25/2012	SM20 4500-CO2D
Bromide, Br	< 1.0	mg/L	1	0.2	KLG	05/01/2012	EPA 300.1
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	05/10/2012	SM20 5220D
Chloride, Cl	5.8	mg/L	0.2	0.05	KLG	05/01/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	04/23/2012	SM20 4500NO3 H
Residue, Filterable, TDS	466	mg/L	20	6	JAV	04/24/2012	SM20 2540C
Sulfate, SO4	105	mg/L	1	0.3	KLG	05/01/2012	EPA 300.1
Total Organic Carbon, TOC	0.883	mg/L	0.02	0.004	DMM	04/26/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

Report Summary

Tuesday June 05, 2012

Report Number: L576055
Samples Received: 05/18/12
Client Project: 13815142

Description: AEP Big Sandy-KY

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: Darren D. Reeder

Darren Reeder , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-01

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1207

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/15/12 17:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	1700	1000	ug/l	9056	05/21/12	1
Sulfate	BDL	5000	ug/l	9056	05/21/12	1
Alkalinity,Bicarbonate	210000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	BDL	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	1600	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	260000	10000	ug/l	2540C	05/23/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	2800	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	BDL	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	760	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	3200	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	100000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

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REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-02

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1206

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/16/12 09:10

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	6400	1000	ug/l	9056	05/21/12	1
Sulfate	6900	5000	ug/l	9056	05/21/12	1
Alkalinity,Bicarbonate	150000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	12000	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	2500	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	190000	10000	ug/l	2540C	05/24/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	29.	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	24000	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	6000	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	8200	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	3000	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	30000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-03

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1203

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/16/12 10:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	6000	1000	ug/l	9056	05/21/12	1
Sulfate	39000	5000	ug/l	9056	05/21/12	1
Alkalinity,Bicarbonate	180000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	BDL	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	BDL	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	250000	10000	ug/l	2540C	05/24/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	60000	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	1900	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	5.0	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	14000	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	4100	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	15000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

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REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-04

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-100

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/16/12 12:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	2400	1000	ug/l	9056	05/21/12	1
Sulfate	6800	5000	ug/l	9056	05/21/12	1
Alkalinity,Bicarbonate	150000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	13000	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	2100	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	180000	10000	ug/l	2540C	05/25/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	29.	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	25000	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	6500	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	8600	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	3100	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	30000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-05

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1202

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/16/12 15:15

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	4100	1000	ug/l	9056	05/21/12	1
Sulfate	200000	25000	ug/l	9056	05/22/12	5
Alkalinity,Bicarbonate	300000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	BDL	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	BDL	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	640000	10000	ug/l	2540C	05/25/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	130000	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	BDL	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	12.	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	40000	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	4700	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	23000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-06

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1204

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/16/12 09:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	11000	1000	ug/l	9056	05/21/12	1
Sulfate	170000	10000	ug/l	9056	05/22/12	2
Alkalinity,Bicarbonate	250000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
COD	62000	10000	ug/l	410.4	05/22/12	1
TOC (Total Organic Carbon)	3200	1000	ug/l	9060A	05/23/12	1
Dissolved Solids	570000	10000	ug/l	2540C	05/25/12	1
Mercury,Dissolved	BDL	0.20	ug/l	7470A	05/23/12	1
Arsenic,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/21/12	1
Calcium,Dissolved	100000	500	ug/l	6010B	05/21/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Iron,Dissolved	BDL	100	ug/l	6010B	05/21/12	1
Lead,Dissolved	8.4	5.0	ug/l	6010B	05/21/12	1
Magnesium,Dissolved	42000	100	ug/l	6010B	05/21/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Potassium,Dissolved	4700	500	ug/l	6010B	05/21/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/21/12	1
Sodium,Dissolved	17000	500	ug/l	6010B	05/21/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/21/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-07

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1201

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/17/12 13:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	38000	1000	ug/l	9056	05/21/12	1
Sulfate	120000	10000	ug/l	9056	05/22/12	2
Alkalinity,Bicarbonate	220000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

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Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Jason Lach
URS Corporation - Cincinnati
36 East Seventh St, Ste 2300
Cincinnati, OH 45202

June 05,2012

ESC Sample # : L576055-08

Date Received : May 18, 2012
Description : AEP Big Sandy-KY

Site ID : BIG SANDY-KY

Sample ID : MW-1205

Project # : 13815142

Collected By : KP / JL
Collection Date : 05/17/12 14:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	9100	1000	ug/l	9056	05/21/12	1
Sulfate	56000	5000	ug/l	9056	05/21/12	1
Alkalinity,Bicarbonate	250000	20000	ug/l	2320B	05/24/12	1
Alkalinity,Carbonate	BDL	20000	ug/l	2320B	05/24/12	1
Arsenic,Dissolved	BDL	20.	ug/l	6010B	05/23/12	1
Cadmium,Dissolved	BDL	5.0	ug/l	6010B	05/23/12	1
Calcium,Dissolved	29000	500	ug/l	6010B	05/23/12	1
Copper,Dissolved	BDL	20.	ug/l	6010B	05/23/12	1
Iron,Dissolved	BDL	100	ug/l	6010B	05/23/12	1
Lead,Dissolved	BDL	5.0	ug/l	6010B	05/23/12	1
Magnesium,Dissolved	7300	100	ug/l	6010B	05/23/12	1
Nickel,Dissolved	BDL	20.	ug/l	6010B	05/23/12	1
Potassium,Dissolved	7500	500	ug/l	6010B	05/23/12	1
Selenium,Dissolved	BDL	20.	ug/l	6010B	05/23/12	1
Sodium,Dissolved	110000	500	ug/l	6010B	05/23/12	1
Zinc,Dissolved	BDL	30.	ug/l	6010B	05/23/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 06/05/12 08:30 Printed: 06/05/12 09:56

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 8/16/2012***

Monitoring Well #1203

Sample Number: 123151-001 **Date Collected: 07/23/2012 11:05** **Date Received: 7/24/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	0.12	ug/L	0.05	0.01	DPC	08/15/2012 11:07	EPA 200.8
Arsenic, As	0.32	ug/L	0.1	0.03	DPC	08/15/2012 11:07	EPA 200.8
Barium, Ba	93.4	ug/L	0.1	0.03	DPC	08/15/2012 11:07	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 09:09	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:07	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 11:07	EPA 200.8
Copper, Cu	0.08	ug/L	0.05	0.02	DPC	08/15/2012 11:07	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:07	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	0.20	ug/L	0.1	0.02	DPC	08/15/2012 11:07	EPA 200.8
Nickel, Ni	0.80	ug/L	0.2	0.04	DPC	08/15/2012 11:07	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 11:07	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:07	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:07	EPA 200.8
Zinc, Zn	1.7	ug/L	0.5	0.1	DPC	08/15/2012 11:07	EPA 200.8
Silica, SiO2 (Dissolved)	8.94	mg/L	0.02	0.004	DAM	08/09/2012 14:29	EPA 200.7
Boron, B	0.095	mg/L	0.01	0.002	DAM	08/14/2012 10:43	EPA 200.7
Calcium, Ca	61.3	mg/L	0.02	0.004	DAM	08/14/2012 10:43	EPA 200.7
Iron, Fe	2.88	mg/L	0.01	0.002	DAM	08/14/2012 10:43	EPA 200.7
Magnesium, Mg	13.9	mg/L	0.05	0.01	DAM	08/14/2012 10:43	EPA 200.7
Manganese, Mn	1.05	mg/L	0.0005	0.0001	DAM	08/14/2012 10:43	EPA 200.7
Potassium, K	3.71	mg/L	0.05	0.01	DAM	08/14/2012 10:42	EPA 200.7
Sodium, Na	14.0	mg/L	0.05	0.01	DAM	08/14/2012 10:42	EPA 200.7
Alkalinity, as CaCO3	208	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	208	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	5.3	mg/L	0.1	0.02	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	265	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	33.1	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	0.564	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

SW-2

Sample Number: 123151-002 **Date Collected:** 07/23/2012 11:48 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	1.0	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	16.9	ug/L	0.05	0.01	DPC	08/15/2012 11:21	EPA 200.8
Arsenic, As	6.80	ug/L	0.1	0.03	DPC	08/15/2012 11:21	EPA 200.8
Barium, Ba	154	ug/L	0.1	0.03	DPC	08/15/2012 11:21	EPA 200.8
Beryllium, Be	0.193	ug/L	0.02	0.004	DPC	08/14/2012 09:26	EPA 200.8
Cadmium, Cd	1.49	ug/L	0.05	0.01	DPC	08/15/2012 11:21	EPA 200.8
Chromium, Cr	0.7	ug/L	0.2	0.03	DPC	08/15/2012 11:21	EPA 200.8
Copper, Cu	10.1	ug/L	0.05	0.02	DPC	08/15/2012 11:21	EPA 200.8
Lead, Pb	0.064	ug/L	0.01	0.003	DPC	08/15/2012 11:21	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	187	ug/L	0.1	0.02	DPC	08/15/2012 11:21	EPA 200.8
Nickel, Ni	34.0	ug/L	0.2	0.04	DPC	08/15/2012 11:21	EPA 200.8
Selenium, Se	5.8	ug/L	0.5	0.1	DPC	08/15/2012 11:21	EPA 200.8
Silver, Ag	0.019	ug/L	0.01	0.003	DPC	08/15/2012 11:21	EPA 200.8
Thallium, Tl	9.68	ug/L	0.05	0.01	DPC	08/15/2012 11:21	EPA 200.8
Zinc, Zn	30.4	ug/L	0.5	0.1	DPC	08/15/2012 11:21	EPA 200.8
Silica, SiO2 (Dissolved)	8.18	mg/L	0.02	0.004	DAM	08/09/2012 14:30	EPA 200.7
Boron, B	1.03	mg/L	0.01	0.002	DAM	08/14/2012 10:47	EPA 200.7
Calcium, Ca	96.8	mg/L	0.02	0.004	DAM	08/14/2012 10:47	EPA 200.7
Iron, Fe	0.017	mg/L	0.01	0.002	DAM	08/14/2012 10:47	EPA 200.7
Magnesium, Mg	41.6	mg/L	0.05	0.01	DAM	08/14/2012 10:47	EPA 200.7
Manganese, Mn	0.423	mg/L	0.0005	0.0001	DAM	08/14/2012 10:47	EPA 200.7
Potassium, K	14.8	mg/L	0.05	0.01	DAM	08/14/2012 10:46	EPA 200.7
Sodium, Na	90.2	mg/L	0.05	0.01	DAM	08/14/2012 10:46	EPA 200.7
Alkalinity, as CaCO3	21	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	21	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	9	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	53.0	mg/L	2	0.5	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	1.52	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	856	mg/L	40	10	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	535	mg/L	10	3	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.59	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

SP-1

Sample Number: 123151-003 **Date Collected:** 07/23/2012 11:30 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	0.08	ug/L	0.05	0.01	DPC	08/15/2012 11:26	EPA 200.8
Arsenic, As	0.42	ug/L	0.1	0.03	DPC	08/15/2012 11:26	EPA 200.8
Barium, Ba	34.6	ug/L	0.1	0.03	DPC	08/15/2012 11:26	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 09:32	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:26	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 11:26	EPA 200.8
Copper, Cu	1.02	ug/L	0.05	0.02	DPC	08/15/2012 11:26	EPA 200.8
Lead, Pb	0.030	ug/L	0.01	0.003	DPC	08/15/2012 11:26	EPA 200.8
Mercury, Hg	2.31	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	0.58	ug/L	0.1	0.02	DPC	08/15/2012 11:26	EPA 200.8
Nickel, Ni	0.65	ug/L	0.2	0.04	DPC	08/15/2012 11:26	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 11:26	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:26	EPA 200.8
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	08/15/2012 11:26	EPA 200.8
Zinc, Zn	2.9	ug/L	0.5	0.1	DPC	08/15/2012 11:26	EPA 200.8
Silica, SiO2 (Dissolved)	10.2	mg/L	0.02	0.004	DAM	08/09/2012 14:31	EPA 200.7
Boron, B	0.025	mg/L	0.01	0.002	DAM	08/14/2012 10:51	EPA 200.7
Calcium, Ca	23.7	mg/L	0.02	0.004	DAM	08/14/2012 10:51	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 10:51	EPA 200.7
Magnesium, Mg	7.40	mg/L	0.05	0.01	DAM	08/14/2012 10:51	EPA 200.7
Manganese, Mn	0.0022	mg/L	0.0005	0.0001	DAM	08/14/2012 10:51	EPA 200.7
Potassium, K	1.45	mg/L	0.05	0.01	DAM	08/14/2012 10:49	EPA 200.7
Sodium, Na	5.18	mg/L	0.05	0.01	DAM	08/14/2012 10:49	EPA 200.7
Alkalinity, as CaCO3	42	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	42	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	7	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	1.9	mg/L	0.1	0.02	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.51	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	154	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	63.5	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	1.65	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

Monitoring Well #1202

Sample Number: 123151-004 **Date Collected:** 07/23/2012 12:59 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	0.11	ug/L	0.05	0.01	DPC	08/15/2012 11:31	EPA 200.8
Arsenic, As	0.62	ug/L	0.1	0.03	DPC	08/15/2012 11:31	EPA 200.8
Barium, Ba	18.7	ug/L	0.1	0.03	DPC	08/15/2012 11:31	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 09:37	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:31	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 11:31	EPA 200.8
Copper, Cu	0.37	ug/L	0.05	0.02	DPC	08/15/2012 11:31	EPA 200.8
Lead, Pb	0.015	ug/L	0.01	0.003	DPC	08/15/2012 11:31	EPA 200.8
Mercury, Hg	18.54	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	0.54	ug/L	0.1	0.02	DPC	08/15/2012 11:31	EPA 200.8
Nickel, Ni	0.78	ug/L	0.2	0.04	DPC	08/15/2012 11:31	EPA 200.8
Selenium, Se	1.9	ug/L	0.5	0.1	DPC	08/15/2012 11:31	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:31	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:31	EPA 200.8
Zinc, Zn	3.5	ug/L	0.5	0.1	DPC	08/15/2012 11:31	EPA 200.8
Silica, SiO2 (Dissolved)	14.0	mg/L	0.02	0.004	DAM	08/09/2012 14:31	EPA 200.7
Boron, B	0.059	mg/L	0.01	0.002	DAM	08/14/2012 10:55	EPA 200.7
Calcium, Ca	138	mg/L	0.02	0.004	DAM	08/14/2012 10:55	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 10:55	EPA 200.7
Magnesium, Mg	41.7	mg/L	0.05	0.01	DAM	08/14/2012 10:55	EPA 200.7
Manganese, Mn	0.0143	mg/L	0.0005	0.0001	DAM	08/14/2012 10:55	EPA 200.7
Potassium, K	4.62	mg/L	0.05	0.01	DAM	08/14/2012 10:53	EPA 200.7
Sodium, Na	23.6	mg/L	0.05	0.01	DAM	08/14/2012 10:53	EPA 200.7
Alkalinity, as CaCO3	356	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	356	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 5	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	3.8	mg/L	0.1	0.02	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.74	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	665	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	198	mg/L	10	3	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	0.905	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

Monitoring Well #1201

Sample Number: 123151-005 **Date Collected:** 07/23/2012 13:27 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	0.56	ug/L	0.05	0.01	DPC	08/15/2012 11:35	EPA 200.8
Arsenic, As	1.54	ug/L	0.1	0.03	DPC	08/15/2012 11:35	EPA 200.8
Barium, Ba	24.9	ug/L	0.1	0.03	DPC	08/15/2012 11:35	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 09:42	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:35	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 11:35	EPA 200.8
Copper, Cu	0.71	ug/L	0.05	0.02	DPC	08/15/2012 11:35	EPA 200.8
Lead, Pb	0.121	ug/L	0.01	0.003	DPC	08/15/2012 11:35	EPA 200.8
Mercury, Hg	8.77	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	21.2	ug/L	0.1	0.02	DPC	08/15/2012 11:35	EPA 200.8
Nickel, Ni	1.18	ug/L	0.2	0.04	DPC	08/15/2012 11:35	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 11:35	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:35	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:35	EPA 200.8
Zinc, Zn	4.4	ug/L	0.5	0.1	DPC	08/15/2012 11:35	EPA 200.8
Silica, SiO2 (Dissolved)	8.88	mg/L	0.02	0.004	DAM	08/09/2012 15:00	EPA 200.7
Boron, B	0.188	mg/L	0.01	0.002	DAM	08/14/2012 10:58	EPA 200.7
Calcium, Ca	9.46	mg/L	0.02	0.004	DAM	08/14/2012 10:58	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 10:59	EPA 200.7
Magnesium, Mg	2.19	mg/L	0.05	0.01	DAM	08/14/2012 10:58	EPA 200.7
Manganese, Mn	0.0971	mg/L	0.0005	0.0001	DAM	08/14/2012 10:58	EPA 200.7
Potassium, K	3.28	mg/L	0.05	0.01	DAM	08/14/2012 10:57	EPA 200.7
Sodium, Na	192	mg/L	0.05	0.01	DAM	08/14/2012 10:57	EPA 200.7
Alkalinity, as CaCO3	359	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	356	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chloride, Cl	13.5	mg/L	2	0.5	KLG	07/30/2012	EPA 300.1
Residue, Filterable, TDS	517	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	69.5	mg/L	10	3	KLG	07/30/2012	EPA 300.1

SP-2

Sample Number: 123151-006 **Date Collected:** 07/23/2012 15:13 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	0.24	ug/L	0.05	0.01	DPC	08/15/2012 11:40	EPA 200.8
Arsenic, As	3.40	ug/L	0.1	0.03	DPC	08/15/2012 11:40	EPA 200.8
Barium, Ba	137	ug/L	0.1	0.03	DPC	08/15/2012 11:40	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 09:48	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:40	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 11:40	EPA 200.8
Copper, Cu	0.40	ug/L	0.05	0.02	DPC	08/15/2012 11:40	EPA 200.8
Lead, Pb	0.088	ug/L	0.01	0.003	DPC	08/15/2012 11:40	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	1.39	ug/L	0.1	0.02	DPC	08/15/2012 11:40	EPA 200.8
Nickel, Ni	3.53	ug/L	0.2	0.04	DPC	08/15/2012 11:40	EPA 200.8
Selenium, Se	0.6	ug/L	0.5	0.1	DPC	08/15/2012 11:40	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:40	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:40	EPA 200.8
Zinc, Zn	1.6	ug/L	0.5	0.1	DPC	08/15/2012 11:40	EPA 200.8
Silica, SiO2 (Dissolved)	13.1	mg/L	0.02	0.004	DAM	08/09/2012 15:01	EPA 200.7
Boron, B	0.136	mg/L	0.01	0.002	DAM	08/14/2012 11:02	EPA 200.7
Calcium, Ca	338	mg/L	0.02	0.004	DAM	08/14/2012 11:02	EPA 200.7
Iron, Fe	0.032	mg/L	0.01	0.002	DAM	08/14/2012 11:03	EPA 200.7
Magnesium, Mg	225	mg/L	0.05	0.01	DAM	08/14/2012 11:02	EPA 200.7
Manganese, Mn	0.484	mg/L	0.0005	0.0001	DAM	08/14/2012 11:02	EPA 200.7
Potassium, K	14.6	mg/L	0.05	0.01	DAM	08/14/2012 11:01	EPA 200.7
Sodium, Na	159	mg/L	0.05	0.01	DAM	08/14/2012 11:01	EPA 200.7
Alkalinity, as CaCO3	350	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	348	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	20	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	11.5	mg/L	2	0.5	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	2810	mg/L	80	20	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	1750	mg/L	10	3	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	7.49	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

SW-1

Sample Number: 123151-007 **Date Collected:** 07/23/2012 16:00 **Date Received:** 7/24/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	1.9	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	17.9	ug/L	0.05	0.01	DPC	08/15/2012 11:45	EPA 200.8
Arsenic, As	16.1	ug/L	0.1	0.03	DPC	08/15/2012 11:45	EPA 200.8
Barium, Ba	141	ug/L	0.1	0.03	DPC	08/15/2012 11:45	EPA 200.8
Beryllium, Be	0.200	ug/L	0.02	0.004	DPC	08/14/2012 09:54	EPA 200.8
Cadmium, Cd	1.80	ug/L	0.05	0.01	DPC	08/15/2012 11:45	EPA 200.8
Chromium, Cr	1.1	ug/L	0.2	0.03	DPC	08/15/2012 11:45	EPA 200.8
Copper, Cu	30.0	ug/L	0.05	0.02	DPC	08/15/2012 11:45	EPA 200.8
Lead, Pb	0.087	ug/L	0.01	0.003	DPC	08/15/2012 11:45	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	07/27/2012	EPA 245.2
Molybdenum, Mo	205	ug/L	0.1	0.02	DPC	08/15/2012 11:45	EPA 200.8
Nickel, Ni	43.6	ug/L	0.2	0.04	DPC	08/15/2012 11:45	EPA 200.8
Selenium, Se	8.8	ug/L	0.5	0.1	DPC	08/15/2012 11:45	EPA 200.8
Silver, Ag	0.017	ug/L	0.01	0.003	DPC	08/15/2012 11:45	EPA 200.8
Thallium, Tl	12.9	ug/L	0.05	0.01	DPC	08/15/2012 11:45	EPA 200.8
Zinc, Zn	29.5	ug/L	0.5	0.1	DPC	08/15/2012 11:45	EPA 200.8
Silica, SiO2 (Dissolved)	10.1	mg/L	0.02	0.004	DAM	08/09/2012 15:01	EPA 200.7
Boron, B	1.24	mg/L	0.01	0.002	DAM	08/14/2012 11:06	EPA 200.7
Calcium, Ca	148	mg/L	0.02	0.004	DAM	08/14/2012 11:06	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 11:07	EPA 200.7
Magnesium, Mg	70.1	mg/L	0.05	0.01	DAM	08/14/2012 11:06	EPA 200.7
Manganese, Mn	0.175	mg/L	0.0005	0.0001	DAM	08/14/2012 11:06	EPA 200.7
Potassium, K	19.5	mg/L	0.05	0.01	DAM	08/14/2012 11:05	EPA 200.7
Sodium, Na	168	mg/L	0.05	0.01	DAM	08/14/2012 11:05	EPA 200.7
Alkalinity, as CaCO3	45	mg/L	5	1	WKE	07/25/2012	SM20 2320B
Bicarbonate Alkalinity	45	mg/L	5	2	WKE	07/25/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	9	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	106	mg/L	2	0.5	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	1.99	mg/L	0.2	0.04	DMM	07/26/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1390	mg/L	80	20	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	855	mg/L	10	3	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	2.50	mg/L	0.02	0.004	DMM	07/25/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 8/16/2012***

Monitoring Well #1205

Sample Number: 123175-001 **Date Collected: 07/24/2012 11:40** **Date Received: 7/25/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	5.83	ug/L	0.05	0.01	DPC	08/15/2012 11:50	EPA 200.8
Arsenic, As	2.21	ug/L	0.1	0.03	DPC	08/15/2012 11:50	EPA 200.8
Barium, Ba	89.2	ug/L	0.1	0.03	DPC	08/15/2012 11:50	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 10:00	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 11:50	EPA 200.8
Chromium, Cr	0.2	ug/L	0.2	0.03	DPC	08/15/2012 11:50	EPA 200.8
Copper, Cu	1.61	ug/L	0.05	0.02	DPC	08/15/2012 11:50	EPA 200.8
Lead, Pb	0.036	ug/L	0.01	0.003	DPC	08/15/2012 11:50	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	07/31/2012	EPA 245.2
Molybdenum, Mo	26.0	ug/L	0.1	0.02	DPC	08/15/2012 11:50	EPA 200.8
Nickel, Ni	1.07	ug/L	0.2	0.04	DPC	08/15/2012 11:50	EPA 200.8
Selenium, Se	2.5	ug/L	0.5	0.1	DPC	08/15/2012 11:50	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 11:50	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	08/15/2012 11:50	EPA 200.8
Zinc, Zn	4.9	ug/L	0.5	0.1	DPC	08/15/2012 11:50	EPA 200.8
Silica, SiO2 (Dissolved)	11.8	mg/L	0.02	0.004	DAM	08/09/2012 14:32	EPA 200.7
Boron, B	0.284	mg/L	0.01	0.002	DAM	08/15/2012 10:35	EPA 200.7
Calcium, Ca	23.1	mg/L	0.02	0.004	DAM	08/15/2012 10:35	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/15/2012 10:35	EPA 200.7
Magnesium, Mg	5.79	mg/L	0.05	0.01	DAM	08/15/2012 10:35	EPA 200.7
Manganese, Mn	0.0195	mg/L	0.0005	0.0001	DAM	08/15/2012 10:35	EPA 200.7
Potassium, K	5.46	mg/L	0.05	0.01	DAM	08/15/2012 10:33	EPA 200.7
Sodium, Na	145	mg/L	0.05	0.01	DAM	08/15/2012 10:33	EPA 200.7
Alkalinity, as CaCO3	350	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	346	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	5.0	mg/L	0.1	0.02	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	1.22	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	460	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	39.3	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	2.96	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Duplicate 1

Sample Number: 123175-002 **Date Collected:** 07/24/2012 **Date Received:** 7/25/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Antimony, Sb	5.51	ug/L	0.05	0.01	DPC	08/15/2012 12:04	EPA 200.8
Arsenic, As	2.19	ug/L	0.1	0.03	DPC	08/15/2012 12:04	EPA 200.8
Barium, Ba	93.3	ug/L	0.1	0.03	DPC	08/15/2012 12:04	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 10:17	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 12:04	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 12:04	EPA 200.8
Copper, Cu	1.05	ug/L	0.05	0.02	DPC	08/15/2012 12:04	EPA 200.8
Lead, Pb	0.060	ug/L	0.01	0.003	DPC	08/15/2012 12:04	EPA 200.8
Mercury, Hg	14.87	ug/L	2	0.3	JAB	07/31/2012	EPA 245.2
Molybdenum, Mo	26.4	ug/L	0.1	0.02	DPC	08/15/2012 12:04	EPA 200.8
Nickel, Ni	1.03	ug/L	0.2	0.04	DPC	08/15/2012 12:04	EPA 200.8
Selenium, Se	2.3	ug/L	0.5	0.1	DPC	08/15/2012 12:04	EPA 200.8
Silver, Ag	0.017	ug/L	0.01	0.003	DPC	08/15/2012 12:04	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	08/15/2012 12:04	EPA 200.8
Zinc, Zn	3.2	ug/L	0.5	0.1	DPC	08/15/2012 12:04	EPA 200.8
Silica, SiO2 (Dissolved)	11.8	mg/L	0.02	0.004	DAM	08/09/2012 14:33	EPA 200.7
Boron, B	0.269	mg/L	0.01	0.002	DAM	08/15/2012 10:38	EPA 200.7
Calcium, Ca	24.1	mg/L	0.02	0.004	DAM	08/15/2012 10:38	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/15/2012 10:39	EPA 200.7
Magnesium, Mg	5.99	mg/L	0.05	0.01	DAM	08/15/2012 10:38	EPA 200.7
Manganese, Mn	0.0230	mg/L	0.0005	0.0001	DAM	08/15/2012 10:38	EPA 200.7
Potassium, K	5.59	mg/L	0.05	0.01	DAM	08/15/2012 10:37	EPA 200.7
Sodium, Na	140	mg/L	0.05	0.01	DAM	08/15/2012 10:37	EPA 200.7
Alkalinity, as CaCO3	350	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	346	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	7	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Chloride, Cl	5.2	mg/L	0.1	0.02	KLG	07/30/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	1.43	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	461	mg/L	20	6	JAB	07/27/2012	SM20 2540C
Sulfate, SO4	40.1	mg/L	0.4	0.1	KLG	07/30/2012	EPA 300.1
Total Organic Carbon, TOC	2.83	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1207

Sample Number: 123175-003 **Date Collected:** 07/24/2012 13:00 **Date Received:** 7/25/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Chemical Oxygen Demand, COD	8	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Nitrate-Nitrite, NO3-NO2, as N	0.44	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Total Organic Carbon, TOC	1.70	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Duplicate 2

Sample Number: 123175-004 **Date Collected:** 07/24/2012 **Date Received:** 7/25/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Chemical Oxygen Demand, COD	8	mg/L	5	1	WKE	08/07/2012	SM20 5220D
Nitrate-Nitrite, NO3-NO2, as N	0.27	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Total Organic Carbon, TOC	1.63	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 8/24/2012***

Monitoring Well #001

Sample Number: 123186-001 **Date Collected: 07/25/2012 13:36** **Date Received: 7/26/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.20	ug/L	0.05	0.01	DPC	08/15/2012 13:02	EPA 200.8
Arsenic, As	0.62	ug/L	0.1	0.03	DPC	08/15/2012 13:02	EPA 200.8
Barium, Ba	42.9	ug/L	0.1	0.03	DPC	08/15/2012 13:02	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 10:34	EPA 200.8
Cadmium, Cd	0.10	ug/L	0.05	0.01	DPC	08/15/2012 13:02	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:02	EPA 200.8
Copper, Cu	1.32	ug/L	0.05	0.02	DPC	08/15/2012 13:02	EPA 200.8
Lead, Pb	0.033	ug/L	0.01	0.003	DPC	08/15/2012 13:02	EPA 200.8
Mercury, Hg	2.78	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	0.18	ug/L	0.1	0.02	DPC	08/15/2012 13:02	EPA 200.8
Nickel, Ni	2.47	ug/L	0.2	0.04	DPC	08/15/2012 13:02	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:02	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:02	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	08/15/2012 13:02	EPA 200.8
Zinc, Zn	7.0	ug/L	0.5	0.1	DPC	08/15/2012 13:02	EPA 200.8
Silica, SiO2 (Dissolved)	8.39	mg/L	0.02	0.004	DAM	08/09/2012 14:34	EPA 200.7
Boron, B	0.074	mg/L	0.01	0.002	DAM	08/14/2012 11:16	EPA 200.7
Calcium, Ca	37.3	mg/L	0.02	0.004	DAM	08/14/2012 11:16	EPA 200.7
Iron, Fe	2.40	mg/L	0.01	0.002	DAM	08/14/2012 11:16	EPA 200.7
Magnesium, Mg	20.4	mg/L	0.05	0.01	DAM	08/14/2012 11:16	EPA 200.7
Manganese, Mn	1.90	mg/L	0.0005	0.0001	DAM	08/14/2012 11:16	EPA 200.7
Potassium, K	3.42	mg/L	0.05	0.01	DAM	08/14/2012 11:15	EPA 200.7
Sodium, Na	19.0	mg/L	0.05	0.01	DAM	08/14/2012 11:15	EPA 200.7
Alkalinity, as CaCO3	149	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	149	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	7	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	5.7	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	244	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	60.9	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	0.976	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Duplicate #3

Sample Number: 123186-002 **Date Collected:** 07/25/2012 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.15	ug/L	0.05	0.01	DPC	08/15/2012 13:07	EPA 200.8
Arsenic, As	0.58	ug/L	0.1	0.03	DPC	08/15/2012 13:07	EPA 200.8
Barium, Ba	41.2	ug/L	0.1	0.03	DPC	08/15/2012 13:07	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 10:39	EPA 200.8
Cadmium, Cd	0.13	ug/L	0.05	0.01	DPC	08/15/2012 13:07	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:07	EPA 200.8
Copper, Cu	0.71	ug/L	0.05	0.02	DPC	08/15/2012 13:07	EPA 200.8
Lead, Pb	0.018	ug/L	0.01	0.003	DPC	08/15/2012 13:07	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	0.17	ug/L	0.1	0.02	DPC	08/15/2012 13:07	EPA 200.8
Nickel, Ni	2.56	ug/L	0.2	0.04	DPC	08/15/2012 13:07	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:07	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:07	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	08/15/2012 13:07	EPA 200.8
Zinc, Zn	6.4	ug/L	0.5	0.1	DPC	08/15/2012 13:07	EPA 200.8
Silica, SiO2 (Dissolved)	8.31	mg/L	0.02	0.004	DAM	08/09/2012 14:37	EPA 200.7
Boron, B	0.070	mg/L	0.01	0.002	DAM	08/14/2012 11:19	EPA 200.7
Calcium, Ca	35.7	mg/L	0.02	0.004	DAM	08/14/2012 11:19	EPA 200.7
Iron, Fe	2.16	mg/L	0.01	0.002	DAM	08/14/2012 11:19	EPA 200.7
Magnesium, Mg	19.4	mg/L	0.05	0.01	DAM	08/14/2012 11:19	EPA 200.7
Manganese, Mn	1.81	mg/L	0.0005	0.0001	DAM	08/14/2012 11:19	EPA 200.7
Potassium, K	3.22	mg/L	0.05	0.01	DAM	08/14/2012 11:18	EPA 200.7
Sodium, Na	17.8	mg/L	0.05	0.01	DAM	08/14/2012 11:18	EPA 200.7
Alkalinity, as CaCO3	147	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	147	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	5.7	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.30	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	243	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	61.7	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	1.00	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #002

Sample Number: 123186-003 **Date Collected:** 07/25/2012 14:32 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:21	EPA 200.8
Arsenic, As	0.54	ug/L	0.1	0.03	DPC	08/15/2012 13:21	EPA 200.8
Barium, Ba	175	ug/L	0.1	0.03	DPC	08/15/2012 13:21	EPA 200.8
Beryllium, Be	0.034	ug/L	0.02	0.004	DPC	08/14/2012 10:57	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:21	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:21	EPA 200.8
Copper, Cu	0.26	ug/L	0.05	0.02	DPC	08/15/2012 13:21	EPA 200.8
Lead, Pb	0.027	ug/L	0.01	0.003	DPC	08/15/2012 13:21	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	0.44	ug/L	0.1	0.02	DPC	08/15/2012 13:21	EPA 200.8
Nickel, Ni	< 0.20	ug/L	0.2	0.04	DPC	08/15/2012 13:21	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:21	EPA 200.8
Silver, Ag	0.021	ug/L	0.01	0.003	DPC	08/15/2012 13:21	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	08/15/2012 13:21	EPA 200.8
Zinc, Zn	1.6	ug/L	0.5	0.1	DPC	08/15/2012 13:21	EPA 200.8
Silica, SiO2 (Dissolved)	15.3	mg/L	0.02	0.004	DAM	08/09/2012 14:38	EPA 200.7
Boron, B	0.084	mg/L	0.01	0.002	DAM	08/14/2012 11:32	EPA 200.7
Calcium, Ca	94.1	mg/L	0.02	0.004	DAM	08/14/2012 11:32	EPA 200.7
Iron, Fe	3.40	mg/L	0.01	0.002	DAM	08/14/2012 11:32	EPA 200.7
Magnesium, Mg	42.0	mg/L	0.05	0.01	DAM	08/14/2012 11:32	EPA 200.7
Manganese, Mn	2.40	mg/L	0.0005	0.0001	DAM	08/14/2012 11:32	EPA 200.7
Potassium, K	6.53	mg/L	0.05	0.01	DAM	08/14/2012 11:31	EPA 200.7
Sodium, Na	16.6	mg/L	0.05	0.01	DAM	08/14/2012 11:31	EPA 200.7
Alkalinity, as CaCO3	402	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	402	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	18	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	4.6	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.24	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	466	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	34.8	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	4.21	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1012

Sample Number: 123186-004 **Date Collected:** 07/25/2012 12:05 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.69	ug/L	0.05	0.01	DPC	08/15/2012 13:26	EPA 200.8
Arsenic, As	167	ug/L	0.1	0.03	DPC	08/15/2012 13:26	EPA 200.8
Barium, Ba	20.7	ug/L	0.1	0.03	DPC	08/15/2012 13:26	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:26	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:26	EPA 200.8
Copper, Cu	0.48	ug/L	0.05	0.02	DPC	08/15/2012 13:26	EPA 200.8
Lead, Pb	0.152	ug/L	0.01	0.003	DPC	08/15/2012 13:26	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	8.65	ug/L	0.1	0.02	DPC	08/15/2012 13:26	EPA 200.8
Nickel, Ni	1.40	ug/L	0.2	0.04	DPC	08/15/2012 13:26	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:26	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:26	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:26	EPA 200.8
Zinc, Zn	1.4	ug/L	0.5	0.1	DPC	08/15/2012 13:26	EPA 200.8
Silica, SiO2 (Dissolved)	6.35	mg/L	0.02	0.004	DAM	08/09/2012 14:39	EPA 200.7
Boron, B	0.192	mg/L	0.01	0.002	DAM	08/14/2012 11:36	EPA 200.7
Calcium, Ca	2.20	mg/L	0.02	0.004	DAM	08/14/2012 11:36	EPA 200.7
Iron, Fe	0.041	mg/L	0.01	0.002	DAM	08/14/2012 11:36	EPA 200.7
Magnesium, Mg	0.770	mg/L	0.05	0.01	DAM	08/14/2012 11:36	EPA 200.7
Manganese, Mn	0.0122	mg/L	0.0005	0.0001	DAM	08/14/2012 11:36	EPA 200.7
Potassium, K	1.51	mg/L	0.05	0.01	DAM	08/14/2012 11:35	EPA 200.7
Sodium, Na	219	mg/L	0.05	0.01	DAM	08/14/2012 11:35	EPA 200.7
Alkalinity, as CaCO3	425	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	389	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	11	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	2.0	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	552	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	45.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	1.14	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1007

Sample Number: 123186-005 **Date Collected:** 07/25/2012 13:15 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	0.5	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.55	ug/L	0.05	0.01	DPC	08/15/2012 13:31	EPA 200.8
Arsenic, As	2.50	ug/L	0.1	0.03	DPC	08/15/2012 13:31	EPA 200.8
Barium, Ba	97.8	ug/L	0.1	0.03	DPC	08/15/2012 13:31	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:08	EPA 200.8
Cadmium, Cd	0.07	ug/L	0.05	0.01	DPC	08/15/2012 13:31	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:31	EPA 200.8
Copper, Cu	0.99	ug/L	0.05	0.02	DPC	08/15/2012 13:31	EPA 200.8
Lead, Pb	0.070	ug/L	0.01	0.003	DPC	08/15/2012 13:31	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	12.4	ug/L	0.1	0.02	DPC	08/15/2012 13:31	EPA 200.8
Nickel, Ni	1.87	ug/L	0.2	0.04	DPC	08/15/2012 13:31	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:31	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:31	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:31	EPA 200.8
Zinc, Zn	2.4	ug/L	0.5	0.1	DPC	08/15/2012 13:31	EPA 200.8
Silica, SiO2 (Dissolved)	10.1	mg/L	0.02	0.004	DAM	08/09/2012 14:40	EPA 200.7
Boron, B	0.295	mg/L	0.01	0.002	DAM	08/14/2012 11:40	EPA 200.7
Calcium, Ca	98.3	mg/L	0.02	0.004	DAM	08/14/2012 11:40	EPA 200.7
Iron, Fe	0.044	mg/L	0.01	0.002	DAM	08/14/2012 11:40	EPA 200.7
Magnesium, Mg	36.3	mg/L	0.05	0.01	DAM	08/14/2012 11:40	EPA 200.7
Manganese, Mn	0.0507	mg/L	0.0005	0.0001	DAM	08/14/2012 11:40	EPA 200.7
Potassium, K	4.86	mg/L	0.05	0.01	DAM	08/14/2012 11:39	EPA 200.7
Sodium, Na	44.4	mg/L	0.05	0.01	DAM	08/14/2012 11:39	EPA 200.7
Alkalinity, as CaCO3	213	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	213	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	16	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	34.6	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.30	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	631	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	260	mg/L	5	2	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	2.69	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1008

Sample Number: 123186-006 **Date Collected:** 07/25/2012 14:00 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.63	ug/L	0.05	0.01	DPC	08/15/2012 13:35	EPA 200.8
Arsenic, As	1.32	ug/L	0.1	0.03	DPC	08/15/2012 13:35	EPA 200.8
Barium, Ba	69.6	ug/L	0.1	0.03	DPC	08/15/2012 13:35	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:14	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:35	EPA 200.8
Chromium, Cr	3.4	ug/L	0.2	0.03	DPC	08/15/2012 13:35	EPA 200.8
Copper, Cu	2.11	ug/L	0.05	0.02	DPC	08/15/2012 13:35	EPA 200.8
Lead, Pb	0.354	ug/L	0.01	0.003	DPC	08/15/2012 13:35	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	4.61	ug/L	0.1	0.02	DPC	08/15/2012 13:35	EPA 200.8
Nickel, Ni	1.85	ug/L	0.2	0.04	DPC	08/15/2012 13:35	EPA 200.8
Selenium, Se	5.0	ug/L	0.5	0.1	DPC	08/15/2012 13:35	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:35	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:35	EPA 200.8
Zinc, Zn	8.8	ug/L	0.5	0.1	DPC	08/15/2012 13:35	EPA 200.8
Silica, SiO2 (Dissolved)	16.6	mg/L	0.02	0.004	DAM	08/09/2012 14:40	EPA 200.7
Boron, B	0.098	mg/L	0.01	0.002	DAM	08/14/2012 11:44	EPA 200.7
Calcium, Ca	70.5	mg/L	0.02	0.004	DAM	08/14/2012 11:44	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 11:44	EPA 200.7
Magnesium, Mg	46.4	mg/L	0.05	0.01	DAM	08/14/2012 11:44	EPA 200.7
Manganese, Mn	0.0012	mg/L	0.0005	0.0001	DAM	08/14/2012 11:44	EPA 200.7
Potassium, K	4.12	mg/L	0.05	0.01	DAM	08/14/2012 11:42	EPA 200.7
Sodium, Na	20.7	mg/L	0.05	0.01	DAM	08/14/2012 11:42	EPA 200.7
Alkalinity, as CaCO3	314	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	312	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	7	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	6.6	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	494	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	124	mg/L	4	0.6	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	0.847	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1009

Sample Number: 123186-007 **Date Collected:** 07/25/2012 14:45 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:40	EPA 200.8
Arsenic, As	1.02	ug/L	0.1	0.03	DPC	08/15/2012 13:40	EPA 200.8
Barium, Ba	17.8	ug/L	0.1	0.03	DPC	08/15/2012 13:40	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:20	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:40	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:40	EPA 200.8
Copper, Cu	0.22	ug/L	0.05	0.02	DPC	08/15/2012 13:40	EPA 200.8
Lead, Pb	0.012	ug/L	0.01	0.003	DPC	08/15/2012 13:40	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	0.26	ug/L	0.1	0.02	DPC	08/15/2012 13:40	EPA 200.8
Nickel, Ni	0.71	ug/L	0.2	0.04	DPC	08/15/2012 13:40	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:40	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:40	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:40	EPA 200.8
Zinc, Zn	1.4	ug/L	0.5	0.1	DPC	08/15/2012 13:40	EPA 200.8
Silica, SiO2 (Dissolved)	17.5	mg/L	0.02	0.004	DAM	08/09/2012 14:41	EPA 200.7
Boron, B	0.181	mg/L	0.01	0.002	DAM	08/14/2012 11:46	EPA 200.7
Calcium, Ca	231	mg/L	0.02	0.004	DAM	08/14/2012 11:46	EPA 200.7
Iron, Fe	2.42	mg/L	0.01	0.002	DAM	08/14/2012 11:46	EPA 200.7
Magnesium, Mg	58.2	mg/L	0.05	0.01	DAM	08/14/2012 11:46	EPA 200.7
Manganese, Mn	0.325	mg/L	0.0005	0.0001	DAM	08/14/2012 11:46	EPA 200.7
Potassium, K	6.21	mg/L	0.05	0.01	DAM	08/14/2012 11:45	EPA 200.7
Sodium, Na	34.5	mg/L	0.05	0.01	DAM	08/14/2012 11:45	EPA 200.7
Alkalinity, as CaCO3	470	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	470	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	14.4	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1140	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	406	mg/L	5	2	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	1.62	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1010

Sample Number: 123186-008 **Date Collected:** 07/25/2012 10:00 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 1.0	mg/L	1	0.2	KLG	08/02/2012	EPA 300.1
Antimony, Sb	1.65	ug/L	0.05	0.01	DPC	08/15/2012 13:45	EPA 200.8
Arsenic, As	37.4	ug/L	0.1	0.03	DPC	08/15/2012 13:45	EPA 200.8
Barium, Ba	30.1	ug/L	0.1	0.03	DPC	08/15/2012 13:45	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:25	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:45	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:45	EPA 200.8
Copper, Cu	0.38	ug/L	0.05	0.02	DPC	08/15/2012 13:45	EPA 200.8
Lead, Pb	0.022	ug/L	0.01	0.003	DPC	08/15/2012 13:45	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	2.98	ug/L	0.1	0.02	DPC	08/15/2012 13:45	EPA 200.8
Nickel, Ni	0.62	ug/L	0.2	0.04	DPC	08/15/2012 13:45	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:45	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:45	EPA 200.8
Thallium, Tl	0.15	ug/L	0.05	0.01	DPC	08/15/2012 13:45	EPA 200.8
Zinc, Zn	1.2	ug/L	0.5	0.1	DPC	08/15/2012 13:45	EPA 200.8
Silica, SiO2 (Dissolved)	9.61	mg/L	0.02	0.004	DAM	08/09/2012 14:42	EPA 200.7
Boron, B	0.111	mg/L	0.01	0.002	DAM	08/14/2012 11:50	EPA 200.7
Calcium, Ca	10.7	mg/L	0.02	0.004	DAM	08/14/2012 11:50	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 11:50	EPA 200.7
Magnesium, Mg	2.34	mg/L	0.05	0.01	DAM	08/14/2012 11:50	EPA 200.7
Manganese, Mn	0.0206	mg/L	0.0005	0.0001	DAM	08/14/2012 11:50	EPA 200.7
Potassium, K	2.69	mg/L	0.05	0.01	DAM	08/14/2012 11:49	EPA 200.7
Sodium, Na	265	mg/L	0.05	0.01	DAM	08/14/2012 11:49	EPA 200.7
Alkalinity, as CaCO3	499	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	494	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	1.4	mg/L	0.2	0.05	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	703	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	98.9	mg/L	1	0.3	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	1.02	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1011

Sample Number: 123186-009 **Date Collected:** 07/25/2012 10:40 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.36	ug/L	0.05	0.01	DPC	08/15/2012 13:50	EPA 200.8
Arsenic, As	23.3	ug/L	0.1	0.03	DPC	08/15/2012 13:50	EPA 200.8
Barium, Ba	49.6	ug/L	0.1	0.03	DPC	08/15/2012 13:50	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:31	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:50	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 13:50	EPA 200.8
Copper, Cu	1.12	ug/L	0.05	0.02	DPC	08/15/2012 13:50	EPA 200.8
Lead, Pb	0.015	ug/L	0.01	0.003	DPC	08/15/2012 13:50	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	3.40	ug/L	0.1	0.02	DPC	08/15/2012 13:50	EPA 200.8
Nickel, Ni	5.13	ug/L	0.2	0.04	DPC	08/15/2012 13:50	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:50	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:50	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 13:50	EPA 200.8
Zinc, Zn	2.9	ug/L	0.5	0.1	DPC	08/15/2012 13:50	EPA 200.8
Silica, SiO2 (Dissolved)	14.2	mg/L	0.02	0.004	DAM	08/09/2012 14:42	EPA 200.7
Boron, B	0.137	mg/L	0.01	0.002	DAM	08/14/2012 12:00	EPA 200.7
Calcium, Ca	76.8	mg/L	0.02	0.004	DAM	08/14/2012 12:00	EPA 200.7
Iron, Fe	0.689	mg/L	0.01	0.002	DAM	08/14/2012 12:00	EPA 200.7
Magnesium, Mg	17.9	mg/L	0.05	0.01	DAM	08/14/2012 12:00	EPA 200.7
Manganese, Mn	0.277	mg/L	0.0005	0.0001	DAM	08/14/2012 12:00	EPA 200.7
Potassium, K	5.24	mg/L	0.05	0.01	DAM	08/14/2012 11:59	EPA 200.7
Sodium, Na	27.8	mg/L	0.05	0.01	DAM	08/14/2012 11:59	EPA 200.7
Alkalinity, as CaCO3	240	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	240	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	2.0	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	364	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	69.9	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	0.928	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #004

Sample Number: 123186-010 **Date Collected:** 07/25/2012 12:15 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.17	ug/L	0.05	0.01	DPC	08/15/2012 13:55	EPA 200.8
Arsenic, As	1.16	ug/L	0.1	0.03	DPC	08/15/2012 13:55	EPA 200.8
Barium, Ba	16.6	ug/L	0.1	0.03	DPC	08/15/2012 13:55	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 11:37	EPA 200.8
Cadmium, Cd	0.10	ug/L	0.05	0.01	DPC	08/15/2012 13:55	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 13:55	EPA 200.8
Copper, Cu	2.12	ug/L	0.05	0.02	DPC	08/15/2012 13:55	EPA 200.8
Lead, Pb	0.039	ug/L	0.01	0.003	DPC	08/15/2012 13:55	EPA 200.8
Mercury, Hg	12.14	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	0.35	ug/L	0.1	0.02	DPC	08/15/2012 13:55	EPA 200.8
Nickel, Ni	17.3	ug/L	0.2	0.04	DPC	08/15/2012 13:55	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 13:55	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 13:55	EPA 200.8
Thallium, Tl	0.24	ug/L	0.05	0.01	DPC	08/15/2012 13:55	EPA 200.8
Zinc, Zn	10.0	ug/L	0.5	0.1	DPC	08/15/2012 13:55	EPA 200.8
Silica, SiO2 (Dissolved)	7.07	mg/L	0.02	0.004	DAM	08/09/2012 14:43	EPA 200.7
Boron, B	0.151	mg/L	0.01	0.002	DAM	08/14/2012 12:04	EPA 200.7
Calcium, Ca	294	mg/L	0.02	0.004	DAM	08/14/2012 12:04	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 12:05	EPA 200.7
Magnesium, Mg	124	mg/L	0.05	0.01	DAM	08/14/2012 12:04	EPA 200.7
Manganese, Mn	0.400	mg/L	0.0005	0.0001	DAM	08/14/2012 12:04	EPA 200.7
Potassium, K	23.2	mg/L	0.05	0.01	DAM	08/14/2012 12:03	EPA 200.7
Sodium, Na	63.6	mg/L	0.05	0.01	DAM	08/14/2012 12:03	EPA 200.7
Alkalinity, as CaCO3	420	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	420	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	14	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	4.0	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.22	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1840	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	972	mg/L	10	3	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	3.61	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1204

Sample Number: 123186-011 **Date Collected:** 07/25/2012 09:50 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.56	ug/L	0.05	0.01	DPC	08/15/2012 14:28	EPA 200.8
Arsenic, As	0.51	ug/L	0.1	0.03	DPC	08/15/2012 14:28	EPA 200.8
Barium, Ba	48.9	ug/L	0.1	0.03	DPC	08/15/2012 14:28	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 12:11	EPA 200.8
Cadmium, Cd	0.42	ug/L	0.05	0.01	DPC	08/15/2012 14:28	EPA 200.8
Chromium, Cr	0.4	ug/L	0.2	0.03	DPC	08/15/2012 14:28	EPA 200.8
Copper, Cu	1.42	ug/L	0.05	0.02	DPC	08/15/2012 14:28	EPA 200.8
Lead, Pb	0.065	ug/L	0.01	0.003	DPC	08/15/2012 14:28	EPA 200.8
Mercury, Hg	3.96	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	1.28	ug/L	0.1	0.02	DPC	08/15/2012 14:28	EPA 200.8
Nickel, Ni	2.88	ug/L	0.2	0.04	DPC	08/15/2012 14:28	EPA 200.8
Selenium, Se	0.7	ug/L	0.5	0.1	DPC	08/15/2012 14:28	EPA 200.8
Silver, Ag	0.024	ug/L	0.01	0.003	DPC	08/15/2012 14:28	EPA 200.8
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	08/15/2012 14:28	EPA 200.8
Zinc, Zn	7.7	ug/L	0.5	0.1	DPC	08/15/2012 14:28	EPA 200.8
Silica, SiO2 (Dissolved)	9.95	mg/L	0.02	0.004	DAM	08/09/2012 14:44	EPA 200.7
Boron, B	0.034	mg/L	0.01	0.002	DAM	08/14/2012 12:08	EPA 200.7
Calcium, Ca	69.3	mg/L	0.02	0.004	DAM	08/14/2012 12:08	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 12:08	EPA 200.7
Magnesium, Mg	29.4	mg/L	0.05	0.01	DAM	08/14/2012 12:08	EPA 200.7
Manganese, Mn	0.0226	mg/L	0.0005	0.0001	DAM	08/14/2012 12:08	EPA 200.7
Potassium, K	2.66	mg/L	0.05	0.01	DAM	08/14/2012 12:06	EPA 200.7
Sodium, Na	10.7	mg/L	0.05	0.01	DAM	08/14/2012 12:06	EPA 200.7
Alkalinity, as CaCO3	196	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	196	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	10	mg/L	5	1	WKE	08/23/2012	SM20 5220D
Chloride, Cl	2.7	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.50	mg/L	0.2	0.04	DMM	08/06/2012	SM20 4500NO3 H
Residue, Filterable, TDS	375	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	101	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Total Organic Carbon, TOC	1.56	mg/L	0.02	0.004	DMM	07/27/2012	SM20 5310C

Monitoring Well #1207

Sample Number: 123186-012 **Date Collected:** 07/25/2012 09:15 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	0.61	ug/L	0.05	0.01	DPC	08/15/2012 14:33	EPA 200.8
Arsenic, As	4.00	ug/L	0.1	0.03	DPC	08/15/2012 14:33	EPA 200.8
Barium, Ba	188	ug/L	0.1	0.03	DPC	08/15/2012 14:33	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 12:16	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 14:33	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	08/15/2012 14:33	EPA 200.8
Copper, Cu	1.15	ug/L	0.05	0.02	DPC	08/15/2012 14:33	EPA 200.8
Lead, Pb	0.022	ug/L	0.01	0.003	DPC	08/15/2012 14:33	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	11.4	ug/L	0.1	0.02	DPC	08/15/2012 14:33	EPA 200.8
Nickel, Ni	6.75	ug/L	0.2	0.04	DPC	08/15/2012 14:33	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 14:33	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 14:33	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 14:33	EPA 200.8
Zinc, Zn	4.5	ug/L	0.5	0.1	DPC	08/15/2012 14:33	EPA 200.8
Silica, SiO2 (Dissolved)	8.35	mg/L	0.02	0.004	DAM	08/09/2012 14:48	EPA 200.7
Boron, B	0.210	mg/L	0.01	0.002	DAM	08/14/2012 12:12	EPA 200.7
Calcium, Ca	3.75	mg/L	0.02	0.004	DAM	08/14/2012 12:12	EPA 200.7
Iron, Fe	0.014	mg/L	0.01	0.002	DAM	08/14/2012 12:12	EPA 200.7
Magnesium, Mg	0.782	mg/L	0.05	0.01	DAM	08/14/2012 12:12	EPA 200.7
Manganese, Mn	0.0075	mg/L	0.0005	0.0001	DAM	08/14/2012 12:12	EPA 200.7
Potassium, K	3.32	mg/L	0.05	0.01	DAM	08/14/2012 12:10	EPA 200.7
Sodium, Na	104	mg/L	0.05	0.01	DAM	08/14/2012 12:10	EPA 200.7
Alkalinity, as CaCO3	226	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	221	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chloride, Cl	2.5	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Residue, Filterable, TDS	270	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	4.9	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1

Duplicate #2

Sample Number: 123186-013 **Date Collected:** 07/25/2012 **Date Received:** 7/26/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Bromide, Br	< 0.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1
Antimony, Sb	1.40	ug/L	0.05	0.01	DPC	08/15/2012 14:38	EPA 200.8
Arsenic, As	4.51	ug/L	0.1	0.03	DPC	08/15/2012 14:38	EPA 200.8
Barium, Ba	154	ug/L	0.1	0.03	DPC	08/15/2012 14:38	EPA 200.8
Beryllium, Be	< 0.020	ug/L	0.02	0.004	DPC	08/14/2012 12:22	EPA 200.8
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 14:38	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	08/15/2012 14:38	EPA 200.8
Copper, Cu	0.36	ug/L	0.05	0.02	DPC	08/15/2012 14:38	EPA 200.8
Lead, Pb	0.020	ug/L	0.01	0.003	DPC	08/15/2012 14:38	EPA 200.8
Mercury, Hg	6.53	ug/L	2	0.3	JAB	08/02/2012	EPA 245.2
Molybdenum, Mo	12.5	ug/L	0.1	0.02	DPC	08/15/2012 14:38	EPA 200.8
Nickel, Ni	2.99	ug/L	0.2	0.04	DPC	08/15/2012 14:38	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	08/15/2012 14:38	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	08/15/2012 14:38	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	08/15/2012 14:38	EPA 200.8
Zinc, Zn	2.6	ug/L	0.5	0.1	DPC	08/15/2012 14:38	EPA 200.8
Silica, SiO2 (Dissolved)	8.09	mg/L	0.02	0.004	DAM	08/09/2012 14:48	EPA 200.7
Boron, B	0.221	mg/L	0.01	0.002	DAM	08/14/2012 12:16	EPA 200.7
Calcium, Ca	3.52	mg/L	0.02	0.004	DAM	08/14/2012 12:16	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	08/14/2012 12:16	EPA 200.7
Magnesium, Mg	0.777	mg/L	0.05	0.01	DAM	08/14/2012 12:16	EPA 200.7
Manganese, Mn	0.0063	mg/L	0.0005	0.0001	DAM	08/14/2012 12:16	EPA 200.7
Potassium, K	3.27	mg/L	0.05	0.01	DAM	08/14/2012 12:14	EPA 200.7
Sodium, Na	104	mg/L	0.05	0.01	DAM	08/14/2012 12:14	EPA 200.7
Alkalinity, as CaCO3	231	mg/L	5	1	WKE	07/31/2012	SM20 2320B
Bicarbonate Alkalinity	227	mg/L	5	2	WKE	07/31/2012	SM20 4500-CO2D
Chloride, Cl	3.1	mg/L	0.1	0.02	KLG	08/02/2012	EPA 300.1
Residue, Filterable, TDS	269	mg/L	20	6	JAB	07/31/2012	SM20 2540C
Sulfate, SO4	6.4	mg/L	0.4	0.1	KLG	08/02/2012	EPA 300.1

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 11/26/2012***

Monitoring Well #1011

Sample Number: 124464-001 **Date Collected: 10/15/2012 12:48** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.34	ug/L	0.05	0.01	DPC	10/30/2012 13:52	EPA 200.8
Arsenic, As	21.4	ug/L	0.1	0.03	DPC	10/30/2012 13:52	EPA 200.8
Barium, Ba	50.4	ug/L	0.1	0.03	DPC	10/30/2012 13:52	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 17:46	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 13:52	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 13:52	EPA 200.8
Copper, Cu	0.09	ug/L	0.05	0.02	DPC	10/30/2012 13:52	EPA 200.8
Lead, Pb	0.027	ug/L	0.01	0.003	DPC	10/30/2012 13:52	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	2.29	ug/L	0.1	0.02	DPC	10/30/2012 13:52	EPA 200.8
Nickel, Ni	5.18	ug/L	0.2	0.04	DPC	10/30/2012 13:52	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 13:52	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 13:52	EPA 200.8
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	10/30/2012 13:52	EPA 200.8
Zinc, Zn	0.8	ug/L	0.5	0.1	DPC	10/30/2012 13:52	EPA 200.8
Silica, SiO2 (Dissolved)	14.6	mg/L	0.02	0.004	DAM	11/26/2012	EPA 200.7
Boron, B	0.278	mg/L	0.01	0.002	DAM	10/26/2012 17:46	EPA 200.7
Calcium, Ca	78.3	mg/L	0.02	0.004	DAM	10/26/2012 17:46	EPA 200.7
Iron, Fe	0.717	mg/L	0.01	0.002	DAM	10/26/2012 17:46	EPA 200.7
Magnesium, Mg	18.0	mg/L	0.05	0.01	DAM	10/26/2012 17:46	EPA 200.7
Manganese, Mn	0.258	mg/L	0.0005	0.0001	DAM	10/26/2012 17:46	EPA 200.7
Potassium, K	5.33	mg/L	0.05	0.01	DAM	10/26/2012 17:44	EPA 200.7
Sodium, Na	27.1	mg/L	0.05	0.01	DAM	10/26/2012 17:44	EPA 200.7
Alkalinity, as CaCO3	243	mg/L	5	1	WKE	10/19/2012	SM20 2320B
Bicarbonate Alkalinity	243	mg/L	5	2	WKE	10/20/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012	EPA 300.1
Chloride, Cl	1.6	mg/L	0.1	0.02	TDF	11/03/2012 00:25	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/03/2012 00:25	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/03/2012 00:25	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/03/2012 00:25	EPA 300.1
Residue, Filterable, TDS	360	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	63.9	mg/L	0.4	0.1	TDF	11/03/2012 00:25	EPA 300.1
Total Organic Carbon, TOC	1.48	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Duplicate #1

Sample Number: 124464-002 **Date Collected: 10/15/2012** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.37	ug/L	0.05	0.01	DPC	10/30/2012 13:57	EPA 200.8
Arsenic, As	21.5	ug/L	0.1	0.03	DPC	10/30/2012 13:57	EPA 200.8
Barium, Ba	51.4	ug/L	0.1	0.03	DPC	10/30/2012 13:57	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 17:48	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 13:57	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 13:57	EPA 200.8
Copper, Cu	0.09	ug/L	0.05	0.02	DPC	10/30/2012 13:57	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 13:57	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	2.28	ug/L	0.1	0.02	DPC	10/30/2012 13:57	EPA 200.8
Nickel, Ni	5.13	ug/L	0.2	0.04	DPC	10/30/2012 13:57	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 13:57	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 13:57	EPA 200.8
Thallium, Tl	0.06	ug/L	0.05	0.01	DPC	10/30/2012 13:57	EPA 200.8
Zinc, Zn	0.7	ug/L	0.5	0.1	DPC	10/30/2012 13:57	EPA 200.8
Silica, SiO2 (Dissolved)	14.9	mg/L	0.02	0.004	DAM	11/26/2012	EPA 200.7
Boron, B	0.273	mg/L	0.01	0.002	DAM	10/26/2012 17:48	EPA 200.7
Calcium, Ca	79.4	mg/L	0.02	0.004	DAM	10/26/2012 17:48	EPA 200.7
Iron, Fe	0.723	mg/L	0.01	0.002	DAM	10/26/2012 17:48	EPA 200.7
Magnesium, Mg	18.3	mg/L	0.05	0.01	DAM	10/26/2012 17:48	EPA 200.7
Manganese, Mn	0.261	mg/L	0.0005	0.0001	DAM	10/26/2012 17:48	EPA 200.7
Potassium, K	5.39	mg/L	0.05	0.01	DAM	10/26/2012 17:47	EPA 200.7
Sodium, Na	27.2	mg/L	0.05	0.01	DAM	10/26/2012 17:47	EPA 200.7
Alkalinity, as CaCO3	240	mg/L	5	1	WKE	10/20/2012	SM20 2320B
Bicarbonate Alkalinity	240	mg/L	5	2	WKE	10/20/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012	EPA 300.1
Chloride, Cl	1.6	mg/L	0.1	0.02	TDF	11/02/2012 23:19	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 23:19	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 23:19	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/03/2012 00:25	EPA 300.1
Residue, Filterable, TDS	363	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	63.5	mg/L	0.4	0.1	TDF	11/02/2012 23:19	EPA 300.1
Total Organic Carbon, TOC	1.56	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Monitoring Well #1010

Sample Number: 124464-003 **Date Collected: 10/15/2012 13:55** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.48	ug/L	0.05	0.01	DPC	10/30/2012 14:02	EPA 200.8
Arsenic, As	32.2	ug/L	0.1	0.03	DPC	10/30/2012 14:02	EPA 200.8
Barium, Ba	28.9	ug/L	0.1	0.03	DPC	10/30/2012 14:02	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/29/2012 10:07	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:02	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:02	EPA 200.8
Copper, Cu	0.62	ug/L	0.05	0.02	DPC	10/30/2012 14:02	EPA 200.8
Lead, Pb	0.022	ug/L	0.01	0.003	DPC	10/30/2012 14:02	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	1.74	ug/L	0.1	0.02	DPC	10/30/2012 14:02	EPA 200.8
Nickel, Ni	0.91	ug/L	0.2	0.04	DPC	10/30/2012 14:02	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:02	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:02	EPA 200.8
Thallium, Tl	0.14	ug/L	0.05	0.01	DPC	10/30/2012 14:02	EPA 200.8
Zinc, Zn	2.6	ug/L	0.5	0.1	DPC	10/30/2012 14:02	EPA 200.8
Silica, SiO2 (Dissolved)	10.2	mg/L	0.02	0.004	DAM	11/26/2012	EPA 200.7
Boron, B	0.107	mg/L	0.01	0.002	DAM	10/29/2012 10:07	EPA 200.7
Calcium, Ca	10.5	mg/L	0.02	0.004	DAM	10/29/2012 10:07	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/29/2012 10:07	EPA 200.7
Magnesium, Mg	2.29	mg/L	0.05	0.01	DAM	10/29/2012 10:07	EPA 200.7
Manganese, Mn	0.0190	mg/L	0.0005	0.0001	DAM	10/29/2012 10:07	EPA 200.7
Potassium, K	2.79	mg/L	0.05	0.01	DAM	10/29/2012 10:05	EPA 200.7
Sodium, Na	269	mg/L	0.05	0.01	DAM	10/29/2012 10:05	EPA 200.7
Alkalinity, as CaCO3	503	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	498	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012	EPA 300.1
Chloride, Cl	1.4	mg/L	0.1	0.02	TDF	11/02/2012 23:39	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 23:39	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 23:39	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 23:39	EPA 300.1
Residue, Filterable, TDS	707	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	94.5	mg/L	0.4	0.1	TDF	11/02/2012 23:39	EPA 300.1
Total Organic Carbon, TOC	1.78	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Monitoring Well #1009

Sample Number: 124464-004 **Date Collected:** 10/15/2012 14:24 **Date Received:** 10/16/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:07	EPA 200.8
Arsenic, As	1.32	ug/L	0.1	0.03	DPC	10/30/2012 14:07	EPA 200.8
Barium, Ba	16.0	ug/L	0.1	0.03	DPC	10/30/2012 14:07	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 17:59	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:07	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:07	EPA 200.8
Copper, Cu	0.07	ug/L	0.05	0.02	DPC	10/30/2012 14:07	EPA 200.8
Lead, Pb	0.011	ug/L	0.01	0.003	DPC	10/30/2012 14:07	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/30/2012 14:07	EPA 200.8
Nickel, Ni	1.08	ug/L	0.2	0.04	DPC	10/30/2012 14:07	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:07	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:07	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:07	EPA 200.8
Zinc, Zn	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:07	EPA 200.8
Silica, SiO2 (Dissolved)	17.4	mg/L	0.02	0.004	DAM	11/09/2012 10:28	EPA 200.7
Boron, B	0.253	mg/L	0.01	0.002	DAM	10/26/2012 17:59	EPA 200.7
Calcium, Ca	104	mg/L	0.02	0.004	DAM	10/26/2012 17:59	EPA 200.7
Iron, Fe	1.03	mg/L	0.01	0.002	DAM	10/26/2012 17:59	EPA 200.7
Magnesium, Mg	26.0	mg/L	0.05	0.01	DAM	10/26/2012 17:59	EPA 200.7
Manganese, Mn	0.156	mg/L	0.0005	0.0001	DAM	10/26/2012 17:59	EPA 200.7
Potassium, K	4.38	mg/L	0.05	0.01	DAM	10/26/2012 17:57	EPA 200.7
Sodium, Na	183	mg/L	0.05	0.01	DAM	10/26/2012 17:57	EPA 200.7
Alkalinity, as CaCO3	459	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	459	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012 22:06	EPA 300.1
Chloride, Cl	12.9	mg/L	0.1	0.02	TDF	11/02/2012 22:06	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 22:06	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:06	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:06	EPA 300.1
Residue, Filterable, TDS	1130	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	389	mg/L	5	2	TDF	11/02/2012 21:07	EPA 300.1
Total Organic Carbon, TOC	2.55	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Monitoring Well #1007

Sample Number: 124464-005 **Date Collected: 10/15/2012 02:58** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.42	ug/L	0.05	0.01	DPC	10/30/2012 14:11	EPA 200.8
Arsenic, As	1.63	ug/L	0.1	0.03	DPC	10/30/2012 14:11	EPA 200.8
Barium, Ba	100	ug/L	0.1	0.03	DPC	10/30/2012 14:11	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 18:02	EPA 200.7
Cadmium, Cd	0.10	ug/L	0.05	0.01	DPC	10/30/2012 14:11	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:11	EPA 200.8
Copper, Cu	0.54	ug/L	0.05	0.02	DPC	10/30/2012 14:11	EPA 200.8
Lead, Pb	0.688	ug/L	0.01	0.003	DPC	10/30/2012 14:11	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	17.4	ug/L	0.1	0.02	DPC	10/30/2012 14:11	EPA 200.8
Nickel, Ni	3.24	ug/L	0.2	0.04	DPC	10/30/2012 14:11	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:11	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:11	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:11	EPA 200.8
Zinc, Zn	0.9	ug/L	0.5	0.1	DPC	10/30/2012 14:11	EPA 200.8
Silica, SiO2 (Dissolved)	11.6	mg/L	0.02	0.004	DAM	11/09/2012 10:29	EPA 200.7
Boron, B	0.574	mg/L	0.01	0.002	DAM	10/26/2012 18:02	EPA 200.7
Calcium, Ca	126	mg/L	0.02	0.004	DAM	10/26/2012 18:02	EPA 200.7
Iron, Fe	0.026	mg/L	0.01	0.002	DAM	10/26/2012 18:02	EPA 200.7
Magnesium, Mg	46.5	mg/L	0.05	0.01	DAM	10/26/2012 18:02	EPA 200.7
Manganese, Mn	0.285	mg/L	0.0005	0.0001	DAM	10/26/2012 18:02	EPA 200.7
Potassium, K	5.77	mg/L	0.05	0.01	DAM	10/26/2012 18:01	EPA 200.7
Sodium, Na	62.9	mg/L	0.05	0.01	DAM	10/26/2012 18:01	EPA 200.7
Alkalinity, as CaCO3	154	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	154	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	0.9	mg/L	0.4	0.1	TDF	11/02/2012 22:33	EPA 300.1
Chloride, Cl	44.8	mg/L	1	0.2	TDF	11/02/2012 21:27	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 22:33	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:33	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:33	EPA 300.1
Residue, Filterable, TDS	826	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	372	mg/L	5	2	TDF	11/02/2012 21:27	EPA 300.1
Total Organic Carbon, TOC	2.83	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Monitoring Well #1008

Sample Number: 124464-006 **Date Collected: 10/15/2012 03:44** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.62	ug/L	0.05	0.01	DPC	10/30/2012 14:16	EPA 200.8
Arsenic, As	1.05	ug/L	0.1	0.03	DPC	10/30/2012 14:16	EPA 200.8
Barium, Ba	66.9	ug/L	0.1	0.03	DPC	10/30/2012 14:16	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 18:06	EPA 200.7
Cadmium, Cd	0.08	ug/L	0.05	0.01	DPC	10/30/2012 14:16	EPA 200.8
Chromium, Cr	2.7	ug/L	0.2	0.03	DPC	10/30/2012 14:16	EPA 200.8
Copper, Cu	1.38	ug/L	0.05	0.02	DPC	10/30/2012 14:16	EPA 200.8
Lead, Pb	0.026	ug/L	0.01	0.003	DPC	10/30/2012 14:16	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	2.83	ug/L	0.1	0.02	DPC	10/30/2012 14:16	EPA 200.8
Nickel, Ni	1.97	ug/L	0.2	0.04	DPC	10/30/2012 14:16	EPA 200.8
Selenium, Se	5.1	ug/L	0.5	0.1	DPC	10/30/2012 14:16	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:16	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:16	EPA 200.8
Zinc, Zn	3.7	ug/L	0.5	0.1	DPC	10/30/2012 14:16	EPA 200.8
Silica, SiO2 (Dissolved)	17.1	mg/L	0.02	0.004	DAM	11/09/2012 10:29	EPA 200.7
Boron, B	0.181	mg/L	0.01	0.002	DAM	10/26/2012 18:06	EPA 200.7
Calcium, Ca	69.5	mg/L	0.02	0.004	DAM	10/26/2012 18:06	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/26/2012 18:06	EPA 200.7
Magnesium, Mg	46.4	mg/L	0.05	0.01	DAM	10/26/2012 18:06	EPA 200.7
Manganese, Mn	< 0.0005	mg/L	0.0005	0.0001	DAM	10/26/2012 18:06	EPA 200.7
Potassium, K	4.07	mg/L	0.05	0.01	DAM	10/26/2012 18:04	EPA 200.7
Sodium, Na	20.2	mg/L	0.05	0.01	DAM	10/26/2012 18:04	EPA 200.7
Alkalinity, as CaCO3	283	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	281	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012	EPA 300.1
Chloride, Cl	3.7	mg/L	0.1	0.02	TDF	11/02/2012 22:53	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 22:53	EPA 300.1
Nitrate, NO3 as N	0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:53	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 22:53	EPA 300.1
Residue, Filterable, TDS	412	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	76.1	mg/L	0.4	0.1	TDF	11/02/2012 22:53	EPA 300.1
Total Organic Carbon, TOC	2.38	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Monitoring Well #1012

Sample Number: 124464-007 **Date Collected: 10/15/2012 04:29** **Date Received: 10/16/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.72	ug/L	0.05	0.01	DPC	10/30/2012 14:21	EPA 200.8
Arsenic, As	154	ug/L	0.1	0.03	DPC	10/30/2012 14:21	EPA 200.8
Barium, Ba	19.5	ug/L	0.1	0.03	DPC	10/30/2012 14:21	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/26/2012 18:10	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:21	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:21	EPA 200.8
Copper, Cu	0.45	ug/L	0.05	0.02	DPC	10/30/2012 14:21	EPA 200.8
Lead, Pb	0.078	ug/L	0.01	0.003	DPC	10/30/2012 14:21	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/25/2012	EPA 245.2
Molybdenum, Mo	5.41	ug/L	0.1	0.02	DPC	10/30/2012 14:21	EPA 200.8
Nickel, Ni	0.46	ug/L	0.2	0.04	DPC	10/30/2012 14:21	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:21	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:21	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:21	EPA 200.8
Zinc, Zn	2.4	ug/L	0.5	0.1	DPC	10/30/2012 14:21	EPA 200.8
Silica, SiO2 (Dissolved)	6.61	mg/L	0.02	0.004	DAM	11/09/2012 10:30	EPA 200.7
Boron, B	0.262	mg/L	0.01	0.002	DAM	10/26/2012 18:10	EPA 200.7
Calcium, Ca	2.07	mg/L	0.02	0.004	DAM	10/26/2012 18:10	EPA 200.7
Iron, Fe	0.027	mg/L	0.01	0.002	DAM	10/26/2012 18:10	EPA 200.7
Magnesium, Mg	0.695	mg/L	0.05	0.01	DAM	10/26/2012 18:10	EPA 200.7
Manganese, Mn	0.0075	mg/L	0.0005	0.0001	DAM	10/26/2012 18:10	EPA 200.7
Potassium, K	1.53	mg/L	0.05	0.01	DAM	10/26/2012 18:08	EPA 200.7
Sodium, Na	221	mg/L	0.05	0.01	DAM	10/26/2012 18:08	EPA 200.7
Alkalinity, as CaCO3	440	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	393	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/26/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/02/2012	EPA 300.1
Chloride, Cl	1.8	mg/L	0.1	0.02	TDF	11/02/2012 23:59	EPA 300.1
Nitrate-Nitrite, NO3-NO2 as N	< 0.22	mg/L	0.2	0.04	TDF	11/02/2012 23:59	EPA 300.1
Nitrate, NO3 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 23:59	EPA 300.1
Nitrite, NO2 as N	< 0.10	mg/L	0.1	0.02	TDF	11/02/2012 23:59	EPA 300.1
Residue, Filterable, TDS	540	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	38.0	mg/L	0.4	0.1	TDF	11/02/2012 23:59	EPA 300.1
Total Organic Carbon, TOC	1.86	mg/L	0.02	0.004	DMM	10/17/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 11/19/2012***

Monitoring Well #1205

Sample Number: 124493-001 **Date Collected: 10/16/2012 09:35** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	4.64	ug/L	0.05	0.01	DPC	11/01/2012 11:16	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:12	EPA 200.7
Barium, Ba	129	ug/L	0.1	0.03	DPC	11/01/2012 11:16	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:11	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:16	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	11/01/2012 11:16	EPA 200.8
Copper, Cu	1.10	ug/L	0.05	0.02	DPC	11/01/2012 11:16	EPA 200.8
Lead, Pb	0.043	ug/L	0.01	0.003	DPC	11/01/2012 11:16	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	20.9	ug/L	0.1	0.02	DPC	11/01/2012 11:16	EPA 200.8
Nickel, Ni	0.86	ug/L	0.2	0.04	DPC	11/01/2012 11:16	EPA 200.8
Selenium, Se	1.8	ug/L	0.5	0.1	DPC	11/01/2012 11:16	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	11/01/2012 11:16	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:16	EPA 200.8
Zinc, Zn	3.1	ug/L	0.5	0.1	DPC	11/01/2012 11:16	EPA 200.8
Silica, SiO2 (Dissolved)	12.7	mg/L	0.02	0.004	DAM	11/09/2012 10:38	EPA 200.7
Boron, B	0.294	mg/L	0.01	0.002	DAM	10/31/2012 19:11	EPA 200.7
Calcium, Ca	24.4	mg/L	0.02	0.004	DAM	10/31/2012 19:11	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 19:12	EPA 200.7
Magnesium, Mg	5.80	mg/L	0.05	0.01	DAM	10/31/2012 19:11	EPA 200.7
Potassium, K	5.26	mg/L	0.05	0.01	DAM	10/31/2012 19:10	EPA 200.7
Sodium, Na	154	mg/L	0.05	0.01	DAM	10/31/2012 19:10	EPA 200.7
Alkalinity, as CaCO3	350	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	347	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	11	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012 16:45	EPA 300.1
Chloride, Cl	4.8	mg/L	0.1	0.02	TDF	11/06/2012 16:45	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	2.34	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	473	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	43.1	mg/L	0.4	0.1	TDF	11/06/2012 16:45	EPA 300.1
Total Organic Carbon, TOC	3.62	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1206

Sample Number: 124493-002 **Date Collected: 10/16/2012 14:20** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:30	EPA 200.8
Arsenic, As	30	ug/L	10	2	DAM	10/31/2012 19:14	EPA 200.7
Barium, Ba	323	ug/L	0.1	0.03	DPC	11/01/2012 11:30	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:14	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:30	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	11/01/2012 11:30	EPA 200.8
Copper, Cu	0.20	ug/L	0.05	0.02	DPC	11/01/2012 11:30	EPA 200.8
Lead, Pb	0.018	ug/L	0.01	0.003	DPC	11/01/2012 11:30	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	2.15	ug/L	0.1	0.02	DPC	11/01/2012 11:30	EPA 200.8
Nickel, Ni	0.96	ug/L	0.2	0.04	DPC	11/01/2012 11:30	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	11/01/2012 11:30	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	11/01/2012 11:30	EPA 200.8
Thallium, Tl	0.11	ug/L	0.05	0.01	DPC	11/01/2012 11:30	EPA 200.8
Zinc, Zn	1.3	ug/L	0.5	0.1	DPC	11/01/2012 11:30	EPA 200.8
Silica, SiO2 (Dissolved)	13.4	mg/L	0.02	0.004	DAM	11/09/2012 10:39	EPA 200.7
Boron, B	0.074	mg/L	0.01	0.002	DAM	10/31/2012 19:14	EPA 200.7
Calcium, Ca	32.2	mg/L	0.02	0.004	DAM	10/31/2012 19:14	EPA 200.7
Iron, Fe	23.8	mg/L	0.01	0.002	DAM	10/31/2012 19:14	EPA 200.7
Magnesium, Mg	12.0	mg/L	0.05	0.01	DAM	10/31/2012 19:14	EPA 200.7
Potassium, K	3.00	mg/L	0.05	0.01	DAM	10/31/2012 19:12	EPA 200.7
Sodium, Na	30.0	mg/L	0.05	0.01	DAM	10/31/2012 19:12	EPA 200.7
Alkalinity, as CaCO3	176	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	176	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	170	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012 12:44	EPA 300.1
Chloride, Cl	8.1	mg/L	0.1	0.02	TDF	11/06/2012 12:44	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	283	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	1.1	mg/L	0.4	0.1	TDF	11/06/2012 12:44	EPA 300.1
Total Organic Carbon, TOC	79.9	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1207

Sample Number: 124493-003 **Date Collected: 10/16/2012 12:00** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.17	ug/L	0.05	0.01	DPC	11/01/2012 11:35	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:18	EPA 200.7
Barium, Ba	71.0	ug/L	0.1	0.03	DPC	11/01/2012 11:35	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:17	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:35	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	11/01/2012 11:35	EPA 200.8
Copper, Cu	0.14	ug/L	0.05	0.02	DPC	11/01/2012 11:35	EPA 200.8
Lead, Pb	0.129	ug/L	0.01	0.003	DPC	11/01/2012 11:35	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	10.7	ug/L	0.1	0.02	DPC	11/01/2012 11:35	EPA 200.8
Nickel, Ni	< 0.20	ug/L	0.2	0.04	DPC	11/01/2012 11:35	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	11/01/2012 11:35	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	11/01/2012 11:35	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	11/01/2012 11:35	EPA 200.8
Zinc, Zn	< 0.5	ug/L	0.5	0.1	DPC	11/01/2012 11:35	EPA 200.8
Silica, SiO2 (Dissolved)	8.29	mg/L	0.02	0.004	DAM	11/09/2012 10:39	EPA 200.7
Boron, B	0.200	mg/L	0.01	0.002	DAM	10/31/2012 19:17	EPA 200.7
Calcium, Ca	1.39	mg/L	0.02	0.004	DAM	10/31/2012 19:17	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 19:18	EPA 200.7
Magnesium, Mg	0.366	mg/L	0.05	0.01	DAM	10/31/2012 19:18	EPA 200.7
Potassium, K	2.51	mg/L	0.05	0.01	DAM	10/31/2012 19:16	EPA 200.7
Sodium, Na	102	mg/L	0.05	0.01	DAM	10/31/2012 19:16	EPA 200.7
Alkalinity, as CaCO3	223	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	217	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	1.2	mg/L	0.1	0.02	TDF	11/06/2012 17:26	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	258	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	1.5	mg/L	0.4	0.1	TDF	11/06/2012 17:26	EPA 300.1
Total Organic Carbon, TOC	2.06	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

SW-2

Sample Number: 124493-004 **Date Collected:** 10/16/2012 03:58 **Date Received:** 10/17/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	8.42	ug/L	0.05	0.01	DPC	11/01/2012 11:39	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:21	EPA 200.7
Barium, Ba	105	ug/L	0.1	0.03	DPC	11/01/2012 11:39	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:21	EPA 200.7
Cadmium, Cd	0.73	ug/L	0.05	0.01	DPC	11/01/2012 11:39	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	11/01/2012 11:39	EPA 200.8
Copper, Cu	6.22	ug/L	0.05	0.02	DPC	11/01/2012 11:39	EPA 200.8
Lead, Pb	0.011	ug/L	0.01	0.003	DPC	11/01/2012 11:39	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	98.8	ug/L	0.1	0.02	DPC	11/01/2012 11:39	EPA 200.8
Nickel, Ni	20.7	ug/L	0.2	0.04	DPC	11/01/2012 11:39	EPA 200.8
Selenium, Se	2.2	ug/L	0.5	0.1	DPC	11/01/2012 11:39	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	11/01/2012 11:39	EPA 200.8
Thallium, Tl	5.01	ug/L	0.05	0.01	DPC	11/01/2012 11:39	EPA 200.8
Zinc, Zn	19.1	ug/L	0.5	0.1	DPC	11/01/2012 11:39	EPA 200.8
Silica, SiO2 (Dissolved)	6.81	mg/L	0.02	0.004	DAM	11/09/2012 10:40	EPA 200.7
Boron, B	0.684	mg/L	0.01	0.002	DAM	10/31/2012 19:21	EPA 200.7
Calcium, Ca	84.6	mg/L	0.02	0.004	DAM	10/31/2012 19:21	EPA 200.7
Iron, Fe	0.025	mg/L	0.01	0.002	DAM	10/31/2012 19:21	EPA 200.7
Magnesium, Mg	38.6	mg/L	0.05	0.01	DAM	10/31/2012 19:21	EPA 200.7
Potassium, K	12.1	mg/L	0.05	0.01	DAM	10/31/2012 19:20	EPA 200.7
Sodium, Na	73.7	mg/L	0.05	0.01	DAM	10/31/2012 19:19	EPA 200.7
Alkalinity, as CaCO3	43	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	43	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	13	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	0.8	mg/L	0.4	0.1	TDF	11/06/2012 17:46	EPA 300.1
Chloride, Cl	43.4	mg/L	0.1	0.02	TDF	11/06/2012 17:46	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	1.74	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	717	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	417	mg/L	10	3	TDF	11/06/2012 17:46	EPA 300.1
Total Organic Carbon, TOC	3.03	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Duplicate #2

Sample Number: 124493-005 **Date Collected: 10/16/2012** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.15	ug/L	0.05	0.01	DPC	10/30/2012 14:35	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:25	EPA 200.7
Barium, Ba	75.1	ug/L	0.1	0.03	DPC	10/30/2012 14:35	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:25	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:35	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:35	EPA 200.8
Copper, Cu	0.13	ug/L	0.05	0.02	DPC	10/30/2012 14:35	EPA 200.8
Lead, Pb	0.175	ug/L	0.01	0.003	DPC	10/30/2012 14:35	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	10.6	ug/L	0.1	0.02	DPC	10/30/2012 14:35	EPA 200.8
Nickel, Ni	< 0.20	ug/L	0.2	0.04	DPC	10/30/2012 14:35	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:35	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:35	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:35	EPA 200.8
Zinc, Zn	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:35	EPA 200.8
Silica, SiO2 (Dissolved)	8.29	mg/L	0.02	0.004	DAM	11/09/2012 10:41	EPA 200.7
Boron, B	0.206	mg/L	0.01	0.002	DAM	10/31/2012 19:25	EPA 200.7
Calcium, Ca	1.42	mg/L	0.02	0.004	DAM	10/31/2012 19:25	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 19:25	EPA 200.7
Magnesium, Mg	0.381	mg/L	0.05	0.01	DAM	10/31/2012 19:25	EPA 200.7
Potassium, K	2.59	mg/L	0.05	0.01	DAM	10/31/2012 19:23	EPA 200.7
Sodium, Na	103	mg/L	0.05	0.01	DAM	10/31/2012 19:23	EPA 200.7
Alkalinity, as CaCO3	227	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	221	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	1.2	mg/L	0.1	0.02	TDF	11/06/2012 18:12	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	261	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	1.5	mg/L	0.4	0.1	TDF	11/06/2012 18:12	EPA 300.1
Total Organic Carbon, TOC	1.89	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1201

Sample Number: 124493-006 **Date Collected: 10/16/2012 15:15** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.17	ug/L	0.05	0.01	DPC	10/30/2012 14:40	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:40	EPA 200.7
Barium, Ba	24.9	ug/L	0.1	0.03	DPC	10/30/2012 14:40	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:39	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:40	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:40	EPA 200.8
Copper, Cu	0.56	ug/L	0.05	0.02	DPC	10/30/2012 14:40	EPA 200.8
Lead, Pb	0.046	ug/L	0.01	0.003	DPC	10/30/2012 14:40	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	21.9	ug/L	0.1	0.02	DPC	10/30/2012 14:40	EPA 200.8
Nickel, Ni	1.27	ug/L	0.2	0.04	DPC	10/30/2012 14:40	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:40	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:40	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:40	EPA 200.8
Zinc, Zn	2.3	ug/L	0.5	0.1	DPC	10/30/2012 14:40	EPA 200.8
Silica, SiO2 (Dissolved)	8.67	mg/L	0.02	0.004	DAM	11/09/2012 10:42	EPA 200.7
Boron, B	0.219	mg/L	0.01	0.002	DAM	10/31/2012 19:39	EPA 200.7
Calcium, Ca	8.42	mg/L	0.02	0.004	DAM	10/31/2012 19:39	EPA 200.7
Iron, Fe	0.075	mg/L	0.01	0.002	DAM	10/31/2012 19:39	EPA 200.7
Magnesium, Mg	1.89	mg/L	0.05	0.01	DAM	10/31/2012 19:39	EPA 200.7
Potassium, K	2.49	mg/L	0.05	0.01	DAM	10/31/2012 19:38	EPA 200.7
Sodium, Na	210	mg/L	0.05	0.01	DAM	10/31/2012 19:38	EPA 200.7
Alkalinity, as CaCO3	429	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	422	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	29	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	8.7	mg/L	0.1	0.02	TDF	11/06/2012 18:32	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	556	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	39.9	mg/L	0.4	0.1	TDF	11/06/2012 18:32	EPA 300.1
Total Organic Carbon, TOC	9.31	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Trip Blank

Sample Number: 124493-007 **Date Collected: 10/16/2012** **Date Received: 10/17/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:45	EPA 200.8
Arsenic, As	< 10	ug/L	10	2	DAM	10/31/2012 19:50	EPA 200.7
Barium, Ba	< 0.10	ug/L	0.1	0.03	DPC	10/30/2012 14:45	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 19:50	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:45	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/30/2012 14:45	EPA 200.8
Copper, Cu	0.16	ug/L	0.05	0.02	DPC	10/30/2012 14:45	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:45	EPA 200.8
Mercury, Hg	< 0.20	ug/L	0.2	0.03	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/30/2012 14:45	EPA 200.8
Nickel, Ni	< 0.20	ug/L	0.2	0.04	DPC	10/30/2012 14:45	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:45	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/30/2012 14:45	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/30/2012 14:45	EPA 200.8
Zinc, Zn	< 0.5	ug/L	0.5	0.1	DPC	10/30/2012 14:45	EPA 200.8
Silica, SiO2 (Dissolved)	< 0.02	mg/L	0.02	0.004	DAM	11/09/2012 10:44	EPA 200.7
Boron, B	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 19:50	EPA 200.7
Calcium, Ca	< 0.020	mg/L	0.02	0.004	DAM	10/31/2012 19:50	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 19:50	EPA 200.7
Magnesium, Mg	< 0.050	mg/L	0.05	0.01	DAM	10/31/2012 19:50	EPA 200.7
Potassium, K	< 0.05	mg/L	0.05	0.01	DAM	10/31/2012 19:49	EPA 200.7
Sodium, Na	0.11	mg/L	0.05	0.01	DAM	10/31/2012 19:49	EPA 200.7
Alkalinity, as CaCO3	< 5	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	< 5	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	< 0.0	mg/L	0.05	0.02	TDF	11/06/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	< 20	mg/L	20	6	MSO	10/18/2012	SM20 2540C
Sulfate, SO4	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012 18:52	EPA 300.1
Total Organic Carbon, TOC	0.172	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Big Sandy Plant ***Report Date: 11/26/2012***

Monitoring Well #002

Sample Number: 124539-001 **Date Collected: 10/18/2012 13:43** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:43	EPA 200.8
Arsenic, As	0.36	ug/L	0.1	0.03	DPC	10/25/2012 12:43	EPA 200.8
Barium, Ba	171	ug/L	0.1	0.03	DPC	10/25/2012 12:43	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 20:35	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:43	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 12:43	EPA 200.8
Copper, Cu	0.57	ug/L	0.05	0.02	DPC	10/25/2012 12:43	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 12:43	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/25/2012 12:43	EPA 200.8
Nickel, Ni	0.33	ug/L	0.2	0.04	DPC	10/25/2012 12:43	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 12:43	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 12:43	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:43	EPA 200.8
Zinc, Zn	0.7	ug/L	0.5	0.1	DPC	10/25/2012 12:43	EPA 200.8
Silica, SiO2 (Dissolved)	15.9	mg/L	0.02	0.004	DAM	11/09/2012 10:49	EPA 200.7
Boron, B	0.287	mg/L	0.01	0.002	DAM	10/31/2012 20:35	EPA 200.7
Calcium, Ca	95.7	mg/L	0.02	0.004	DAM	10/31/2012 20:35	EPA 200.7
Iron, Fe	4.10	mg/L	0.01	0.002	DAM	10/31/2012 20:35	EPA 200.7
Magnesium, Mg	43.6	mg/L	0.05	0.01	DAM	10/31/2012 20:35	EPA 200.7
Manganese, Mn	2.68	mg/L	0.0005	0.0001	DAM	10/31/2012 20:35	EPA 200.7
Potassium, K	6.83	mg/L	0.05	0.01	DAM	10/31/2012 20:34	EPA 200.7
Sodium, Na	17.0	mg/L	0.05	0.01	DAM	10/31/2012 20:34	EPA 200.7
Alkalinity, as CaCO3	421	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	421	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	16	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012 20:44	EPA 300.1
Chloride, Cl	5.4	mg/L	0.1	0.02	TDF	11/06/2012 20:44	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	475	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	32.0	mg/L	0.4	0.1	TDF	11/06/2012 20:44	EPA 300.1
Total Organic Carbon, TOC	5.49	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Field Blank

Sample Number: 124539-002 **Date Collected: 10/18/2012 13:50** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:48	EPA 200.8
Arsenic, As	< 0.10	ug/L	0.1	0.03	DPC	10/25/2012 12:48	EPA 200.8
Barium, Ba	< 0.10	ug/L	0.1	0.03	DPC	10/25/2012 12:48	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 20:39	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:48	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 12:48	EPA 200.8
Copper, Cu	0.08	ug/L	0.05	0.02	DPC	10/25/2012 12:48	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 12:48	EPA 200.8
Mercury, Hg	< 0.20	ug/L	0.2	0.03	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/25/2012 12:48	EPA 200.8
Nickel, Ni	< 0.20	ug/L	0.2	0.04	DPC	10/25/2012 12:48	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 12:48	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 12:48	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:48	EPA 200.8
Zinc, Zn	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 12:48	EPA 200.8
Silica, SiO2 (Dissolved)	< 0.02	mg/L	0.02	0.004	DAM	11/09/2012 10:51	EPA 200.7
Boron, B	0.150	mg/L	0.01	0.002	DAM	10/31/2012 20:39	EPA 200.7
Calcium, Ca	0.059	mg/L	0.02	0.004	DAM	10/31/2012 20:39	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 20:39	EPA 200.7
Magnesium, Mg	0.051	mg/L	0.05	0.01	DAM	10/31/2012 20:39	EPA 200.7
Manganese, Mn	0.0010	mg/L	0.0005	0.0001	DAM	10/31/2012 20:39	EPA 200.7
Potassium, K	< 0.05	mg/L	0.05	0.01	DAM	10/31/2012 20:38	EPA 200.7
Sodium, Na	0.07	mg/L	0.05	0.01	DAM	10/31/2012 20:38	EPA 200.7
Alkalinity, as CaCO3	< 5	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	< 5	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	< 0.0	mg/L	0.05	0.02	TDF	11/06/2012	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	< 20	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	< 0.4	mg/L	0.4	0.1	TDF	11/06/2012 21:04	EPA 300.1
Total Organic Carbon, TOC	1.17	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Equipment Blank

Sample Number: 124539-003 **Date Collected: 10/18/2012 15:10** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:53	EPA 200.8
Arsenic, As	0.12	ug/L	0.1	0.03	DPC	10/25/2012 12:53	EPA 200.8
Barium, Ba	1.53	ug/L	0.1	0.03	DPC	10/25/2012 12:53	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 20:54	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:53	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 12:53	EPA 200.8
Copper, Cu	1.87	ug/L	0.05	0.02	DPC	10/25/2012 12:53	EPA 200.8
Lead, Pb	0.207	ug/L	0.01	0.003	DPC	10/25/2012 12:53	EPA 200.8
Mercury, Hg	< 0.20	ug/L	0.2	0.03	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/25/2012 12:53	EPA 200.8
Nickel, Ni	0.42	ug/L	0.2	0.04	DPC	10/25/2012 12:53	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 12:53	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 12:53	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 12:53	EPA 200.8
Zinc, Zn	8.5	ug/L	0.5	0.1	DPC	10/25/2012 12:53	EPA 200.8
Silica, SiO2 (Dissolved)	< 0.02	mg/L	0.02	0.004	DAM	11/09/2012 10:53	EPA 200.7
Boron, B	0.096	mg/L	0.01	0.002	DAM	10/31/2012 20:54	EPA 200.7
Calcium, Ca	0.511	mg/L	0.02	0.004	DAM	10/31/2012 20:54	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 20:54	EPA 200.7
Magnesium, Mg	< 0.050	mg/L	0.05	0.01	DAM	10/31/2012 20:54	EPA 200.7
Manganese, Mn	< 0.0005	mg/L	0.0005	0.0001	DAM	10/31/2012 20:54	EPA 200.7
Potassium, K	< 0.05	mg/L	0.05	0.01	DAM	10/31/2012 20:52	EPA 200.7
Sodium, Na	0.11	mg/L	0.05	0.01	DAM	10/31/2012 20:52	EPA 200.7
Alkalinity, as CaCO3	< 5	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	< 5	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	< 0.1	mg/L	0.1	0.02	TDF	11/06/2012 21:24	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	< 20	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	48.5	mg/L	0.4	0.1	TDF	11/06/2012 21:24	EPA 300.1
Total Organic Carbon, TOC	1.14	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

SW-1

Sample Number: 124539-004 **Date Collected: 10/18/2012 08:40** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	7.69	ug/L	0.05	0.01	DPC	10/25/2012 12:57	EPA 200.8
Arsenic, As	4.88	ug/L	0.1	0.03	DPC	10/25/2012 12:57	EPA 200.8
Barium, Ba	90.5	ug/L	0.1	0.03	DPC	10/25/2012 12:57	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 20:57	EPA 200.7
Cadmium, Cd	0.60	ug/L	0.05	0.01	DPC	10/25/2012 12:57	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	10/25/2012 12:57	EPA 200.8
Copper, Cu	4.83	ug/L	0.05	0.02	DPC	10/25/2012 12:57	EPA 200.8
Lead, Pb	0.090	ug/L	0.01	0.003	DPC	10/25/2012 12:57	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	108	ug/L	0.1	0.02	DPC	10/25/2012 12:57	EPA 200.8
Nickel, Ni	19.4	ug/L	0.2	0.04	DPC	10/25/2012 12:57	EPA 200.8
Selenium, Se	4.7	ug/L	0.5	0.1	DPC	10/25/2012 12:57	EPA 200.8
Silver, Ag	0.012	ug/L	0.01	0.003	DPC	10/25/2012 12:57	EPA 200.8
Thallium, Tl	4.77	ug/L	0.05	0.01	DPC	10/25/2012 12:57	EPA 200.8
Zinc, Zn	11.3	ug/L	0.5	0.1	DPC	10/25/2012 12:57	EPA 200.8
Silica, SiO2 (Dissolved)	7.31	mg/L	0.02	0.004	DAM	11/09/2012 10:54	EPA 200.7
Boron, B	0.780	mg/L	0.01	0.002	DAM	10/31/2012 20:57	EPA 200.7
Calcium, Ca	93.5	mg/L	0.02	0.004	DAM	10/31/2012 20:57	EPA 200.7
Iron, Fe	0.029	mg/L	0.01	0.002	DAM	10/31/2012 20:57	EPA 200.7
Magnesium, Mg	46.4	mg/L	0.05	0.01	DAM	10/31/2012 20:57	EPA 200.7
Manganese, Mn	0.173	mg/L	0.0005	0.0001	DAM	10/31/2012 20:57	EPA 200.7
Potassium, K	12.4	mg/L	0.05	0.01	DAM	10/31/2012 20:56	EPA 200.7
Sodium, Na	87.6	mg/L	0.05	0.01	DAM	10/31/2012 20:56	EPA 200.7
Alkalinity, as CaCO3	66	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	66	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	14	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	1.0	mg/L	0.4	0.1	TDF	11/06/2012 23:16	EPA 300.1
Chloride, Cl	54.0	mg/L	2	0.5	TDF	11/06/2012 23:16	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	2.92	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	823	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	420	mg/L	10	3	TDF	11/06/2012 23:16	EPA 300.1
Total Organic Carbon, TOC	3.29	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1202

Sample Number: 124539-005 **Date Collected: 10/18/2012 10:07** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	0.05	0.01	DPC	10/25/2012 13:45	EPA 200.8
Arsenic, As	0.54	ug/L	0.1	0.03	DPC	10/25/2012 13:45	EPA 200.8
Barium, Ba	19.7	ug/L	0.1	0.03	DPC	10/25/2012 13:45	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 21:01	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 13:45	EPA 200.8
Chromium, Cr	0.2	ug/L	0.2	0.03	DPC	10/25/2012 13:45	EPA 200.8
Copper, Cu	0.20	ug/L	0.05	0.02	DPC	10/25/2012 13:45	EPA 200.8
Lead, Pb	0.015	ug/L	0.01	0.003	DPC	10/25/2012 13:45	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	0.28	ug/L	0.1	0.02	DPC	10/25/2012 13:45	EPA 200.8
Nickel, Ni	0.91	ug/L	0.2	0.04	DPC	10/25/2012 13:45	EPA 200.8
Selenium, Se	1.7	ug/L	0.5	0.1	DPC	10/25/2012 13:45	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 13:45	EPA 200.8
Thallium, Tl	0.08	ug/L	0.05	0.01	DPC	10/25/2012 13:45	EPA 200.8
Zinc, Zn	2.2	ug/L	0.5	0.1	DPC	10/25/2012 13:45	EPA 200.8
Silica, SiO2 (Dissolved)	14.2	mg/L	0.02	0.004	DAM	11/09/2012 10:55	EPA 200.7
Boron, B	0.147	mg/L	0.01	0.002	DAM	10/31/2012 21:01	EPA 200.7
Calcium, Ca	143	mg/L	0.02	0.004	DAM	10/31/2012 21:01	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 21:01	EPA 200.7
Magnesium, Mg	44.2	mg/L	0.05	0.01	DAM	10/31/2012 21:01	EPA 200.7
Manganese, Mn	0.0123	mg/L	0.0005	0.0001	DAM	10/31/2012 21:01	EPA 200.7
Potassium, K	4.77	mg/L	0.05	0.01	DAM	10/31/2012 20:59	EPA 200.7
Sodium, Na	27.2	mg/L	0.05	0.01	DAM	10/31/2012 20:59	EPA 200.7
Alkalinity, as CaCO3	348	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	348	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	3.7	mg/L	0.1	0.02	TDF	11/06/2012 23:36	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.29	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	687	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	201	mg/L	10	3	TDF	11/06/2012 23:36	EPA 300.1
Total Organic Carbon, TOC	1.63	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1203

Sample Number: 124539-006 **Date Collected: 10/18/2012 11:04** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.14	ug/L	0.05	0.01	DPC	10/25/2012 13:50	EPA 200.8
Arsenic, As	0.26	ug/L	0.1	0.03	DPC	10/25/2012 13:50	EPA 200.8
Barium, Ba	91.7	ug/L	0.1	0.03	DPC	10/25/2012 13:50	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 21:03	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 13:50	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 13:50	EPA 200.8
Copper, Cu	0.13	ug/L	0.05	0.02	DPC	10/25/2012 13:50	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 13:50	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	< 0.10	ug/L	0.1	0.02	DPC	10/25/2012 13:50	EPA 200.8
Nickel, Ni	1.14	ug/L	0.2	0.04	DPC	10/25/2012 13:50	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 13:50	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 13:50	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 13:50	EPA 200.8
Zinc, Zn	3.5	ug/L	0.5	0.1	DPC	10/25/2012 13:50	EPA 200.8
Silica, SiO2 (Dissolved)	8.94	mg/L	0.02	0.004	DAM	11/09/2012 10:56	EPA 200.7
Boron, B	0.164	mg/L	0.01	0.002	DAM	10/31/2012 21:03	EPA 200.7
Calcium, Ca	60.5	mg/L	0.02	0.004	DAM	10/31/2012 21:03	EPA 200.7
Iron, Fe	1.95	mg/L	0.01	0.002	DAM	10/31/2012 21:03	EPA 200.7
Magnesium, Mg	14.2	mg/L	0.05	0.01	DAM	10/31/2012 21:03	EPA 200.7
Manganese, Mn	1.29	mg/L	0.0005	0.0001	DAM	10/31/2012 21:03	EPA 200.7
Potassium, K	3.77	mg/L	0.05	0.01	DAM	10/31/2012 21:02	EPA 200.7
Sodium, Na	14.4	mg/L	0.05	0.01	DAM	10/31/2012 21:02	EPA 200.7
Alkalinity, as CaCO3	203	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	203	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	5.0	mg/L	0.1	0.02	TDF	11/06/2012 21:43	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	268	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	31.8	mg/L	0.4	0.1	TDF	11/06/2012 21:43	EPA 300.1
Total Organic Carbon, TOC	1.46	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #1204

Sample Number: 124539-007 **Date Collected: 10/18/2012 11:31** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.16	ug/L	0.05	0.01	DPC	10/25/2012 13:55	EPA 200.8
Arsenic, As	0.44	ug/L	0.1	0.03	DPC	10/25/2012 13:55	EPA 200.8
Barium, Ba	50.0	ug/L	0.1	0.03	DPC	10/25/2012 13:55	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 21:07	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 13:55	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 13:55	EPA 200.8
Copper, Cu	0.40	ug/L	0.05	0.02	DPC	10/25/2012 13:55	EPA 200.8
Lead, Pb	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 13:55	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	1.09	ug/L	0.1	0.02	DPC	10/25/2012 13:55	EPA 200.8
Nickel, Ni	0.69	ug/L	0.2	0.04	DPC	10/25/2012 13:55	EPA 200.8
Selenium, Se	0.6	ug/L	0.5	0.1	DPC	10/25/2012 13:55	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 13:55	EPA 200.8
Thallium, Tl	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 13:55	EPA 200.8
Zinc, Zn	1.1	ug/L	0.5	0.1	DPC	10/25/2012 13:55	EPA 200.8
Silica, SiO2 (Dissolved)	12.5	mg/L	0.02	0.004	DAM	11/09/2012 10:56	EPA 200.7
Boron, B	0.103	mg/L	0.01	0.002	DAM	10/31/2012 21:07	EPA 200.7
Calcium, Ca	77.5	mg/L	0.02	0.004	DAM	10/31/2012 21:07	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 21:07	EPA 200.7
Magnesium, Mg	33.8	mg/L	0.05	0.01	DAM	10/31/2012 21:07	EPA 200.7
Manganese, Mn	0.0174	mg/L	0.0005	0.0001	DAM	10/31/2012 21:07	EPA 200.7
Potassium, K	2.94	mg/L	0.05	0.01	DAM	10/31/2012 21:05	EPA 200.7
Sodium, Na	11.3	mg/L	0.05	0.01	DAM	10/31/2012 21:05	EPA 200.7
Alkalinity, as CaCO3	229	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	229	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	2.7	mg/L	0.1	0.02	TDF	11/06/2012 12:24	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.29	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	404	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	105	mg/L	0.4	0.1	TDF	11/06/2012 12:24	EPA 300.1
Total Organic Carbon, TOC	2.07	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Monitoring Well #004

Sample Number: 124539-008 **Date Collected:** 10/18/2012 12:37 **Date Received:** 10/19/2012

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.08	ug/L	0.05	0.01	DPC	10/25/2012 14:00	EPA 200.8
Arsenic, As	0.97	ug/L	0.1	0.03	DPC	10/25/2012 14:00	EPA 200.8
Barium, Ba	14.4	ug/L	0.1	0.03	DPC	10/25/2012 14:00	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 21:11	EPA 200.7
Cadmium, Cd	0.06	ug/L	0.05	0.01	DPC	10/25/2012 14:00	EPA 200.8
Chromium, Cr	< 0.2	ug/L	0.2	0.03	DPC	10/25/2012 14:00	EPA 200.8
Copper, Cu	1.90	ug/L	0.05	0.02	DPC	10/25/2012 14:00	EPA 200.8
Lead, Pb	0.034	ug/L	0.01	0.003	DPC	10/25/2012 14:00	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	0.20	ug/L	0.1	0.02	DPC	10/25/2012 14:00	EPA 200.8
Nickel, Ni	22.4	ug/L	0.2	0.04	DPC	10/25/2012 14:00	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 14:00	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 14:00	EPA 200.8
Thallium, Tl	0.24	ug/L	0.05	0.01	DPC	10/25/2012 14:00	EPA 200.8
Zinc, Zn	8.1	ug/L	0.5	0.1	DPC	10/25/2012 14:00	EPA 200.8
Silica, SiO2 (Dissolved)	7.25	mg/L	0.02	0.004	DAM	11/26/2012	EPA 200.7
Boron, B	0.208	mg/L	0.01	0.002	DAM	10/31/2012 21:11	EPA 200.7
Calcium, Ca	302	mg/L	0.02	0.004	DAM	10/31/2012 21:11	EPA 200.7
Iron, Fe	< 0.010	mg/L	0.01	0.002	DAM	10/31/2012 21:11	EPA 200.7
Magnesium, Mg	133	mg/L	0.05	0.01	DAM	10/31/2012 21:11	EPA 200.7
Manganese, Mn	0.605	mg/L	0.0005	0.0001	DAM	10/31/2012 21:11	EPA 200.7
Potassium, K	24.9	mg/L	0.05	0.01	DAM	10/31/2012 21:09	EPA 200.7
Sodium, Na	70.4	mg/L	0.05	0.01	DAM	10/31/2012 21:09	EPA 200.7
Alkalinity, as CaCO3	429	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	428	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	12	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.2	mg/L	0.2	0.1	TDF	11/06/2012	EPA 300.1
Chloride, Cl	4.4	mg/L	0.1	0.02	TDF	11/06/2012 23:55	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	0.33	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	1840	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	923	mg/L	10	3	TDF	11/06/2012 23:55	EPA 300.1
Total Organic Carbon, TOC	4.60	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Location: Big Sandy Plant *Report Date: 11/26/2012*

Monitoring Well #001

Sample Number: 124539-009 **Date Collected: 10/18/2012 14:55** **Date Received: 10/19/2012**

Parameter	Result	Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	0.05	0.01	DPC	10/25/2012 14:04	EPA 200.8
Arsenic, As	1.36	ug/L	0.1	0.03	DPC	10/25/2012 14:04	EPA 200.8
Barium, Ba	48.7	ug/L	0.1	0.03	DPC	10/25/2012 14:04	EPA 200.8
Beryllium, Be	< 0.5	ug/L	0.5	0.1	DAM	10/31/2012 21:13	EPA 200.7
Cadmium, Cd	< 0.05	ug/L	0.05	0.01	DPC	10/25/2012 14:04	EPA 200.8
Chromium, Cr	0.3	ug/L	0.2	0.03	DPC	10/25/2012 14:04	EPA 200.8
Copper, Cu	0.11	ug/L	0.05	0.02	DPC	10/25/2012 14:04	EPA 200.8
Lead, Pb	0.026	ug/L	0.01	0.003	DPC	10/25/2012 14:04	EPA 200.8
Mercury, Hg	< 2.00	ug/L	2	0.3	JAB	10/29/2012	EPA 245.2
Molybdenum, Mo	0.26	ug/L	0.1	0.02	DPC	10/25/2012 14:04	EPA 200.8
Nickel, Ni	6.44	ug/L	0.2	0.04	DPC	10/25/2012 14:04	EPA 200.8
Selenium, Se	< 0.5	ug/L	0.5	0.1	DPC	10/25/2012 14:04	EPA 200.8
Silver, Ag	< 0.010	ug/L	0.01	0.003	DPC	10/25/2012 14:04	EPA 200.8
Thallium, Tl	0.12	ug/L	0.05	0.01	DPC	10/25/2012 14:04	EPA 200.8
Zinc, Zn	2.7	ug/L	0.5	0.1	DPC	10/25/2012 14:04	EPA 200.8
Silica, SiO2 (Dissolved)	8.81	mg/L	0.02	0.004	DAM	11/26/2012	EPA 200.7
Boron, B	0.124	mg/L	0.01	0.002	DAM	10/31/2012 21:13	EPA 200.7
Calcium, Ca	38.9	mg/L	0.02	0.004	DAM	10/31/2012 21:13	EPA 200.7
Iron, Fe	3.48	mg/L	0.01	0.002	DAM	10/31/2012 21:13	EPA 200.7
Magnesium, Mg	21.2	mg/L	0.05	0.01	DAM	10/31/2012 21:13	EPA 200.7
Manganese, Mn	2.22	mg/L	0.0005	0.0001	DAM	10/31/2012 21:13	EPA 200.7
Potassium, K	3.41	mg/L	0.05	0.01	DAM	10/31/2012 21:12	EPA 200.7
Sodium, Na	20.0	mg/L	0.05	0.01	DAM	10/31/2012 21:12	EPA 200.7
Alkalinity, as CaCO3	148	mg/L	5	1	WKE	10/23/2012	SM20 2320B
Bicarbonate Alkalinity	148	mg/L	5	2	WKE	10/23/2012	SM20 4500-CO2D
Chemical Oxygen Demand, COD	< 10	mg/L	10	2	WKE	10/31/2012	SM20 5220D
Bromide, Br	< 0.4	mg/L	0.4	0.1	TDF	11/07/2012 00:22	EPA 300.1
Chloride, Cl	6.0	mg/L	0.1	0.02	TDF	11/07/2012 00:22	EPA 300.1
Nitrate-Nitrite, NO3-NO2, as N	< 0.20	mg/L	0.2	0.04	DMM	11/13/2012	SM20 4500NO3 H
Residue, Filterable, TDS	251	mg/L	20	6	MSO	10/22/2012	SM20 2540C
Sulfate, SO4	58.7	mg/L	0.4	0.1	TDF	11/07/2012 00:22	EPA 300.1
Total Organic Carbon, TOC	1.93	mg/L	0.02	0.004	DMM	10/20/2012	SM20 5310C

Brian Snyder, Chemist II

Email bssnyder@aep.com *Tel. 614-836-4224*

Fax 614-836-4168 *Audinet 210-4224*

LABORATORY REPORT

Geotechnics, Inc.
544 Braddock Ave.
East Pittsburgh, PA 15112
ATTENTION: David Backstrom
Telephone: 412-823-7600

Report Date:	April 18, 2013
Samples Received:	March 8, 2013
RJ Lee Group Job No.:	CXH1026026
Client Job No.:	13815151.10000
Purchase Order No.:	N/A

ANALYSIS: X-ray diffraction (XRD) for Clay Identification

Stokes separation was performed on all samples.to separate the <4um portion. The <4um portion of the sample was mounted, oriented, on a glass slide for analysis. Each sample was run on a PANalytical X'Pert Pro diffractometer using copper radiation. Following the initial run, each sample underwent an ethylene glycol treatment, followed by two heat treatments, the first at 450°C and the second at 500°C. Each sample was rerun on the diffractometer under the same conditions as the initial run after each preparation step. Each resulting diffraction pattern was then analyzed with the X'Pert HighScore Plus program utilizing the ICDD PDF 4+database. The results are listed on the following pages.

Client Sample No.: PB-1 50-52
RJ Lee Group Sample No.: 10232611

Phase	Composition	Concentration
Kaolinite	$Al_2Si_2O_5(OH)_4$	Major/Minor
Quartz	SiO_2	Minor
Illite	$(K_2H_3O)Al_2(Si_3Al)O_{10}(OH)\cdot xH_2O$	Major/Minor
Vermiculite	$Mg_3Si_4O_{10}(OH)_2$	Trace
Attapulgite (Palygorskite)	$(Mg,Al)_2Si_4O_{10}(OH)\cdot 4H_2O$	Trace/Possible

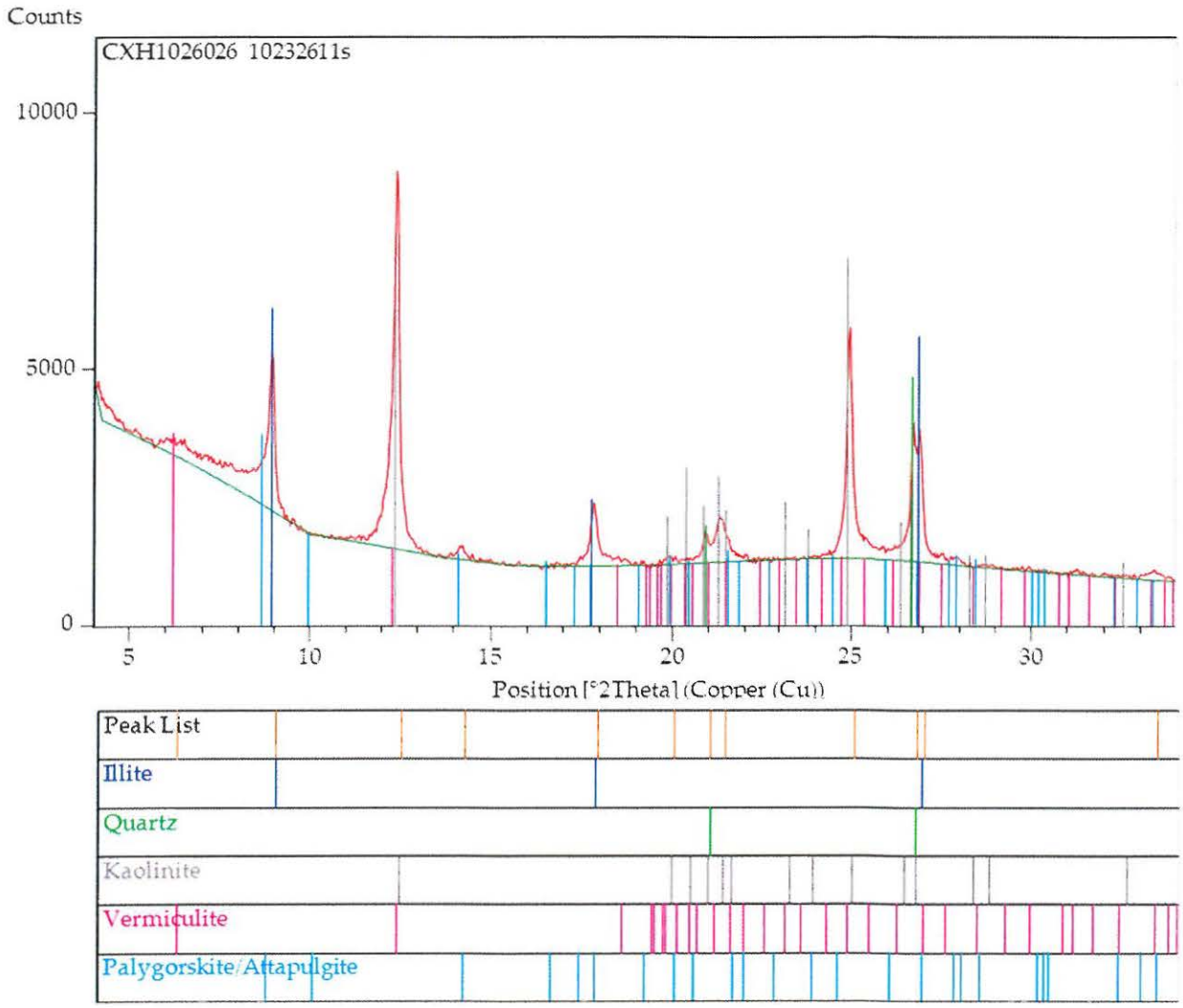

Figure 1 –X-ray diffraction pattern of sample *"PB-1 50-52"*, with degrees 2θ along the x-axis and intensity (counts) along the y-axis.

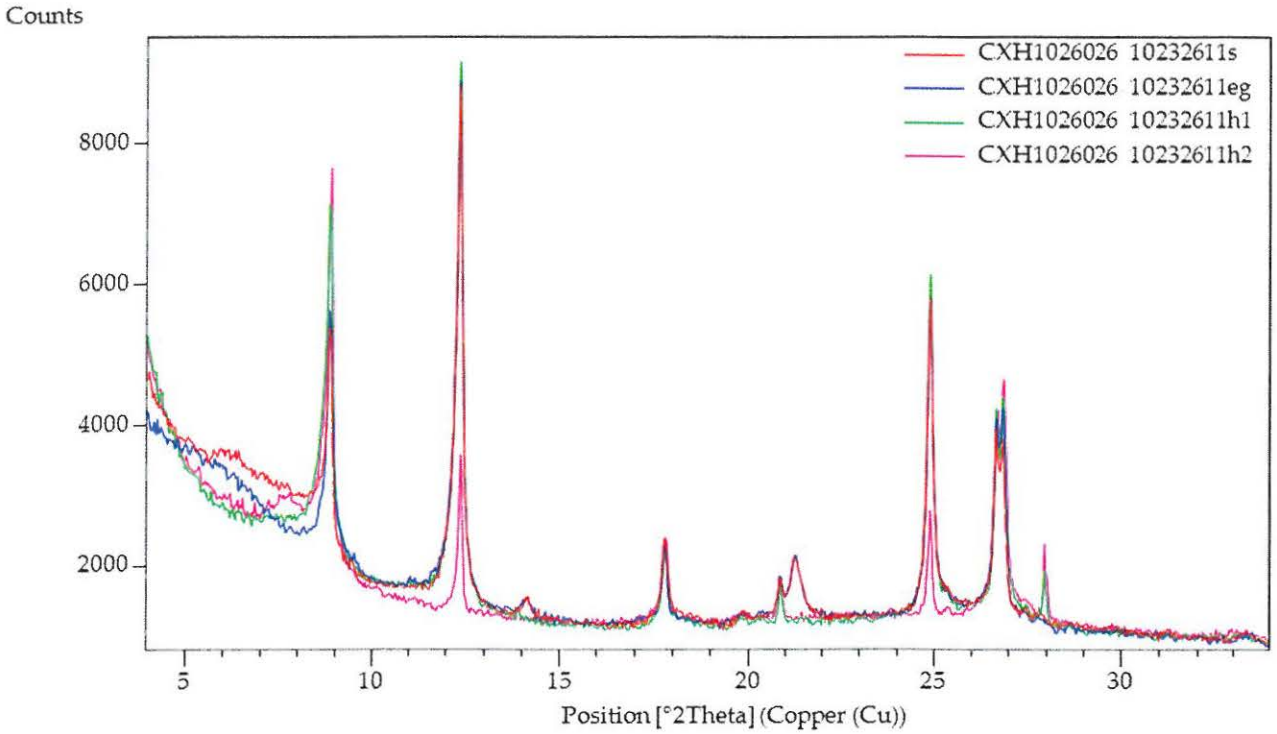

Figure 2 – Overlay x-ray diffraction pattern of untreated sample "PB-1 50-52" (in red), overlain with the patterns after ethylene glycol treatment (blue), 350°C heat treatment (in green) and the 550°C heat treatment (in pink), with degrees 2✾ along the x-axis and intensity (counts) along the y-axis.

Client Sample No.: PB-4 87-89
RJ Lee Group Sample No.: 10232613

Phase	Composition	Concentration
Kaolinite	$Al_2Si_2O_5(OH)_4$	Major/Minor
Quartz	SiO_2	Minor
Illite	$(K_2H_3O)Al_2(Si_3Al)O_{10}(OH)\cdot xH_2O$	Major/Minor
Vermiculite	$Mg_3Si_4O_{10}(OH)_2$	Trace
Attapulgite (Palygorskite)	$(Mg,Al)_2Si_4O_{10}(OH)\cdot 4H_2O$	Trace/Possible
Sepiolite	$(Mg,Fe)_4Si_6O_{15}(OH)_2\cdot 6H_2O$	Trace/Possible

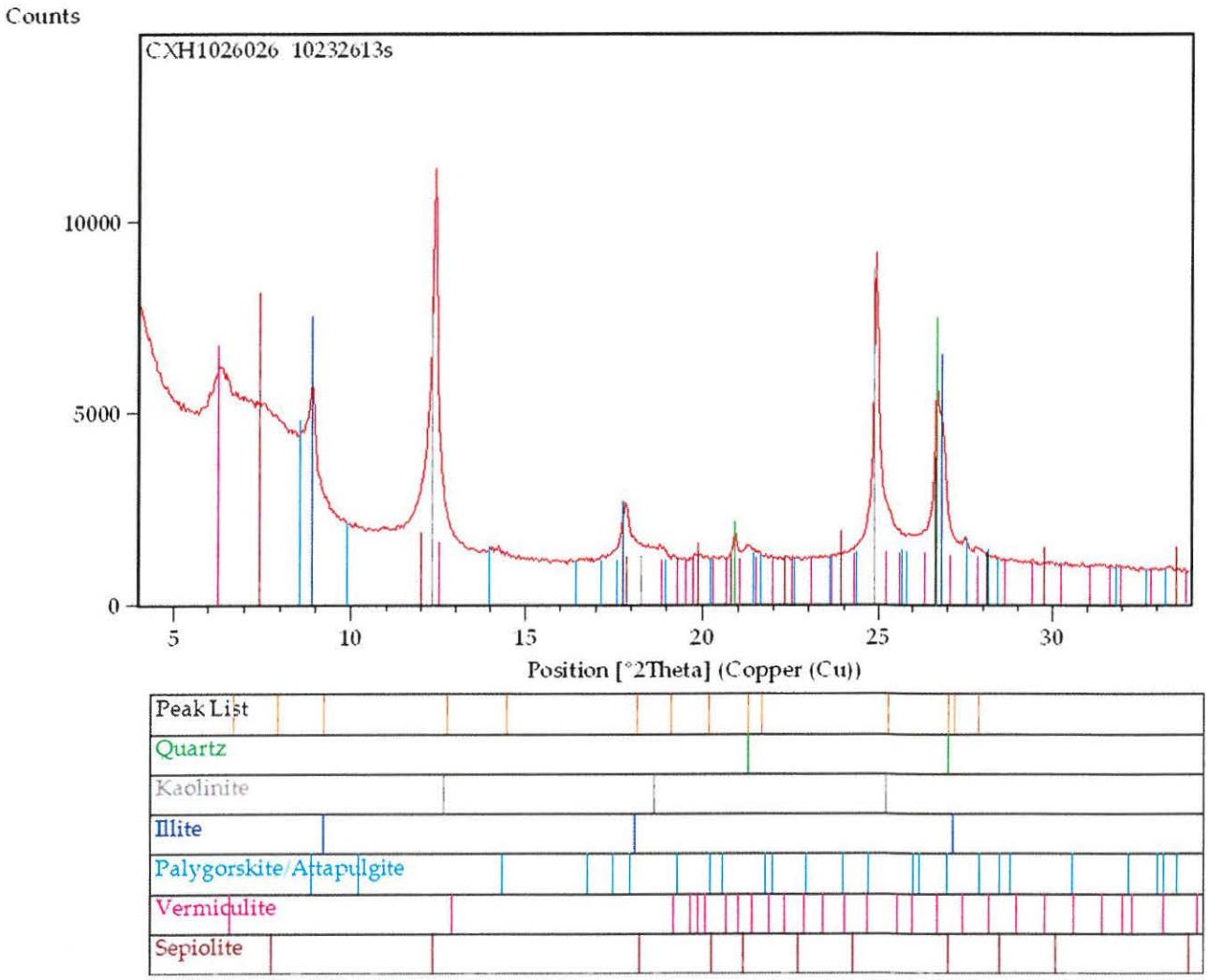

Figure 3 –X-ray diffraction pattern of sample *"PB-4 87-89"*, with degrees 2θ along the x-axis and intensity (counts) along the y-axis.

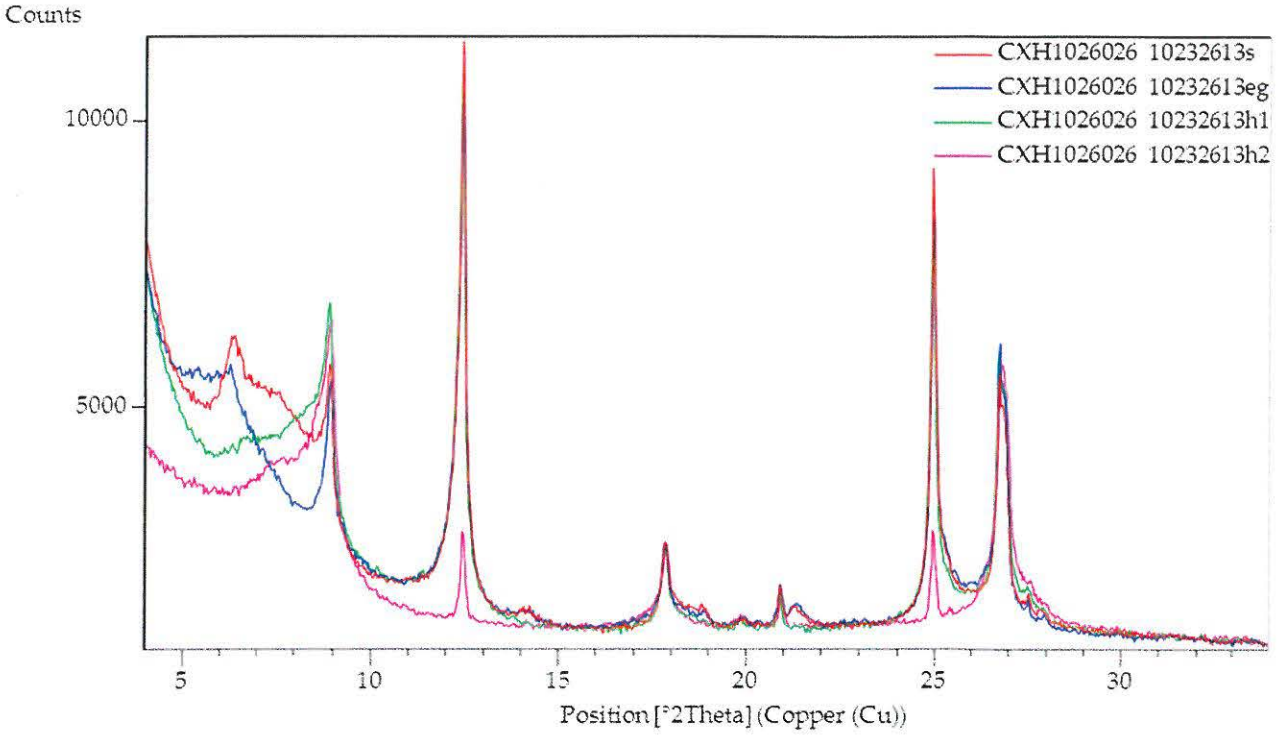

Figure 4 – Overlay x-ray diffraction pattern of untreated sample *"PB-4 87-89"* (in red), overlain with the patterns after ethylene glycol treatment (blue), 350°C heat treatment (in green) and the 550°C heat treatment (in pink), with degrees 2θ along the x-axis and intensity (counts) along the y-axis.

Client Sample No.: PB-6 78-80 Top
RJ Lee Group Sample No.: 10232618

Phase	Composition	Concentration
Kaolinite	$Al_2Si_2O_5(OH)_4$	Major/Minor
Quartz	SiO_2	Minor
Illite	$(K_2H_3O)Al_2(Si_3Al)O_{10}(OH)\cdot xH_2O$	Major/Minor
Vermiculite	$Mg_3Si_4O_{10}(OH)_2$	Trace
Sepiolite	$(Mg,Fe)_4Si_6O_{15}(OH)_2\cdot 6H_2O$	Trace/Possible

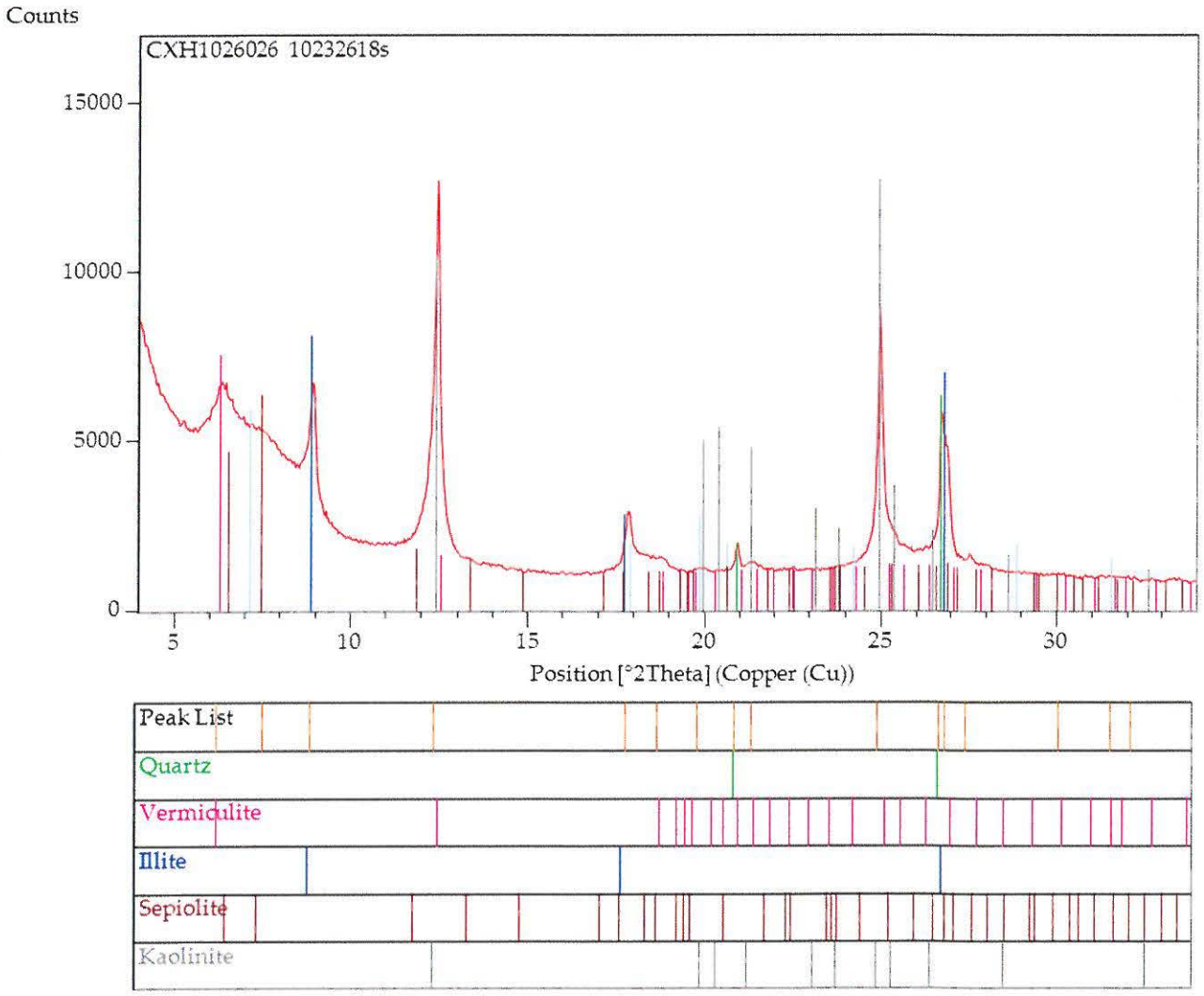

Figure 5 –X-ray diffraction pattern of sample *"PB-6 78-80 Top"*, with degrees 2θ along the x-axis and intensity (counts) along the y-axis.

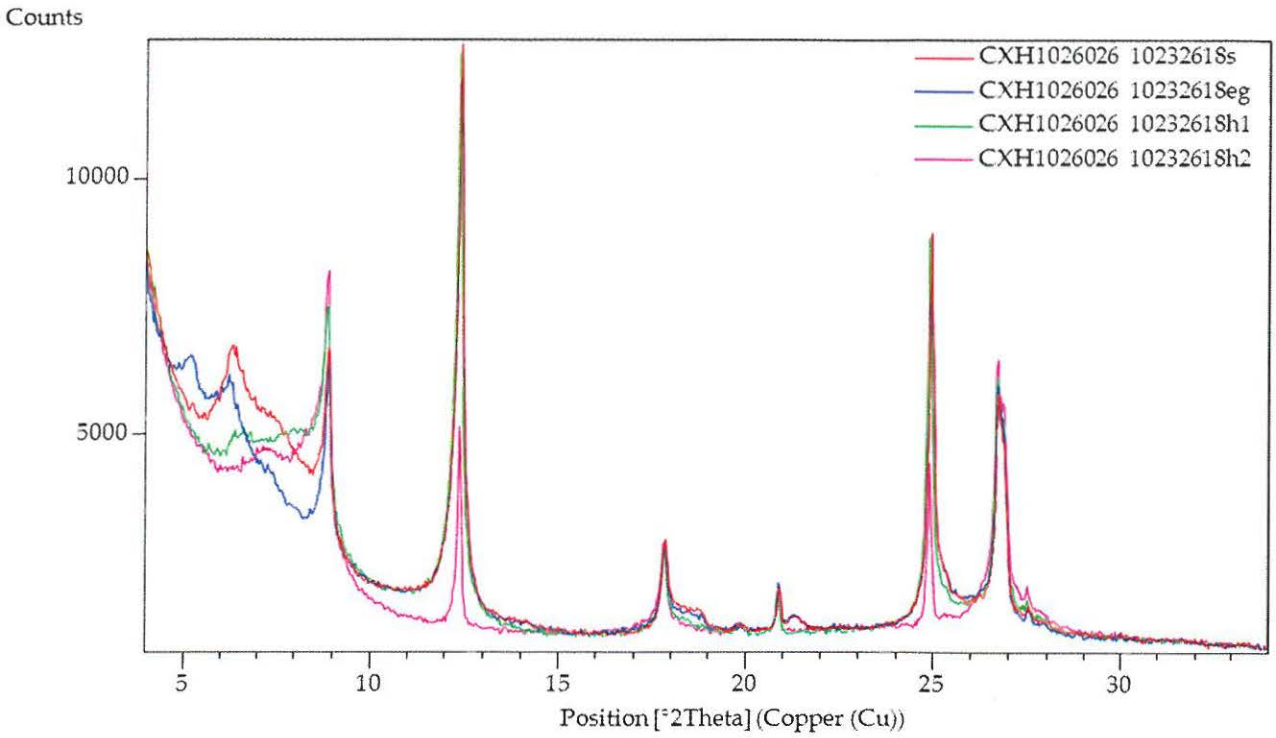

Figure 6 – Overlay x-ray diffraction pattern of untreated sample *"PB-6 78-80 Top"* (in red), overlain with the patterns after ethylene glycol treatment (blue), 350°C heat treatment (in green) and the 550°C heat treatment (in pink), with degrees 2Θ along the x-axis and intensity (counts) along the y-axis.

Client Sample No.: PB-6 78-80 Bot
RJ Lee Group Sample No.: 10232619

Phase	Composition	Concentration
Kaolinite	$Al_2Si_2O_5(OH)_4$	Major/Minor
Quartz	SiO_2	Minor
Illite	$(K_2H_3O)Al_2(Si_3Al)O_{10}(OH)\cdot xH_2O$	Major/Minor
Vermiculite	$Mg_3Si_4O_{10}(OH)_2$	Trace
Sepiolite	$(Mg,Fe)_4Si_6O_{15}(OH)_2\cdot 6H_2O$	Trace/Possible

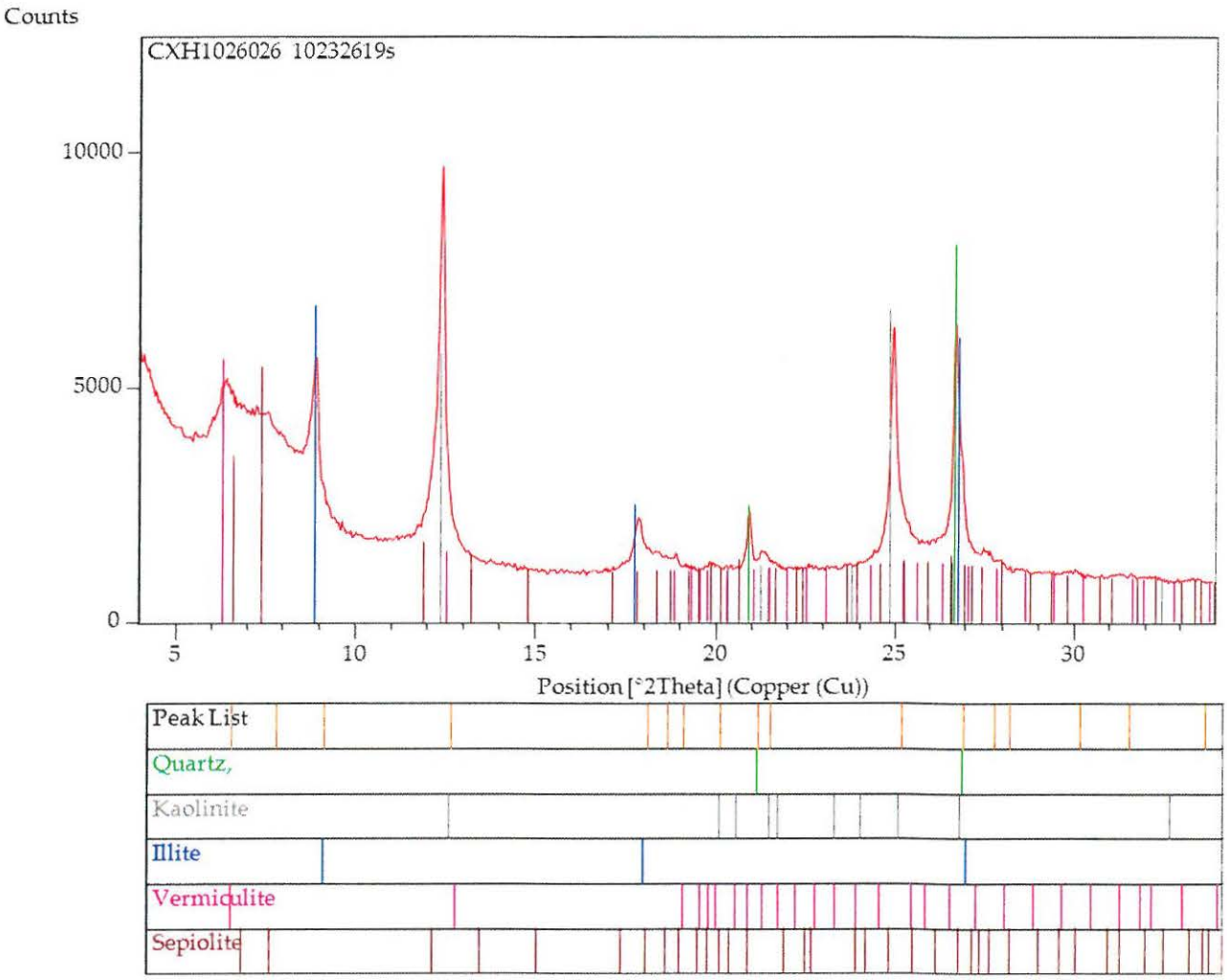

Figure 7 –X-ray diffraction pattern of sample *"PB-6 78-80 Bot"*, with degrees 2θ along the x-axis and intensity (counts) along the y-axis.

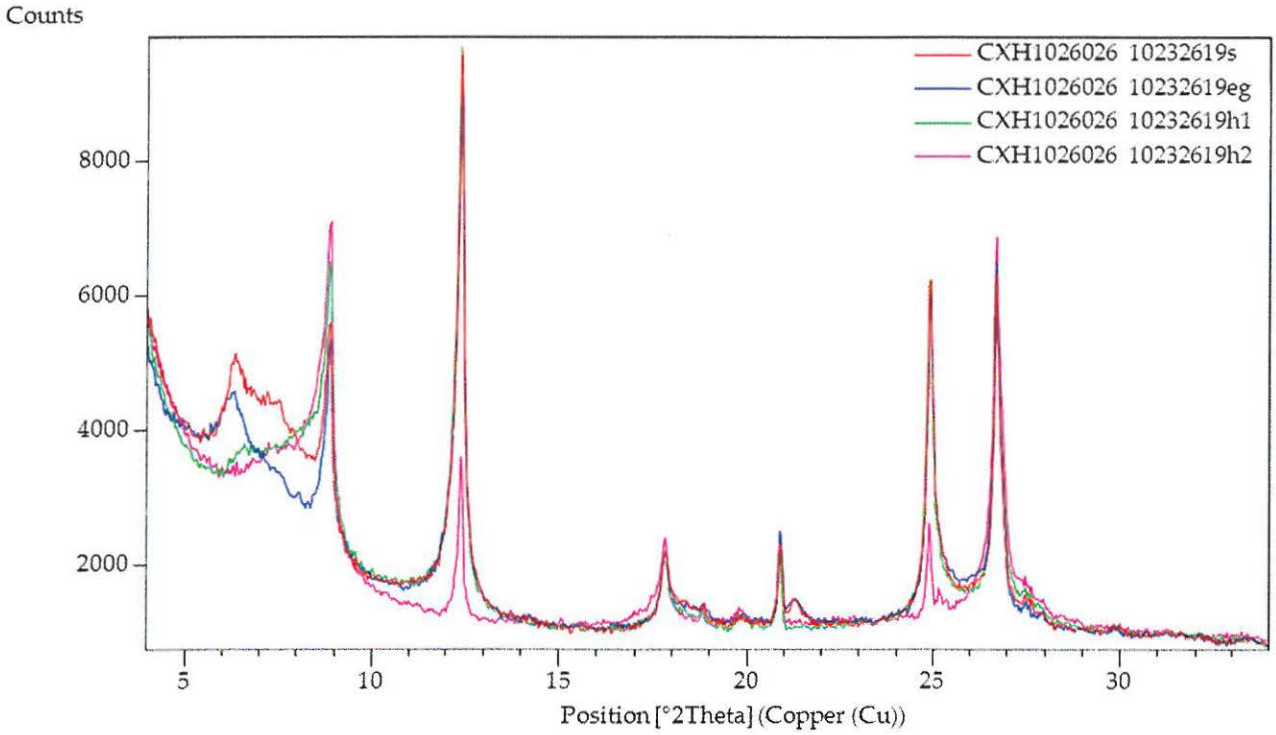

Figure 8 – Overlay x-ray diffraction pattern of untreated sample "*PB-6 78-80 Bot*" (in red), overlain with the patterns after ethylene glycol treatment (blue), 350°C heat treatment (in green) and the 550°C heat treatment (in pink), with degrees 2Θ along the x-axis and intensity (counts) along the y-axis.

Authorized Signature _____ Date 04/18/13

Shannon Arlauckas
Scientist, X-ray Diffraction Group

RJ Lee*Group* , Inc.
350 Hochberg Road, Monroeville, PA 15146
Tel: (724) 325-1776 | Fax: (724) 733-1799

LABORATORY REPORT

Geotechnics
544 Braddock Ave
East Pittsburgh, PA 15112

Attn: David Backstrom
Phone: 4128237600
Fax: 4128238999
Email: dbackstrom@geotechnics.net

RJ Lee Group Job No.: CXH1026026
RJ Lee Group Chemistry Job No.: IN15032013P020
Samples Received: March 13, 2013
Report Date: March 29, 2013
Client Project: N/A
Purchase Order No.: N/A
Prep/Analysis: Extraction / Compulsive Exchange-PA

Client Sample ID	RJ Lee Group ID	Sampling Date	Analyte	Matrix	Sample Concentration Total mg/L (PPM)	Minimum Reporting Limit mg/L (PPM)	Analysis Date	Q
PB-1 50-52	10232611	NP	CEC($cmol_c$/Kg soil)	Solid	2.7	--	--	
PB-1 50-52	10232611	NP	Aluminum	Solid	< 0.0200	0.0200	03/26/2013	
PB-1 50-52	10232611	NP	Calcium	Solid	36.2	0.300	03/26/2013	
PB-1 50-52	10232611	NP	Magnesium	Solid	8.21	1.00	03/26/2013	
PB-1 50-52	10232611	NP	Potassium	Solid	6.60	0.200	03/26/2013	
PB-3 75-76	10232612	NP	CEC($cmol_c$/Kg soil)	Solid	2.7	--	--	
PB-3 75-76	10232612	NP	Aluminum	Solid	0.110	0.0200	03/26/2013	
PB-3 75-76	10232612	NP	Calcium	Solid	33.9	0.300	03/26/2013	
PB-3 75-76	10232612	NP	Magnesium	Solid	11.0	1.00	03/26/2013	
PB-3 75-76	10232612	NP	Potassium	Solid	5.26	0.200	03/26/2013	
PB-4 87-89	10232613	NP	CEC($cmol_c$/Kg soil)	Solid	2.3	--	--	
PB-4 87-89	10232613	NP	Aluminum	Solid	2.06	0.0200	03/26/2013	
PB-4 87-89	10232613	NP	Calcium	Solid	26.5	0.300	03/26/2013	
PB-4 87-89	10232613	NP	Magnesium	Solid	10.00	1.00	03/26/2013	
PB-4 87-89	10232613	NP	Potassium	Solid	6.57	0.200	03/26/2013	
PB-4 97.5-98.5	10232614	NP	CEC($cmol_c$/Kg soil)	Solid	7.8	--	--	
PB-4 97.5-98.5	10232614	NP	Aluminum	Solid	4.79	0.0200	03/26/2013	
PB-4 97.5-98.5	10232614	NP	Calcium	Solid	118	3.00	03/26/2013	
PB-4 97.5-98.5	10232614	NP	Magnesium	Solid	20.6	1.00	03/26/2013	
PB-4 97.5-98.5	10232614	NP	Potassium	Solid	7.78	0.200	03/26/2013	

Lykourgos Iordanidis
Chemistry Laboratory Manager

RJ Lee*Group* , Inc.
350 Hochberg Road, Monroeville, PA 15146
Tel: (724) 325-1776 | Fax: (724) 733-1799

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RJ Lee Group Job No.: CXH1026026
RJ Lee Group Chemistry Job No.: IN15032013P020
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Report Date: March 29, 2013
Client Project: N/A
Purchase Order No.: N/A
Prep/Analysis: Extraction / Compulsive Exchange-PA

Client Sample ID	RJ Lee Group ID	Sampling Date	Analyte	Matrix	Sample Concentration Total mg/L (PPM)	Minimum Reporting Limit mg/L (PPM)	Analysis Date	Q
PB-4 102-104	10232615	NP	CEC($cmol_c$/Kg soil)	Solid	9.9	--	--	
PB-4 102-104	10232615	NP	Aluminum	Solid	0.0574	0.0200	03/26/2013	
PB-4 102-104	10232615	NP	Calcium	Solid	168	3.00	03/26/2013	
PB-4 102-104	10232615	NP	Magnesium	Solid	15.7	1.00	03/26/2013	
PB-4 102-104	10232615	NP	Potassium	Solid	8.22	0.200	03/26/2013	
PB-5 42-42.75	10232616	NP	CEC($cmol_c$/Kg soil)	Solid	2.2	--	--	
PB-5 42-42.75	10232616	NP	Aluminum	Solid	2.56	0.0200	03/26/2013	
PB-5 42-42.75	10232616	NP	Calcium	Solid	26.6	0.300	03/26/2013	
PB-5 42-42.75	10232616	NP	Magnesium	Solid	7.67	1.00	03/26/2013	
PB-5 42-42.75	10232616	NP	Potassium	Solid	7.61	0.200	03/26/2013	
PB-5 47.5-49	10232617	NP	CEC($cmol_c$/Kg soil)	Solid	0.37	--	--	
PB-5 47.5-49	10232617	NP	Aluminum	Solid	2.05	0.0200	03/26/2013	
PB-5 47.5-49	10232617	NP	Calcium	Solid	3.71	0.0300	03/26/2013	
PB-5 47.5-49	10232617	NP	Magnesium	Solid	1.48	1.00	03/26/2013	
PB-5 47.5-49	10232617	NP	Potassium	Solid	2.42	0.200	03/26/2013	
PB-6 78-80 Top	10232618	NP	CEC($cmol_c$/Kg soil)	Solid	5.0	--	--	
PB-6 78-80 Top	10232618	NP	Aluminum	Solid	< 0.0200	0.0200	03/26/2013	
PB-6 78-80 Top	10232618	NP	Calcium	Solid	71.3	3.00	03/26/2013	
PB-6 78-80 Top	10232618	NP	Magnesium	Solid	11.5	1.00	03/26/2013	
PB-6 78-80 Top	10232618	NP	Potassium	Solid	19.4	0.200	03/26/2013	

Lykourgos Iordanidis
Chemistry Laboratory Manager

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RJ Lee Group Chemistry Job No.: IN15032013P020
Samples Received: March 13, 2013
Report Date: March 29, 2013
Client Project: N/A
Purchase Order No.: N/A
Prep/Analysis: Extraction / Compulsive Exchange-PA

Client Sample ID	RJ Lee Group ID	Sampling Date	Analyte	Matrix	Sample Concentration Total mg/L (PPM)	Minimum Reporting Limit mg/L (PPM)	Analysis Date	Q
PB-6 78-80 Bot	10232619	NP	CEC($cmol_c$/Kg soil)	Solid	4.3	--	--	
PB-6 78-80 Bot	10232619	NP	Aluminum	Solid	0.122	0.0200	03/26/2013	
PB-6 78-80 Bot	10232619	NP	Calcium	Solid	57.1	3.00	03/26/2013	
PB-6 78-80 Bot	10232619	NP	Magnesium	Solid	12.5	1.00	03/26/2013	
PB-6 78-80 Bot	10232619	NP	Potassium	Solid	16.7	0.200	03/26/2013	

Analyst Comments: The concentrations of the cations were measured in the extract by ICP. The CEC is determined by adding the results i.e. CEC (cmolc/kg soil) = [Ca/20 + Mg/12 + K/39 + Al/9] whereas the element designation represents the concentration of that element in the leachate solution in mg/L.

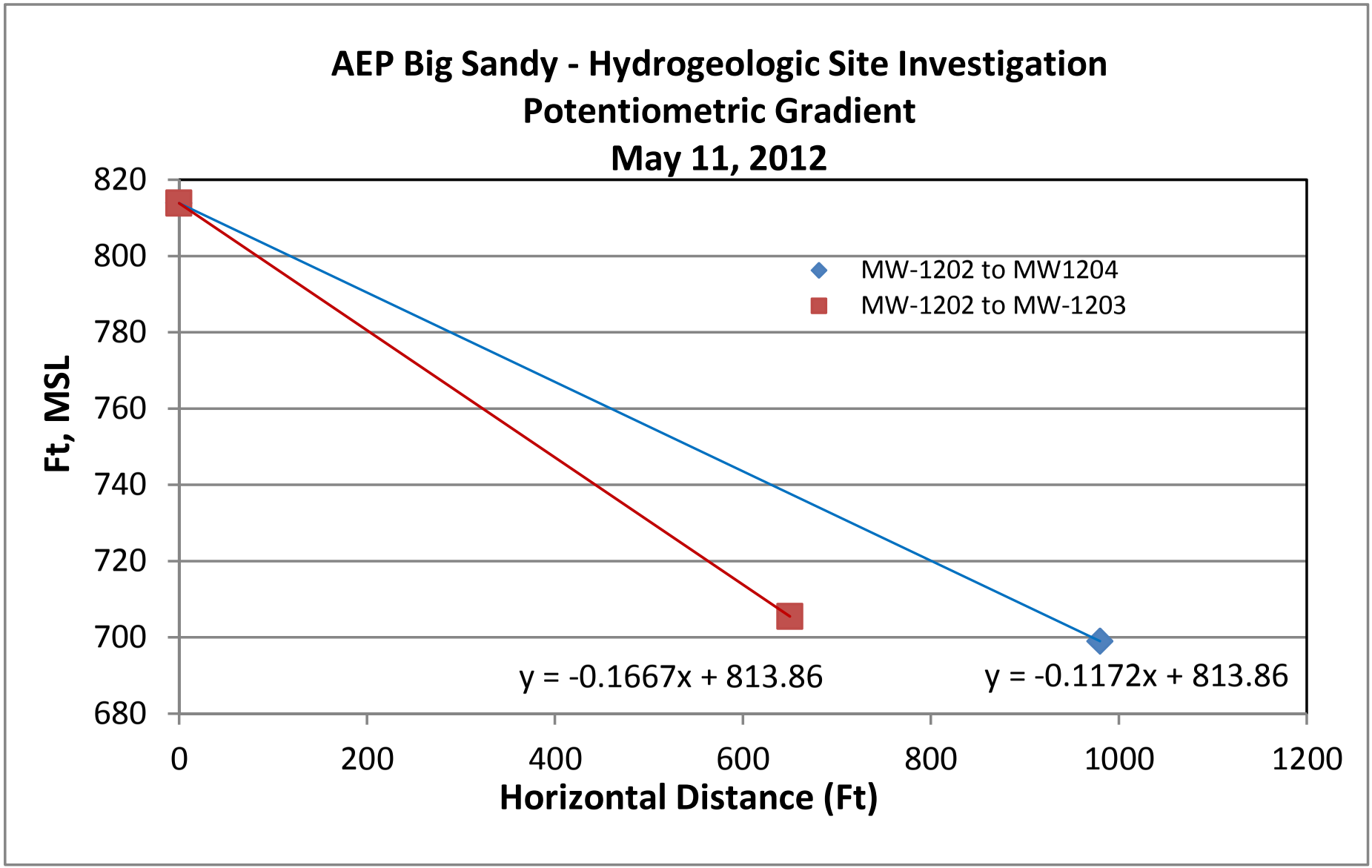
Report Qualifiers (Q):

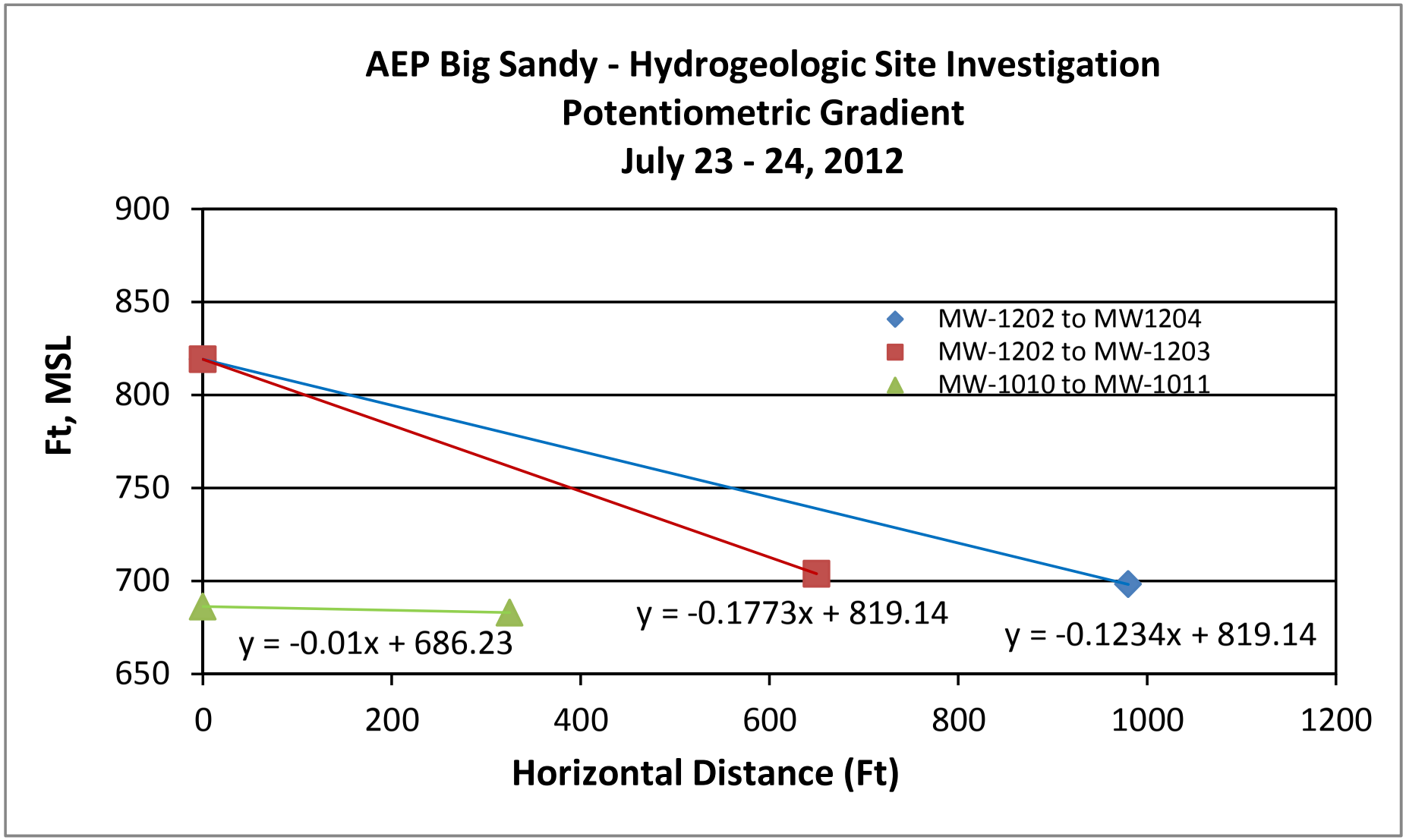
P=PA-DEP Accredited (PA DEP Lab ID 02-00396, NELAP)
N=NY ELAP Accredited (NY ELAP Lab Code 10884)
C=CA ELAP Accredited (CA ELAP Certificate 1970)
V=VA Accredited (VA DCLS Lab ID 00297, NELAP)
O=LA LELAP Accredited (LA DEQ Agency Interest 94775)
E = Value above highest calibration standard
J = Value below lowest calibration standard but above MDL (Method Detection Limit)
L = LCS (Laboratory Control Standard)/SRM (Standard Reference Material) recovery outside accepted recovery limits
H = Holding times for preparation or analysis exceeded
B = Analyte detected in the associated Method Blank
S = Spike Recovery outside accepted limits
R = RPD (relative percent difference) outside accepted limits
D = RL (reporting limit verification) outside accepted limits
NP = Not Provided

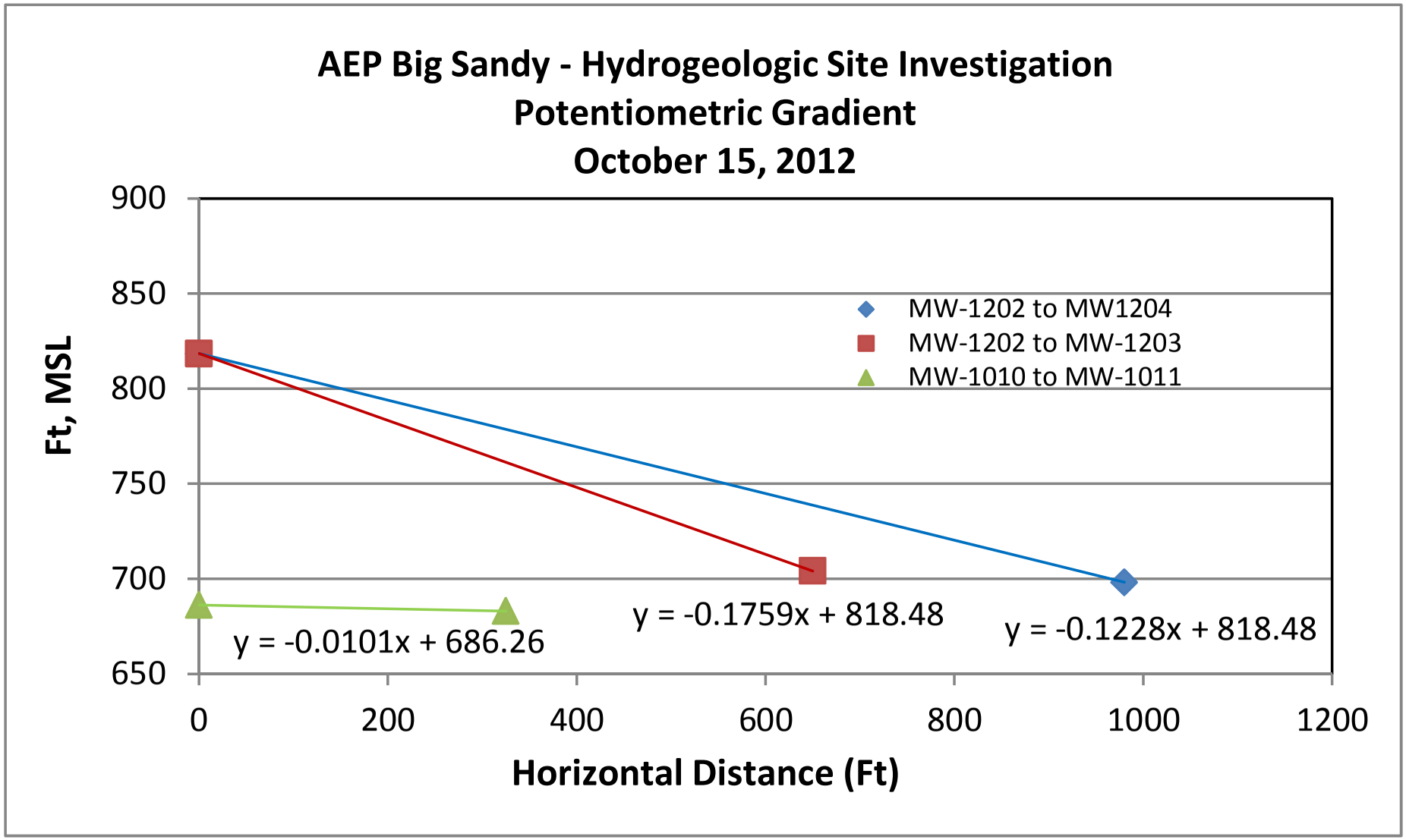
Lykourgos Iordanidis
Chemistry Laboratory Manager

APPENDIX D

POTENTIOMETRIC GRADIENT CHARTS


AEP Big Sandy - Hydrogeologic Site Investigation
Potentiometric Gradient
May 11, 2012
820
800
780
760
740
720
700
680
Ft, MSL
0
200
400
600
800
1000
1200
Horizontal Distance (Ft)
MW-1202 to MW1204
MW-1202 to MW-1203
y = -0.1667x + 813.86
y = -0.1172x + 813.86


AEP Big Sandy - Hydrogeologic Site Investigation
Potentiometric Gradient
July 23 - 24, 2012
Ft, MSL
900
850
800
750
700
650
0
200
400
600
800
1000
1200
Horizontal Distance (Ft)
MW-1202 to MW1204
MW-1202 to MW-1203
MW-1010 to MW-1011
y = -0.01x + 686.23
y = -0.1773x + 819.14
y = -0.1234x + 819.14


AEP Big Sandy - Hydrogeologic Site Investigation
Potentiometric Gradient
October 15, 2012
Ft, MSL
900
850
800
750
700
650
0
200
400
600
800
1000
1200
Horizontal Distance (Ft)
MW-1202 to MW1204
MW-1202 to MW-1203
MW-1010 to MW-1011
y = -0.0101x + 686.26
y = -0.1759x + 818.48
y = -0.1228x + 818.48

APPENDIX E

BINARY MIXING MODEL SUMMARY AND CALCULATIONS

June 11, 2013

AEP Big Sandy – Binary Mixing

Dr. Mike Simms, URS Baton Rouge

Response:

Mixing models are used in geochemistry (Faure, G., 1998, Principles and Applications of Geochemistry, second edition, Chapter 18) to assess compositions of mixtures from the relative abundances of the end member components. In addition, the proportions of end-member components can be assessed from the compositions of mixtures and the known end-member compositions. A binary mixing model describes the chemical composition of a mixture M in terms of the varying proportions of two end-member components of known composition. In this case, one end member would be surface water from the fly ash pond. The surface water potentially could be moving into and mixing with a second end-member component consisting of bedrock aquifer groundwater.

The concentration of any conservative species in a binary mixture of the two end members depends on the concentrations of that species in the end-member components and on the proportion of the end-member components in the mixture. If the concentration in the groundwater end member is X_{gw} and the concentration in the surface-water end member is X_{sw}, concentration in the mixture X_M is calculated as

$$X_M = X_{gw} f_{gw} + X_{sw} (1-f_{gw})$$

where f_{gw} is the dimensionless mixing parameter or proportion of the groundwater end member in the mixture.

The proportion f can be evaluated as a volume fraction or as a weight fraction. The proportion of one end member is equal to 1 minus the proportion of the other end member so that $f_{gw} = 1 – f_{sw}$, where f_{sw} is the proportion of surface water in a mixture composition.

If the concentration of a species is known in the mixture and in the two end members, the proportions of the end members in the mixture can be solved for by rearranging the equation for X_M:

$$f_{gw} = (X_M – X_{sw}) / (X_{gw} – X_{sw})$$

Therefore the volume fraction of the end members in a specific mixture can be estimated, provided that the composition of the assumed mixture is derived from mixing of the assumed end member components.

Based on the species concentrations, the groundwater at MW-1202 is assumed to represent an end-member groundwater composition. The surface water in the fly ash pond at sampling locations SW-1 and SW-2 is the other end member. The groundwaters at MW-1206, MW-1007, MW-1008, and MW-1009 could represent mixtures of those two end members if surface water moves into the underlying bedrock aquifer and mixes with groundwater by processes of dispersion.

The binary mixing model is based on the species being conservative (they are not altered by chemical reactions as the end members undergo mixing or by degradation processes, sources of the species from dissolution of minerals, or sinks due to adsorption of species on mineral surfaces), that only two end-member components are contributing to the composition of the mixture, and that the compositions of the end members are constant.

The groundwater composition at MW-1202 shows small variability between the July 2012 and October 2012 sampling events. The surface water compositions in the fly ash pond show variation with time and location in the July 2012 and October 2012 sampling events.

URS calculated the proportions f_{gw} and f_{sw} for the groundwater compositions of metals and other parameters at MW-1206, MW-1007, MW-1008, and MW-1009. The calculations were conducted for the July 2012 and the October 2012 sampling events using each of the surface water samples SW-1 and SW-2 to represent the surface-water end member.

The calculated proportions were reviewed to assess if the metals and other parameters could represent conservative mixing behavior. Constituents undergoing conservative mixing should have equal values of the f_{gw} or f_{sw} proportions for a set of calculations using the same end member compositions. Based on the review of the calculations, it is concluded that chloride behaves conservatively. Bromide also functions as a conservative constituent for the groundwater at MW-1007, but occurred at less than the detection limit in the end member groundwater and in groundwater samples from MW-1206, MW-1008, and MW-1009. Chloride and bromide typically can function as conservative species in mixing of water composition end members provided that a potential source of chloride or bromide in evaporite minerals is not present in the bedrock.

Sulfate and total dissolved solids (TDS) also could represent conservative mixing for the composition of MW-1007. Sulfate also could function as a conservative species in the absence of sulfate reduction or of sulfate sources such as pyrite oxidation.

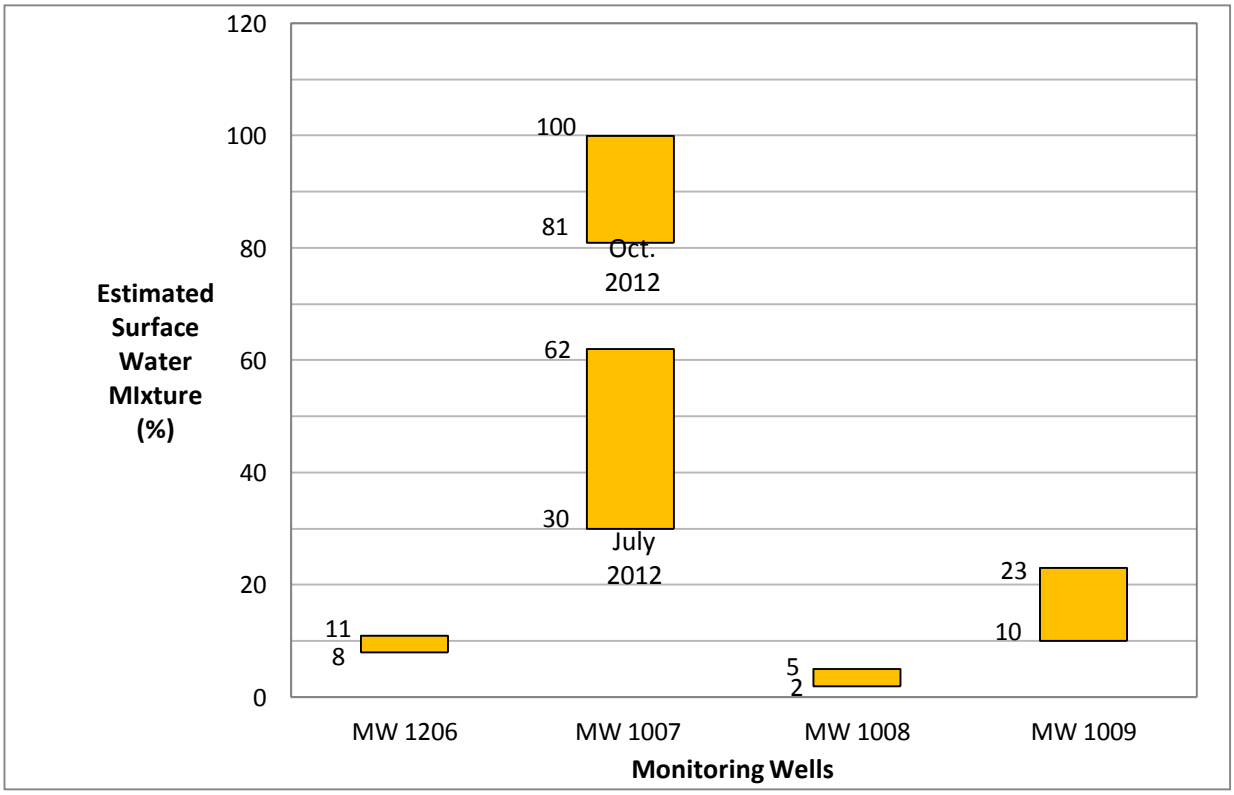
Based on assuming conservative binary mixing of the chloride concentrations, the proportions of surface water at the locations of MW-1206, MW-1007, MW-1008, and MW-1009 have been estimated and are summarized in the figure. The groundwater at MW-1206 is estimated to include between 8 and 11 % surface water admixture. The groundwater at MW-1007 showed different results for the sampling events of July 2012 and October 2012, with the surface water admixture ranging from 30 to 62 % for the July 2012 groundwater end member composition and

from 81 to over 100 % for the October 2012 groundwater end member composition. The groundwater at MW-1008 is estimated to include between 2 and 5 % admixture of surface water. The groundwater at MW-1009 is estimated to include between 10 and 23 % surface water admixture based on conservative mixing of chloride.

For well MW-1007, the mixing proportions estimated from bromide, sulfate, and TDS agree with the range of proportions estimated from chloride. At MW-1206, MW-1008, and MW-1009, the bromide cannot be used because it was not detected. The proportions derived from the sulfate and TDS in these wells do not agree with the proportions derived from chloride and could be related to variability of sulfate concentrations due to pyrite oxidation as a source of sulfate or due to decreases of sulfate from sulfate reduction.

Well MW-1007 shows the largest proportion of potential admixture of surface water. The lowest estimated surface-water proportions are estimated at wells MW-1008 and MW-1206.

	Low	High	Difference		
MW 1206	8	11	3	0	0
MW 1007	30	62	32	19	19
MW 1008	2	5	3	0	0
MW 1009	10	23	13	0	0



Note: Surface water fraction based on chloride concentrations and binary mixing of MW-1202 groundwater and surface water SW-1 and SW-2.

AEP Big Sandy

Groundwater and Surface Water Mixing

Groundwater Fraction

	MW 1007				MW 1008				MW 1009				MW 1206	
	July -1202 (gw)		October -1202 (gw)		July -1202 (gw)		October -1202 (gw)		July -1202 (gw)		October -1202 (gw)		October -1202 (gw)	
Constituents	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2
Antimony, Sb	0.975	0.974	0.953	0.957	0.971	0.969	0.927	0.933	1.006	1.007	1.008	1.007	1.008	1.007
Arsenic, As	0.879	0.696	0.749	3.019	0.955	0.887	0.882	1.944	0.974	0.935	0.820	2.444	-5.788	55.556
Barium, Ba	0.353	0.415	-0.134	0.059	0.584	0.624	0.333	0.447	1.007	1.007	1.052	1.043	-3.284	-2.556
Beryllium, Be	1.000	1.000	*NA*	*NA*	1.000	1.000	*NA*	*NA*	1.000	1.000	*NA*	*NA*	*NA*	*NA*
Cadmium, Cd	0.961	0.953	0.833	0.863	1.000	1.000	0.867	0.890	1.000	1.000	1.000	1.000	0.917	0.932
Chromium, Cr	1.375	1.750	3.000	0.000	-2.875	-6.750	-24.000	13.500	1.375	1.750	3.000	0.000	3.000	0.000
Copper, Cu	0.979	0.936	0.927	0.944	0.941	0.821	0.745	0.804	1.005	1.015	1.028	1.022	1.000	1.000
Lead, Pb	0.236	-0.122	-7.973	169.250	-3.708	-5.918	0.853	3.750	1.042	1.061	1.053	0.000	0.960	1.750
Molybdenum, Mo	0.942	0.936	0.841	0.826	0.980	0.978	0.976	0.974	1.001	1.002	1.003	1.003	0.983	0.981
Mercury, Hg	0.000	0.000	*NA*	*NA*	0.000	0.000	*NA*	*NA*	0.000	0.000	*NA*	*NA*	*NA*	*NA*
Nickel, Ni	0.975	0.967	0.874	0.882	0.975	0.968	0.943	0.946	1.002	1.002	0.991	0.991	0.997	0.997
Selenium, Se	1.275	1.487	1.567	4.400	0.551	0.205	-0.133	-5.800	1.275	1.487	1.567	4.400	1.567	4.400
Silver, Ag	1.000	1.000	1.000	*NA*	1.000	1.000	1.000	*NA*	1.000	1.000	1.000	*NA*	1.000	*NA*
Thallium, Tl	1.000	1.000	1.017	1.016	1.000	1.000	1.017	1.016	1.000	1.000	1.017	1.016	0.994	0.994
Zinc, Zn	1.042	1.041	1.143	1.077	0.796	0.803	0.835	0.911	1.081	1.078	1.242	1.130	1.099	1.053
Boron, B	0.800	0.757	0.325	0.205	0.967	0.960	0.946	0.937	0.897	0.874	0.833	0.803	1.115	1.136
Calcium, Ca	4.970	0.036	0.657	0.709	7.750	-0.638	-0.485	-0.259	-8.300	3.257	0.212	0.332	-1.238	-0.897
Iron, Fe	*NA*	-1.588	0.103	-0.040	*NA*	1.000	1.000	1.000	*NA*	-141.353	-34.517	-40.200	-819.690	-951.000
Magnesium, Mg	1.190	-53.000	-0.045	1.411	0.835	48.000	0.000	1.393	0.419	166.000	9.273	-2.250	15.636	-4.750
Manganese, Mn	0.773	0.911	-0.697	*NA*	1.082	1.032	1.077	*NA*	-0.933	0.240	0.106	*NA*	*NA*	*NA*
Potassium, K	0.984	0.976	0.869	0.864	1.034	1.049	1.092	1.095	0.893	0.844	1.051	1.053	1.232	1.241
Sodium, Na	0.856	0.688	0.409	0.232	1.020	1.044	1.116	1.151	0.925	0.836	-1.579	-2.351	0.954	0.940
Total Alkalinity, as CaCO3	0.540	0.573	0.312	0.364	0.865	0.875	0.770	0.787	1.367	1.340	1.394	1.364	0.390	0.436
Bicarbonate	0.540	0.573	0.312	0.364	0.859	0.869	0.762	0.780	1.367	1.340	1.394	1.364	0.390	0.436
Bromide, Br	0.737	0.500	0.100	-0.125	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Chemical Oxygen Demand, COD	-0.778	-0.778	1.000	1.000	0.222	0.222	1.000	1.000	-0.111	-0.111	1.000	1.000	-11.143	-12.077
Chloride, Cl	0.699	0.374	0.183	-0.035	0.973	0.943	1.000	1.000	0.896	0.785	0.817	0.768	0.913	0.889
Nitrite, NO2 as N	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitrate, NO3 as N	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitrate-Nitrite, NO3-NO2, as N	1.352	1.564	1.110	1.200	1.592	1.949	1.110	1.200	1.592	1.949	1.110	1.200	1.110	1.200
Silica, SiO2 (Dissolved)	0.000	0.330	0.623	0.648	1.667	1.447	1.421	1.392	1.897	1.601	1.464	1.433	0.884	0.892
Sulfate, SO4	0.906	0.816	0.219	0.208	1.113	1.220	1.570	1.578	0.683	0.383	0.142	0.130	1.913	1.925
Residue, Filterable, TDS	1.047	1.178	-0.022	-3.633	1.236	1.895	3.022	10.167	0.345	-1.487	-2.257	-13.767	3.971	14.467
Total Organic Carbon, TOC	-0.119	-1.606	0.277	0.143	1.036	1.085	0.548	0.464	0.552	-0.044	0.446	0.343	-46.151	-54.907

NA - Not detectable or Not Analyzed

AEP Big Sandy

Groundwater and Surface Water Mixing

Surface Water Fraction

	MW 1007				MW 1008				MW 1009				MW 1206	
	July -1202 (gw)		October -1202 (gw)		July -1202 (gw)		October -1202 (gw)		July -1202 (gw)		October -1202 (gw)		October -1202 (gw)	
Constituents	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2	SW-1	SW-2
Antimony, Sb	0.025	0.026	0.047	0.043	0.029	0.031	0.073	0.067	-0.006	-0.007	-0.008	-0.007	-0.008	-0.007
Arsenic, As	0.121	0.304	0.251	-2.019	0.045	0.113	0.118	-0.944	0.026	0.065	0.180	-1.444	6.788	-54.556
Barium, Ba	0.647	0.585	1.134	0.941	0.416	0.376	0.667	0.553	-0.007	-0.007	-0.052	-0.043	4.284	3.556
Beryllium, Be	0.000	0.000	*NA*	*NA*	0.000	0.000	*NA*	*NA*	0.000	0.000	*NA*	*NA*	*NA*	*NA*
Cadmium, Cd	0.039	0.047	0.167	0.137	0.000	0.000	0.133	0.110	0.000	0.000	0.000	0.000	0.083	0.068
Chromium, Cr	-0.375	-0.750	-2.000	1.000	3.875	7.750	25.000	-12.500	-0.375	-0.750	-2.000	1.000	-2.000	1.000
Copper, Cu	0.021	0.064	0.073	0.056	0.059	0.179	0.255	0.196	-0.005	-0.015	-0.028	-0.022	0.000	0.000
Lead, Pb	0.764	1.122	8.973	-168.250	4.708	6.918	0.147	-2.750	-0.042	-0.061	-0.053	1.000	0.040	-0.750
Molybdenum, Mo	0.058	0.064	0.159	0.174	0.020	0.022	0.024	0.026	-0.001	-0.002	-0.003	-0.003	0.017	0.019
Mercury, Hg	1.000	1.000	*NA*	*NA*	1.000	1.000	*NA*	*NA*	1.000	1.000	*NA*	*NA*	*NA*	*NA*
Nickel, Ni	0.025	0.033	0.126	0.118	0.025	0.032	0.057	0.054	-0.002	-0.002	0.009	0.009	0.003	0.003
Selenium, Se	-0.275	-0.487	-0.567	-3.400	0.449	0.795	1.133	6.800	-0.275	-0.487	-0.567	-3.400	-0.567	-3.400
Silver, Ag	0.000	0.000	0.000	*NA*	0.000	0.000	0.000	*NA*	0.000	0.000	0.000	*NA*	0.000	*NA*
Thallium, Tl	0.000	0.000	-0.017	-0.016	0.000	0.000	-0.017	-0.016	0.000	0.000	-0.017	-0.016	0.006	0.006
Zinc, Zn	-0.042	-0.041	-0.143	-0.077	0.204	0.197	0.165	0.089	-0.081	-0.078	-0.242	-0.130	-0.099	-0.053
Boron, B	0.200	0.243	0.675	0.795	0.033	0.040	0.054	0.063	0.103	0.126	0.167	0.197	-0.115	-0.136
Calcium, Ca	-3.970	0.964	0.343	0.291	-6.750	1.638	1.485	1.259	9.300	-2.257	0.788	0.668	2.238	1.897
Iron, Fe	*NA*	2.588	0.897	1.040	*NA*	0.000	0.000	0.000	*NA*	142.353	35.517	41.200	820.690	952.000
Magnesium, Mg	-0.190	54.000	1.045	-0.411	0.165	-47.000	1.000	-0.393	0.581	-165.000	-8.273	3.250	-14.636	5.750
Manganese, Mn	0.227	0.089	1.697	*NA*	-0.082	-0.032	-0.077	*NA*	1.933	0.760	0.894	*NA*	*NA*	*NA*
Potassium, K	0.016	0.024	0.131	0.136	-0.034	-0.049	-0.092	-0.095	0.107	0.156	-0.051	-0.053	-0.232	-0.241
Sodium, Na	0.144	0.312	0.591	0.768	-0.020	-0.044	-0.116	-0.151	0.075	0.164	2.579	3.351	0.046	0.060
Total Alkalinity, as CaCO3	0.460	0.427	0.688	0.636	0.135	0.125	0.230	0.213	-0.367	-0.340	-0.394	-0.364	0.610	0.564
Bicarbonate	0.460	0.427	0.688	0.636	0.141	0.131	0.238	0.220	-0.367	-0.340	-0.394	-0.364	0.610	0.564
Bromide, Br	0.263	0.500	0.900	1.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chemical Oxygen Demand, COD	1.778	1.778	0.000	0.000	0.778	0.778	0.000	0.000	1.111	1.111	0.000	0.000	12.143	13.077
Chloride, Cl	0.301	0.626	0.817	1.035	0.027	0.057	0.000	0.000	0.104	0.215	0.183	0.232	0.087	0.111
Nitrite, NO2 as N	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitrate, NO3 as N	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitrate-Nitrite, NO3-NO2, as N	1.009	1.006	-0.110	-0.200	1.010	1.008	-0.110	-0.200	1.010	1.008	-0.110	-0.200	-0.110	-0.200
Silica, SiO2 (Dissolved)	1.000	0.997	0.377	0.352	0.990	0.987	-0.421	-0.392	0.989	0.986	-0.464	-0.433	0.116	0.108
Sulfate, SO4	0.303	0.485	0.781	0.792	0.144	0.230	-0.570	-0.578	0.474	0.758	0.858	0.870	-0.913	-0.925
Residue, Filterable, TDS	0.454	0.737	1.022	4.633	0.355	0.577	-2.022	-9.167	0.820	1.332	3.257	14.767	-2.971	-13.467
Total Organic Carbon, TOC	1.076	1.692	0.723	0.857	0.339	0.533	0.452	0.536	0.648	1.019	0.554	0.657	47.151	55.907

NA - Not detectable or Not Analyzed

Groundwater Fraction

	GW- 1202 - July 2012							
	SW-1				SW-2			
Constituents	MW-1206	MW-1007	MW-1008	MW-1009	MW-1206	MW-1007	MW-1008	MW-1009
Antimony, Sb	NA	0.975	0.971	1.006	NA	0.974	0.969	1.007
Arsenic, As	NA	0.879	0.955	0.974	NA	0.696	0.887	0.935
Barium, Ba	NA	0.353	0.584	1.007	NA	0.415	0.624	1.007
Beryllium, Be	NA	1.000	1.000	1.000	NA	1.000	1.000	1.000
Cadmium, Cd	NA	0.961	1.000	1.000	NA	0.953	1.000	1.000
Chromium, Cr	NA	1.375	-2.875	1.375	NA	1.750	-6.750	1.750
Copper, Cu	NA	0.979	0.941	1.005	NA	0.936	0.821	1.015
Lead, Pb	NA	0.236	-3.708	1.042	NA	-0.122	-5.918	1.061
Molybdenum, Mo	NA	0.942	0.980	1.001	NA	0.936	0.978	1.002
Mercury, Hg	NA	0.000	0.000	0.000	NA	0.000	0.000	0.000
Nickel, Ni	NA	0.975	0.975	1.002	NA	0.967	0.968	1.002
Selenium, Se	NA	1.275	0.551	1.275	NA	1.487	0.205	1.487
Silver, Ag	NA	1.000	1.000	1.000	NA	1.000	1.000	1.000
Thallium, Tl	NA	1.000	1.000	1.000	NA	1.000	1.000	1.000
Zinc, Zn	NA	1.042	0.796	1.081	NA	1.041	0.803	1.078
Boron, B	NA	0.800	0.967	0.897	NA	0.757	0.960	0.874
Calcium, Ca	NA	4.970	7.750	-8.300	NA	0.036	-0.638	3.257
Iron, Fe	NA	NA	NA	NA	NA	-1.588	1.000	-141.353
Magnesium, Mg	NA	1.190	0.835	0.419	NA	-53.000	48.000	166.000
Manganese, Mn	NA	0.773	1.082	-0.933	NA	0.911	1.032	0.240
Potassium, K	NA	0.984	1.034	0.893	NA	0.976	1.049	0.844
Sodium, Na	NA	0.856	1.020	0.925	NA	0.688	1.044	0.836
Total Alkalinity, as CaCO3	NA	0.540	0.865	1.367	NA	0.573	0.875	1.340
Bicarbonate	NA	0.540	0.859	1.367	NA	0.573	0.869	1.340
Bromide, Br	NA	0.737	1.000	1.000	NA	0.500	1.000	1.000
Chemical Oxygen Demand, COD	NA	-0.778	0.222	-0.111	NA	-0.778	0.222	-0.111
Chloride, Cl	NA	0.699	0.973	0.896	NA	0.374	0.943	0.785
Nitrate-Nitrite, NO3-NO2, as N	NA	0.849	1.000	1.000	NA	0.803	1.000	1.000
Silica, SiO2 (Dissolved)	NA	0.000	-0.644	-0.733	NA	-0.235	-1.029	-1.139
Sulfate, SO4	NA	0.906	1.113	0.683	NA	0.816	1.220	0.383
Residue, Filterable, TDS	NA	1.047	1.236	0.345	NA	1.178	1.895	-1.487
Total Organic Carbon, TOC	NA	-0.119	1.036	0.552	NA	-1.606	1.085	-0.044

Surface Water Fraction

	GW- 1202 - October 2012							
	SW-1				SW-2			
Constituents	MW-1206	MW-1007	MW-1008	MW-1009	MW-1206	MW-1007	MW-1008	MW-1009
Antimony, Sb	1.008	0.953	0.927	1.008	1.007	0.957	0.933	1.007
Arsenic, As	-5.788	0.749	0.882	0.820	55.556	3.019	1.944	2.444
Barium, Ba	-3.284	-0.134	0.333	1.052	-2.556	0.059	0.447	1.043
Beryllium, Be	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Cadmium, Cd	0.917	0.833	0.867	1.000	0.932	0.863	0.890	1.000
Chromium, Cr	3.000	3.000	-24.000	3.000	0.000	0.000	13.500	0.000
Copper, Cu	1.000	0.927	0.745	1.028	1.000	0.944	0.804	1.022
Lead, Pb	0.960	-7.973	0.853	1.053	1.750	169.250	3.750	0.000
Molybdenum, Mo	0.983	0.841	0.976	1.003	0.981	0.826	0.974	1.003
Mercury, Hg	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Nickel, Ni	0.997	0.874	0.943	0.991	0.997	0.882	0.946	0.991
Selenium, Se	1.567	1.567	-0.133	1.567	4.400	4.400	-5.800	4.400
Silver, Ag	1.000	1.000	1.000	1.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Thallium, Tl	0.994	1.017	1.017	1.017	0.994	1.016	1.016	1.016
Zinc, Zn	1.099	1.143	0.835	1.242	1.053	1.077	0.911	1.130
Boron, B	1.115	0.325	0.946	0.833	1.136	0.205	0.937	0.803
Calcium, Ca	-1.238	0.657	-0.485	0.212	-0.897	0.709	-0.259	0.332
Iron, Fe	-819.690	0.103	1.000	-34.517	-951.000	-0.040	1.000	-40.200
Magnesium, Mg	15.636	-0.045	0.000	9.273	-4.750	1.411	1.393	-2.250
Manganese, Mn	#VALUE!	-0.697	1.077	0.106	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Potassium, K	1.232	0.869	1.092	1.051	1.241	0.864	1.095	1.053
Sodium, Na	0.954	0.409	1.116	-1.579	0.940	0.232	1.151	-2.351
Total Alkalinity, as CaCO3	0.390	0.312	0.770	1.394	0.436	0.364	0.787	1.364
Bicarbonate	0.390	0.312	0.762	1.394	0.436	0.364	0.780	1.364
Bromide, Br	1.000	0.100	1.000	1.000	1.000	-0.125	1.000	1.000
Chemical Oxygen Demand, COD	-11.143	1.000	1.000	1.000	-12.077	1.000	1.000	1.000
Chloride, Cl	0.913	0.183	1.000	0.817	0.889	-0.035	1.000	0.768
Nitrite, NO2 as N	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Nitrate, NO3 as N	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Nitrate-Nitrite, NO3-NO2 as N	1.110	1.110	1.110	1.110	1.200	1.200	1.200	1.200
Silica, SiO2 (Dissolved)	0.884	0.623	1.421	1.464	0.892	0.648	1.392	1.433
Sulfate, SO4	1.913	0.219	1.570	0.142	1.925	0.208	1.578	0.130
Residue, Filterable, TDS	3.971	-0.022	3.022	-2.257	14.467	-3.633	10.167	-13.767
Total Organic Carbon, TOC	-46.151	0.277	0.548	0.446	-54.907	0.143	0.464	0.343