Mitchell Power Plant

Notice of Intent to Comply With the Site-Specific Alternative to Initiation of Closure

CCR Unit – Bottom Ash Pond

As required by 40 CFR 257.103(f)(1)(ix)(A), this is a notification that on November 30, 2020 Mitchell Power Plant (Mitchell Plant) submitted a site-specific alternative to initiation of closure due to development of alternative capacity infeasible to US EPA. The submission has been placed in Mitchell Plant's operating record and posted to the CCR Rule Compliance Data and Information website.

American Electric Power
1 Riverside Plaza
Columbus, OH 43215
aep.com

November 30, 2020

Submitted Electronically via Email

Mr. Andrew R. Wheeler, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code 5304-P
Washington, DC 20460

RE: Kentucky Power Company and Wheeling Power Company
Mitchell Power Plant Alternative Closure Demonstration

Dear Administrator Wheeler,

Kentucky Power Company (Kentucky Power) and Wheeling Power Company (Wheeling) Mitchell Power Plant (Mitchell Plant), hereby submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(1) for the Bottom Ash Pond located at the Mitchell Plant near Moundsville, West Virginia. Mitchell Plant is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(1) to allow the Bottom Ash Pond to continue to receive CCR and non-CCR wastestreams after April 11, 2021, such that retrofits can be completed. Enclosed is a demonstration prepared by American Electric Power and Worley that addresses all of the criteria in 40 C.F.R. § 257.103(f)(1)(i)-(iii) and contains the documentation required by 40 C.F.R. § 257.103(f)(1)(iv). As allowed by the agency, in lieu of hard copies of these documents, electronic files were submitted to Kirsten Hillyer, Frank Behan, and Richard Huggins via email. A separate cover letter and confidential copy of Appendix C is being submitted in hard copy by overnight mail. If you have any questions regarding this submittal, please contact me at 614-716-2281 or damiller@aep.com.

Sincerely,

David A. Miller

David A. Miller, P.E.
Director, Land Environment & Remediation Services
Environmental Services Division

Attachments

cc: Kirsten Hillyer – USEPA
Frank Behan – USEPA
Richard Huggins – USEPA

Kentucky Power Company

Wheeling Power Company

Mitchell Plant

Demonstration Request to Develop Alternative Disposal Capacity for the Bottom Ash Pond CCR Management Unit

Prepared by:

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

and

Worley
2675 Morgantown Road
Reading, PA 19607

Submitted

11/30/2020

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Professional Engineer's Certification

I certify, as a Professional Engineer in the State of West Virginia, that the information in this document was assembled under my direct supervisory control and is accurate as of the date of my signature. This report is not intended or represented to be suitable for reuse without the specific verification or adaptation by the engineer.

DAVID ANTHONY MILLER

Printed Name of Registered Professional Engineer

David Anthony Miller

Signature

22663	WEST VIRGINIA	11.30.2020
Registration No.	**Registration State**	**Date**

INTRODUCTION

American Electric Power Service Corporation (AEP), as agent for its affiliates, Kentucky Power Company (Kentucky Power) and Wheeling Power Company (Wheeling), the owners of the Mitchell Plant, seek EPA approval under 40 CFR 257.103(f)(1) - *"Development of Alternate Capacity Infeasible"* for the coal combustion residuals (CCR) surface impoundment located at Mitchell Plant (8999 Energy Road, (Marshall County) Moundsville, West Virginia). Kentucky Power and Wheeling seeks to establish a site-specific compliance deadline to continue to receive CCR wastestreams in the bottom ash pond (BAP) until April 21, 2023 while the last generating unit is converted to dry ash handling. Non-CCR wastestreams will continue to be routed to the unlined BAP until March 13, 2023. The BAP will be physically separated in half with sheet piling and sequentially closed by removal and converted to lined wastewater ponds for the non-CCR wastestreams. Tank-based systems will provide chemical treatment for the non-CCR wastestreams to assure continued compliance with the requirements of the facility's wastewater discharge permit. Closure of the BAP will be completed by July 31, 2023. This document will demonstrate that the CCR and/or non-CCR wastestreams must continue to be managed in the CCR surface impoundments because no alternative disposal capacity is available on or off-site and it is technically infeasible to complete the measures necessary to provide alternative disposal capacity either on-site or off-site by April 11, 2021. The BAP meets the location restriction requirements including the minimum aquifer separation, but does not meet the liner requirements of the CCR regulation and must close. A groundwater monitoring system was developed for the BAP and to date, no statistically significant levels above groundwater protection standards have been observed, therefore, the BAP meets the definition of an eligible unlined CCR surface impoundment.

OVERVIEW OF MITCHELL PLANT AND AFFECTED CCR UNITS

The Mitchell Plant is located along West Virginia Route 2 near the City of Cresap, West Virginia (WV). The Mitchell Plant began operations in 1971 with two coal-fired generating units each nominally rated at 800 megawatts (MW). The mailing address of the Mitchell Plant is P.O. Box K, Moundsville, WV 26041-0961. The facility and overall layout of the plant site and CCR units are shown on **Figure 1**.

The Mitchell Plant uses bituminous coal as the primary fuel source for its two steam-turbine electric generating units. The total nameplate electric production capacity of this plant is 1,600 MW. Processes and equipment that control air emissions from the coal fired units generate CCRs comprised of fly ash, bottom ash, and gypsum. Fly ash is managed on a dry basis and goes to the Mitchell Landfill (LF). Gypsum is sent to an adjacent wallboard manufacturing facility for beneficial reuse. Bottom ash produced at the Mitchell Plant is currently sluiced to the BAP and dewatered prior to beneficial reuse or transport to the LF for disposal. This active LF is located along Gatts Ridge Road (Marshall County Road 72) approximately 2 miles north of the intersection with County Road 74 (about 2 miles due east of the Mitchell Plant).

The Mitchell BAP is an active CCR surface impoundment that is part of the Bottom Ash Complex at the facility. The Bottom Ash Complex is comprised of the BAP and the Clear Water Pond as shown on **Figure 1**. Within the Bottom Ash Complex, the BAP is positioned immediately north of the Clear Water Pond and the south dike of the BAP separates the two ponds. The Clear Water Pond is not part of the Mitchell BAP.

The Mitchell BAP is divided into two primary areas for effective settlement and treatment of the bottom ash and non-CCR wastestreams that are sluiced into the BAP. The CCR wastestream is sluiced into the eastern portion of the pond. The settled ash is stockpiled within the pond limits until it is either taken to the Mitchell landfill or removed for beneficial reuse. The non-CCR wastestreams and CCR transport water are directed into the western portion of the pond. The total flows of the CCR and non-CCR wastestreams are discharged from the BAP to the Clear Water Pond. Discharge from the Clear Water Pond to the Ohio River via Outfall 001 is authorized by West Virginia National Pollutant Discharge Elimination System (NPDES) Permit No. WV0005304.

The Mitchell BAP comprises a total area of approximately 11.9 acres (measured to the toe of the exterior dikes). Using the operating pool elevation of 676 feet amsl and the pond bottom elevation of 660 feet amsl, the maximum storage capacity of the BAP is approximately 85 acre-feet. Based upon the operating pool elevation the BAP area is 6.7 acres and the Clearwater pond is 2.2 acres.

The initial pond construction was approved by West Virginia Department of Environmental Protection (WVDEP) Division of Water and Waste Management, Dam Safety Section in 1975 as a Hazard Class 2 structure under Dam ID #05108. The BAP is constructed with compacted soil dikes along the north, west and south perimeters. The east interior slope is incised within the natural hillside. The crests of the dikes are 20 feet wide. The interior slopes are lined with a PVC liner that is covered with 3 feet of soil.

Groundwater monitoring at the BAP is accomplished using a PE-certified groundwater monitoring network composed of seven groundwater monitoring wells installed in the Ohio River alluvial aquifer. The complete Groundwater Monitoring Well Network (GWMN) Evaluation Report is provided in Appendix D. Groundwater at the unit is monitored in accordance with an assessment monitoring program, following the requirements of 40 CFR 257.95 in the CCR rule. There have been no statistically significant levels over groundwater protection standards detected for any constituent at any monitoring well in the unit’s groundwater monitoring network. Following the requirements of 40 CFR 257.95, groundwater samples from each monitoring well are analyzed for all parameters in Appendix IV of the CCR rule during the first monitoring event of the annual monitoring cycle, then during the two subsequent events in the cycle, samples from each well are analyzed for all parameters in Appendix III and those parameters in Appendix IV that were detected during the first sampling event in the cycle. Analysis results for each constituent at each monitoring well are compared to corresponding groundwater protection standards according to statistical procedures and performance standards specified in 40 CFR 257.93(f) and 40 CFR 257.93(g).

SATISFACTION OF THE CRITERIA IN 40 CFR §257.101(f)(1) FOR THE BAP CCR UNIT

WORK PLAN

To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(1)(i) and (ii) have been met, the following is a workplan, consisting of the elements required by § 257.103(f)(1)(iv)(A). Specifically, this workplan documents that there is no alternative capacity available on or off-site for each of the CCR and/or non-CCR wastestreams that AEP manages in the BAP and discusses the options considered for obtaining alternative disposal capacity. As discussed in more detail below, AEP has elected to convert to dry bottom ash handling at the Mitchell Plant. The workplan provides a detailed schedule for the conversion project, including a narrative description of the schedule and an update on the progress already made toward obtaining the alternative capacity. In addition, the narrative includes an analysis of the site-specific conditions that led to the decision to convert to dry handling and an analysis of the adverse impact to plant operations if the Mitchell Plant were no longer able to use the BAP.

Section One – Narrative Description of How Alternative Capacity will be Developed

From the regulatory text § 257.103(f)(1)(iv)(A)(1)

> *(1) A written narrative discussing the options considered both on and off-site to obtain alternative capacity for each CCR and/or non-CCR wastestreams, the technical infeasibility of obtaining alternative capacity prior to April 11, 2021, and the option selected and justification for the alternative capacity selected. The narrative must also include all of the following:*
>
> > *(i) An in-depth analysis of the site and any site-specific conditions that led to the decision to select the alternative capacity being developed;*
> > *(ii) An analysis of the adverse impact to plant operations if the CCR surface impoundment in question were to no longer be available for use; and*
> > *(iii) A detailed explanation and justification for the amount of time being requested and how it is the fastest technically feasible time to complete the development of the alternative capacity;*

<u>Existing On and Off-site Disposal Capacity Evaluation</u>

The Mitchell Plant does not currently have an existing alternate pond that meets the liner requirements of EPA's CCR regulation, and considerable modifications to plant equipment, facilities, and processes will be necessary before the Mitchell Plant can cease placing CCR and non-CCR wastestreams into the BAP. Likewise, considerable modifications and new equipment would be necessary to transport CCR and non-CCR wastestreams to an off-site disposal facility, if one were available. Currently, no known off-site facilities are available that are capable of processing the wastestreams generated by the Mitchell Plant.

CCR Wastestreams:

The BAP receives approximately 1 million gallons a day (MGD) of sluiced water containing bottom ash.

In terms of on-site alternative disposal capacity; there are no other CCR surface impoundments that are available to dispose of the CCR materials. In order to develop this capacity refer to Table 3 and the timing required to do so; the current approach is the fastest feasible alternative which is to convert the generating unit to dry bottom ash handling and utilize the existing landfill. Relative to off-site disposal capacity, the effluent limitation guidelines prohibit the disposal of CCR sluice water into public treatment works. The sheer volume which will need to be handled on a daily basis makes off-site disposal of wet ash impractical. 1 MGD of bottom ash sluice flows equates to approximately 4,150 tons per day of sluiced water and would require 208 trucks per day twenty four hours per day seven days per week to haul off and dispose. There are currently no facilities to collect and load this wastestream into tankers for transport, and construction of such facilities to manage these flows on a temporary basis would interfere with the activities needed to comply with the new requirements of both the CCR and ELG rules. The increase in traffic associated with such an operation on the plant site poses significant safety risks and is impossible to achieve. The most likely facility type capable of managing industrial wastewaters are publicly-owned or private treatment works, underground injection wells, or publicly available waste management facilities capable of solidifying liquid wastes for disposal in a landfill. Given the volume and characteristics of the CCR wastestream, increases in permitted capacity or other modifications to the permitted pretreatment programs of a public or private wastewater treatment facility would likely be required to manage this flow, if one were available.

AEP evaluated each CCR wastestream placed in the BAP at the Mitchell Plant. For the reasons discussed above, and in Table 1 below, the following CCR wastestreams must continue to be placed in the BAP due to lack of alternative capacity both on and off-site.

Table 1: Mitchell Plant CCR Wastestreams

CCR Wastestream	Average Flow (gpd)	Current Configuration	AEP Notes
Bottom Ash	1,000,000	Bottom ash is currently sluiced to the BAP, where it is temporarily stored until removed, dewatered, and beneficially reused or disposed in the Mitchell Landfill.	Bottom ash wastestream cannot be removed from the BAP until new Under Hopper Drag Chain (UHDC) dry bottom ash system is installed allowing ash to be collected and transported to the Mitchell Landfill. This wastestream will cease in April 2023. The number of trucks per day to transport this wastestream off-site for disposal was calculated as follow: 1,000,000 million gallons per day * 8.3 pounds per gallon = 8,300,000 pounds / 2000 pounds per ton = 4,150 tons per day / 20 tons per truck = 207.5 or 208 trucks per day

Non-CCR Wastestreams:

Approximately 7.2 MGD of various non-CCR wastestreams are sent to the BAP. These wastewater streams include: fly ash silo sumps, landfill leachate, cooling tower blowdown, effluent from the chloride purge treatment system, pyrites sluice water, plant drains and sumps, and intermittent metal cleaning wastewaters and non-chemical metal cleaning wash.

There are no alternate ponds on the site that can accept these waststreams nor is there the existing infrastructure to deliver the wastestreams to a different location The feasibility of re-routing each individual non-CCR flow to another on-site pond such as the existing Clearwater pond or stormwater pond was evaluated initially based on wastewater quality, followed by a hydraulics analysis to assess treatment and operational efficiency. The non-CCR flows not included in the analysis are the intermittent flows and the Pyrites sluice water because the pyrites are managed with the bottom ash and will not discharge after dry conversion. Several of the non-CCR wastestreams are not recommended for re-routing based on risk of NPDES permit noncompliance due to their pollutant load, including: the fly ash silo sumps and landfill leachate tend to have high metal content and specifically high selenium in the leachate; the chloride purge stream tends to have high mercury and selenium at concentrations of concern for permit compliance. The remaining non-CCR wastestreams were then evaluated based on hydraulics. Using the ideal settling rate of 0.05 gpm/sqft or less and the TSS concentration of each stream, the pond size required to adequately settle solids was calculated and compared to the 1.4 acre area of the Clearwater pond that has 10' depth available for settling. The hydraulics analysis indicates that the larger waste streams (cooling tower blowdown and U12 WW Sumps) would require 2.4 and 1.8 acres, respectively, to allow adequate settling for permit compliance. All of the non-CCR wastestreams will be routed through the new chemical mix tanks for treatment prior to discharge to the new wastewater ponds. Rerouting these non-CCR wastestreams prior to completion of the new chemical mix tank would require permitting equivalent to the permitting required for the selected alternative. Thus doing this would not accelerate the removal of wastestreams from the BAP as compared to the selected option.

Therefore, the existing non-CCR wastestreams need to be discharged to the existing ponds and receive treatment in the current treatment path through the BAP to ensure and maintain compliance with current NPDES permit limits. In addition, once the BAP is closed and converted to lined wastewater ponds the majority of these non-CCR wastesteams will be routed through the new mix tanks, which will be constructed in parallel with the new West wastewater pond, to allow for enhanced solids settling. Relative to off-site disposal capacity and similar to bottom ash, the sheer volume which will need to be handled on a daily basis makes off-site disposal impractical. 7.2 MGD equates to approximately 30,000 tons per day of non-CCR wastestreams and would require 1,500 trucks per day (more than one truck leaving the plant site every minute of every day) to haul off and dispose of. There are currently no facilities to collect and load these wastestreams into tankers for transport, and construction of such facilities to manage these flows on a temporary basis would interfere with the activities needed to comply with the new requirements of both the CCR and ELG rules. The increase in traffic associated with such an operation on the plant site poses significant safety risks and is impossible to achieve. The most likely facility type capable of managing industrial wastewaters are publicly-owned or private treatment works, underground injection wells, or publicly available waste management facilities capable of solidifying liquid wastes for disposal in a landfill. Given the volume and characteristics of the non-CCR wastestreams, increases in permitted capacity or other modifications to the permitted pretreatment programs of a public or private wastewater treatment facility would likely be required to manage this flow, if one were available.

AEP evaluated each non-CCR wastestream placed in the BAP at Mitchell Plant. For the reasons discussed above, and in Table 2 below, each of the non-CCR wastestreams must continue to be placed in the BAP due to lack of alternative capacity both on and off-site.

Table 2: Mitchell Plant non-CCR Wastestreams

Non-CCR Wastestream	Average Flow (gpd)	Current Configuration	AEP Notes
Fly Ash Silo Sumps & Landfill Leachate	109,000	Flows to the existing BAP	The BAP provides treatment for these non-CCR wastestreams (primarily solids settling) to allow them to meet the NPDES discharge limits and no alternative capacity exists for treatment until the repurposed WWP is completed. The number of trucks per day to transport each wastestream off-
Chloride Purge System	730,000		
Cooling Tower Blowdown	1,590,000		
U1 & U2 ESP Sumps	140,000		
U1 & U2 WW Sumps	3,800,000		
Pyrite Sluice Water	860,000	Sluiced to the existing BAP	

Non-CCR Wastestream	Average Flow (gpd)	Current Configuration	AEP Notes
Non-chemical metal cleaning wash*	Intermittent: 430,000 ~ twice per year	Intermittent flow to the existing BAP	site for disposal was calculated as follow: 109,000 gallons per day * 8.3 pounds per gallon = 904,700 pounds per day / 2000 pounds per ton = 452.35 tons per day / 20 tons per truck = 22.61 → 23 trucks per day 730,000 gallons per day * 8.3 pounds per gallon = 6,059,000 pounds per day/ 2000 pounds per ton = 3,029.5 tons per day / 20 tons per truck = 151.475 → 151 trucks per day 1,590,000 gallons per day * 8.3 pounds per gallon = 13,197,000 pounds per day / 2000 pounds per ton = 6,598.5 / 20 tons per truck = 329.92 → 330 trucks per day 140,000 gallons per day * 8.3 pounds per gallon = 1,162,000 pounds per day / 2000 pounds per ton = 581 tons per day / 20 tons per truck = 29.05 → 29 trucks per day 3,800,000 gallons per day * 8.3 pounds per gallon = 31,540,000 pounds per day / 2000 pounds per ton = 15,770 / 20 tons per truck = 788.5 → 789 trucks per day 860,000 gallons per day * 8.3 pounds per gallon = 7,138,000 pounds per day / 2000 pounds per ton = 3,569 / 20 tons per truck = 178.45 → 178 trucks per day
Metal cleaning waste*	Intermittent: 45,000 over 10 days ~ every 18 months		
Gypsum Building sump*	Intermittent		
Transfer House 6/7 Sump*	Intermittent		

*Intermittent Flows not included in trucking calculations

i) Alternatives for Disposal Capacity

In order to comply with the CCR rule, AEP performed an evaluation (beginning in 2017 and completing in 2018) of alternative disposal capacity options at the Mitchell Plant for both CCR and non-CCR wastestreams that are managed in the BAP The evaluation determined the feasibility of options to achieve CCR compliance requirements. Feasible options were evaluated by balancing the technology, performance, schedule duration, other risk factors, and considered potential Effluent Limitation Guidelines (ELG) compliance alternatives.

The options considered for alternative disposal capacity of the wastestreams currently routed to the Bottom Ash Complex are summarized in **Table 3** below.

Table 3: Alternatives for Disposal Capacity

Alternative Capacity Technology	Estimated Implementation Time (Months)	Feasible at the Mitchell Plant?	Selected?	AEP Notes
Conversion to dry handling	32	Yes	Yes	Adequate space is available at the site to install equipment necessary for a dry bottom ash conversion. This alternative has a similar compliance schedule to the other alternatives considered and allows for compliance with ELG rules.
New CCR surface impoundment	38 to 72	No	No	New CCR impoundment alone does not provide compliance with the ELG rules. Not feasible due to the time required for siting, permitting, engineering and design, and construction of the new impoundment. Past AEP projects experienced a range from 38-72 months before waste could be placed in the new impoundment and thus was not further pursued.
Retrofit a portion of CCR surface impoundment	31.5	Yes	No	Retrofitting a portion of the pond alone will not bring the facility into compliance with the ELG rule without additional water recycle systems that have an uncertain impact on the plant water balance; the dry ash handling systems have a similar compliance schedule
Repurpose a portion of CCR surface impoundment to a lined pond for non-CCR wastestreams	31	Yes	Yes	This alternative was selected for the Mitchell Plant since the existing BAP currently handles the existing non-CCR wastestreams and provides the treatment capacity required to comply with the facility’s NPDES permit. These ponds will be closed by removal and converted to lined wastewater ponds.

Alternative Capacity Technology	Estimated Implementation Time (Months)	Feasible at the Mitchell Plant?	Selected?	AEP Notes
Multiple technology system	31-32	Yes	Yes	This alternative was selected for the Mitchell Plant since the existing BAP has the capacity to receive the non-CCR wastestreams once it is closed and converted to lined wastewater ponds. Dry handling of the bottom ash (32 months) and repurposing the ponds to receive non-CCR wastestreams (31 months) will provide the necessary compliance needs on the fastest feasible schedule for the site balancing both CCR and ELG rule requirements.
Off-site disposal	N/A	No	No	As EPA explained in the preamble of the 2015 rule, it is not possible for sites that sluice CCR material to an impoundment to eliminate the impoundment and dispose of the material offsite. See 80 Fed. Reg. 21,301, 21,423 (Apr. 17, 2015) It is infeasible to collect, transport, and provide offsite treatment of the large volume of CCR and non-CCR wastestreams currently routed to the BAP without considerable modifications and new equipment necessary to transport CCR and non-CCR wastestreams to an off-site disposal facility, if one were available.
Temporary treatment system	Not defined	No	No	These systems are not proven for reliable long-term management of high volume CCR materials in the industry and would not realistically provide the required non-CCR wastewater storage capacity to replace the BAP. Temporary treatment systems to manage the CCR and non-CCR wastestreams for Mitchell Plant would require a chemical feed system, chemical mix tanks, clarifiers, and a filtration system. Based on the flow rates, the number and size of clarifiers required to handle these streams outside of the BAP would range from 2 to 4, 110 foot diameter tanks based upon typical and max flow characteristics. The size of this temporary system is well beyond any type of rental units that are available in the market.

Based on the decision to convert to a dry ash handling system at the Mitchell Plant, AEP evaluated potential options for compliance with both the CCR and ELG rules as noted in the **Table 4** below.

Table 4: Alternatives Considered for CCR Wastestreams

System	Technology	Practicability or Feasibility for the Mitchell Plant
Bottom Ash	Under Hopper Drag Chain Conveyor System	Feasible
Bottom Ash	Remote Drag Chain Conveyor System	Feasible. Challenging to add remote pumps and power supply for recirculation not required with other options. Risk associated with managing plant water balance.
Bottom Ash	Dry Belt/Tray Conveying System	Feasible
Bottom Ash	Pneumatic Conveying System	Feasible
Bottom Ash	Vibratory Conveying System	Not practicable; requires frequent labor intensive maintenance and no longer industry standard practice for bottom ash (replaced by remote conveyors for similar costs)
Bottom Ash	Remote Settling Basins	Not practicable; requires frequent labor intensive maintenance and both water balance and safety concerns. Challenging to add remote pumps and power supply for recirculation that is not required with other options.
Bottom Ash	Remote Dewatering Bins	Not Practicable; requires frequent labor intensive maintenance and no longer industry standard practice for bottom ash (option replaced by remote conveyors for similar costs)
Bottom Ash	Closed Loop Recirculation System	Not practicable; risks associated with managing plant water balance.

Timeframe for delivering dry ash handling alternatives were determined to be equivalent and not a factor in the final selection.

Based on the evaluation of alternative disposal options, AEP selected the following options for compliance at the Mitchell Plant:

- Converting from wet bottom ash system to dry handling system, using an under hopper drag chain conveyor (UHDC).
- Closure of the BAP by CCR material removal.
- Constructing new non-CCR wastewater ponds (WWP) within the footprint of the closed BAP.

This alternative and strategy can be implemented in the least or equal amount of time of the alternatives and accommodates the unique site features such as quantity of wastestreams and the lack of off-site disposal facilities. This alternative complies with both the CCR and ELG rules at the Mitchell Plant.

AEP contracted with Worley to provide engineering, design and procurement services for the selected alternative disposal option. The conceptual design stage of the projects has been completed and includes the following scope:

- Dry Bottom Ash Handling System
  - Installation of a UHDC and associated equipment to collect and dewater bottom ash from Unit 1 and Unit 2.
  - Installation of a common ash bunker for Units 1 and 2 to collect and temporarily store material from the UHDC.
  - Installation of a sump at the ash bunker to collect stormwater and excess quench water and return flow to the cooling tower basin
  - Material from ash bunker will either be hauled to the Mitchell landfill for disposal or beneficially reused.
- Bottom Ash Pond Closure by Removal
  - All CCR material within the existing BAP will be removed via dewatering and mechanical excavation. All CCR material will either be hauled to the Mitchell landfill for disposal or beneficially reused.
  - A third-party engineer will certify the removal of CCR upon completion. Certification will be performed in phases across the BAP.
  - After certification of removal of all CCR within a given area of the existing BAP, construction of the new Non-CCR WWP will proceed.
- New Non-CCR WWP
  - New (4-acre) lined East WWP constructed within the eastern footprint of the existing BAP to treat non-CCR wastestreams generated at the plant.
  - New (3-acre) lined West WWP constructed within the western footprint of the existing BAP to receive effluent from the East WWP. The West WWP will discharge to the existing Clearwater Pond, which in turn will continue to discharge to the Ohio River through NPDES Permit WV No. WV0005304 Outfall 001.
  - Installation of tank-based chemical treatment system with appropriate retention time to provide proper mixing of chemicals to facilitate settling to meet plant discharge requirements at the new Non-CCR wastewater ponds as necessary to meet plant discharge requirements.

Appendix A includes a site plan showing the existing and future configurations after rerouting of non-CCR wastewater and removal of CCR from the BAP. The current and future water balance diagrams are included in **Appendix B**.

ii) <u>Impact to Plant Operations if Alternative Capacity Not Obtained</u>

If Mitchell Plant were required to immediately cease the placement of CCR and non-CCR wastestreams into the BAP, which is necessary for handling as much as 8.24 million gallons per day of CCR and non-CCR wastestreams, and initiate closure, AEP would have to temporarily or permanently cease power production at the plant. Idling or closure of the plant would stop the production of CCR wastestreams and some non-CCR wastestreams but would not eliminate the need for handling other non-CCR wastestreams, such as cooling tower blowdown and low volume wastewater from various water collection sumps from around the plant. The BAP is integral in receiving and treating these flows as required to meet the NPDES discharge limits. Therefore, the need for uninterrupted non-CCR wastestream capacity will be necessary for a significant amount of time after CCR waste ceases to be generated. Put simply, the BAP will be unable to immediately cease operation even if the Mitchell Plant immediately discontinued the combustion of coal and production of CCR wastestreams.

The immediate forced cessation of power production at Mitchell Plant could cause serious local power delivery constraints and more regional reliability concerns in the affected states. If other coal-fired facilities in these or neighboring states are also forced to cease power production, the consequences could be serious. For example, according to the Energy Information Administration's Electric Power Annual for 2019, coal-fired units provide the following percentages of electricity generation in 2018 and 2019 in midwestern states where AEP's units operate:

Utility Scale Generation from Coal – 2018•

State	Total Utility Scale Generation (Thousands MWh)	Utility Scale Generation from Coal (Thousands MWh)	Percentage of Utility Scale Generation from Coal
Indiana	113,460	77,455	68.3%
Kentucky	78,804	59,168	75.1%
Ohio	126,185	58,727	46.5%
West Virginia	67,249	62,039	92.3%

- Data from *Electric Power Annual 201*9, Tables 3.7 and 3.8, Energy Information Administration, eia.gov/electricity/annual/pdf/epa.gov (last referenced October 26, 2020).

Utility Scale Generation from Coal – 2019•

State	Total Utility Scale Generation (Thousands MWh)	Utility Scale Generation from Coal (Thousands MWh)	Percentage of Utility Scale Generation from Coal
Indiana	102,505	60,762	59.3%
Kentucky	71,804	51,714	72.0%
Ohio	120,001	46,765	39.0%
West Virginia	63,926	58,182	91.0%

- Data from *Electric Power Annual 201*9, Tables 3.7 and 3.8, Energy Information Administration, eia.gov/electricity/annual/pdf/epa.gov (last referenced October 26, 2020).

As shown in these tables, West Virginia and Kentucky are particularly dependent on coal-fired generation for the vast majority of electricity produced in that region. Simultaneous immediate closure of a significant portion of the coal-fired capacity in these states could destabilize the electricity grid and would not be in the public's best interest.

iii) <u>Justification for Time Needed to Complete Development of Alternative Capacity Approach</u>

The schedule for developing alternative disposal capacity is described in more detail in Section 3. As the schedule shows, AEP has already undertaken significant planning and implementation steps towards ceasing the receipt of CCR and non-CCR wastestreams within the BAP. Finalization of the both the CCR and ELG rules impacts Wheeling and Kentucky Power's ability as regulated utilities to obtain regulatory approval for the required capital expenditures to comply with both rules. This schedule represents the fastest technically feasible timeframe for compliance at the Mitchell Plant, driven primarily by the need for two major equipment tie-in outages to allow for removal of the current sluicing equipment and installation of the new UHDC equipment. The Mitchell Plant serves the PJM interconnection which manages the grid to provide electricity to 13 states and the District of Columbia. Outages are planned many years in advance with the Regional Transmission Operator (RTO) to effectively manage the generation capacity footprint. The RTO does not typically allow the Mitchell Plant much flexibility to adjust these outages or perform them in the non-shoulder months (summer and winter) due to the limited generating capacity during these peak electricity usage times and resulting potential impacts to grid stability. The sequencing and final tie-ins associated with this work as described in the work plan in Section 3 further elaborates on the complexities associated with this option. The Units must be converted to dry ash handling in order to cease receipt of CCR wastestreams in the current configuration. After receipt of regulatory approval, the dry ash handling conversion will be worked in parallel with the pond closure, new pond construction, and tank based chemical treatment and non-CCR stream reroute construction activities scope to achieve compliance as soon as possible. The total project duration of approximately 32 months from the date AEP initiated detailed design (August 2020) until the date that CCR sluicing is ceased and alternative capacity is provided for non-CCR wastestreams (April 21, 2023) is less than the average multiple technology system timeline of 39.1 months identified in the EPA Final Part A rule.

Section Two – Visual Timeline Depicting the Steps Necessary to Obtain Alternative Capacity

From the regulatory text § 257.103(f)(1)(iv)(A)(2)

> *(2) A detailed schedule of the fastest technically feasible time to complete the measures necessary for alternative capacity to be available including a visual timeline representation. The visual timeline must clearly show all of the following:*
> *(i) How each phase and the steps within that phase interact with or are dependent on each other and the other phases;*
> *(ii) All of the steps and phases that can be completed concurrently;*
> *(iii) The total time needed to obtain the alternative capacity and how long each phase and step within each phase will take; and*
> *(iv) At a minimum, the following phases: engineering and design, contractor selection, equipment fabrication and delivery, construction, and start up and implementation.*

Appendix C contains a timeline that illustrates all relevant phases and details the steps necessary for implementation of obtaining Alternative Capacity.

Section Three – Narrative of the Schedule and Timeline to Obtain Alternative Capacity

From the regulatory text § 257.103(f)(1)(iv)(A)(3). *A narrative discussion of the schedule and visual timeline representation, which must discuss all of the following:*

> *(i) Why the length of time for each phase and step is needed and a discussion of the tasks that occur during the specific step;*
> *(ii) Why each phase and step shown on the chart must happen in the order it is occurring;*
> *(iii) The tasks that occur during each of the steps within the phase; and*
> *(iv) Anticipated worker schedules;*

The schedule for this project is generally broken down into two major scopes of work: Dry Ash Handling (DAH) System installation and Pond Closure / New Pond Construction.

Dry Ash Handling System

<u>Engineering, Design and Procurement (September 2021 – January 2023)</u>
The conceptual design of the new DAH system has been completed. Regulatory approvals from the West Virginia and Kentucky Public Service Commissions are required for capital improvements of this magnitude. Applications for approval are being prepared and will be

submitted by the end of January 2021. Proceedings are estimated to be concluded by August 31, 2021. Detailed design of the DAH System will start in September 2021 and is scheduled to be completed by October 2022. Equipment procurement for the DAH system to support this project has a forecasted delivery date of the major equipment by January 2023.

Contractor Selection (April 2022 – December 2022)
There are 3 Construction (Labor) bid packages that are planned to be developed in parallel with the detailed design efforts. The typical timeframe to competitively bid major labor contracts is six months in accordance with AEP's procurement processes. The Civil labor contract package will be issued for bid beginning April 2022 and awarded to the selected construction contractors by September 2022. The Structural/Mechanical (S/M) and Electrical, Instrumentation, and Controls (EIC) construction bid packages are planned to be issued in June and July of 2022 and awarded by October and December of 2022. Civil construction is planned to start immediately following award in September 2022.

Construction (September 2022 – June 2023)
The civil work will include underground utility relocations, excavation and subgrade prep for the ash bunker footings and foundation installation. Once the footings and foundation are poured, the new ash bunker walls will be formed and poured. Similar activities will be performed for the belt transfer conveyor and transfer tower foundations. Soon after the civil work has started the structural/mechanical (S/M) contractor will mobilize to begin above ground utility relocations inside each Unit, structural steel reinforcing along Unit 1 and Unit 2 boiler building columns, and setting of transfer tower structural steel. Once the transfer tower steel is set, assembly and erection of the transfer conveyors from the common ash bunker back towards each Unit's boiler building will follow. The ash bunker sump pumps will be set, and piping ran back to the cooling tower basin. Balance of plant piping such as service water, instrument air, plant air, and other systems will be installed. Building penetrations will be made for the UHDC conveyors. The existing ash hopper pit concrete will be saw cut to make additional space required to route the conveyor out from underneath the ash hopper in each Unit. During this time as much demolition of existing equipment and structural steel that can be performed ahead of the Unit outages will be completed which includes reinforcing of the existing ash hopper structural steel to accommodate the new UHDC equipment loads.

The electrical/instrumentation and controls contractor (EIC) will mobilize soon after the S/M contractor to begin above ground utility relocations, installation of conduit and cable tray for both power and control cabling to the new equipment mentioned above. New electrical equipment will be set which includes distributed control system cabinets. Once the conduit and cable tray runs are completed the power and control cabling will be pulled, tested and terminated to the greatest extent possible. A majority of the power feeds and control cables for the UHDC equipment will need to be rolled up and temporarily staged at the ash hopper pits to be completed once the UHDC equipment is erected in place during the tie-in outages.

Although as much work as possible will be performed while the Units are operating, a significant portion of the work to complete the DAH system equipment installation requires a Unit outage. The generating units will be removed from service in Spring of 2023 to complete the UHDC outage related activities and final tie-ins. A portion of the outage schedule for the two units overlaps to accommodate work on common equipment.

Once the Spring outage begins both the S/M and EIC contractors will work two shifts sixty hours per week to complete the outage related activities. The pulverizer housing rotation will begin along with the demolition of boiler downcomer piping and any remaining equipment in the ash hopper pit area to allow for installation of the collection and dewatering conveyors. The support steel will be set, and the conveyors will be erected. The instrumentation and remaining connections trimmed out both electrically and mechanically to complete the UHDC system installation.

All CCR flows to the BAP will completely cease no later than April 21, 2023.

Startup and Implementation (April 2023 – June 2023)
Once the system is substantially complete, the AEP startup and commissioning group will begin checkout and functional testing to ensure proper operation once the system is completed and turned over. After the commissioning and check out is complete the system will be turned over to plant operations to perform plant testing and checkout and return the generating unit back to service.

Bottom Ash Pond Closure/ New Pond Construction

Engineering and Design (September 2020 – April 2022)
Detailed design of the balance of plant systems and tank based chemical treatment system has started and is planned to be completed by April 2022. The civil design work started in November 2020 and will complete by September 2021. The design of the ponds is dependent upon performing topographic survey, bathymetric survey, and geotechnical investigations to understand subgrade materials at the locations of the new ponds. The investigations will also be used to verify CCR depths at certain locations.

Permitting (December 2020 – June 2022)
The regulatory filing process has commenced and is planned to continue through January 2021. Additional permitting efforts relative to dam/dike modifications, the NPDES, and SWPPP necessary to construct the ponds will commence in 2021 and are planned to continue through June 2022.

Contractor Selection (May 2021 – August 2022)
There are three Construction (Labor) bid packages that are planned to be developed in parallel with the detailed design efforts. The typical time frame to competitively bid major labor contracts is six months in accordance with AEP’s procurement process. The Civil labor package will be issued for bid in May 2021 and awarded to the selected construction contractors by September 2021 following receipt of regulatory approval. The S/M and EIC construction bid packages are planned to be issued in March and April of 2022 and awarded by July and August of 2022. Civil construction is planned to start immediately following award in September 2021.

Construction (September 2021 - November 2023)
The closure of the BAP and construction of the new East and West WWP requires specific sequencing in order to complete the work due to the fact that the new ponds will be located within the existing BAP footprint and need to maintain overall pond operations while including provisions to meet the NPDES discharge permit requirements throughout construction. Final completion of the Eastern portion of the pond closure and repurposing activities is dependent upon installation of the DAH system equipment and ceasing CCR flows to the BAP. However, steps have been included in the project plan to allow for parallel activities to complete the work as early as possible as shown on the schedule in **Appendix C** and further described in this section.

The Mitchell BAP was constructed with a PVC liner, overlain by three (3) feet of protective cover soil. The CCR and protective cover soil will be removed and placed in the Mitchell landfill. The existing PVC liner will be removed and disposed offsite. When the excavation has finished removing the PVC liner (or the visual bottom of the CCR in any local area where the PVC liner has been compromised, if applicable), the contractor will remove an additional one foot of material to confirm removal of CCR. Additionally, a third-party engineer will perform quality assurance/quality control (QAQC) services to independently verify that all CCR materials are removed.

The closure by removal will be verified with a minimum of two groundwater sampling events. If the groundwater monitoring concentrations taken during those events do not exceed the groundwater protections standard the BAP will be considered closed.

The pond construction and closure work will be performed in phases primarily during calendar years 2021-2023, with final certification work in July 2023. The phases are shown in the schedule in **Appendix C** and timeframes are based on the estimated volumes of material to be removed as well as the estimated earthwork, liner, and protective cover quantities required for pond construction. These durations are based on an average work schedule of five days per week / ten hours per day and do not take into account delays from periods with significant rain events greater than average or normal for the geographic location.

Phase 1 (West BAP Closure and Pond Repurpose) – The contractor will mobilize September 2021 to begin Pond Closure and Repurposing scope of work. The contractor will work to complete site preparation activities including mobilization, installing erosion control, preparing laydown and construction office areas, installation of temporary wastewater treatment equipment, installing sheet piling to isolate and prevent seepage between the two halves of the existing BAP, diverting wastewater inflows from the initial closure and construction work area, and dewatering the west half of the BAP.

The first phase of the pond closure and new pond construction scope of work also includes removal of CCR material in the existing western footprint of the BAP and will be completed in July 2022. During this time all non-CCR streams that are currently routed through the BAP will be flowing through the Eastern footprint of the BAP while pond closure and repuposing takes place in the Western portion. Upon certification of closure by removal, construction of the new West Wastewater Pond will proceed. New subgrade will be established and prepped for the liner installation which is planned to begin in August 2022. At this same time, subgrade prep and installation of the new tank based chemical treatment system will also begin. The construction of the West Wastewater Pond is scheduled for completion in March 2023 which includes the tank-based chemical treatment equipment and rerouting of non-CCR wastewater piping. Startup and commissioning activities associated with the tank-based chemical treatment equipment will also be completed in parallel.

All Non-CCR wastewater streams will cease running through the BAP by March 13, 2023 with the initial operation of the new West WWP.

Phase 2 (East BAP Closure and Pond Repurpose) - The second phase of the BAP closure and new wastewater pond construction scope of work includes removal of CCR materials from the eastern portion of the existing BAP and completion of similar activities as described above. During this time all non-CCR streams are running through the newly lined western half of the repurposed pond until the last Unit is taken out of service to allow for CCR streams to cease and CCR removal activities to begin. The removal of CCR material will be completed and certified in July 2023. The closure by removal will be certified by a third-party engineer and the records will be posted in the operating record and on the AEP CCR website as appropriate. Work will continue to construct a new lined East WWP after CCR removal is certified.

At the completion of the pond construction and CCR material removal, the temporary construction facilities, laydown areas, and erosion controls will be removed, and these areas will be restored to their pre-construction conditions.

Section Four – Narrative of the Steps Already Taken to Initiate Closure and Develop Alternative Capacity

From the regulatory text § 257.103(f)(1)(iv)(A)(4).

> *(4) A narrative discussion of the progress the owner or operator has made to obtain alternative capacity for the CCR and/or non-CCR wastestreams. The narrative must discuss all the steps taken, starting from when the owner or operator initiated the design phase up to the steps occurring when the demonstration is being compiled. It must discuss where the facility currently is on the timeline and the efforts that are currently being undertaken to develop alternative capacity.*

As described in Section 1 and as shown in **Appendix C**, AEP has made considerable progress at the time of this request towards creating alternative disposal capacity for the CCR and non-CCR wastestreams at the Mitchell Plant that are currently managed in the BAP. The following major activities have been completed or are in process:

- Conceptual design for all aspects of the project required to achieve the alternate disposal capacity has been completed and detailed design has commenced.
- Dry bottom ash equipment has been specified and will be procured after receipt of regulatory approval from West Virginia and Kentucky Public Service Commissions.
- Contractors have been engaged to discuss different aspects of the work and identify expected construction timeframes.
- Permitting agencies have been engaged to discuss plans.
- Geotechnical investigations required to support the work have been started and are expected to be completed in 2020

NARRATIVE STRATEGY FOR COMPLIANCE WITH ALL REQUIREMENTS OF 40 CFR 257 SUBPART D

From the regulatory text § 257.103(f)(1)(iv)(B)

(B) To demonstrate that the criteria in paragraph (f)(1)(iii) of this section have been met, the owner or operator must submit all of the following:

> *(1) A certification signed by the owner or operator that the facility is in compliance with all of the requirements of this subpart;*
>
> I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for the Mitchell Plant, the facility is in compliance with all of the requirements contained in 40 CFR 257 Subpart D –

Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

x David A. Miller
David A. Miller, P.E.
Director—Land Environment and Remediation Services

The Mitchell Plant is maintaining compliance with all requirements of Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. Reports documenting compliance with the rule's provisions, such as location restriction, design criteria, operating criteria, and groundwater monitoring are posted to the AEP public CCR Rule Compliance Data and Information Internet site at the following link:
http://www.aep.com/about/codeofconduct/ccrrule/.

From the regulatory text § 257.103(f)(1)(iv)(B)*(2) Visual representation of hydrogeologic information at and around the CCR unit(s) that supports the design, construction and installation of the groundwater monitoring system. This includes all of the following:*

> *(i) Map(s) of groundwater monitoring well locations in relation to the CCR unit(s);*
> *(ii) Well construction diagrams and drilling logs for all groundwater monitoring wells; and*
> *(iii) Maps that characterize the direction of groundwater flow accounting for seasonal variations;*

Groundwater monitoring at the Mitchell CCR units is accomplished using PE-certified groundwater monitoring networks. Each network is composed of 7 groundwater monitoring wells. The complete Groundwater Monitoring Well Network (GWMN) Evaluation Report is provided in Appendix D and includes the following:

- The map showing the location of the monitoring wells relative to the CCR unit is presented in the GWMN Report as *Figure 3*;
- The associated boring logs and well construction diagrams are provided in *Appendix B*.
- Groundwater flow direction maps of the latest monitoring events completed in the winter, spring, summer, and autumn, to show seasonal changes, are provided in this submittal as **Figures 2 - 5** for the BAP and **Figures 6 – 9** for the Landfill.

From the regulatory text § 257.103(f)(1)(iv)(B)*(3) Constituent concentrations, summarized in table form, at each groundwater monitoring well monitored during each sampling event;*

The most recent Groundwater Monitoring and Corrective Action Reports summarize Appendix III and IV constituent concentrations at each groundwater monitoring well monitored during each sampling event as Table 1 (see **Appendix E**).

From the regulatory text § 257.103(f)(1)(iv)(B)*(4) A description of site hydrogeology including stratigraphic cross-sections;*

The Mitchell BAP site is located in the Ohio River valley and lies within the regional geologic area of West Virginia known as the Appalachian Plateau Province. The Ohio River Valley is a significant regional geomorphological feature in the region and is separated into the upper and lower parts. The upper Ohio River valley is entrenched in the unglaciated and dissected Allegheny Plateau and is characterized by valley walls incised commonly 200 feet below the regional upland

surface. The valley is a remnant of the historic preglacial Teays Valley drainage system, which is an integral part of the history of the present Ohio River drainage basin.
The Ohio Department of Natural Resources (ODNR) has published the Groundwater Resource Map of Monroe County (1991), which is the neighboring county along the west side of the Ohio River across from the Mitchell Plant. The ODNR map distinguishes groundwater well yields in the county, including bedrock strata and the Ohio River alluvium. Mapped well yields in Monroe County, Ohio are considered to be representative of groundwater yield conditions in neighboring Marshall County, WV. The ODNR Monroe County map indicates that the Ohio River alluvial deposits, referenced herein as the Ohio River alluvial aquifer, can provide yields of several hundred gallons per minute that will support large industrial and municipal supplies from sand and gravel deposits ranging from 55 to 75 feet thick which are hydraulically connected to the Ohio River. Comparatively, bedrock strata, positioned below and confining the lateral boundaries of the Ohio River alluvium, yield very limited groundwater supplies, typically less than 2 gpm. ODNR describes the bedrock strata groundwater resource potential as “very limited and often inadequate”.

The Mitchell BAP is constructed on the Ohio River floodplain and above the sand and gravel alluvial deposits. The saturated portion of these alluvial deposits, that are in direct hydraulic connection with the Ohio River, are the regional Ohio River alluvial aquifer. Ground surface elevations range from approximately 685 to 630 feet amsl at the Mitchell Power Generation Plant with surrounding hilltops reaching elevation 1,120 to 1,200 feet amsl.

Two sets of site specific geologic cross sections have been prepared at Mitchell Plant, one from an Electric Power Research Institute (EPRI) study and another prepared from monitoring well borings completed at the periphery of the Mitchell BAP for the CCR unit’s groundwater monitoring network design report. Both sets are provided in Appendix D of the Groundwater Monitoring Network (GWMN) Evaluation Reports as follows:

- The cross sections from the EPRI study are discussed on *page 11* and presented in *Appendix A*.
- The cross sections from monitoring well borings completed at the periphery of the Mitchell BAP are discussed on *pages 14,15, and 18* and presented as *Figures 4, 5 and 6*.

Based on the data collected from the CCR unit’s monitoring well borings, both unconsolidated soils and bedrock underlying the Mitchell BAP are depicted on the cross sections. The saturated portion of the sand and gravel deposits comprises the Ohio River alluvial aquifer. This alluvial aquifer, which consists of the saturated portion of the sand and gravel alluvial deposits that are in direct hydraulic connection with the Ohio River, is appropriately defined as the uppermost aquifer beneath the Mitchell BAP.

The complete GWMN report for the Mitchell Landfill is provided in Appendix D and includes a description of the site hydrogeology. Stratigraphic cross-sections are included in the GWMN Report as *Figures 4 – 6*.

From the regulatory text § 257.103(f)(1)(iv)(B)*(5) Any corrective measures assessment conducted as required at § 257.96;*

The BAP is expected to remain in assessment monitoring until closure by removal is complete. The LF is in detection monitoring. The CCR units will transition to an assessment of corrective measures and selection of a remedy following requirements in 40 CFR 257.96 and 40 CFR 257.97, and a corrective action program following requirements in 40 CFR 257.98, if necessary.

From the regulatory text § 257.103(f)(1)(iv)(B)*(6) Any progress reports on corrective action remedy selection and design and the report of final remedy selection required at § 257.97(a);*

The Mitchell CCR units have not entered Assessment of Corrective Measures, therefore no progress reports on remedy selection and design and a report of final remedy selection have been required or prepared.

From the regulatory text § 257.103(f)(1)(iv)(B)*(7) The most recent structural stability assessment required at § 257.73(d); and*

The most recent structural stability assessment required by § 257.73(d) for the BAP is included in Appendix F. This report will be updated every 5 years as required by the CCR rule.

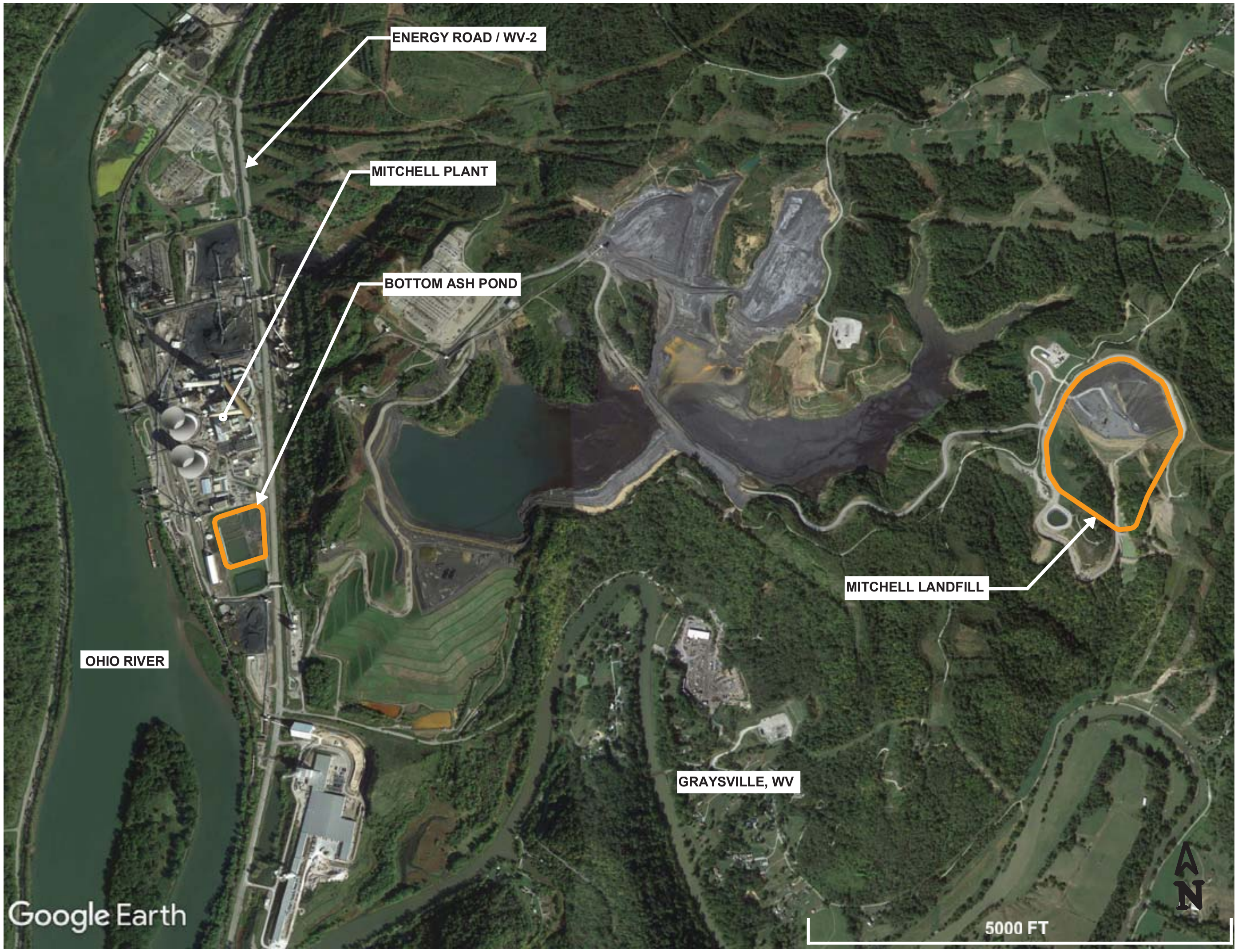
From the regulatory text § 257.103(f)(1)(iv)(B)*(8) The most recent safety factor assessment required at § 257.73(e).*

The most recent safety factor assessment required by § 257.73(e) for the BAP is included in Appendix G. This report will be updated every 5 years as required by the CCR rule.

CONCLUSION

As set forth and allowed by 40 CFR 257.103 – *Alternate Closure Requirements* and specifically 40 CFR 257.103(f)(1) – *Site Specific Alternate to Initiation of Closure Deadline,* the Mitchell Plant qualifies for the site specific alternate time frame provisions for continuing to receive CCR and non-CCR wastestreams and initiate closure of the CCR surface impoundments. Based upon the information submitted Wheeling Power Company and Kentucky Power Company seek to establish a site-specific compliance deadline to continue to receive Non-CCR wastestreams until March 13, 2023 and CCR wastestreams in the BAP until April 21, 2023. Closure by removal of the BAP will be completed by July 31, 2023.

Figures



LEGEND:

CCR UNIT BOUNDARY

REV	DATE	DESCRIPTION
A	JUN 20	ISSUED FOR REVIEW

Worley

OneWay

PRELIMINARY STATUS — DATE — INFORMATION ONLY - NOT TO BE USED FOR CONSTRUCTION.

APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL

DRAWN BY

CHECKED BY

LEAD DESIGNER

ENGINEER/TECH SPECIALIST

PROJECT ENGINEERING MANAGER

REVISIONS

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OHIO POWER COMPANY

MITCHELL PLANT

CRESAP — WEST VIRGINIA

CCR/ELG PROJECT

Facility and CCR Unit Layout

MECHANICAL ENGINEERING

DOCUMENT PREPARED BY WORLEY

AEP AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

CROSS REFS:

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on February 17, 2017) provided by AEP.
- Approximate Ohio River elevation was 622.83 feet at Mitchell Power Plant on February 17, 2017. Data Source: USGS Ohio River gage at Hannibal Lock and Dam (Upper), OH.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater and river elevation units are feet above mean sea level (NAVD 88).

Potentiometric Surface Map - Uppermost Aquifer February 2017

Mitchell Power Generation Plant - Bottom Ash Pond
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/10/20

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\AEP-Mitchell_Pond_GW_Feb2017.mxd. ARevezzo. 9/1/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on April 4, 2017) provided by AEP.
- Approximate Ohio River elevation was 622.88 feet at Mitchell Power Plant on April 4, 2017. Data Source: USGS Ohio River gage at Hannibal Lock and Dam (Upper), OH.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater and river elevation units are feet above mean sea level (NAVD 88).

* Wells marked with an asterisk were not use for contouring due to anamolous or inconsistent data. Contours and flow direction were inferred from professional judgement and observed river elevation.

Potentiometric Surface Map - Uppermost Aquifer April 2017

Mitchell Power Generation Plant - Bottom Ash Pond
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/10/20

Figure 3

C:\Users\mmuenich\Documents\local_projects\AEP_GIS\Mitchell\MXDs\AEP-Mitchell_BAP_2017_04Apr.mxd. MMuenich. 10/20/2017. Project/Phase/Task.

Legend
- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes
- Monitoring well coordinates and water level data (collected on July 18, 2017) provided by AEP.
- Approximate Ohio River elevation was 623.16 feet at Mitchell Power Plant on July 18, 2017. Data Source: USGS Ohio River gage at Hannibal Lock and Dam (Upper), OH.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater and river elevation units are feet above mean sea level (NAVD 88).

* Wells marked with an asterisk were not use for contouring due to anamolous or inconsistent data. Contours and flow direction were inferred from professional judgement and observed river elevation.

250 125 0 250
Feet

Potentiometric Surface Map - Uppermost Aquifer July 2017

Mitchell Power Generation Plant - Bottom Ash Pond
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/10/20

Figure **4**

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Legend
- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes
- Monitoring well coordinates and water level data (collected on October 9, 2017) provided by AEP.
- Approximate Ohio River elevation was 623.5 feet at Mitchell Power Plant on October 9, 2017. Data Source: USGS Ohio River gage at Hannibal Lock and Dam (Upper), OH.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater and river elevation units are feet above mean sea level (NAVD 88).

Potentiometric Surface Map - Uppermost Aquifer
October 2017

Mitchell Power Generation Plant - Bottom Ash Pond
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2018/01/29

Figure **5**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\BAP\AEP-Mitchell_Pond_GW_Oct2017.mxd. ARevezzo. 1/29/2018. Project/Phase/Task.

Legend
- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contours (Inferred)

Notes
- Monitoring well coordinates and water level data (collected on February 7, 2017) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

500 250 0 500 Feet

Potentiometric Surface Map - Fish Creek February 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/11/06

Figure 6

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-FC\AEP-Mitchell_Landfill-FC_GW_Feb2017.mxd. ARevezzo. 11/6/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on April 4, 2017) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (AMEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

500 250 0 500 Feet

Potentiometric Contours - Fish Creek Aquifer April 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/12/29

Figure 7

C:\Users\mmuenich\Documents\local_projects\AEP_GIS\Mitchell\MXDs\Landfill-FC\AEP-Mitchell_Landfill-FC_GW_Apr2017.mxd. MMuenich. 12/29/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on July 18, 2017) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

* MW1101F not gauged during July 2017 event; contours inferred from previous monitoring events.

Potentiometric Contours - Fish Creek Aquifer July 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2017/11/06

Figure 8

C:\Users\mmuenich\Documents\local_projects\AEP_GIS\Mitchell\MXDs\Landfill-FC\AEP-Mitchell_Landfill-FC_GW_July2017.mxd. MMuenich. 11/6/2017. Project/Phase/Task.

Legend
- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contours (Inferred)

Notes
- Monitoring well coordinates and water level data (collected on October 9, 2017) provided by AEP.
-Site features based on information available in the Groundwater Monitoring Network Evaluation (AMEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

Potentiometric Surface Map - Fish Creek October 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Columbus, Ohio | 2018/01/29

Figure 9

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-FC\AEP-Mitchell_Landfill-FC_GW_Oct2017.mxd. ARevezzo. 1/29/2018. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on February 7, 2017) provided by AEP.
-Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

500 250 0 500 Feet

Potentiometric Surface Map - Rush Run
February 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Clumbus, Ohio | 2017/11/07

Figure **10**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-RR\AEP-Mitchell_Landfill-RR_GW_Feb2017.mxd. ARevezzo. 11/7/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on April 4, 2017) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

500 250 0 500 Feet

Potentiometric Surface Map - Rush Run April 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Clumbus, Ohio | 2017/11/07

Figure **11**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-RR\AEP-Mitchell_Landfill-RR_GW_April2017.mxd. ARevezzo. 11/7/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on July 18, 2017) provided by AEP.
-Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

Potentiometric Surface Map - Rush Run
July 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

Clumbus, Ohio | 2017/11/07

Figure **12**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-RR\AEP-Mitchell_Landfill-RR_GW_July2017.mxd. ARevezzo. 11/7/2017. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on October 9, 2017) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).

Potentiometric Surface Map - Rush Run
October 2017

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec consultants

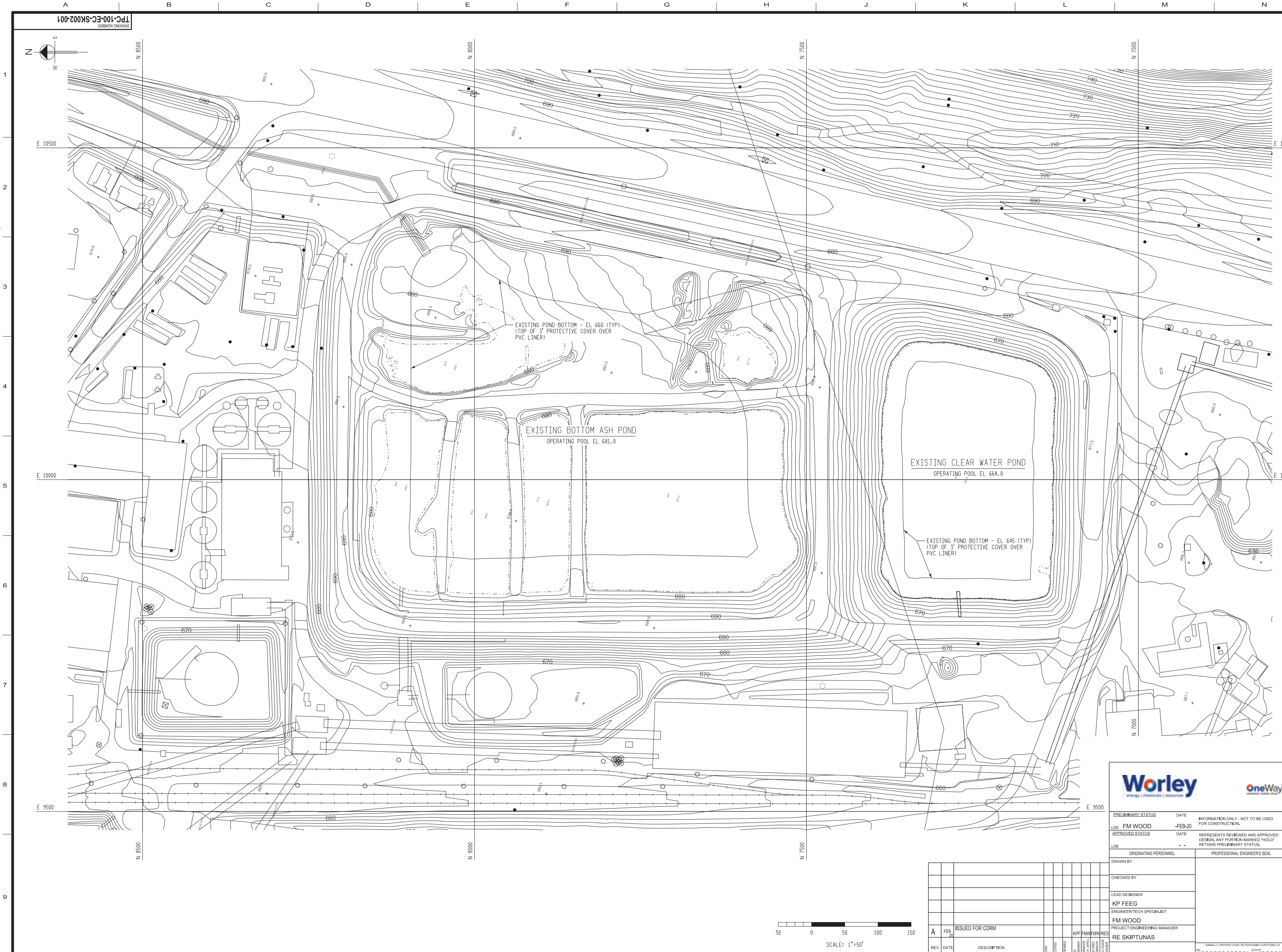
Clumbus, Ohio | 2018/01/29

Figure **13**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mitchell\Landfill-RR\AEP-Mitchell_Landfill-RR_GW_Oct2017.mxd. ARevezzo. 1/29/2018. Project/Phase/Task.

Appendix A

Existing and Future Pond Configurations



DATE	NO.	DESCRIPTION	APPD.
		REVISIONS	

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OHIO POWER COMPANY

MITCHELL PLANT

CRESAP WEST VIRGINIA

CCR/ELG PROJECT

ASH POND CLOSURE AND NEW WASTEWATER POND COMPLEX

FINAL CONDITIONS PLAN

Worley OneWay

PRELIMINARY STATUS	DATE	
LDE: FM WOOD	-FEB-20	INFORMATION ONLY - NOT TO BE USED FOR CONSTRUCTION.
APPROVED STATUS	DATE	REPRESENTS REVIEWED AND APPROVED DESIGN, ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
LDE:	- -	

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL

DRAWN BY

CHECKED BY

LEAD DESIGNER: KP FEEG

ENGINEER/TECH SPECIALIST: FM WOOD

PROJECT ENGINEERING MANAGER: RE SKIPTUNAS

REV	DATE	DESCRIPTION	DRAWN	CHECKED	REVIEWED	LEAD DESIGNER	ENGINEER/TECH SPECIALIST	LEAD ENGINEER	PROJECT ENGINEERING MANAGER
A	FEB 20	ISSUED FOR CDRM				KPF	FMW	FMW	RES

UNIT: — DRAWING NUMBER: **TPC-100-EC-SK002-001** — REV:

SCALE: 1"=50' — CIVIL ENGINEERING

DR: CH: SUP: ENG: DATE: — APPROVED BY — DOCUMENT PREPARED BY WORLEY

AMERICAN ELECTRIC POWER — AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215

DRAWING NUMBER: TPC-100-EC-SK002-001

CROSS REFS:

...\TPC-100-EC-SK002-001.dgn 2/11/2020 8:45:31 AM

Appendix B

Existing and Future Water Balances

CROSS REFS:

DRAWING NUMBER:

REV	DATE	DESCRIPTION	DRAWN	CHECKED	REVIEWED	LEAD DESIGNER	ENGINEER/TECH SPECIALIST	LEAD DISC ENGINEER	PROJ ENGR MANAGER
C	28 May 20	REVISED TO SHOW 2 PONDS	KL						
B	MAR 20	ISSUED FOR USE	EG		TH		KL	KL	TM
A	FEB 20	ISSUED FOR REVIEW	EG		TH		KL	KL	TM

Worley

OneWay

PRELIMINARY STATUS — K. LEBER — DATE 11-MAR-20 — INFORMATION ONLY - NOT TO BE USED FOR CONSTRUCTION.

LDE

APPROVED STATUS — DATE - - — REPRESENTS REVIEWED AND APPROVED DESIGN, ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

LDE

ORIGINATING PERSONNEL

DRAWN BY: E. GARCIA

CHECKED BY

LEAD DESIGNER

ENGINEER/TECH SPECIALIST: K. LEBER

PROJECT ENGINEERING MANAGER: T. MILLER

PROFESSIONAL ENGINEER'S SEAL

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

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OHIO POWER COMPANY

MITCHELL PLANT

CRESAP — WEST VIRGINIA

CCR/ELG PROJECT

FUTURE CONFIGURATION
WATER TREATMENT

UNIT: 0 — DRAWING NUMBER: MLP-WT-0-600-EN-SK305-001 — REV: B

SCALE: — MECHANICAL ENGINEERING

DR:
CH:
SUP:
ENG:
DATE:

APPROVED BY

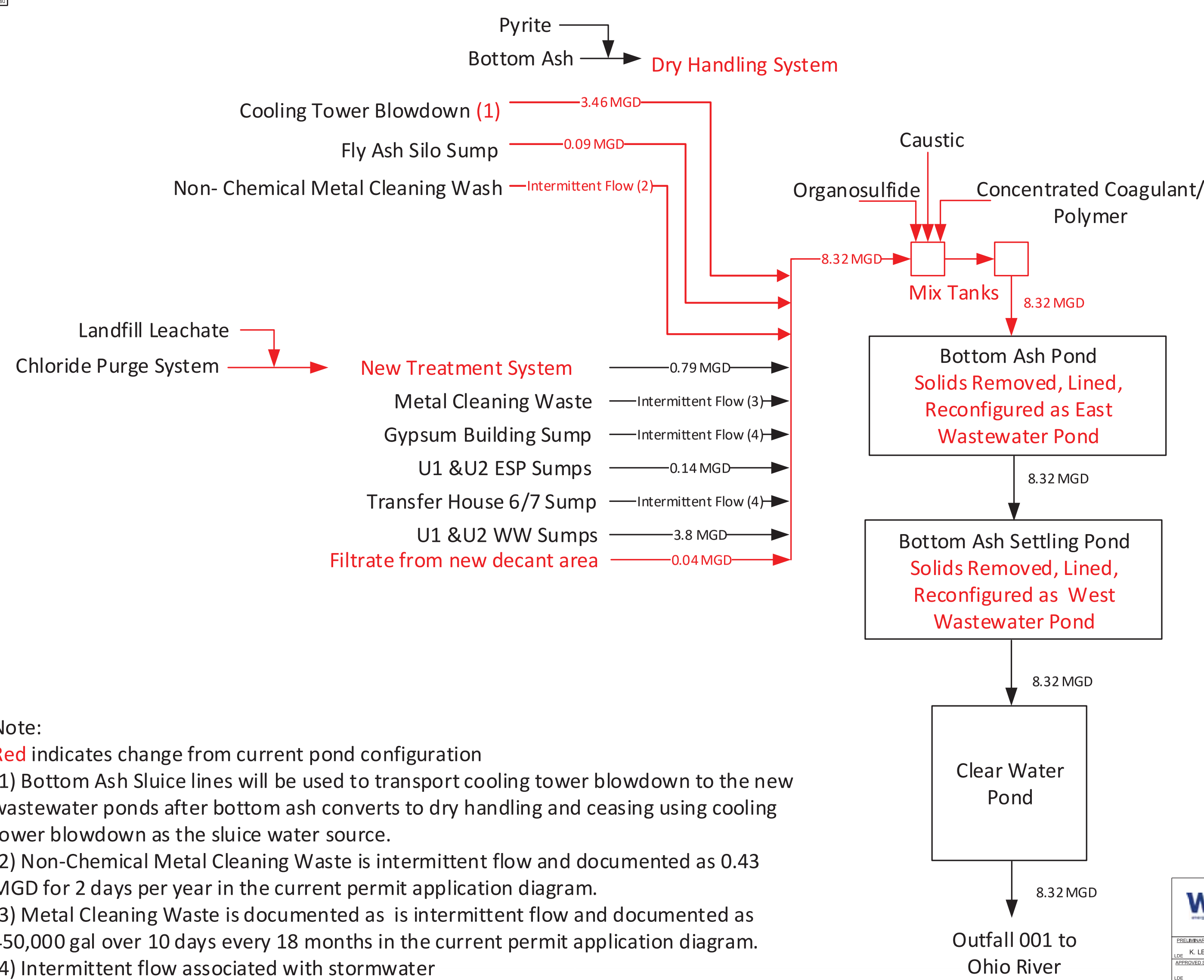
DOCUMENT
PREPARED BY
WORLEY

AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

2/4/2020 — 8:10:15 AM

CROSS REFS:



Note:
Red indicates change from current pond configuration
(1) Bottom Ash Sluice lines will be used to transport cooling tower blowdown to the new wastewater ponds after bottom ash converts to dry handling and ceasing using cooling tower blowdown as the sluice water source.
(2) Non-Chemical Metal Cleaning Waste is intermittent flow and documented as 0.43 MGD for 2 days per year in the current permit application diagram.
(3) Metal Cleaning Waste is documented as is intermittent flow and documented as 450,000 gal over 10 days every 18 months in the current permit application diagram.
(4) Intermittent flow associated with stormwater

REV	DESCRIPTION
D	ISSUED FOR USE
C	REVISED TO SHOW 2 PONDS
B	ISSUED FOR USE
A	ISSUED FOR REVIEW

Worley | OneWay

PRELIMINARY STATUS: K. LEBER, 14-OCT-20 — INFORMATION ONLY - NOT TO BE USED FOR CONSTRUCTION.

DRAWN BY: E. GARCIA
ENGINEER/TECH SPECIALIST: K. LEBER
PROJECT ENGINEERING MANAGER: T. MILLER

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA
CCR/ELG PROJECT
FUTURE CONFIGURATION WATER TREATMENT

DRAWING NUMBER: MLP-WT-0-600-EN-SK305-001 REV: B
MECHANICAL ENGINEERING
DOCUMENT PREPARED BY WORLEY

AMERICAN ELECTRIC POWER
AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

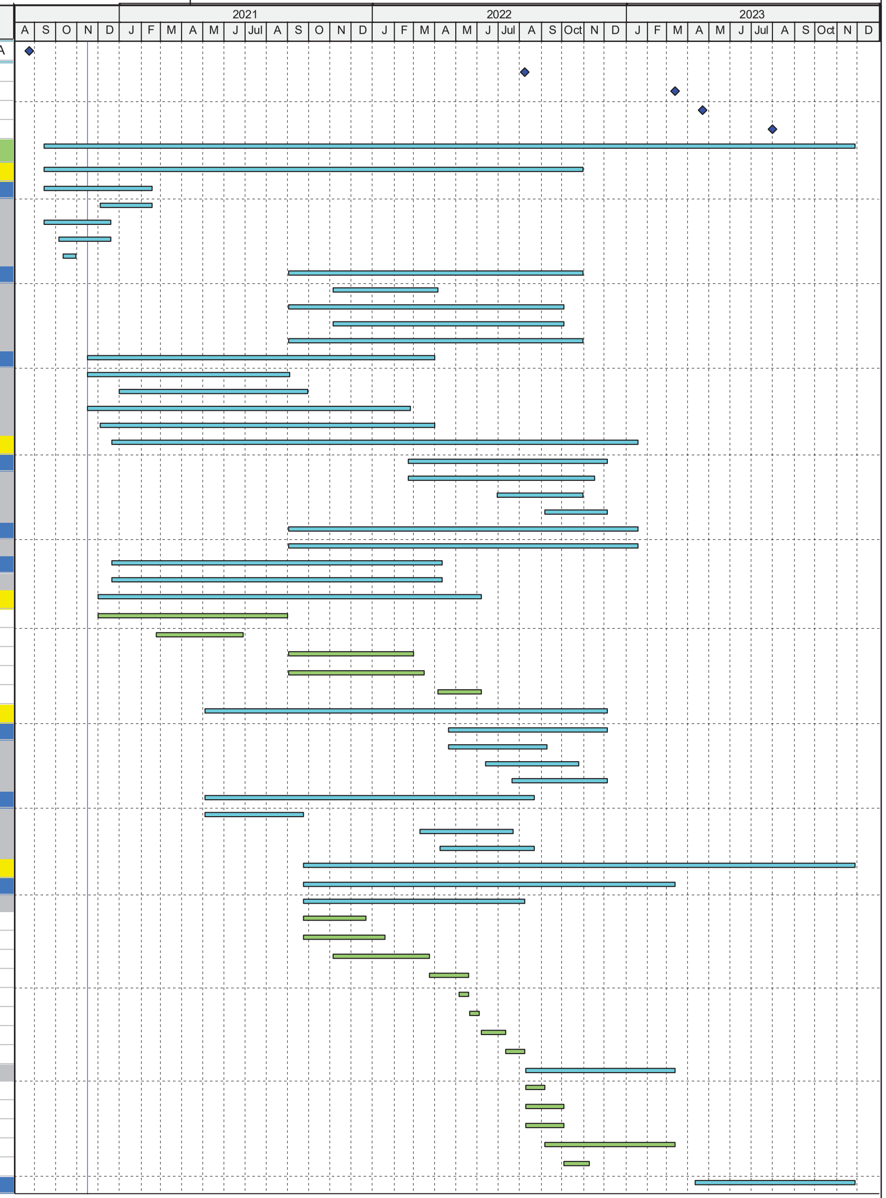
Appendix C

Site-Specific Schedule to Obtain Alternative Capacity

Mitchell - CCR/ELG EPA Updated Timelines...

AEP CCR-ELG MLP USEPA Public Version

Activity ID	Activity Name	Duration (Months)	Start	Finish
T-00-M-020-SR-G-RPS-A80	AEP Release Engineer and OEM to Complete Detailed Design for CCR Compliance	0.0		24-Aug-20 A
T-PR-M-020-SR-G-RPS-A60	3rd Party QAQC Certification of CCR Materials Removed for West Ash Pond Closure by Removal	0.0		08-Aug-22
T-PR-M-600-SR-G-RPS-A20	Initial Operation of Repurposed West Wastewater Pond / All non-CCR Streams Routed through Lined Wastewater Pond	0.0		13-Mar-23
T-PR-M-020-SR-G-RPS-A40	Cease sluicing CCR from Unit 1 & 2 (CCR Compliance)	0.0		21-Apr-23
T-PR-M-020-SR-G-RPS-A80	3rd Party QAQC Certification of CCR Materials Removed for East Ash Pond Closure by Removal	0.0		31-Jul-23
Mitchell Plant		33.4	Sep-20 A	Nov-23
Engineering & Design		22.2	Sep-20 A	Oct-22
Common		4.5	Sep-20 A	Feb-21
Civil / Site Infrastructure		2.1	Dec-20	Feb-21
Byproduct Handling		2.8	Sep-20 A	Dec-20
Mechanical BOP Systems		2.2	Oct-20 A	Dec-20
Electrical BOP Systems		0.6	Oct-20 A	Oct-20 A
BA Conversion		12.2	Sep-21	Oct-22
Civil / Site Infrastructure		4.3	Nov-21	Apr-22
Byproduct Handling		11.4	Sep-21	Oct-22
Mechanical BOP Systems		9.5	Nov-21	Oct-22
Electrical BOP Systems		12.2	Sep-21	Oct-22
Pond Repurpose		14.4	Nov-20	Mar-22
Civil / Site Infrastructure		8.4	Nov-20	Sep-21
Byproduct Handling		7.7	Jan-21	Sep-21
Mechanical BOP Systems		13.3	Nov-20	Feb-22
Electrical BOP Systems		13.8	Dec-20	Mar-22
Procurement		21.7	Dec-20	Jan-23
Common		8.2	Feb-22	Dec-22
Byproduct Handling		7.7	Feb-22	Nov-22
Mechanical BOP Systems		3.6	Jun-22	Oct-22
Electrical BOP Systems		2.6	Sep-22	Dec-22
BA Conversion		14.4	Sep-21	Jan-23
OEM Ash Handling Equipment Engineering / Design / Fabrication / Delivery		14.4	Sep-21	Jan-23
Pond Repurpose		13.6	Dec-20	Apr-22
Mechanical BOP Systems		13.6	Dec-20	Apr-22
Permitting		15.8	Dec-20	Jun-22
T-BA-E-100-E0-Z-000-A05	Prepare / Submit CPCN Application & Obtain Regulatory Approval from Public Service Commission	7.8	Dec-20	Aug-21
T-00-L-915-SP-MP-PMT-A60	Dam/Dike Modifications (Mitchell)	3.6	Feb-21	Jun-21
T-00-L-915-SP-MP-PMT-A90	Air Permit (Mitchell)	5.2	Sep-21	Mar-22
T-00-L-915-SP-MP-PMT-A70	NPDES (Mitchell)	5.6	Sep-21	Mar-22
T-00-L-915-SP-MP-PMT-A40	SWPPP (Mitchell)	1.8	Apr-22	Jun-22
Labor Contracts		16.6	May-21	Dec-22
Bottom Ash Conversion Labor Contracts		6.6	Apr-22	Dec-22
Civil		4.1	Apr-22	Sep-22
Mechanical / Structural		3.9	Jun-22	Oct-22
Electrical / I&C		3.9	Jul-22	Dec-22
Pond Repurpose & Closure Labor Contracts		13.6	May-21	Aug-22
Civil		4.1	May-21	Sep-21
Mechanical / Structural		3.9	Mar-22	Jul-22
Electrical / I&C		3.9	Apr-22	Aug-22
Construction		22.7	Sep-21	Nov-23
West Wastewater Pond Closure & Repurpose		15.3	Sep-21	Mar-23
West Bottom Ash Pond Closure		9.1	Sep-21	Aug-22
T-PC-C-100-C-CON-S1-20	Install sheet piling to establish isolation of West Bottom Ash Pond	2.6	Sep-21	Dec-21
T-PC-C-100-C-CON-S1-10	Install piping to divert pond inflows to East Bottom Ash Pond	3.4	Sep-21	Jan-22
T-PC-C-100-C-CON-S1-70	Remove CCR from East Bottom Ash Pond (For capacity and create settling basins)	4.0	Nov-21	Mar-22
T-PC-C-100-C-CON-S1-80	Install temporary Chemical Treatment System for East Bottom Ash Pond	1.6	Mar-22	May-22
T-PC-C-100-C-CON-S1-90	Prepare Sand Filters / Pumps for Operation in East Bottom Ash Pond	0.4	May-22	May-22
T-PC-C-100-C-CON-S1-30	Dewater West Bottom Ash Pond	0.4	May-22	Jun-22
T-PC-C-100-C-CON-S1-40	CCR & PVC Liner Material Removal from West Bottom Ash Pond	1.0	Jun-22	Jul-22
T-PC-C-100-C-CON-S1-50	QA/QC of CCR Removal	0.8	Jul-22	Aug-22
West Wastewater Pond Repurpose		6.2	Aug-22	Mar-23
T-PR-C-100-C-CON-S1-10	Subgrade prep for pond enhancement equipment area (Includes Area Fill)	0.8	Aug-22	Sep-22
T-PR-C-100-C-CON-S1-20	Subgrade prep for liner	1.6	Aug-22	Oct-22
T-PR-C-100-C-CON-S1-80	Compact Fill to Construct NS Dike of the Pond	1.6	Aug-22	Oct-22
T-PR-C-100-C-CON-S1-120	Tank Based Chemical Treatment System Installation	5.4	Sep-22	Mar-23
T-PR-C-100-C-CON-S1-50	Liner installation (Double Liner)	1.1	Oct-22	Nov-22
East Bottom Ash Pond Closure & Repurpose		6.6	Apr-23	Nov-23

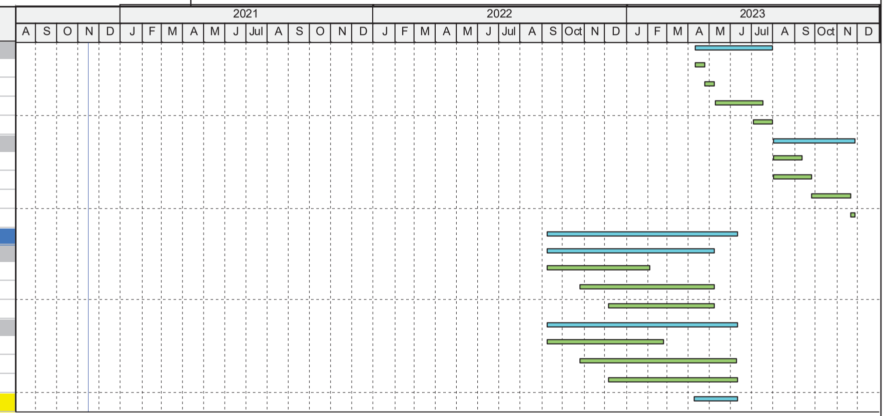


Current Bar Labels
Summary
Milestone

Date: 19-Nov-20

AEP CCR-ELG MLP USEPA Public Version

Activity ID	Activity Name	Duration (Months)	Start	Finish
East Bottom Ash Pond Closure		3.2	Apr-23	Jul-23
T-PC-C-100-C-CON-S2-10	Dewater East Bottom Ash Pond	0.4	Apr-23	Apr-23
T-PC-C-100-C-CON-S2-15	Remove Sheet Piling	0.4	Apr-23	May-23
T-PC-C-100-C-CON-S2-25	CCR & PVC Liner Material Removal	2.0	May-23	Jul-23
T-PC-C-100-C-CON-S2-30	QA/QC of CCR Removal	0.8	Jul-23	Jul-23
East Wastewater Pond Repurpose		3.4	Aug-23	Nov-23
T-PR-C-100-C-CON-S2-15	Compact Fill to Construct Waste Decant Area	1.2	Aug-23	Sep-23
T-PR-C-100-C-CON-S2-10	Subgrade prep for liner	1.6	Aug-23	Sep-23
T-PR-C-100-C-CON-S2-20	Liner and protective cover installation (Double liner, Revetment)	1.6	Sep-23	Nov-23
T-PR-C-100-C-CON-S2-25	QA/QC Consultant Prepare East Wastewater Pond Certification for Operation	0.2	Nov-23	Nov-23
Bottom Ash Conversion Construction		7.8	Sep-22	Jun-23
Construction Unit 2		6.9	Sep-22	May-23
T-BA-C-492-C-CON-72	Civil (UG Piping Relocations and Installation / Foundations / Ash Bunker)	4.2	Sep-22	Feb-23
T-BA-C-492-M-CON-99	Str / Mech (AG Utility Relos / Conv Steel / Eqpmnt Install / BoP Piping)	5.6	Oct-22	May-23
T-BA-C-492-E-CON-80	Elec / I&C (Conduit & Cable Tray Install / DCS Eqpmnt Install / Pull Power and Control Cabling and Terminate)	4.4	Dec-22	May-23
Construction Unit 1		7.8	Sep-22	Jun-23
T-BA-C-492-C-CON-82	Civil (UG Piping Relocations and Installation / Foundations / Ash Bunker)	4.8	Sep-22	Feb-23
T-BA-C-492-M-CON-109	Str / Mech (AG Utility Relos / Conv Steel / Eqpmnt Install / BoP Piping)	6.5	Oct-22	Jun-23
T-BA-C-492-E-CON-90	Elec / I&C (Conduit & Cable Tray Install / DCS Eqpmnt Install / Pull Power and Control Cabling and Terminate)	8.5	Dec-22	Jun-23
BA System Start-Up & Commissioning		1.8	Apr-23	Jun-23



Current Bar Labels
Summary
◆ Milestone

Appendix D

Groundwater Monitoring Well Network Evaluation Reports

for

Mitchell Plant's

Bottom Ash Pond

and

Landfill

CCR GROUNDWATER MONITORING SYSTEM DEMONSTRATION

BOTTOM ASH POND
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

Prepared For:

KENTUCKY POWER COMPANY
d/b/a AMERICAN ELECTRIC POWER, INC.
COLUMBUS, OHIO

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CINCINNATI, OHIO

CEC Project 110-416

JUNE 2016

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1.0 OBJECTIVE

This report has been prepared for the Mitchell Power Generation Plant, which is owned and operated by Kentucky Power Company, a public utility subsidiary of American Electric Power, Inc. (AEP), to demonstrate that the Mitchell Bottom Ash Pond, a Coal Combustion Residuals (CCR) Unit by definition of the United States Environmental Protection Agency (EPA) CCR Rule which has been published in the Federal Register (FR) on April 17, 2015 and is an extension of the current Code of Federal Rules (CFR) Title 40, Part 257 (§257), meets or exceeds the requirements for Groundwater Monitoring Systems (GMS) as defined in §257.91. Civil & Environmental Consultants, Inc. (CEC) has been contracted by AEP to provide a qualified Professional Engineer to certify compliance with the referenced GMS requirements.

2.0 BACKGROUND INFORMATION

Kentucky Power Company (KPC), a subsidiary of AEP, owns and operates the Mitchell Power Generation Plant. This facility is located along West Virginia Route 2 near the City of Cresap, West Virginia (WV) as shown on Figure 1 – Site Location Map. The mailing address of the Mitchell Power Generation Plant is P.O. Box K, Moundsville, WV 26041-0961.

The Mitchell Power Generation Plant uses bituminous coal as the primary fuel source for its two steam-turbine electric generating units. The total electric production capacity of this plant is 1,600 megawatts. Processes and equipment that control air emissions from the coal fired units generate CCRs comprised of fly ash, bottom ash and gypsum. Bottom ash produced at the Mitchell Plant is piped to the BAP and de-watered prior to beneficial reuse or transport and disposal at the Mitchell Landfill, which is located along Gatts Ridge Road (Marshall County Road 72), approximately 2 miles north of the intersection with County Road 74 (about 2 miles due east of the Mitchell Power Generation Plant).

The following subsections provide a summary of the Mitchell BAP CCR Unit.

2.1 CCR UNIT LOCATION

The Mitchell BAP is located on the southern portion of the Mitchell Power Generation Plant facility as depicted on Figure 2 – Plant and CCR Unit Location Map. The approximate center of the Mitchell BAP has the following coordinates:

- Latitude: 39 degrees 49 minutes 30.58 seconds North
- Longitude: 80 degrees 48 minutes 55.16 seconds West

2.2 DESCRIPTION OF THE CCR UNIT

The Mitchell BAP is an active CCR surface impoundment that is part of the Bottom Ash Complex at the facility. The Bottom Ash Complex is comprised of the BAP and the Clear Water Pond as shown on Figure 2 – Plant and CCR Unit Location Map. Within the Bottom Ash Complex, the BAP is positioned immediately north of the Clear Water Pond and the south dike of the BAP separates the two ponds. The BAP outlet structure, located in the southwest quadrant of the pond, is hydraulically connected to the Clear Water Pond. The Clear Water Pond is not considered part of the Mitchell BAP CCR Unit.

The Mitchell BAP was constructed utilizing dikes comprised of compacted local sandy soils for the north, west and south perimeters and is partially incised into a natural hillside along the east side. The interior slopes of the BAP are lined with a polyvinyl chloride (PVC) liner which is overlain by 3 feet of composite soils. The exterior and interior pond/dike slopes are vegetated (above the pool level on the interior slopes) to minimize erosion.

The Mitchell BAP is divided into two primary areas for progressive settlement of the bottom ash that is sluiced into the CCR unit. Initially, the bottom ash is sluiced into the northeast corner of the eastern half of the pond for initial settling and primary excavation of the decanted material. The sluice water containing finer fractions of bottom ash flows toward the south end of the eastern half of the pond before flowing into the western half of the pond for final settlement of the suspended solids. A culvert pipe allows the sluice water to transition into the west half of the pond. The working bottom of the south half of the Mitchell BAP east side is above the normal operating pool level to allow excavation and load-out operations of the bottom ash collected within the eastern portion of the pond. The western half of the pond is separated from the east half by an interior "splitter" dike and is divided into four (4) individual containment areas separated by internal dikes that direct the flow of water into the containment areas and increase the retention time in order to promote further settling of the bottom ash. After the sluice water proceeds through the west half of the pond, the water is then released from the BAP through a 30-inch diameter reinforced concrete outlet pipe located at the southwest corner of the pond to the Clear Water Pond. The normal pool elevation in the west half of the pond is maintained at approximate elevation 676 feet above mean sea level (amsl).

2.2.1 Embankment and Liner System Configuration

The BAP is constructed with compacted soil dikes along the north, west and south perimeters. The east interior slope is incised within the natural hillside. The interior and exterior slopes are constructed to approximately 3 horizontal to 1 vertical (3H:1V). The crest of the dikes are 20 feet wide. The interior slopes are lined with a PVC liner that is covered with 3 feet of soil.

A summary of the BAP dike and pool operation details is provided below:

- Dike Crest Elevation: 690 feet amsl
- Maximum Dike Height: 28 feet
- Normal Operating Pool Level: 676 feet amsl
- Maximum Design Storm Level: 678.37 feet amsl
- Freeboard: 14 feet
- Liner Bottom Elevation: 657 to 660 feet amsl

2.2.2 Area/Volume

Mitchell BAP comprises a total area of approximately 11.9 acres (measured to the toe of the exterior dikes). Using the operating pool elevation of 676 feet amsl and the pond bottom elevation of 660 feet amsl, the maximum storage capacity of the BAP is approximately 123 acre-feet. However, the operating volume of water maintained in the pond is significantly less than the maximum capacity due to the relatively dry bottom ash load-out area, splitter dike and interior diversion dikes.

2.2.3 Construction and Operational History

The Mitchell BAP was constructed and began operation in the mid to late 1970’s. The pond construction was approved by West Virginia Department of Environmental Protection (WVDEP) Division of Water and Waste Management, Dam Safety Section in 1975 as a Hazard Class 2 structure under Dam ID #05108. In addition, the BAP was granted operational approval from WVDEP, in conjunction with the Clear Water Pond, in 1977 under National Pollutant Discharge Elimination System (NPDES) Permit No. WV0005304.

The BAP receives approximately 27,000 tons of bottom ash per year that is transported from the Mitchell Power Station boilers to the pond via sluiced transport methods. The bottom ash that settles from the sluice water is regularly excavated from within the BAP and is either beneficially reused off-site or transported to Mitchell Landfill for disposal. The operational pool level is maintained and controlled at about elevation 676 feet amsl through the outlet structure located near the southwest corner of the pond.

The Bottom Ash Pond Complex, including the BAP, is regularly inspected and maintained in accordance with the Maintenance Plan that has been reviewed and approved by the WVDEP Division of Water and Waste Management, Dam Safety Section. As a minimum, Mitchell BAP is inspected monthly by AEP plant personnel from the Mitchell Power Station and annually by AEP engineering staff. The inspections focus on the various structural and operation items associated with the pond and include: 1) interior and exterior dike maintenance and stability; 2) maintenance and operation of the internal water conveyance structures; 3) maintenance and operation of the inlet and outlet structures; and, 4) monitoring of established instrumentation. In addition to the owner inspection program, the WVDEP, Division of Water and Waste Management, Dam Safety Section completed and inspection on October 15, 2014. Required site and/or appurtenance maintenance or repairs identified during the inspections are completed by AEP plant personnel.

2.2.4 Surface Water Control

The Mitchell BAP is primarily designed to handle the operational inflow of sluiced bottom ash from the Mitchell Power Generation Station. Surface water from within the surrounding drainage area for the BAP is included to determine the maximum required design storage capacity. For this purpose, the design storm used in the analyses is one-half of the 6-hour Probable Maximum Precipitation (PMP) event. Based on the maximum design storm level and the normal operating pool elevation of 676 feet amsl, the maximum pool level increase is 2.37 feet (Elevation 678.37 feet amsl). The normal pool elevation is maintained by the 30-inch diameter reinforced concrete pipe outlet structure located near the southwest corner of the pond. Overflow from the BAP is conveyed to the Clear Water Pond via a concrete overflow shaft and a 30-inch diameter perforated distribution pipe that extends into the Clear Water Pond. Overflow from the Clear Water Pond is conveyed through a 36-inch diameter corrugated metal pipe; where after, it is discharged into the Ohio River in accordance with the referenced NPDES permit.

2.2.5 Groundwater Monitoring

The Mitchell BAP GMS is designed to monitor the Ohio River alluvial aquifer, which is designated to be the uppermost aquifer at the Mitchell BAP as discussed in Sections 3.1.1.4 and 3.1.1.5. The BAP GMS was installed in October and November 2015 and consists of seven monitoring wells constructed at the locations shown on Figure 3 – CCR Unit and Monitoring Wells. Well construction details are provided in Table 1 – Monitoring Well Construction Summary. BAP GMS monitoring wells are designated with a MW15XX naming convention, where the follow abbreviations apply:

- MW = monitoring well;
- 15 = last two digits of the year the monitoring well was installed; and,
- XX = monitoring well number (varies).

Initially, monitoring wells MW1509 and MW1510 were designated as piezometers P-2 and P-1, respectively. Following the collection of static water levels in December 2015 and February 2016 (provided in Table 2 – Static Water Levels) the piezometers were re-designated as groundwater monitoring wells in the BAP GMS.

The BAP Monitoring Well Network Installation Report (February 2016) provides details of the BAP GMS installation, including descriptions of the following activities:

- Drilling and soil sampling;
- Monitoring well construction;

- Monitoring well development;
- Single well slug testing;
- Static water level measurement; and,
- Installation of dedicated pumps.

In addition, a Field Sampling and Analysis Plan (FSAP, April 2016) was completed which includes methods and procedures for background, detection, and assessment monitoring for compliance with the CCR rules in 40 CFR §257.93, §257.94, and §257.95, respectively.

The BAP Monitoring Well Network Installation Report (February 2016) and the FSAP (April 2016) have been added to the Mitchell BAP CCR Operating Record.

Additional information describing the Mitchell BAP GMS is provided in Section 3.1.1.6.

2.3 SUPPORTING INVESTIGATIONS AND DOCUMENTS

CEC has reviewed the following documents which are the most relevant for evaluation of compliance with the CCR GMS requirements:

1. Groundwater Quality at the Kammer and Mitchell Power Plants, Marshall County, West Virginia, EPRI Research Project 9106, Site Investigation Report, May 1999.
2. Response to WVDWWM Order Number DS2009-0002 (Item 2), Mitchell Bottom Ash Complex, Marshall County, West Virginia WVOWWM 1.0. No. 05108, GA File No. 09-379, Prepared For AEP Service Corporation, 1 Riverside Plaza, Columbus, Ohio 43215-2373, Prepared by Geo/Environmental Associates, Inc., 3502 Overlook Circle, Knoxville, Tennessee 37909, March 18, 2009.
3. CCW Impoundments Inspection Report (Draft), Mitchell Power Plant, Marshall County, West Virginia, Prepared for U.S. Environmental Protection Agency, Washington, D.C., Under Subcontract to Lockhead Martin, Edison, New Jersey, Prepared by Paul C. Rizzo Associates, Inc., 101 Westpark Boulevard, Columbia, South Carolina, USA 29210, Project No. 09-4157, October 2009.
4. Well Details from G. M. Baker & Son Co. Production Test of Well June 12, 2014.
5. State of West Virginia, Source Water Assessment and Protection Program, Source Water Assessment Report, Revised Report, Mitchell Plant, PWSID WV9925015, Marshall County, Prepared by: West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Environmental Health Services, Source Water Protection Unit, January 2014.

6. Monitoring Well Network Installation Work Plan, Revision #1, Bottom Ash Pond, Mitchell Power Generation Plant, Marshall County, West Virginia, Prepared for American Electric Power, Columbus, Ohio, Prepared by Civil & Environmental Consultants, Inc., Cincinnati, Ohio, CEC Project 110-416.7701, September 2015.
7. Monitoring Well Network Installation Report, Bottom Ash Pond, Mitchell Power Generation Plant, Marshall County, West Virginia, Prepared for American Electric Power, Prepared by Civil & Environmental Consultants, Inc., Cincinnati, Ohio, CEC Project 110-416.7709, February 2016
8. Field Sampling and Analysis Plan, Mitchell Power Generation Plant, Mitchell Landfill and Mitchell Bottom Ash Pond, Marshall County, West Virginia, Prepared for Kentucky Power Company, D/B/A American Electric Power, Inc., 1 Riverside Drive, Columbus, Ohio 43215, Prepared by Civil & Environmental Consultants, Inc., Worthington, Ohio, CEC Project 110-416.7608. April 2016.
9. BAP Piezometer and Pool Water Levels, September 2009 to December 2012 and May 2015, provided by Kentucky Power, Mitchell Power Generation Plant, Marshall County, West Virginia.

2.4 HYDROGEOLOGIC SETTING

Hydrogeologic conditions at the Mitchell BAP have been investigated, evaluated and reported in several documents including: 1) Groundwater Quality at the Kammer and Mitchell Power Plants by EPRI dated May 1999; 2) Response to WVOWWM Order Number DS2009-0002 (Item 2), Mitchell Bottom Ash Complex, Marshall County, West Virginia by Geo/Environmental Associates, Inc. (GA) dated March 18, 2009; and, 3) CCW Impoundments Inspection Report (Draft) by Paul C. Rizzo Associates, Inc. (PCR) dated October 2009. In addition, groundwater and pool level measurements recorded as part of the regular inspections were reviewed. Based on a review of the available information, the following sections provide a summary of the hydrogeologic conditions at the Mitchell BAP. Wells and/or piezometers installed for the investigations cited above are not incorporated into the Mitchell BAP GMS.

2.4.1 Climate

Climatic data for Mitchell BAP is summarized as follows:

Average monthly temperature:

Jan./July (degrees F)	Feb./Aug. (degrees F)	March/Sep. (degrees F)	April/Oct. (degrees F)	May/Nov. (degrees F)	June/Dec. (degrees F)
26.70	28.80	38.50	50.10	59.70	68.1
72.00	70.60	64.10	52.50	41.60	31.4

Average monthly precipitation:

Jan./July (inches)	Feb./Aug. (inches)	March/Sep. (inches)	April/Oct. (inches)	May/Nov. (inches)	June/Dec. (inches)
2.86	2.40	3.58	3.28	3.54	3.30
3.83	3.31	2.80	2.49	2.34	2.57

Evapotranspiration:

Jan./July (inches)	Feb./Aug. (inches)	March/Sep. (inches)	April/Oct. (inches)	May/Nov. (inches)	June/Dec. (inches)
0.603	0.467	1.022	2.826	2.477	2.315
2.485	2.087	1.607	1.633	1.349	0.896

2.4.2 Regional and Local Geologic Setting

2.4.2.1 Regional Geomorphology and Bedrock Geology

The Mitchell BAP site is located in the Ohio River valley and lies within the regional geologic area of West Virginia known as the Appalachian Plateau Province. The Ohio River Valley is a significant regional geomorphological feature in the region and is separated into the upper and lower parts. The upper Ohio River valley is entrenched in the unglaciated and dissected Allegheny Plateau and is characterized by valley walls incised commonly 200 feet below the regional upland surface. The valley is a remnant of the historic preglacial Teays Valley drainage system, which is an integral part of the history of the present Ohio River drainage basin. Dismemberment of the preglacial Teays Valley system and development of the present Ohio River valley began in the late Tertiary or early Pleistocene glacial age.

The width characteristics of the upper Ohio River valley upstream from Marietta, Ohio, indicates that at some time during the Pleistocene, the head of southwest-flowing drainage in the Ohio River valley originated in southern Marshall County, WV. Above this point, drainage flowed northeastward. Ray (1974) describes that somewhere near New Martinsville, WV there was a divide in the Ohio River valley between north- and south-flowing drainage. The north-flowing drainage followed the valley of Beaver Creek in Pennsylvania and was blocked by the advance of a continental glacier from the north. The glacial dam caused the formation of a lake in the valley of the Ohio River that rose high enough to overflow the divide. The divide was worn down rapidly by the overflow, and, when the glacial ice had finally melted back, the channel through the divide near New Martinsville was lower than the old north-heading channel at Beaver Creek, which had been filled with morainal debris. As a result, the present headwaters of the Ohio River above New Martinsville were diverted to their present course.

By Illinoian time, the present Ohio River was largely established in its present course. The bedrock valley was deepened and broadened and filled with glaciofluvial deposits during interglacial stages. Post-glacial activity has resulted in downgrading and cutting of terraces and floodplain surficial deposits. Alluvial sand, gravel and clay deposits in the Ohio River valley are more than 100 feet thick and more than one-half mile wide in some areas and are a significant regional groundwater resource. The alluvial sediments in the valley consist of a glaciofluvial fill of medium- to coarse-grained sand and gravel of Wisconsin age and postglacial terrace deposits mainly of the "point-bar" type of river sediment. Sedimentary structures are of the cut-and-fill type, characteristic of aggrading streams. The individual beds are highly lenticular, and there are abrupt changes in particle size both horizontally and vertically. Lower terraces are often covered by 20 to 30 feet of silty clay and clay which contain some channel-fill sand lenses. These are interpreted as normal flood-plain deposits, mainly of the point-bar type. Flood plains are commonly underlain by thick sections of silt, sand, and clay.

The existing Ohio River bedrock valley has the shape of a trench with a flat bottom and abrupt, steep walls with buried rock benches (Carlston, 1962). Based on the Geologic Map of West Virginia (WVGES Publication: Map 25A), the bedrock in Marshall County predominantly consists of sedimentary bedrock of the Pennsylvanian and Permian age Dunkard, Monogahela and Conemaugh Groups. Bedrock forming the valley walls is composed of cyclic sequences of sandstone, siltstone, claystone, shale, limy shale, shaly limestone, and minor coal beds. While limestone is present within the region, the beds are generally thin and discontinuous. Most of the limestone is non-marine and there are no known karst features noted in the region. The literature indicates that the bedrock was deposited in a wide fluvial-deltaic plain where sediment eroding from the Appalachian Mountains traveled west to be deposited in a large shallow sea in the interior of the continent (Martin, 1998).

The Mitchell BAP is located approximately five miles northwest of the Proctor Syncline which strikes to the northeast/southwest. No evidence of folding or faulting was observed during at the site during field investigations completed at the Mitchell Landfill located approximately 2 miles east of the Mitchell BAP. Additional regional folds identified on the West Virginia GIS Technical Center website (http://wvgis.wvu.edu/index.php) are present southeast of the BAP which include the New Martinsville Anticline, the Loudenville Syncline, the Washington Anticline and Nineveh Syncline all striking northeast/southwest.

2.4.2.2 Regional Groundwater Resources

The Ohio Department of Natural Resources (ODNR) has published the Groundwater Resource Map of Monroe County (1991), which is the neighboring county along the west side of the Ohio River across from the Mitchell Power Generation Plant. The ODNR map distinguishes groundwater well yields in the county, including bedrock strata and the Ohio River alluvium. Mapped well yields in Monroe County, Ohio are considered to be representative of groundwater yield conditions in neighboring Marshall County, WV. The ODNR Monroe County map indicates that the Ohio River alluvial deposits, referenced herein as the Ohio River alluvial aquifer, can provide yields of several hundred gallons per minute that will support large industrial and municipal supplies from sand and gravel deposits ranging from 55 to 75 feet thick which are hydraulically connected to the Ohio River. Comparatively, bedrock strata, positioned below and confining the lateral boundaries of the Ohio River alluvium, yield very limited groundwater supplies, typically less than 2 gpm. ODNR describes the bedrock strata groundwater resource potential as "very limited and often inadequate".

CEC interprets that the Ohio River acts as a discharge boundary for the alluvial aquifer during low river flow and a recharge boundary during seasonal high river stage conditions. Seasonal water levels in the Ohio River are partially controlled by a series of locks and dams that are operated by the USACE. Thus, the seasonal high water elevation in the Ohio River alluvial aquifer is interpreted to be equal to the Ohio River Ordinary High Water Elevation published by the US Army Corp of Engineers (USACE).

2.4.2.3 Local Geology

The Mitchell BAP is constructed on the Ohio River floodplain and above the sand and gravel alluvial deposits. The saturated portion of these alluvial deposits, that are in direct hydraulic connection with the Ohio River, are the regional Ohio River alluvial aquifer. Ground surface elevations range from approximately 685 to 630 feet amsl at the Mitchell Power Generation Plant with surrounding hilltops reaching elevation 1,120 to 1,200 feet amsl. Local geologic conditions at the Mitchell BAP were primarily identified by the referenced EPRI report which included approximately 75 geotechnical borings and water level data from eight monitoring wells. These borings ranged in depth from about 36 feet below ground surface (bgs) to 116 feet bgs. Five of the borings were advanced into bedrock with core samples collected from depths of 98 feet bgs to 116 feet bgs. Additional boring data was developed as part of the referenced GA 2009 report that included 5 borings and installation of 4 piezometers. These supplemental borings were advanced through the constructed perimeter BAP dikes and the investigated depths were limited to about 50 feet below the original ground surface. GA field boring logs describe subsurface soils to be primarily classified as sand, with occasional, thin silt or clay intervals. There is no indication on the boring logs that organic soils or dredge materials were encountered in the BAP dike borings. Laboratory analysis of select soils samples verified these field classifications.

Site specific geologic cross sections from the referenced EPRI report are provided in Appendix A. The cross section locations are presented on Figure 3-3. Figures 3-4 and 3-5 present Sections A-A' and B-B', which are oriented approximately perpendicular to the Ohio River. Section C-C' is presented on Figure 3-6 and is aligned with the river. These cross sections show the variability in the natural unconsolidated soils and strata beneath the Mitchell Power Generation Plant and that the confining bedrock strata rise steeply to the east along the eastern portion of the plant boundary. Generally, the stratigraphy of unconsolidated soil deposits consists of a surficial fill layer underlain by natural silts and clays, then sand and interbedded sand and gravel deposits. EPRI identified four generalized textural zones were within the alluvial deposits. Significant variability was noted with respect to both zone thickness and textural characteristics. The referenced EPRI textural zones and their thickness ranges are as follows:

Textural Zone	Thickness (ft.)
Clay	0-17
Sand	0-30
Gravel	0-97
Gravel lenses	0-50

Fill was used extensively for establishing the required land surface grade of about elevation 667 feet amsl at the BAP site. The fill is composed of light brown silts and clays with minor amounts of coal, sand, and gravel. The fill is up to 25 feet thick and covers the western portion of the site, where it was used to extend an upper river terrace toward the river and establish the required land surface grade of about 667 feet amsl for the Mitchell Power Generation Plant. Between the Ohio River and the eastern portion of the Mitchell Power Generation Plant, including most of the BAP, the bedrock is near level at about elevations 570 feet amsl or about 100 feet below the original ground surface as shown on Figures 3-4 and 3-5 in Appendix A.

Subsurface data collected during installation of the Mitchell BAP GMS in October and November 2015 are presented in Section 3.1.1 and are consistent with hydrogeologic conditions described in the GA and EPRI investigations, completed in 2009 and 1999, respectively.

2.4.3 Local Groundwater Use

The Mitchell Power Generating Plant withdrawals water from the Ohio River alluvial aquifer that serves as a source of potable water for the plant. Currently, there are two groundwater supply wells operating at the plant. Information provided by AEP indicates that the supply wells produced an approximate average of 628,000 gallons per month in 2014. The influence of the supply wells is shown on the EPRI Water Table Contour Map for the Mitchell Plant site (August 20, 1996) on Figure 3-7 in Appendix A. Water levels collected on May 20, 2015 from six of the eight original monitoring wells at the plant are similar to those recorded during the EPRI study and also reflect the pumping well influence. A summary of the supply wells is provided below.

Supply Well #2

- Total Well Depth 92.6 feet
- Screen Length 15 feet with Top of Screen at 77 feet
- Well Diameter 10 inches
- Static Water Level 43.6 feet on 6/12/14 Step Test
- Step Test performed – specific capacity at 163 GPM = 233 GPM/FT
- End of Step Test 224 GPM = 1.10 feet drawdown

Supply Well #3

- Total Well Depth 91.6 feet
- Screen Length 20 feet with Top of Screen at 71 feet
- Well Diameter 14 inches
- Static Water Level 41.2 feet on 5/30/14 Step Test
- Step Test performed – specific capacity at 172 GPM = 82 GPM/FT
- End of Step Test 231 GPM = 2.70 feet drawdown

3.0 §257.91 GROUNDWATER MONITORING SYSTEM

3.1 §257.91(A) THROUGH §257.91(C) RULE DESCRIPTION

40 CFR 257.91(a) through (c) states:

(a) Performance standard. The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:

- ***(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:***
  - ***(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or,***
  - ***(ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and,***
- ***(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.***

(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:

- ***(1) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and,***
- ***(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.***

(c) The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a)

of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:

(1) A minimum of one upgradient and three downgradient monitoring wells; and,

(2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.

3.1.1 Information Supporting Rule Compliance

3.1.1.1 Hydrostratigraphic Units

The Mitchell BAP is constructed on the Ohio River floodplain and above the sand and gravel alluvial deposits. The saturated portion of these alluvial deposits that are in direct hydraulic connection with the Ohio River are the regional Ohio River alluvial aquifer, which is a prolific aquifer capable of supplying hundreds of gallons per minute. Bedrock forming the Ohio River valley, which contains the Ohio River alluvial aquifer, is composed of cyclic sequences of sandstone, siltstone, claystone, shale, limy shale, shaly limestone, and minor coal beds. While limestone is present within the region, the beds are generally thin and discontinuous and there are no known karst features in the vicinity. Comparatively, bedrock strata yield very limited groundwater supplies, typically less than 2 gpm. ODNR describes the bedrock strata groundwater resource potential as “very limited and often inadequate”.

As stated in Section 2.4.2.3, GA field boring logs describe subsurface soils below the Mitchell BAP to be primarily classified as sand, with occasional, thin silt or clay intervals. There is no indication on the boring logs that organic soils or dredge materials were encountered in the BAP dike borings. Laboratory analysis of select soils samples verified these field classifications. This was further confirmed by the 2015 GMS borings described in Section 3.1.1.6.

Geologic cross sections were prepared from monitoring well borings completed at the periphery of the Mitchell BAP in October 2015 at the locations shown on Figure 4 – Geologic Cross Section Location Map. Based on the data collected from these monitoring well borings, unconsolidated soils and bedrock underlying the Mitchell BAP are depicted on Figure 5 – Geologic Cross Sections A-A’ and Figure 6 – Geologic Cross Section B-B’. The saturated portion of the sand and gravel deposits comprises the Ohio River alluvial aquifer. Unconsolidated deposits comprising the Ohio River alluvial aquifer at the Mitchell BAP monitoring wells locations consist of sand and gravel, classified as well graded sand (SP), poorly graded sand with gravel (SP), well graded sand (SW), and well graded sand with gravel (SW).

As depicted on Figure 5 – Geologic Cross Section A-A' the Ohio River alluvial aquifer ranges in thickness due to the confining bedrock strata that rises to the east along the eastern portion of the plant boundary. Beneath the Mitchell BAP, the saturated aquifer ranges in thickness from approximately 47 feet to the west to 27 feet to the east.

The Mitchell BAP monitoring wells were constructed with well screens that monitor the phreatic surface (water table) in the Ohio River alluvial aquifer. Monitoring well screened intervals range from approximate elevations 616 feet amsl to 596 feet amsl as indicated in Table 1 – Monitoring Well Construction Summary. Further description of the Mitchell BAP monitoring wells is provided in Section 3.1.1.6.

3.1.1.2 Hydraulic Conductivity

Groundwater flow in the Ohio River alluvial aquifer is through primary porosity in the sand and gravel deposits that comprise the aquifer. In-situ hydraulic conductivity tests (slug tests) were completed at each of the Mitchell BAP monitoring wells installed in October 2015. Slug testing was completed five days following the completion of well development activities for the Mitchell BAP monitoring wells. Slug test data were collected with In-Situ Level Troll 700™ electronic data transducers. Downloaded data were analyzed using AQTESOLV™ software. Hydraulic conductivity (K) values calculated from the Mitchell BAP monitoring wells are summarized as follows:

- Highest K value: MW1505 1.43 x 10^{-2} centimeters per second (cm/s);
- Lowest K value: MW1508 5.61 x 10^{-3} cm/s; and,
- Average K value: 4.62 x 10^{-2} cm/s.

These hydraulic conductivity values are representative of the Ohio River alluvial aquifer at the Mitchell BAP.

3.1.1.3 Groundwater Flow

Groundwater flow in the Ohio River alluvial aquifer in the vicinity of the Mitchell BAP was initially determined by the referenced EPRI report to be toward the Ohio River with some influence from the Mitchell Generation Power Station water supply wells as shown in Figure 3-7 in Appendix A. Figure 7 – Ohio River Alluvial Aquifer Potentiometric Map, December 10, 2015 and Figure 8 – Ohio River Alluvial Aquifer Potentiometric Map, February 8, 2016 were prepared using static water levels from the recently installed Mitchell BAP monitoring wells and the remaining EPRI wells. The potentiometric surface maps are comparable to those reported by EPRI in 1999. Groundwater flow at the Mitchell BAP is influenced by the on-site pumping wells to the north, bedrock confining beds to the east, and the Ohio River discharge boundary to the west. The potentiometric surface beneath the Mitchell BAP is relatively flat, exhibiting only 0.14 feet difference between the highest and lowest static water level measurement on December 10, 2015 and 0.37 feet difference on February 8, 2016. Based on the December 2015 and February 2016 water level data, monitoring well MW1508 is upgradient and wells MW1504 and MW1510 are sidegradient of the Mitchell BAP. The remaining BAP monitoring wells are downgradient wells as indicated in Table 1 – Monitoring Well Construction Summary.

Groundwater flow velocities in the alluvial aquifer were calculated using monitoring well water level data recorded on December 10, 2015 and corresponding potentiometric contours and flow lines depicted in Figure 7–Ohio River Alluvial Aquifer Potentiometric Map, December 10, 2015. Groundwater flow velocities were calculated using Darcy's Law, average hydraulic conductivity from slug tests, a referenced effective porosity for the aquifer deposits, and the change in potentiometric head along two representative flow lines, one toward the Mitchell Plant groundwater supply wells north of the BAP and the other from monitoring well MW1508 to EPRI well MW-8 to the south of the BAP. The calculated groundwater flow velocities along these flow paths are:

- Flow line from BAP toward the supply well: 0.87 feet per day (ft./day); 319 feet per year (ft./yr.)
- Flow line from MW1508 to MW-8: 0.26 ft./day; 94 ft./yr.

Based on these groundwater flow velocities, the approximate travel time from the BAP to the Mitchell Plant supply well is approximately three years and travel time from the BAP to the Ohio River is approximately eight years. The BAP Monitoring Well Network Installation Report (February 2016) provides the groundwater flow velocity calculations.

3.1.1.4 CCR Rule Definition of Uppermost Aquifer

The CCR Rule definition of the uppermost aquifer is found in 40 CFR §257.53 and is provided below:

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

As further discussed in Section 3.1.1.5, the Ohio River alluvial aquifer meets the CCR rule criteria for being the uppermost aquifer at the Mitchell BAP.

3.1.1.5 Identified On-site Uppermost Aquifer

The referenced EPRI report identifies that the Mitchell Power Generation Station and subject BAP are positioned over Ohio River alluvial deposits consisting of 40 to 50 feet of lenticular sand and gravel overlain by a layer of fine grained material, consisting of approximately 20 feet of clay and clayey silt and 10 to 20 feet of clayey sand. The unconsolidated alluvial deposits pinch out against the confining bedrock strata that contain the Ohio River channel and form the adjacent ridges positioned east of the subject site and west of the Ohio River.

The Ohio River alluvial aquifer, which consists of the saturated portion of the sand and gravel alluvial deposits that are in direct hydraulic connection with the Ohio River, is appropriately defined as the uppermost aquifer beneath the Mitchell BAP. Water elevations in Mitchell BAP monitoring wells and remaining EPRI wells on December 10, 2015 are presented in Table 2 – Static Water Levels. Comparison of the remaining EPRI well water elevation measured December 10, 2015 to EPRI monitoring well elevations included in the referenced EPRI report are comparable, as summarized below:

EPRI Well No.	December 10, 2015 Static Water Level feet amsl	November 1996 Static Water Level feet amsl
MW-4	623.00	622.57
MW-5	623.05	622.60
MW-6	623.11	622.51
MW-7	623.33	623.15
MW-8	623.87	624.32

EPRI Figure 3-8 in Appendix A provides temporal variations in groundwater elevations in the Ohio River alluvial aquifer which vary less than one foot during two monitoring events in August and November 1996. Water levels and are expected to fluctuate slightly due to seasonal conditions. Additional static water levels collected in February 2016 are presented in Section 3.1.1.3 and are consistent with groundwater levels recorded during the EPRI investigation in 1999.

The seasonal high water elevation in the Ohio River alluvial aquifer is equal to the Ohio River Ordinary High Water Elevation, which is elevation 627.3 feet amsl in the vicinity of the Mitchell BAP.

3.1.1.6 Monitoring Well Network

The BAP CCR groundwater monitoring system was installed from October 5 to November 12, 2015 and consists of seven groundwater monitoring wells installed in the Ohio River alluvial aquifer at the locations shown on Figure 3 – Bottom Ash Pond Monitoring Well Network. The well locations were selected to provide potential upgradient and downgradient monitoring positions relative to the Mitchell BAP based on the influence of the water supply wells at the Mitchell Power Plant, the Ohio River, surrounding bedrock hydraulic boundaries, and drill rig access constraints. EPRI monitoring wells also provide additional water levels for potentiometric mapping.

Table 1 – Monitoring Well Construction Summary provides construction details for the Mitchell BAP GMS. The wells monitor the uppermost aquifer, defined in Section 3.1.1.5 as the Ohio River alluvial aquifer. Boring logs and as-built well diagrams provided in Appendix B describe the monitored unconsolidated deposit characteristics. Graphic representations of the alluvial deposits penetrated by the Mitchell BAP monitoring well borings and well construction details are shown on Figure 5 – Geologic Cross Section A-A' and Figure 6 – Geologic Cross Section B-B'. Static water levels measured in December 2015 are also included on these geologic cross sections.

Subsequent to monitoring well installation and development, AEP installed dedicated bladder pumps in the five BAP monitoring wells (MW1504 through MW1508) on December 19, 2015. AEP selected and installed Geotech stainless steel bladder pumps, model 1.66, 36-inch length. The dedicated pumps were set approximately 1 to 2 feet above each well bottom. Subsequently, AEP installed dedicated Geotech bladder pumps in BAP monitoring wells MW1509 and MW1510 on April 8, 2016.

A summary of the Mitchell BAP monitoring well bottom depths measured from ground surface and elevations is provided below:

<u>Ohio River Alluvial Aquifer Monitoring Well Depths/Elevations (measured from ground surface)</u>

- MW1504: 93.5 ft. bgs/598.40 ft. amsl
- MW1505: 94.0 ft. bgs/597.05 ft. amsl
- MW1506: 95.0 ft. bgs/596.36 ft. amsl
- MW1507: 94.0 ft. bgs/598.08 ft. amsl
- MW1508: 87.0 ft. bgs/595.72 ft. amsl

- MW1509 (P-2): 94.0 ft. bgs/597.86 ft. amsl
- MW1510 (P-1): 81.0 ft. bgs/597.01 ft. amsl

As stated previously, static water levels measured in December 2015 and February 2016 are presented on Figure 7 – Ohio River Alluvial Aquifer Potentiometric Map, December 10, 2015 and Figure 8 – Ohio River Alluvial Aquifer Potentiometric Map, February 8, 2016. Based on the initial water elevation data from the Mitchell BAP GMS, there is 0.14 feet of variation in groundwater elevations in December 2015 and 0.37 feet of variation in February 2016 (Table 2 – Static Water Levels). Interpreted groundwater flow lines based on the December 2015 and February 2016 water level data indicate that monitoring well MW1508 is upgradient of the Mitchell BAP and wells MW1504 and MW1510 are sidegradient. The remaining monitoring wells are downgradient of the Mitchell BAP as indicated in Table 1 – Monitoring Well Construction Summary.

3.1.1.7 BAP CCR Background, Detection, and Assessment Monitoring

There will be a total of eight background sampling events beginning in late May 2016 and will be completed by October 17, 2017 for compliance with 40 CFR §257.93. BAP CCR background monitoring will include all of the parameters listed in Appendix III and Appendix IV of the CCR rules. Detection monitoring is required by the CCR rules in 40 CFR §257.94 to be semi-annual (twice yearly) and will begin after the October 17, 2017 deadline for background monitoring. BAP detection monitoring will include the parameters listed in Appendix III of the CCR rules and will occur every six months (semi-annually).

Within 90 days of determining a statistically significant increase (SSI) over background for an Appendix III parameter during semi-annual detection monitoring events, it may be demonstrated that the SSI is a result of error in sampling, analysis, statistical analysis or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, detection monitoring may continue. If a successful demonstration is not completed within the 90-day period, as assessment monitoring program must be initiated as required by 40 CFR §257.95, which includes sampling each well for Appendix III and IV parameters.

3.1.2 Compliance with §257.91(a) through §257.91(c) Requirements

The Mitchell BAP GMS, as described in the Monitoring Well Network Installation Report (February 2016) and summarized in Section 3.1.1.6, consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples that: 1) accurately represent the quality of background groundwater that has not been affected by leakage from the Mitchell BAP CCR unit; 2) accurately represent the quality of groundwater passing the waste boundary of the Mitchell BAP CCR unit; and, 3) the monitoring well network consists of appropriate number, spacing, and depths of monitoring wells based upon site-specific technical information (summarized in Section 3.1.1) that included thorough characterization of the saturated and unsaturated geologic units, aquifer thicknesses, groundwater flow rates, groundwater flow directions, and seasonal/temporal fluctuations in groundwater flow. Thus, the Mitchell BAP GMS complies with 40 CFR 257.91(a) through 40 CFR 257.91(c) requirements.

3.2 §257.91(D) RULE DESCRIPTION

40 CFR 257.91(d) states:

(d) The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.

> ***(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors:***
>
> ***(i) Number, spacing, and orientation of each CCR unit;***
>
> ***(ii) Hydrogeologic setting;***
>
> ***(iii) Site history; and,***
>
> ***(iv) Engineering design of the CCR unit.***
>
> ***(2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by § 257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under § 257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under § 257.101(a) to retrofit or close.***

3.2.1 Compliance With §257.91(D)

AEP is not proposing to install a multi-unit groundwater monitoring system; therefore, this rule does not apply to Mitchell Landfill.

3.3 §257.91(E) AND §257.91(F) RULE DESCRIPTION

40 CFR 257.91(e) and (f) states:

(e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.

> ***(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.***
>
> ***(2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.***

(f) The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.

3.3.1 Information Supporting Rule Compliance

The Mitchell BAP monitoring wells were installed following the procedures and materials specified in the Monitoring Well Network Installation Work Plan (September 2015), including:

- Monitoring well locations
- Drilling and soil sampling methods
- Annulus sealing methods
- Monitoring well materials
- Well development procedure

- Well testing procedures

The BAP Monitoring Well Network Installation Report (February 2016) documents completed drilling and well installation procedures and materials, well development activities, and well testing details.

Figure 3 – CCR Unit and Monitoring Wells identifies the locations of the Mitchell BAP monitoring wells. Table 1 – Monitoring Well Construction Summary provides construction details for the Mitchell BAP GMS. Boring logs and as-built well diagrams are provided in Appendix B. Monitoring well development records are included in Appendix C. Final turbidity levels following well development ranged as follows:

Well Development Results

Well No.	Final Turbidity (NTUs)	Well Volumes Removed	Gallons Removed
MW1504	9.7	156.9	687.5
MW1505	736.0	161.4	785
MW1506	16.9	106.7	525
MW1507	20.8	82.0	362.5
MW1508	23.8	180.1	836.3
MW1509 (P-2)	85.8	96.4	431.5
MW1510 (P-1)	4.7	121.4	552.5

Note that well volumes vary depending on the height of the water column in the individual well and that well volumes do not equal gallons of water removed from a well.

Interpreted groundwater flow lines based on the December 2015 and February 2016 water level data indicate that monitoring well MW1508 is upgradient of the Mitchell BAP and wells MW1504 and MW1510 are sidegradient. The remaining monitoring wells are downgradient of the Mitchell BAP as indicated in Table 1 – Monitoring Well Construction Summary. Groundwater flow lines relative to the Mitchell BAP are depicted on Figure 7 – Ohio River Alluvial Aquifer Potentiometric Map, December 10, 2015 and Figure 8 – Ohio River Alluvial Aquifer Potentiometric Map, February 8, 2016.

3.3.2 Compliance with §257.91(e) and §257.91(f) Requirements

As described in the Monitoring Well Network Installation Report (February 2016) and summarized in Section 3.1.1.6, the Mitchell BAP groundwater monitoring wells were constructed and cased in a manner that maintains the integrity of the monitoring well borehole for the collection of groundwater samples, including: 1) the annular space above each well's sampling depth is sealed with bentonite to prevent contamination of samples and the groundwater; and 2) wells are constructed with slotted well screens surrounded by silica sand filter packs that reduce suspended solids and turbidity in the groundwater samples. Well design, installation, and development of monitoring wells is contained in the BAP Monitoring Well Network Installation Report (February 2016) as summarized in Section 3.1.1.6. The developed data is maintained in the Mitchell BAP CCR Operating Record. The measurement, sampling, and analytical device maintenance and operation are documented in the FSAP (April 2016) which is also maintained in the CCR Operating Record.

A CEC Certified Professional Geologist (CPG), under the supervision and direction of the certifying Professional Engineer, has been directly involved with the design of the BAP GMS, data collection, site characterization, well installation, and well development, and has reviewed applicable information recorded in the Operating Record. The information referenced in Section 3.3.1 demonstrates that the Mitchell BAP GMS complies with 40 CFR 257.91(e) and 40 CFR 257.91(f) requirements.

4.0 SUMMARY AND PROFESSIONAL ENGINEER'S CERTIFICATION

This CCR Groundwater Monitoring System Demonstration describes the Mitchell Bottom Ash Pond CCR unit, site geology and groundwater monitoring system in support of demonstrating compliance with 40 CFR §257.91 Groundwater Monitoring Systems. Section 3.0 of this report provides supporting information and conclusions demonstrating that the applicable Groundwater Monitoring System requirements have been met.

The following certification statement provides confirmation that this report was prepared by a qualified professional engineer and that there is sufficient information to demonstrate that the existing Mitchell Bottom Ash Pond meets the Groundwater Monitoring System requirements stated in 40 CFR §257.91.

Professional Engineer's Certification

By means of this certification, I certify that I have reviewed this CCR Groundwater Monitoring System Demonstration Report, Mitchell Bottom Ash Pond, Mitchell Power Generation Plant, and the design, construction, operation, and maintenance of Mitchell Bottom Ash Pond Groundwater Monitoring System meets the requirements of Section 40 CFR §257.91.

Anthony P. Amicon
Printed Name of Professional Engineer

Signature

ANTHONY P. AMICON
REGISTERED
APA
19206
6/7/16
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

19206	West Virginia	06-23-2011
Registration No.	Registration State	Date

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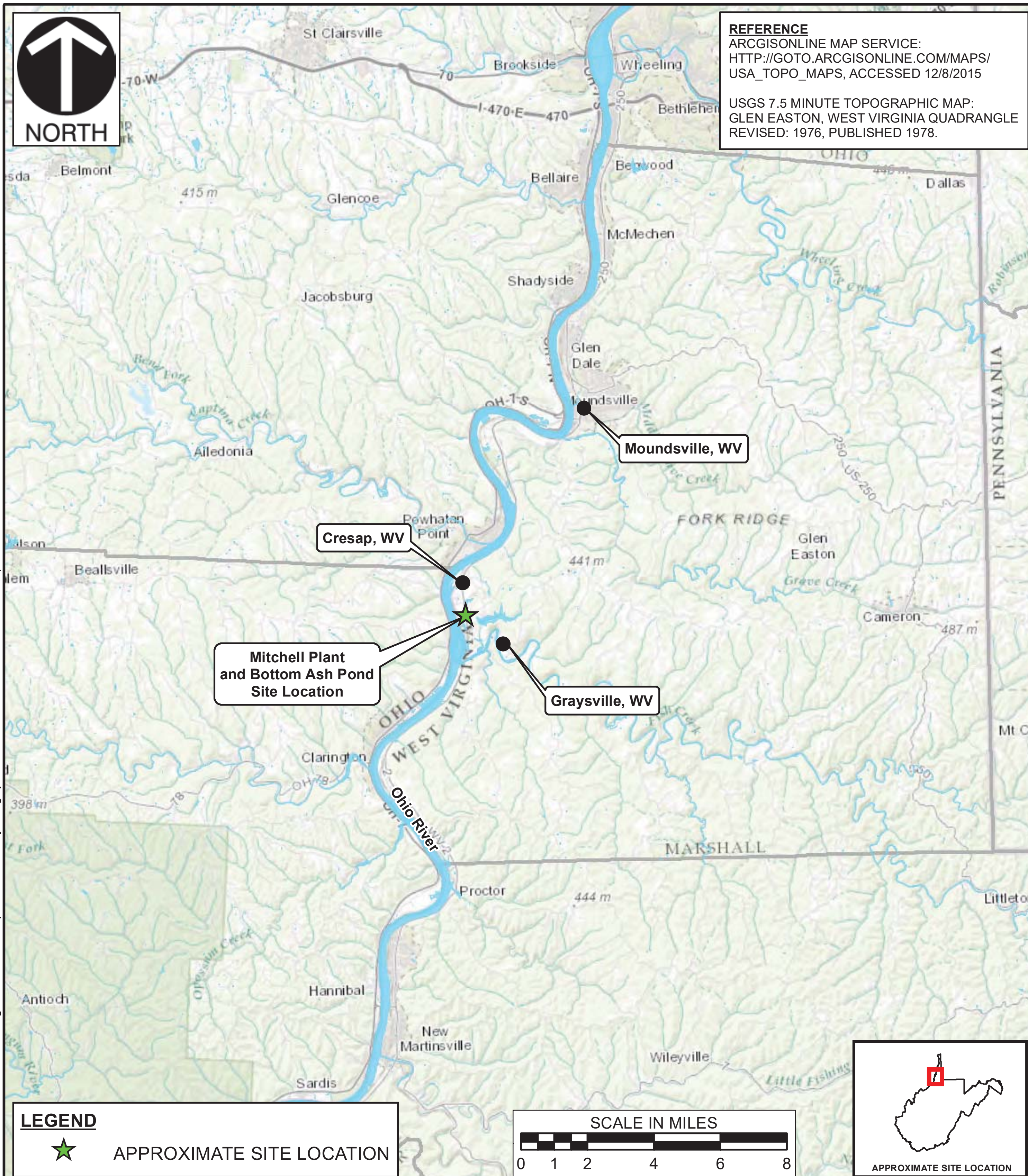
Web: www.wvgs.wvnet.edu, Map: Original 1968/1969 map revised, March 2011, Map Date: May 16, 2011.

FIGURES



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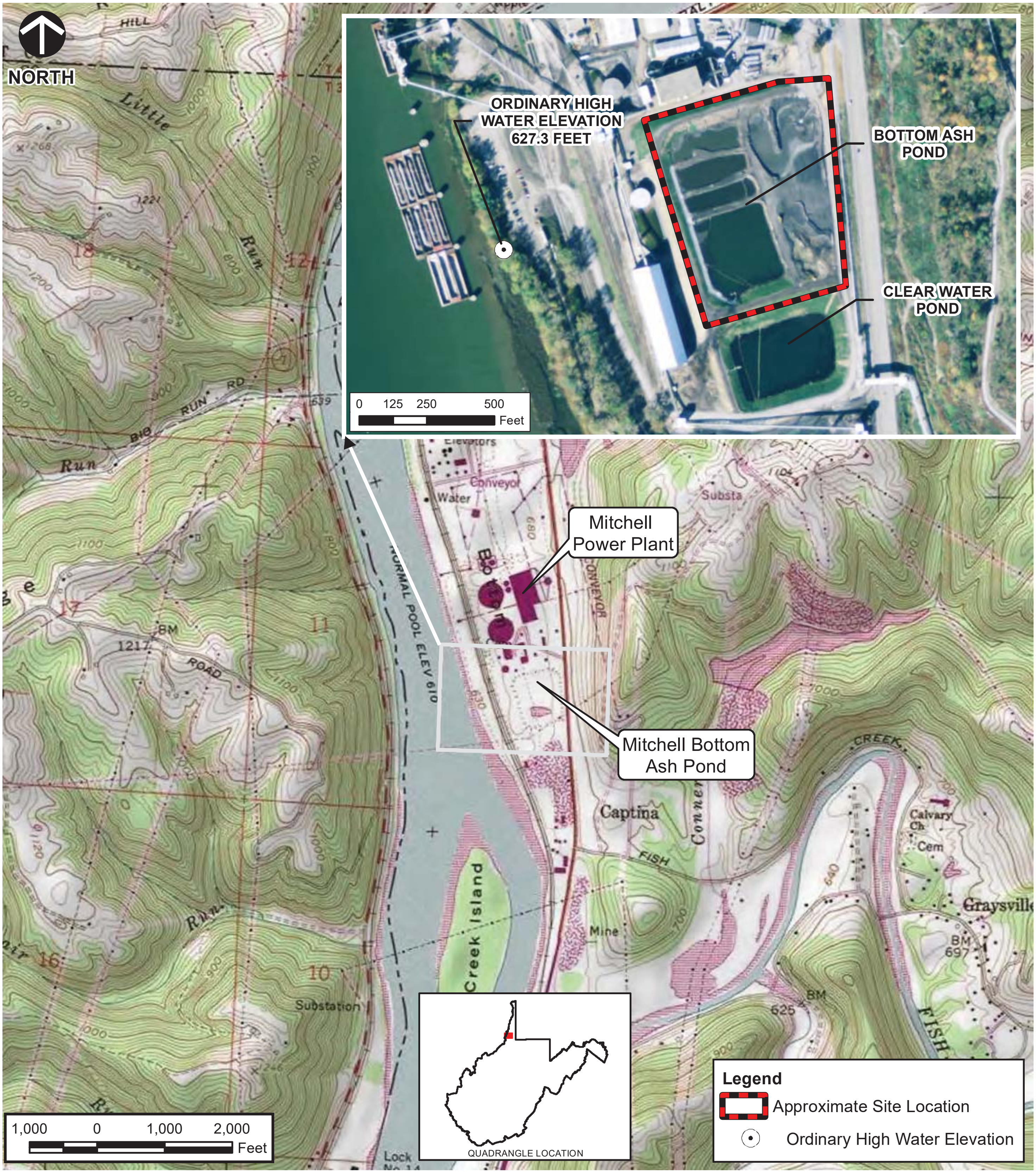
GROUNDWATER MONITORING SYSTEM DEMONSTRATION
SITE LOCATION MAP

DRAWN BY: MAD	CHECKED BY:	RAS	APPROVED BY:	APA*	FIGURE:	1
DATE: 12/8/2015	MAP SCALE:	1 " = 4 miles	PROJECT NO:	110-416-7701		

*Hand signature on file



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - GLEN EASTON, WV - 1978 AND POWHATAN POINT, WV - 1978.
SOURCE; AERIAL PHOTOGRAPH - ARCGISONLINE MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY, ACCESSED 12/8/2015 IMAGERY DATE 10/24/2014

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GROUNDWATER MONITORING SYSTEM DEMONSTRATION
PLANT AND CCR UNIT LOCATION MAP

DRAWN BY: JBF	CHECKED BY: RAS	APPROVED BY: APA*	FIGURE NO: 2
DATE: DECEMBER 08, 2015	DWG SCALE: 1 " = 2,000 '	PROJECT NO: 110-416-7701	

Signature on File *

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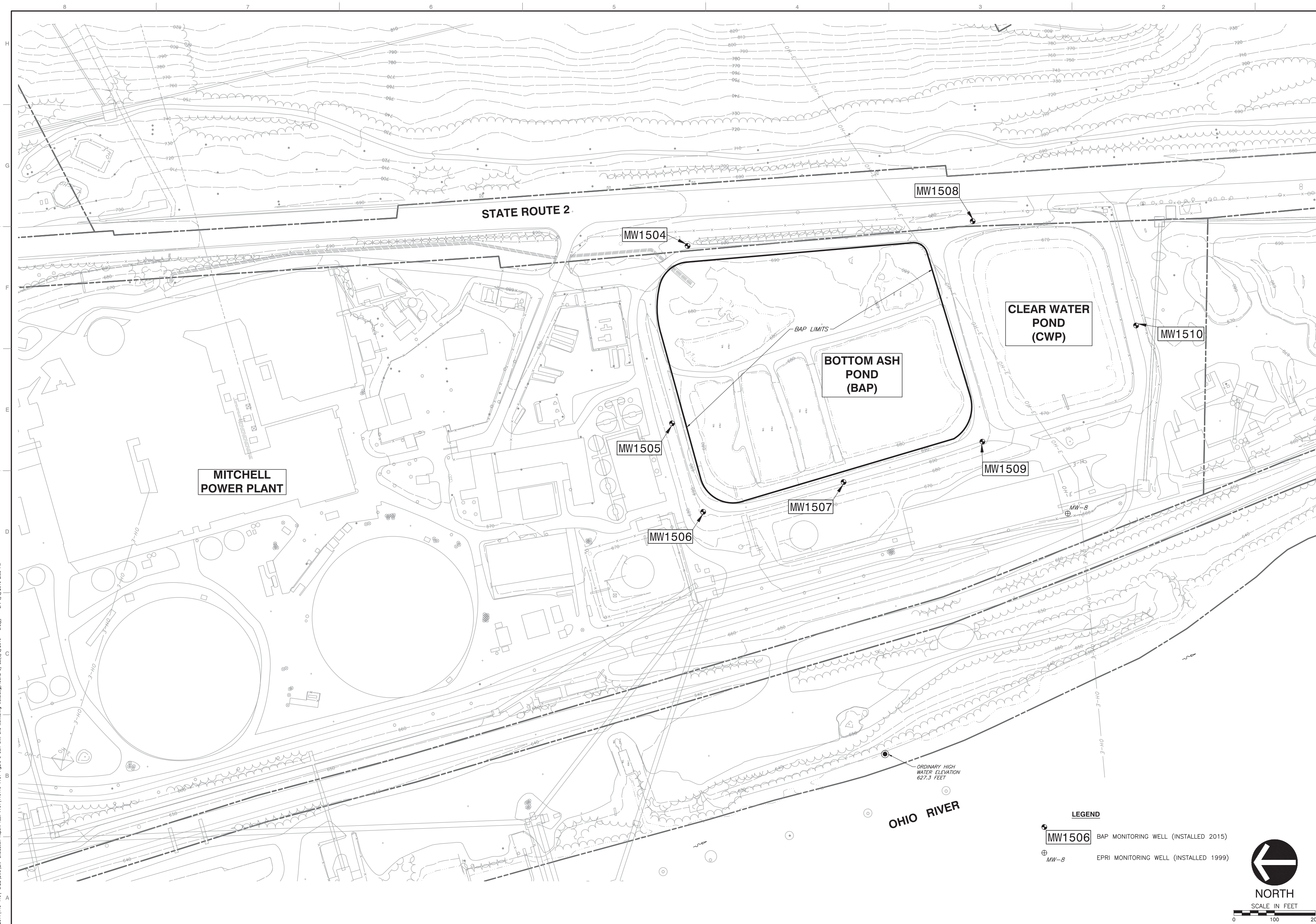

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GROUNDWATER MONITORING SYSTEM DEMONSTRATION

CCR UNIT AND MONITORING WELLS

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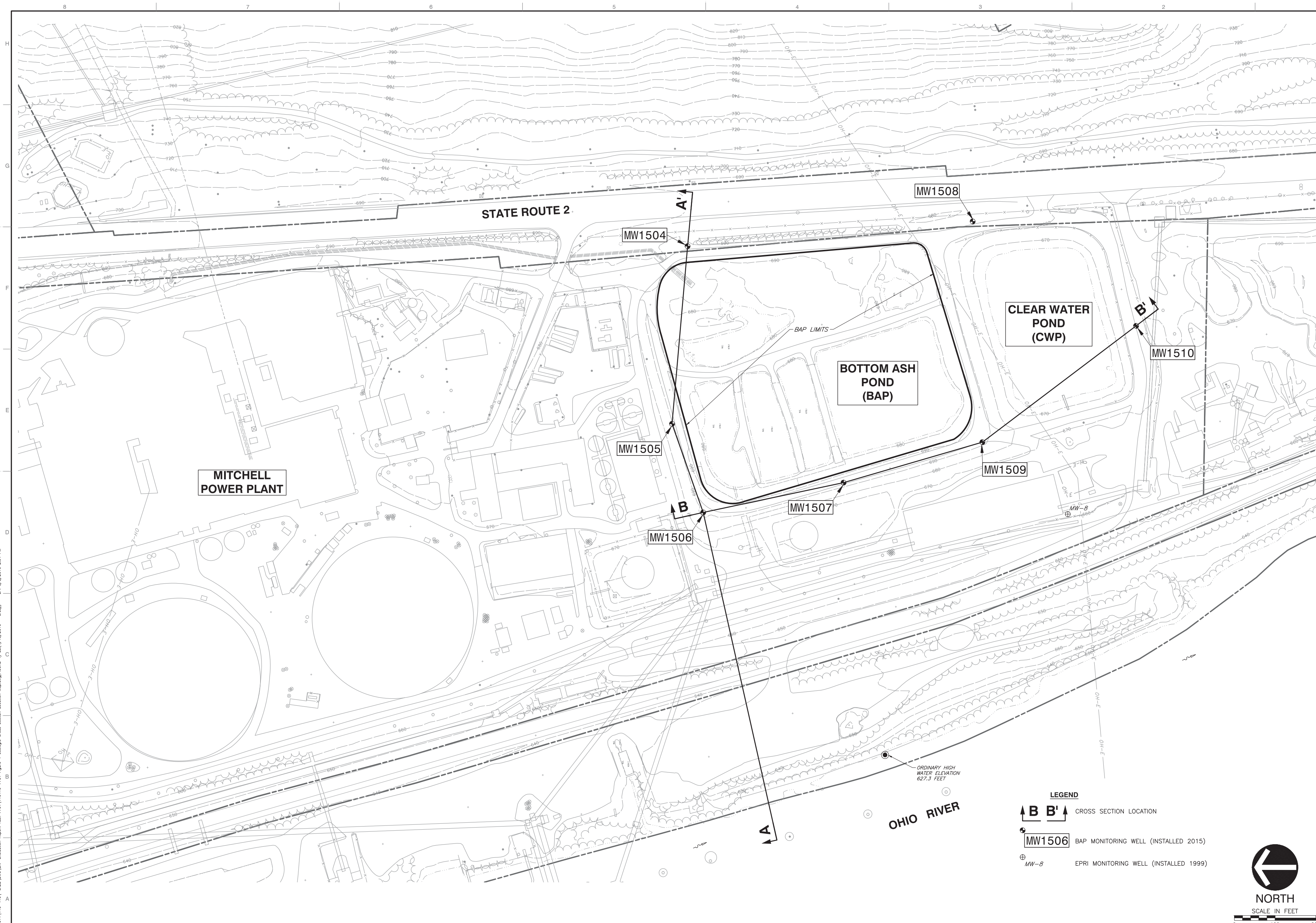
PROJECT NO:	110-416-7701		
APPROVED BY:	(HAND SIGNATURE ON FILE) *APA		

FIGURE NO.: **3**

P:\2011\110-416\--CADD\DWG\BAP Evaluation Report Task 7701\110416-7701 Figure 3 CCR Unit and Monitoring Wells.dwg[FIGURE 3] LS:(6/8/2016 - dredy) - LP: 6/8/2016 2:03 PM



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GROUNDWATER MONITORING SYSTEM DEMONSTRATION

GEOLOGIC CROSS SECTION LOCATION MAP

DATE:	DECEMBER 2015	DRAWN BY:	DAR
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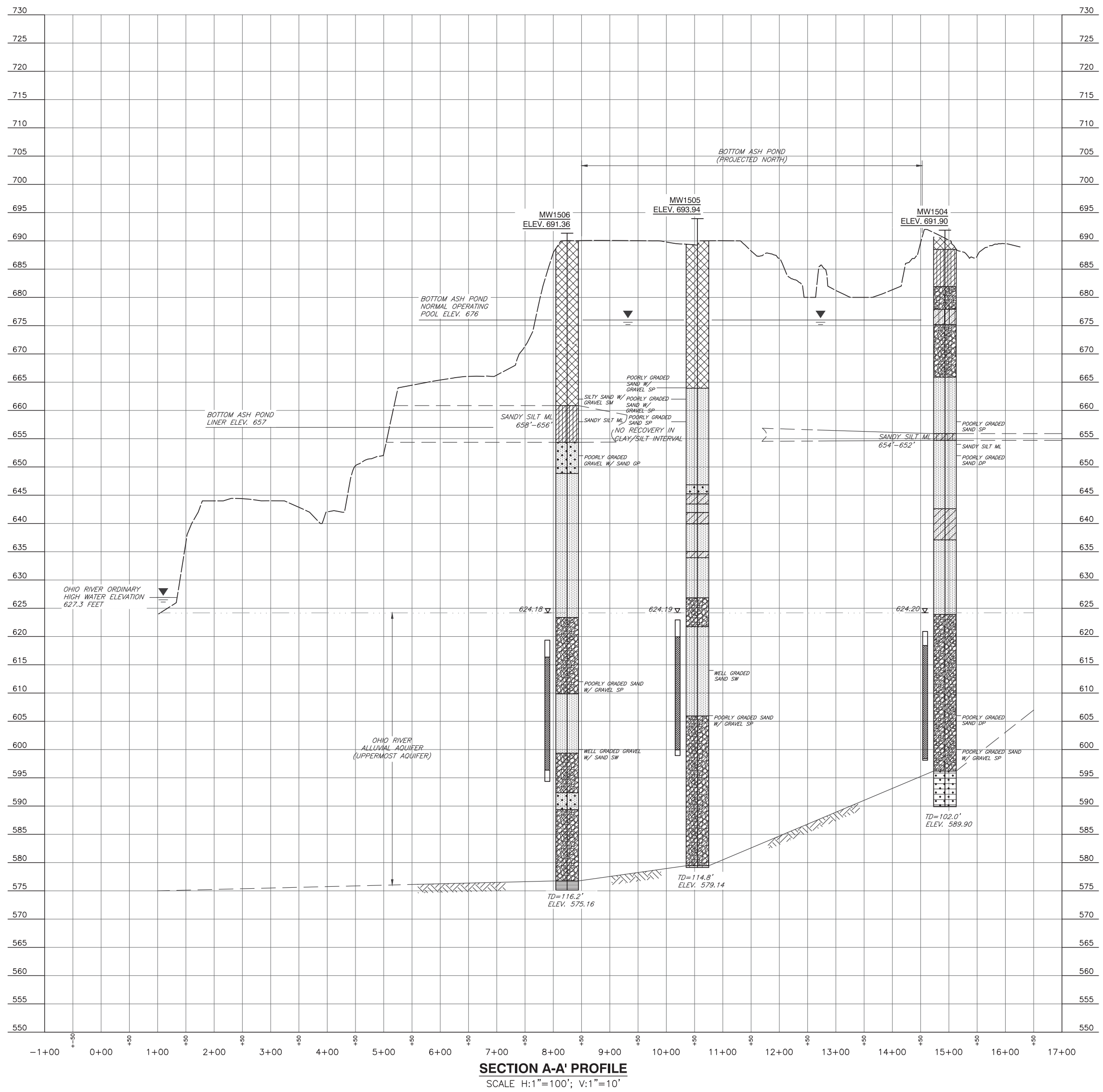
PROJECT NO:	110-416-7701		
APPROVED BY:	(HAND SIGNATURE ON FILE) *APA		

FIGURE NO.: 4

P:\2011\110-416\-CADD\DWG\BAP Evaluation Report Task 7701\110416-7701 Figure 4 Geologic Cross Section Location Map.dwg{FIGURE 4} LS:(4/13/2016 - dhudy) - LP: 6/8/2016 2:04 PM



SECTION A-A' PROFILE

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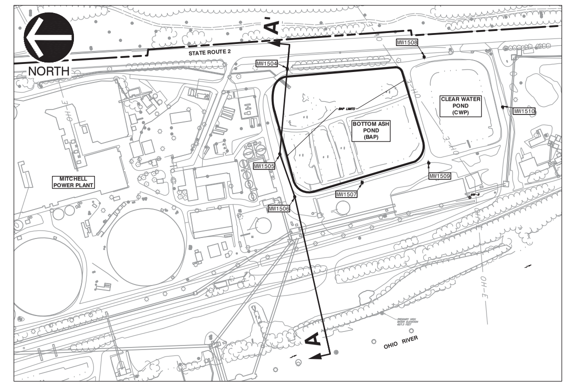

KEY PLAN

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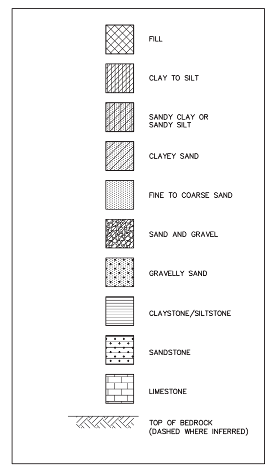

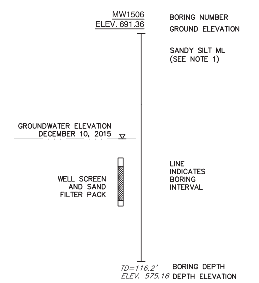

MONITORING WELL DIAGRAM

NOTE:

1. NOTED SOIL DESCRIPTIONS FROM GEOTECHNICAL LABORATORY TESTING RESULTS PROVIDED BY AEP DOLAN LABORATORY.

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GEOLOGIC CROSS SECTION A-A'

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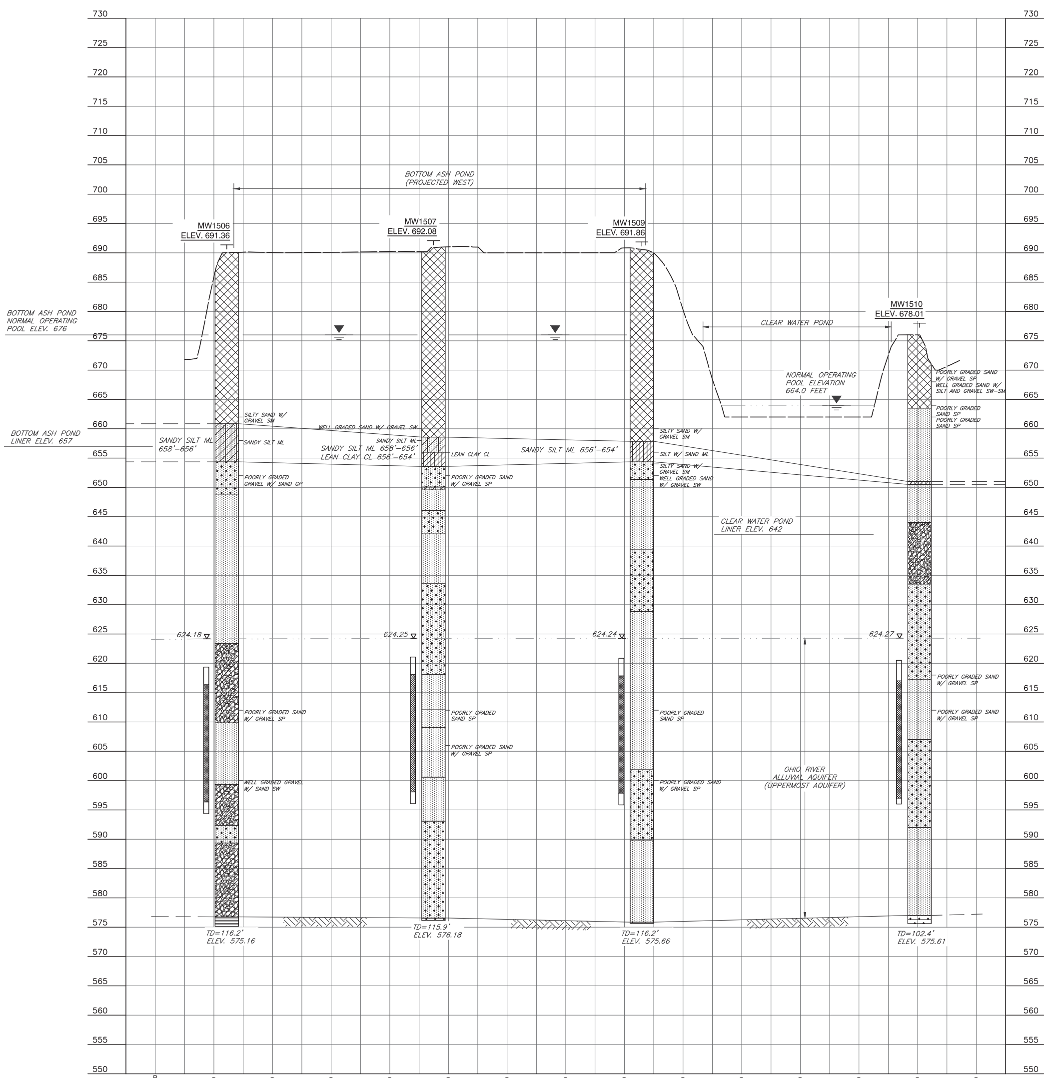
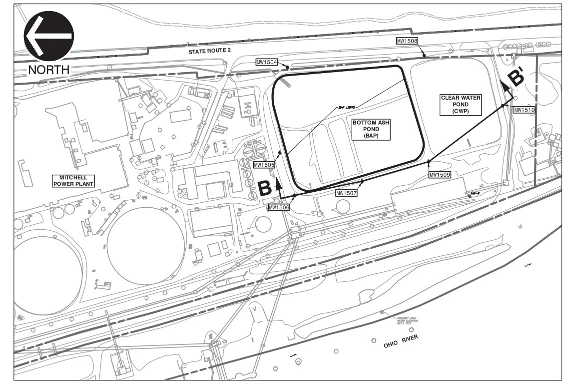
FIGURE NO.: 5

P:\2011\110-416\-CADD\DWG\BAP Evaluation Report Task 7701\110416-7701 Figure 5 Geologic Cross Section A-A.dwg{FIGURE 5} LS:(5/3/2016 - drusty) - LP: 6/8/2016 2:06 PM



SECTION B-B" PROFILE
SCALE H:1"=100'; V:1"=10'



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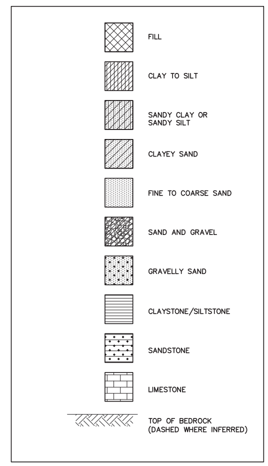

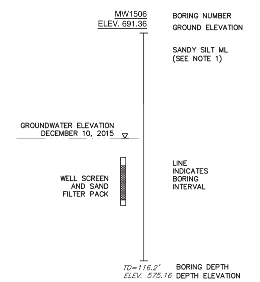

MONITORING WELL DIAGRAM

NOTE:

1. NOTED SOIL DESCRIPTIONS FROM GEOTECHNICAL LABORATORY TESTING RESULTS PROVIDED BY AEP DOLAN LABORATORY.

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GEOLOGIC CROSS SECTION B-B'

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PROJECT NO:	110-416-7701		
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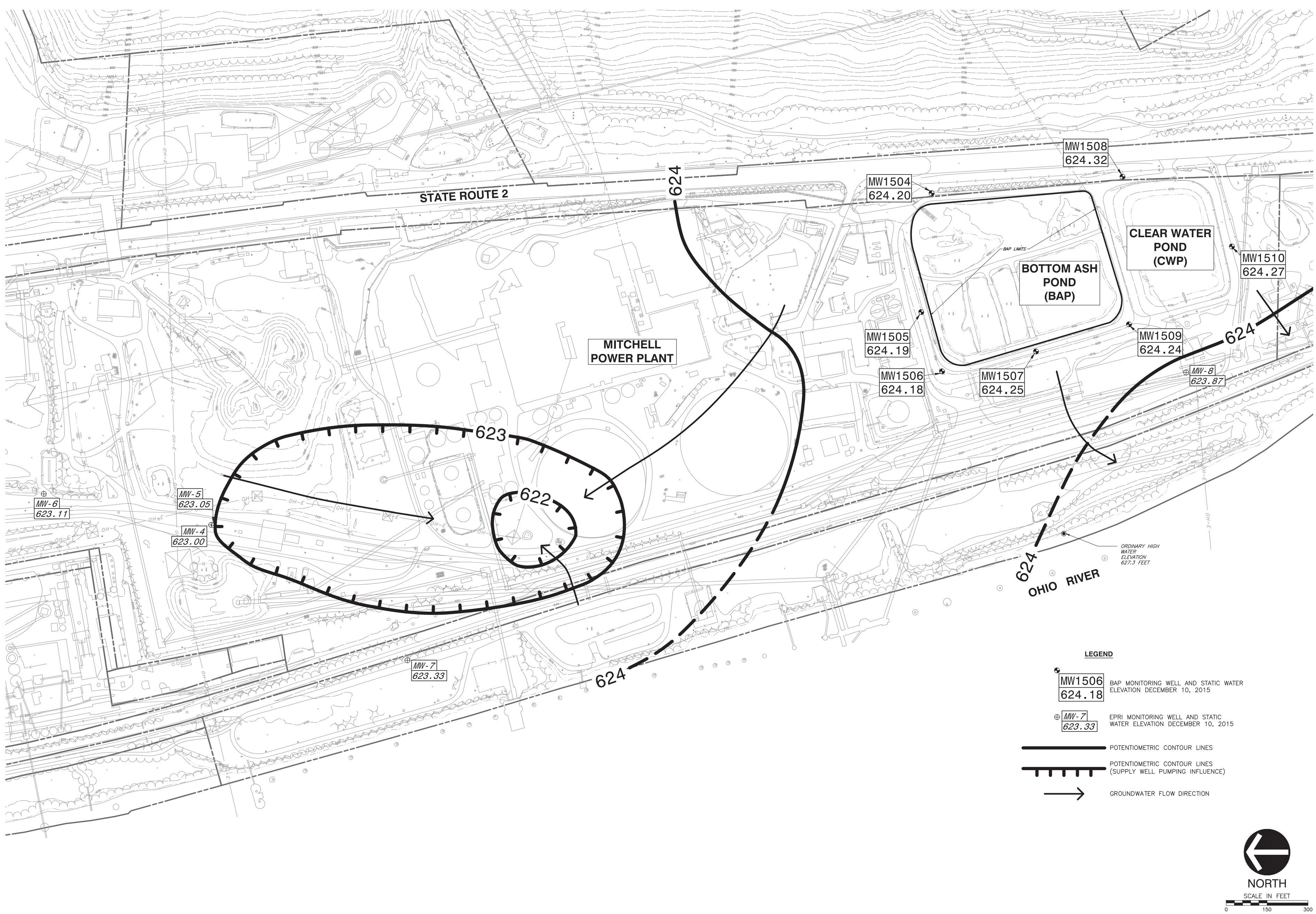
FIGURE NO.: 6

P:\2011\110-416\-CADD\DWG\BAP Evaluation Report Task 7701\110416-7701 Figure 6 Geologic Cross Section B-B.dwg{FIGURE 6} LS:(6/8/2016 - druby) - LP: 6/8/2016 2:07 PM



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GROUNDWATER MONITORING SYSTEM DEMONSTRATION

OHIO RIVER ALLUVIAL AQUIFER
POTENTIOMETRIC MAP, DECEMBER 10, 2015

DATE:	DECEMBER 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416-7701		
APPROVED BY:	(HAND SIGNATURE ON FILE) *APA		

FIGURE NO.: 7

P:\2011\110-416\-CADD\DWG\BAP Evaluation Report Task 7701\110416-7701 Figure 7 Ohio River Alluvial Aquifer Potentiometric Map.dwg{FIGURE 7} LS:(5/13/2016 - dlaw) - LP: 6/8/2016 2:10 PM

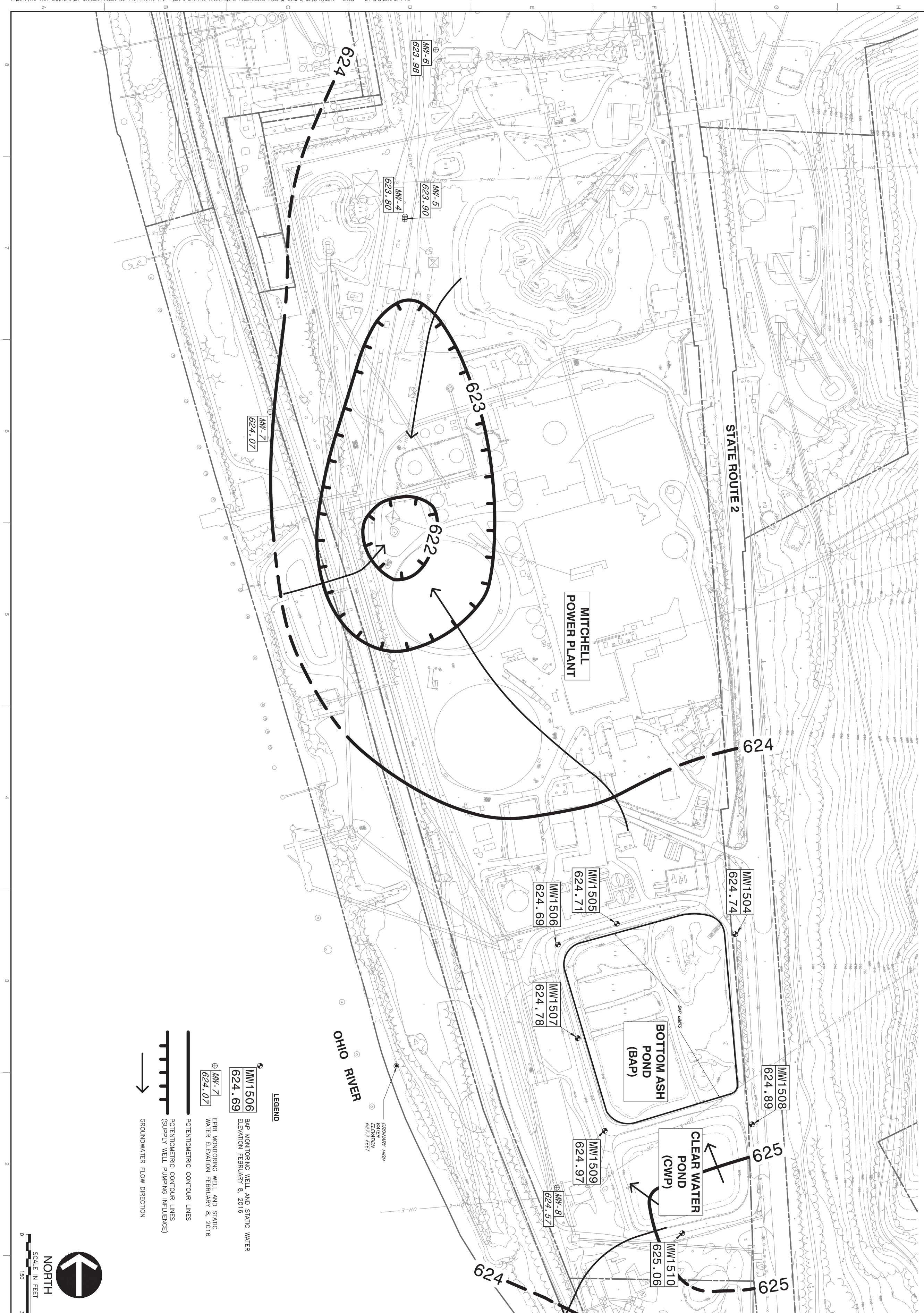

FIGURE NO.:	GROUNDWATER MONITORING SYSTEM DEMONSTRATION		
8	OHIO RIVER ALLUVIAL AQUIFER POTENTIOMETRIC MAP, FEBRUARY 8, 2016		
	DATE: FEBRUARY 2016	DRAWN BY:	DAR
	DWG SCALE: AS NOTED	CHECKED BY:	RAS
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	APPROVED BY:	(HAND SIGNATURE ON FILE)	*APA

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TABLES

TABLE 1
MONITORING WELL CONSTRUCTION SUMMARY
MITCHELL BOTTOM ASH POND GROUNDWATER MONITORING SYSTEM DEMONSTRATION
MITCHELL POWER GENERATION PLANT
AMERICAN ELECTRIC POWER
CEC PROJECT 110-416.7701

Well No.	Date Installed	Northing	Easting	Ground Elevation (ft. MSL)	Boring Total Depth (ft. BGS)	Top of Riser Elevation (ft. MSL)	Screen Interval* (ft. MSL)		Screen Interval* (ft. BGS)		Screen Interval** (ft. BGS)		Sand Pack Interval* (ft. MSL)		Sand Pack Interval* (ft. BGS)		Stratigraphic Unit	Hydraulic Position Relative to BAP
							Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom		
Ohio River Alluvial Aquifer Monitoring Wells & Piezometers																		
MW1504	10/14/15	485671.78	1599370.81	691.90	102.00	694.79	618.40	598.40	73.5	93.5	76.4	96.4	620.90	598.1	71.0	93.8	Sand & Gravel	Sidegradient
MW1505	10/26/15	485699.10	1598929.25	691.05	114.80	693.94	617.05	597.05	74.0	94.0	76.9	96.9	620.05	596.1	71.0	95.0	Sand & Gravel	Downgradient
MW1506	10/23/15	485633.39	1598717.14	691.36	116.20	694.26	616.36	596.36	75.0	95.0	77.9	97.9	619.36	594.4	72.0	97.0	Sand & Gravel	Downgradient
MW1507	10/30/15	485288.61	1598790.27	692.08	115.90	694.98	618.08	598.08	74.0	94.0	76.9	96.9	621.08	596.1	71.0	96.0	Sand & Gravel	Downgradient
MW1508	10/08/15	484971.27	1599431.57	682.72	106.80	685.77	615.72	595.72	67.0	87.0	70.1	90.1	618.12	594.7	64.6	88.0	Sand & Gravel	Upgradient
MW1509 (P-2)	11/06/15	484947.44	1598889.64	691.86	116.40	694.63	617.86	597.86	74.0	94.0	76.8	96.8	620.86	595.9	71.0	96.0	Sand & Gravel	Downgradient
MW1510 (P-1)	11/12/15	484569.80	1599175.22	678.01	102.40	680.77	617.01	597.01	61.0	81.0	63.8	83.8	620.41	596.0	57.6	82.0	Sand & Gravel	Sidegradient

Notes:
* Measured from ground surface
** Measured from top of casing
ft. MSL = feet above mean sea level
ft. BGS = feet below ground surface
Monitoring Wells MW1504 through MW1508 have dedicated Geotech® bladder pumps installed approximately 2 feet above the screen bottoms

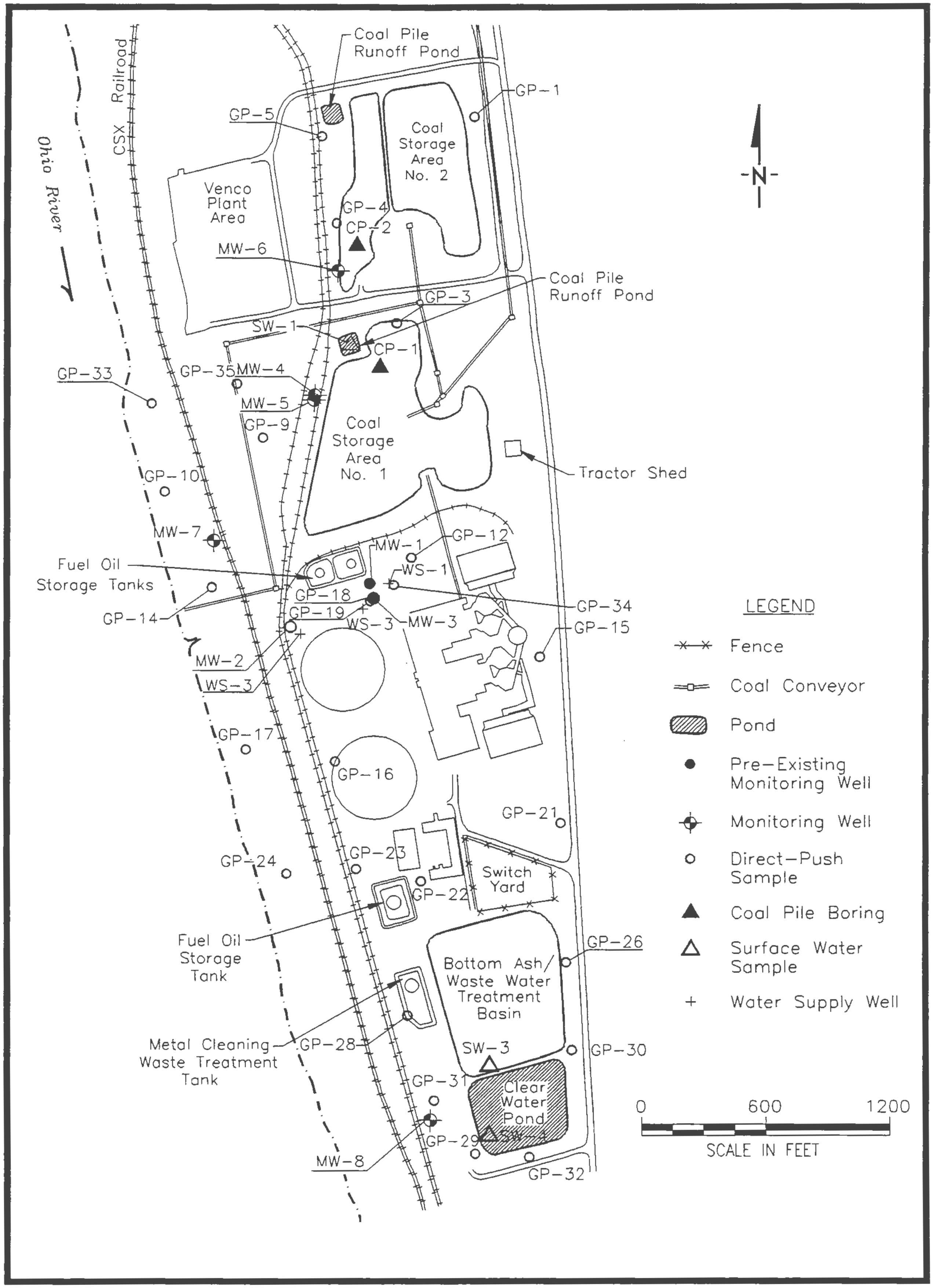
TABLE 2
STATIC WATER LEVELS
MITCHELL BOTTOM ASH POND GROUNDWATER MONITORING SYSTEM DEMONSTRATION
MITCHELL POWER GENERATION PLANT
AMERICAN ELECTRIC POWER
CEC PROJECT 110-416.7701

Well No.	Northing	Easting	Ground Elevation (ft. MSL)	Top of Casing Elevation (ft. MSL)	Screen Interval (ft. MSL)		Screen Interval (ft. BGS)		Depth to Water 12/10/15 (ft. TOC)	Groundwater Elevation 12/10/15 (ft. MSL)	Depth to Water 2/8/16 (ft. TOC)	Groundwater Elevation 2/8/16 (ft. MSL)
					Top	Bottom	Top	Bottom				
Bottom Ash Pond Monitoring Well/Piezometers Network												
MW1504	485671.78	1599370.81	691.90	694.79	618.40	598.40	73.5	93.5	70.59	624.20	70.05	624.74
MW1505	485699.10	1598929.25	691.05	693.94	617.05	597.05	74.0	94.0	69.75	624.19	69.23	624.71
MW1506	485633.39	1598717.14	691.36	694.26	616.36	596.36	75.0	95.0	70.08	624.18	69.57	624.69
MW1507	485288.61	1598790.27	692.08	694.98	618.08	598.08	74.0	94.0	70.73	624.25	70.20	624.78
MW1508	484971.27	1599431.57	682.72	685.77	615.72	595.72	67.0	87.0	61.45	624.32	60.88	624.89
MW1509	484947.44	1598889.64	691.86	694.63	617.86	597.86	74.0	94.0	70.39	624.24	69.66	624.97
MW1510	484569.80	1599175.22	678.01	680.77	617.01	597.01	61.0	81.0	56.50	624.27	55.71	625.06
EPRI Piezometers												
MW-4	488310.90	1598152.80	NA	668.02	NA	NA	NA	NA	45.02	623.00	44.22	623.80
MW-5	488304.80	1598152.10	NA	667.88	NA	NA	NA	NA	44.83	623.05	43.98	623.90
MW-6	488930.20	1598267.50	NA	663.40	NA	NA	NA	NA	40.29	623.11	39.42	623.98
MW-7	487595.80	1597656.50	NA	640.26	NA	NA	NA	NA	16.93	623.33	16.19	624.07
MW-8	484737.60	1598712.90	NA	663.34	NA	NA	NA	NA	39.47	623.87	38.77	624.57

Notes:
Static water levels were collected December 10, 2015 and February 8, 2016
ft. MSL = feet above mean sea level
ft. BGS = feet below ground surface
ft. TOC = feet below top of casing (top of PVC riser pipe)

APPENDIX A

EPRI DRAWINGS



K00392A.DWG

Figure 3-1 Mitchell Plant site.

STMI/187-6/KAMI
May 1999

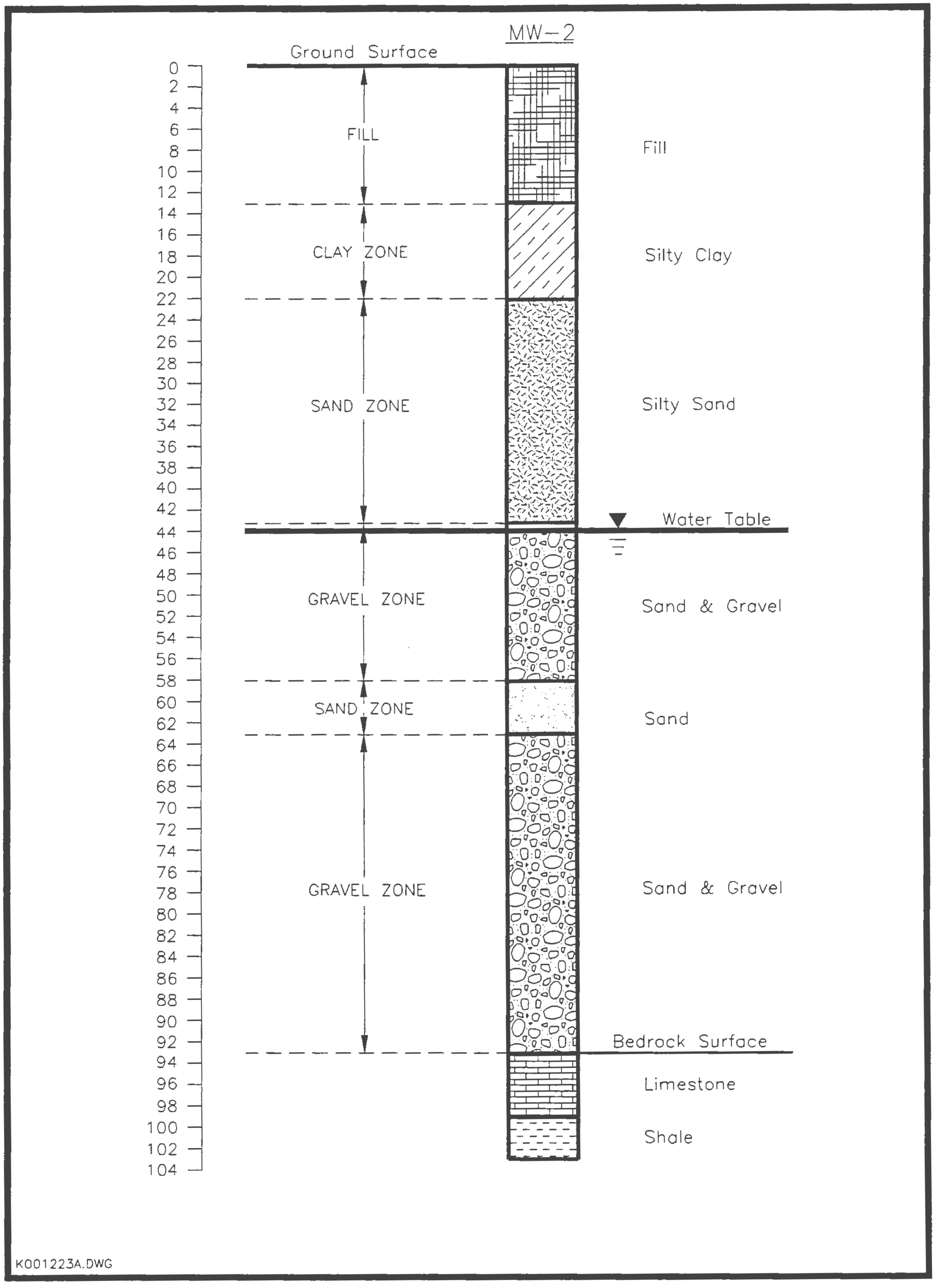


Figure 3-2 Lithologic log for monitoring well MW-2 at the Mitchell Plant site.

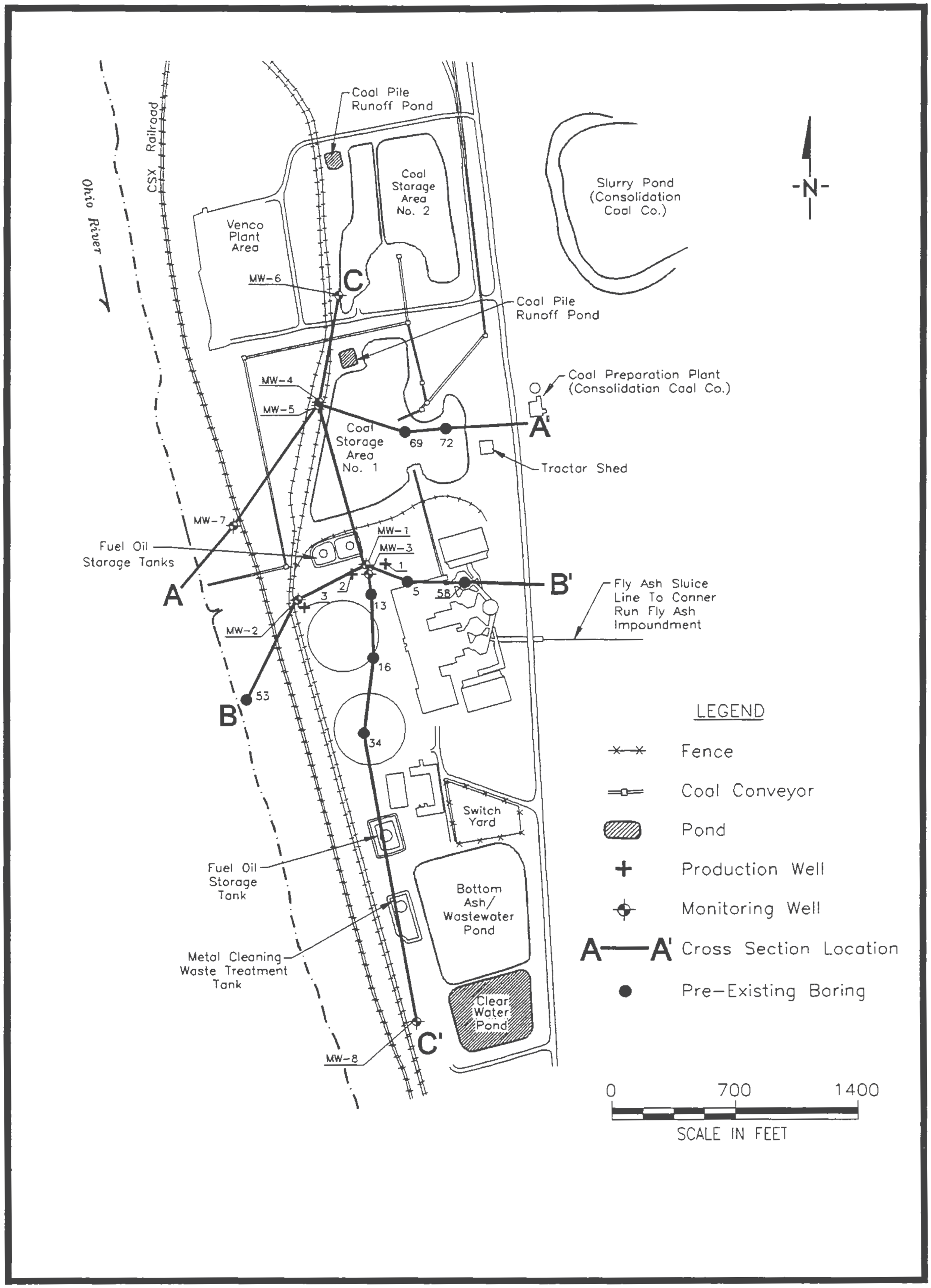


Figure 3-3 Locations of geologic cross-sections at the Mitchell Plant site.

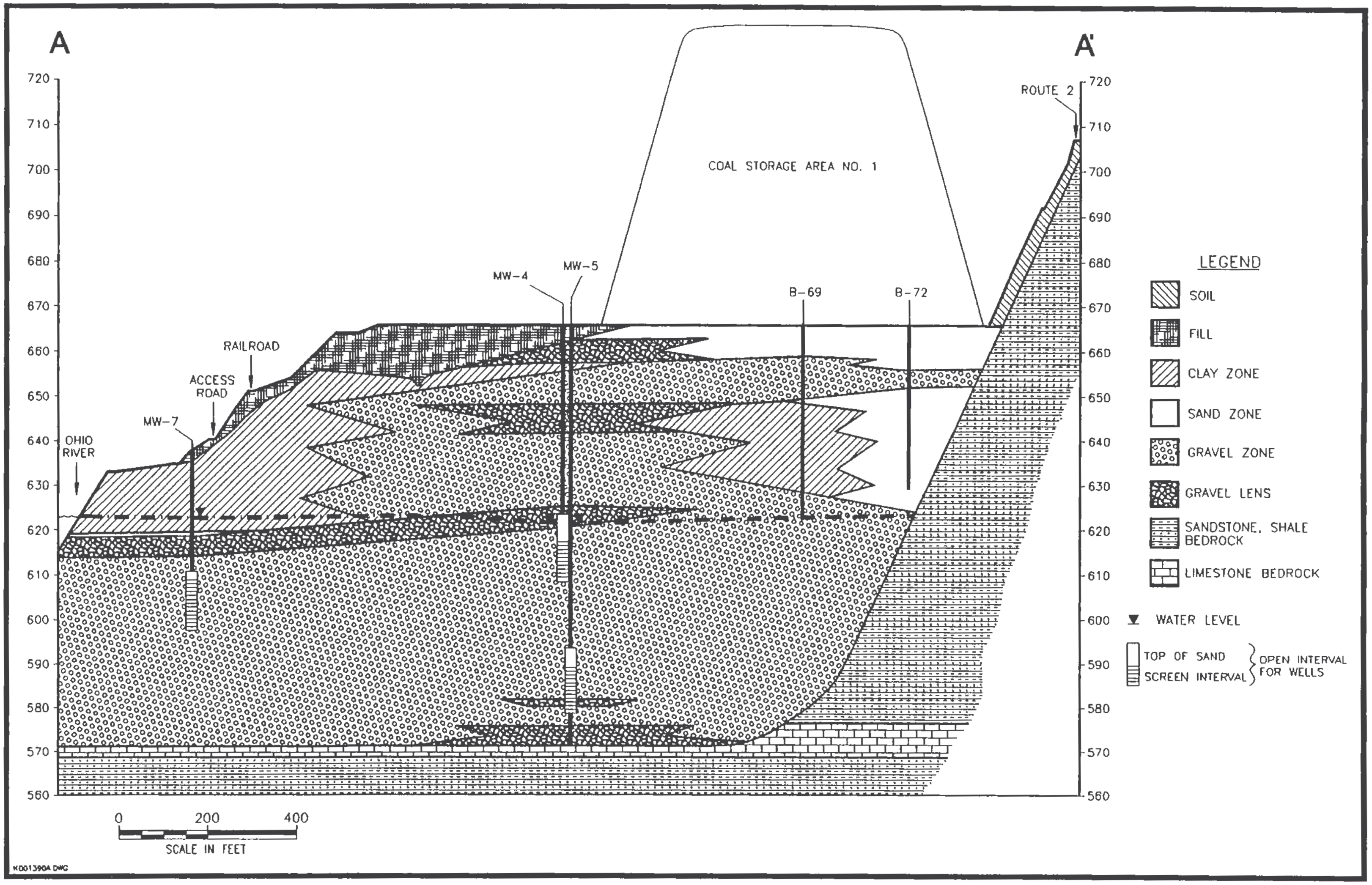


Figure 3-4 Geologic cross-section A-A' at the Mitchell Plant site.

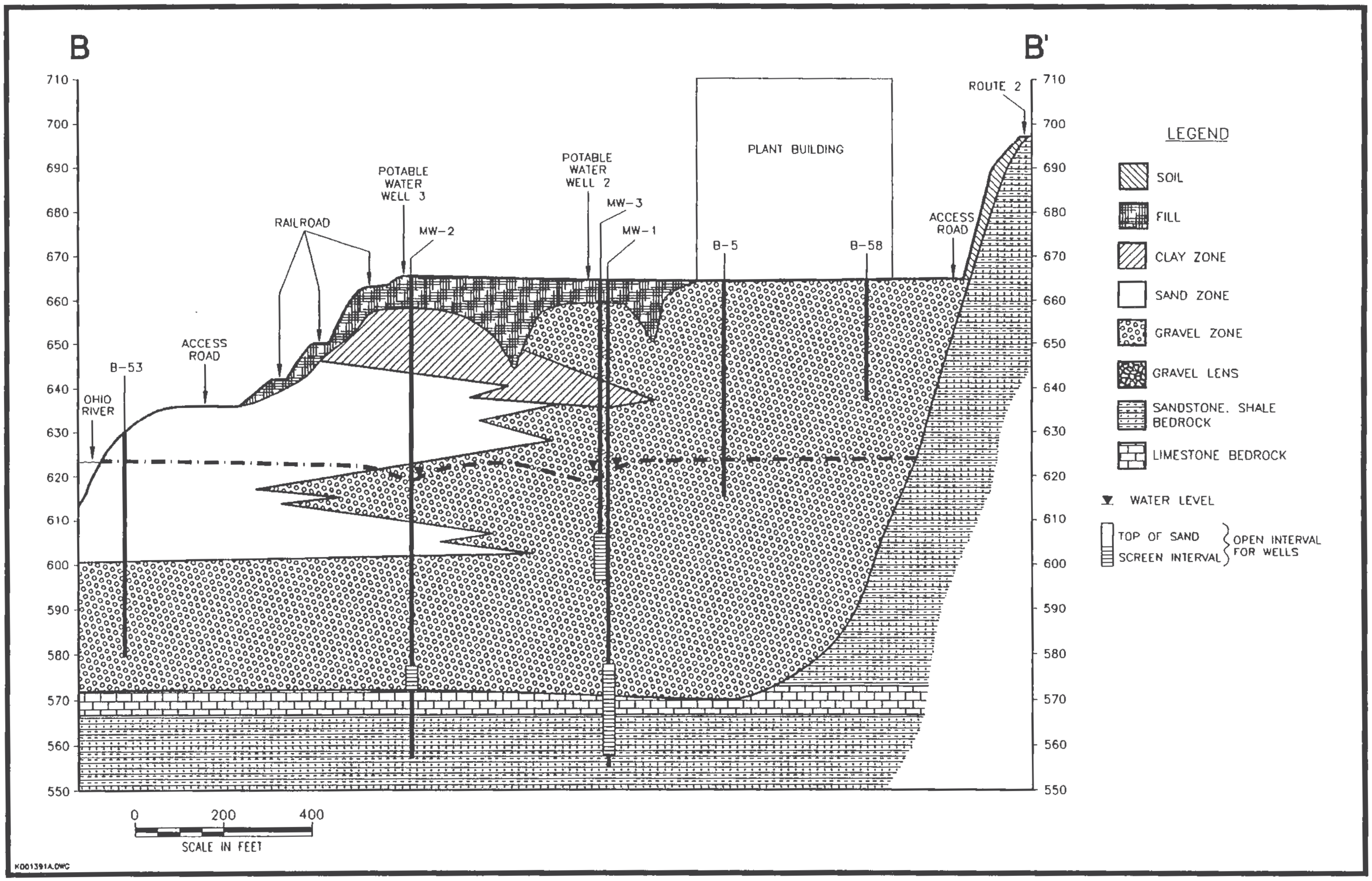


Figure 3-5 Geologic cross-section B-B' at the Mitchell Plant site.

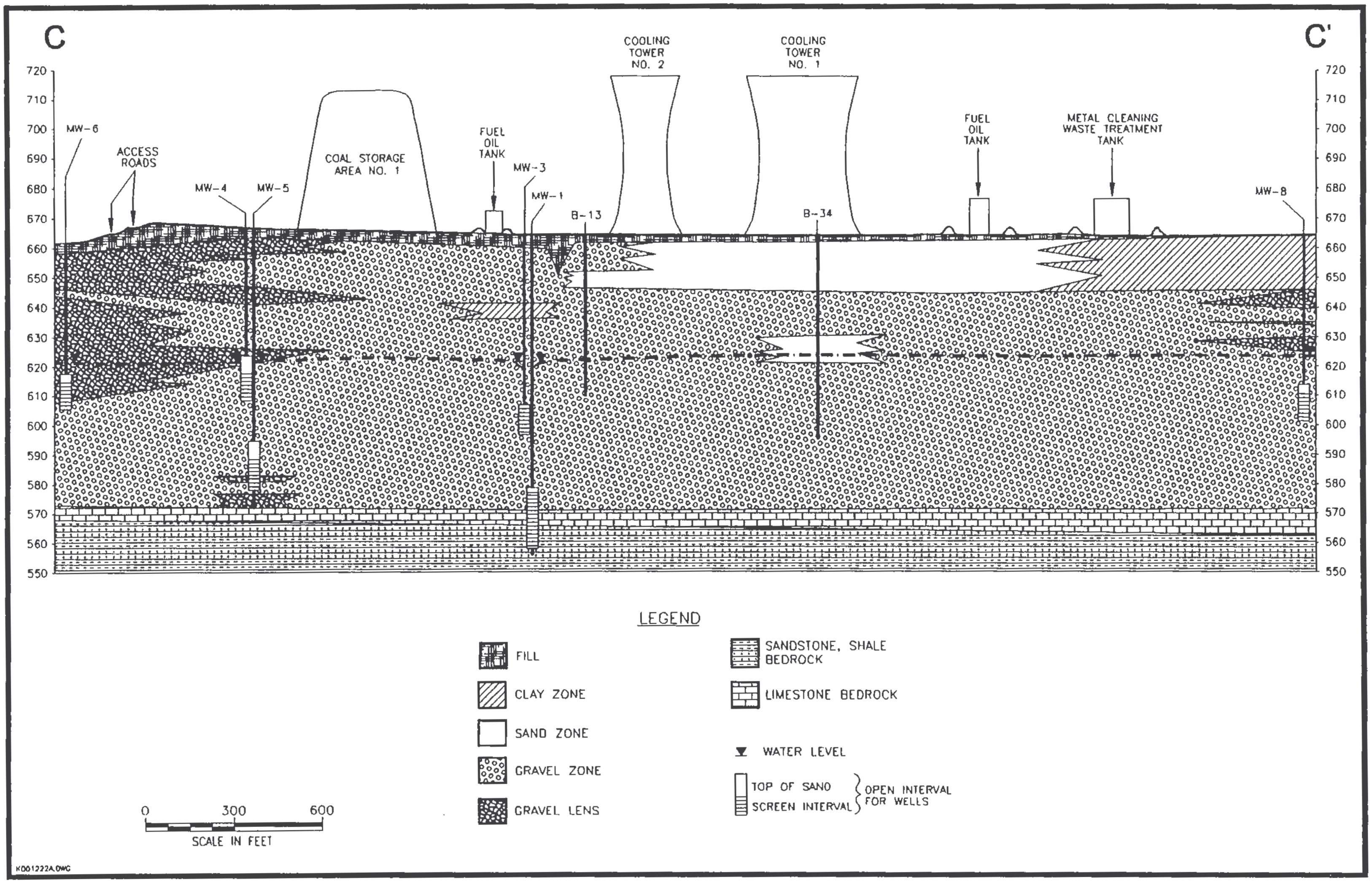


Figure 3-6 Geologic cross-section C-C' at the Mitchell Plant site.

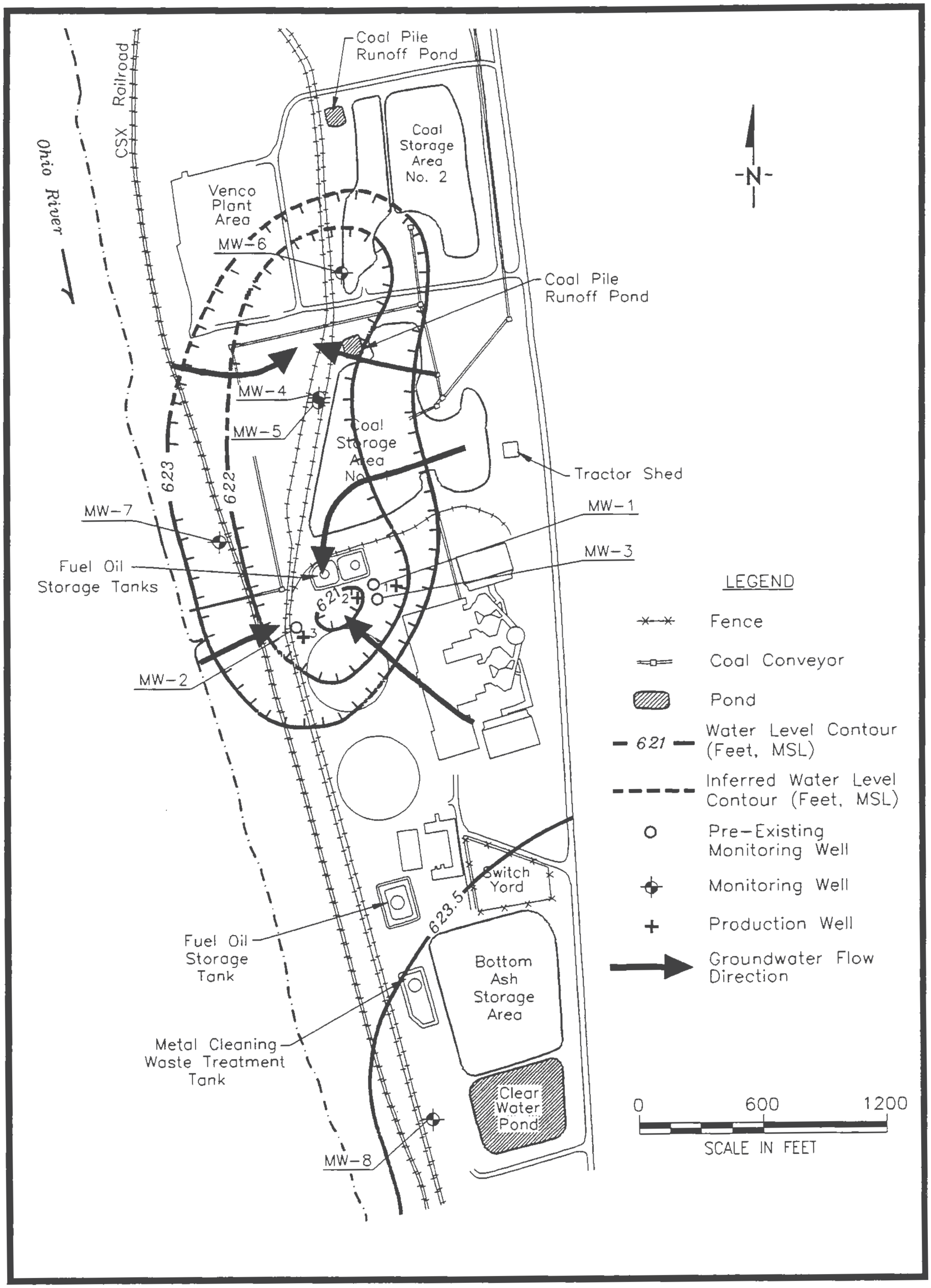


Figure 3-7 Water table contour map for the Mitchell Plant site (August 20, 1996).

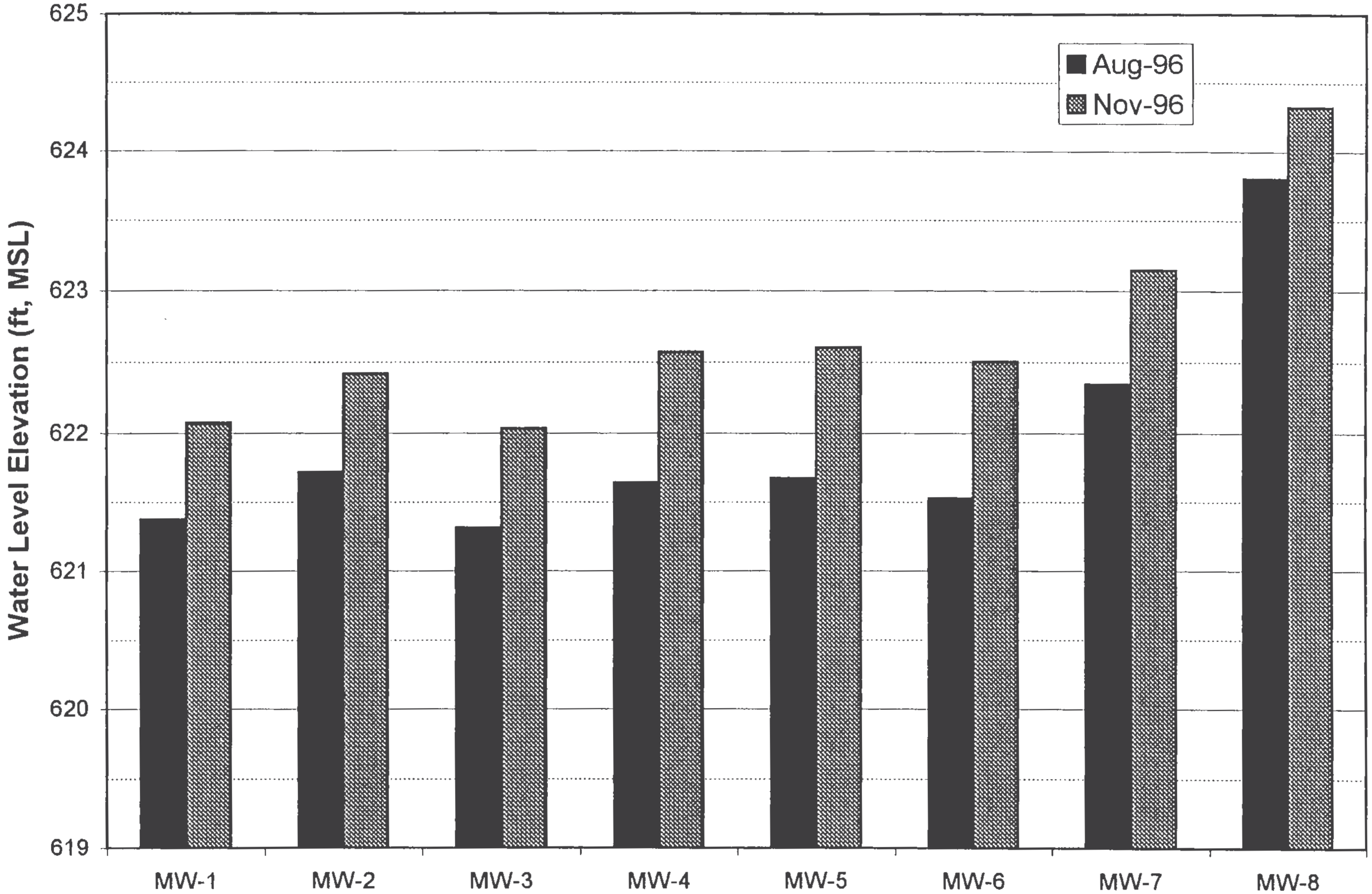


Figure 3-8 Temporal variations in groundwater elevations in monitoring wells at the Mitchell Plant site.

APPENDIX B

MONITORING WELL AND PIEZOMETER BORING LOGS AND AS-BUILT DIAGRAMS

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1504

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DATE STARTED 10/9/15 **COMPLETED** 10/14/15

GROUND ELEVATION 691.90 ft **HOLE SIZE** 8.25"

DRILLINGCONTRACTOR AEP

TOP OF PVC ELEVATION 694.79 ft

DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon

GROUND WATER LEVELS:

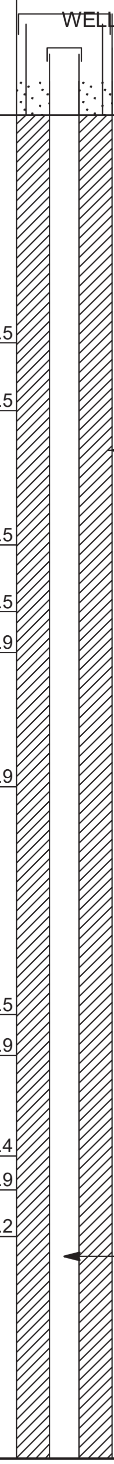
LOGGED BY B. Bashore **CHECKED BY** RAS

AT END OF DRILLING ---

LOCATION Northing: 485671.78 Easting: 1599370.81

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION	Elevation
0	SS 1	75	16-20-25-27 (45)	Dark Gray to Brown SILTY GRAVEL (FILL), dry, dense, some clay and fine sand.	
	SS 2	100	3-8-9-12 (17)	Below 2', loose.	
3.4				Gray to Brown SILTY CLAY (CL - ML), dry, stiff, low plasticity, some roots.	688.5
4.4	SS 3	83	4-15-20-28 (35)	Dark Gray to Brown SILTY SAND (SM), dry, dense, medium grained, trace fine gravel, trace clay, trace coal fragments.	687.5
5					
6.4	SS 4	96	3-5-5-7 (10)	Brown SANDY CLAY (CLS), moist, medium stiff, low to medium plasticity, some fine gravel.	685.5
7.4				Gray SILTY CLAY (CL - ML), moist, medium stiff, high plasticity, some fine sand and gravel.	684.5
8.0	SS 5	83	3-6-14-22 (20)	Orange - Brown SILTY SAND (SM), moist, loose to medium dense, fine to medium grained, some fine gravel, trace clay.	683.9
10.0	SS 6	79	7-11-9-18 (20)	Brown CLAYEY SAND w/ GRAVEL (SC), moist, loose to medium dense, medium to coarse grained sand, fine to coarse gravel.	681.9
	SS 7	96	5-14-16-13 (30)		
13.4				Gray SILTY SAND & GRAVEL (SM, GM), moist to wet, medium dense, medium grained sand, fine gravel, trace clay.	678.5
14.0	SS 8	75	4-6-10-18 (16)	Gray SILTY CLAY (CL - ML), dry to moist, medium stiff to stiff, low plasticity, trace fine gravel.	677.9
15					
15.5				Orange - Brown SANDY CLAY (CLS), dry to moist, very stiff, low plasticity.	676.4
16.0	SS 9	100	3-7-11-18 (18)	Gray SILTY CLAY (CL - ML), dry to moist, soft to medium stiff, low to medium plasticity, trace fine gravel.	675.9
16.7				Orange - Brown CLAYEY SAND & GRAVEL (SC, GC), moist, medium dense, medium to coarse grained sand, fine gravel.	675.2
	SS 10	67	3-7-9-12 (16)	Below 18', loose to medium dense, clay content decreasing.	
20					

WELL DIAGRAM



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CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20	SS 11	75	5-6-6-7 (12)		Orange - Brown CLAYEY SAND & GRAVEL (SC, GC), moist, medium dense, medium to coarse grained sand, fine gravel. *(continued)* Below 20', loose.	
	SS 12	54	5-8-9-7 (17)			
25	SS 13	71	2-5-4-6 (9)		25.5' to 26', moist to wet.	
26.0 (665.9)	SS 14	58	0-2-3-7 (5)		Orange - Brown SANDY GRAVEL (GWS), wet, very loose to loose, fine to coarse, fine to medium grained sand, some clay.	
28.8 (663.1)	SS 15	83	4-4-4-11 (8)		Orange - Brown GRAVELLY SAND (SWG), wet, loose, coarse to medium grained, fine to coarse gravel, trace clay	
30						2-Inch Solid PVC Riser
30.7 (661.2)	SS 16	92	7-8-8-7 (16)		Orange - Brown SAND (SP), moist, loose, fine to medium grained, trace fine gravel.	
	SS 17	79	3-4-7-11 (11)			
35	SS 18	75	4-6-6-8 (12)		Below 34', moist to wet.	
36.0 (655.9)					Orange - Brown CLAYEY SAND (SC), wet, very loose, fine grained.	
36.6 (655.3)	SS 19	100	2-2-3-11 (5)		Orange - Brown SANDY CLAY (CLS), moist, soft, low plasticity, fine grained sand.	
37.2 (654.7)					Orange - Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel.	
	SS 20	71	0-4-4-10 (8)		At 39.1', coal stringer <0.05" thick.	
40	SS 21	63	0-4-8-17 (12)		Below 40', no gravel.	Bentonite Grout

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1504

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 22	88	3-8-7-12 (15)		Orange - Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel. *(continued)*	
44.0					647.9	
45	SS 23	75	2-4-6-11 (10)		Brown SAND (SP), moist, very loose to loose, fine to medium grained, some coal fragments at 45.5'.	
46.5					645.4	
46.9	SS 24	75	0-2-5-10 (7)		Brown SANDY CLAY (CLS), moist, soft, low plasticity, fine grained sand. 645.0	
					Brown SAND (SP), moist, loose, fine to medium grained. 47.4' to 47.5', coal seam.	
	SS 25	83	3-5-4-5 (9)		48.5' to 49.3', laminated coal , wet.	
49.3					642.6	
50					Orange - Brown CLAYEY SAND (SC), moist, loose, fine grained. Below 50', very loose.	
	SS 26	71	2-1-3-9 (4)			
51.2					640.7	
					Brown SAND (SP), moist, loose to very loose, fine grained.	
52.0					639.9	
	SS 27	75	0-3-1-5 (4)		Brown CLAYEY SAND (SC), moist to wet, very loose to loose, fine grained.	
54.8					637.1	
55	SS 28	83	0-2-4-8 (6)		Brown to Orange - Brown SAND (SP), moist to wet, loose, fine grained.	2-Inch Solid PVC Riser
56.0					635.9	
	SS 29	75	0-2-4-7 (6)		Orange - Brown SAND (SP), moist to wet, very loose to loose, fine grained, trace to some clay.	
	SS 30	71	1-2-3-8 (5)		Below 58', some to trace clay.	
60 / 60.0					631.9	Bentonite Grout
	SS 31	92	5-6-7-10 (13)		Orange - Brown SAND (SP), moist, loose, fine grained.	
62.0					629.9	
	SS 32	71	5-5-7-12 (12)		Orange - Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel.	
65	SS 33	75	5-6-9-17 (15)			

(Continued Next Page)

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Depth of change (ft)	MATERIAL DESCRIPTION	Elevation (ft)	WELL DIAGRAM
					Orange - Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel. *(continued)*		
	SS 34	67	5-7-9-13 (16)	68.0	Below 66', moist to wet.	623.9	Bentonite Pellets
	SS 35	67	5-5-7-13 (12)	68.8	Brown GRAVELLY SAND (SWG), wet, loose, medium to fine grained, fine gravel.	623.1	
70				70.0	Brown SAND (SP), wet, loose to medium dense, medium to fine grained, trace fine gravel.	621.9	
	SS 36	100	11-10-12-15 (22)	72.4	Brown GRAVELLY SAND (SWG), wet, medium dense, fine to coarse grained, fine to coarse gravel, some silt.	619.5	
	SS 37	75	9-11-14-19 (25)		Brown SANDY GRAVEL (GWS), wet, medium dense, fine to coarse, medium to coarse grained sand, trace silt		
75	SS 38	54	10-10-13-14 (23)	76.0	Below 74', sand medium to coarse grained.	615.9	#5 Filter Sand
	SS 39	50	8-9-11-16 (20)	78.0	Brown SAND (SP), wet, loose to medium dense, medium to coarse grained, trace fine gravel.	613.9	
	SS 40	58	6-7-8-10 (15)		Brown SANDY GRAVEL (GPS), wet, loose, fine, medium to coarse sand, trace silt.		
80	SS 41	58	7-6-7-11 (13)		Below 80', coarse to fine gravel.		2-Inch, 0.010-Inch Slotted Screen
				82.8	Below 82', loose.	609.1	
	SS 42	63	8-8-10-13 (18)		Brown SAND (SP), wet, medium dense, medium to coarse grained, some fine gravel, trace silt.		
85	SS 43	67	7-9-11-12 (20)	86.0	Below 84', loose to medium dense, fine to medium grained.	605.9	
	SS 44	67	10-8-7-9 (15)		Brown GRAVELLY SAND (SPG), wet, loose, medium to coarse grained, fine to coarse gravel, trace coal fragments.		
					Below 88', loose to medium dense.		

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1504

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 45	96	9-8-10-15 (18)		Highly weather coal seam 89.4' to 89.5'. Brown GRAVELLY SAND (SPG), wet, loose, medium to coarse grained, fine to coarse gravel, trace coal fragments. *(continued)*	#5 Filter Sand
90					90.0 — 601.9	
					90.3 Black COAL, wet, soft, highly weathered, some fine sand. 601.6	
	SS 46	63	10-11-11-14 (22)		Brown GRAVELLY SAND (SPG), wet, loose, medium to coarse grained, fine to coarse gravel, trace coal fragments.	
					92.0 — 599.9	2-Inch, 0.010-Inch Slotted Screen
	SS 47	114	23-50/1"		Brown SANDY GRAVEL (GWS), wet, medium dense, coarse to fine, medium to coarse grained sand. Sandstone boulder at bottom of spoon (93.7')	
					94.6 — 597.3	
95	SS 48	88	21-18-23-42 (41)		Gray SAND (SP), moist to wet, medium dense to dense, fine to medium grained, trace fine to coarse gravel.	
					95.7 — 596.2	
	SS 49	54	12-33-13-32 (46)		Gray SANDSTONE (BEDROCK), moderate hard to weak, moderately cemented, fine to medium grained, moderately to highly weathered, micaceous.	
	SS 50	25	12-12-16-44 (28)			
100					100.0 — 591.9	
	SS 51	50	23-16-33-36 (49)		Gray SHALE (BEDROCK), very weak, trace interbedded fine sand, soft and moderately plastic when wet (clayey).	
					100.9 — 591.0	
					Gray SANDSTONE (BEDROCK), moderate hard to weak, moderately cemented, fine to medium grained, moderately to highly weathered, micaceous.	
					102.0 — 589.9	

Bottom of hole at 102.0 feet

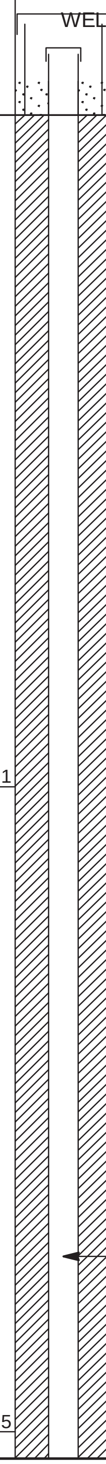
Boring grouted to surface and monitoring well installed on 10/14/2015 in offset boring.

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia
DATE STARTED 10/15/15 **COMPLETED** 10/26/15
GROUND ELEVATION 691.05 ft **HOLE SIZE** 8.25"
DRILLINGCONTRACTOR AEP
TOP OF PVC ELEVATION 693.94 ft
DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon
GROUND WATER LEVELS:
LOGGED BY B. Bashore **CHECKED BY** RAS
AT END OF DRILLING ---
LOCATION Northing: 485699.10 Easting: 1598929.25

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SS 1	88	21-24-29-41 (53)		Brown to Dark Gray SILTY SAND & GRAVEL (FILL), dry, medium dense to dense, fine to medium grained sand, fine to coarse gravel, some clay.
	SS 2	100	2-10-14-15 (24)		Below 2', loose to medium dense.
5	SS 3	88	1-5-6-5 (11)		Below 4', very loose to loose, trace clay.
	SS 4	75	2-1-5-22 (6)		Below 6', very loose to medium dense, wet. 6.7' to 7.1', trace coal and limestone fragments.
	SS 5	83	4-20-32-31 (52)		Below 8', loose to dense.
10					10.0 — 681.1
	SS 6	100	2-9-25-45 (34)		Brown to Dark Gray SILTY SAND & GRAVEL (FILL), dry, loose to dense, some clay, trace limestone and coal fragments.
	SS 7	83	3-9-17-36 (26)		Below 12', no coal fragments.
15	SS 8	100	5-15-22-29 (37)		Below 14', dry to moist, loose to medium dense.
	SS 9	100	4-15-11-16 (26)		Below 16', moist, loose to medium dense, some shale fragments.
	SS 10	100	6-13-9-15 (22)		Wet at 19.6'.
20					19.6 — 671.5

WELL DIAGRAM



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CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20	SS 11	100	6-7-10-20 (17)		Dark Gray to Brown CLAYEY SAND (FILL), moist, medium dense, fine to medium grained, some shale fragments, trace coal. *(continued)* Below 20', loose to medium dense.	
					22.0 ... 669.1	
	SS 12	50	3-12-13-14 (25)		Orange - Brown to Dark Gray CLAYEY SAND (FILL), moist to dry, loose to medium dense, medium to fine grained, some silt, some sandstone boulder fragments, trace shale fragments.	
					Below 24', loose.	
25	SS 13	42	3-5-6-7 (11)			
					Below 26', very loose to loose.	
	SS 14	33	0-4-5-7 (9)			
	SS 15	4	3-5-4-5 (9)			
30					30.0 ... 661.1	Bentonite Grout
	SS 16	54	0-2-3-5 (5)		Orange - Brown SAND (SP), moist to wet, very loose to loose, medium to coarse grained, trace fine gravel. Wet at 30'.	
					Below 32', moist, very loose, no gravel.	
	SS 17	63	0-2-2-4 (4)		33.0 ... 658.1	
					Orange - Brown SAND (SP), moist, very loose, medium to fine grained.	
					Below 34', very loose to loose, trace fine gravel.	
35	SS 18	58	0-2-4-8 (6)			
					36.0 ... 655.1	
	SS 19	75	0-2-2-4 (4)		Orange - Brown SAND (SP), moist, very loose, fine to medium grained.	
					Below 38', orange - brown to brown, very loose to loose.	
	SS 20	75	0-2-3-6 (5)			
40					Below 40', moist to dry.	Bentonite Grout
	SS 21	75	0-0-5-8 (5)			
					42.0 ... 649.1	
					Brown SAND (SP), moist to dry, very loose to loose, fine to medium grained.	

(Continued Next Page)

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 22	79	0-4-4-5 (8)		Brown SAND (SP), moist to dry, very loose to loose, fine to medium grained. *(continued)*	
45	SS 23	96	4-4-5-9 (9)		Below 44', moist. Coal stringer at 45.5', 0.25" thick.	
	SS 24	71	2-5-5-8 (10)		Below 46', moist to wet. 47.1 — 644.0 Brown GRAVELLY SAND (SWG), moist, loose, fine to coarse grained, fine to coarse gravel. Below 48', very loose.	
	SS 25	71	0-3-5-5 (8)		48.7 — 642.4 Orange - Brown CLAYEY SAND (SC), moist, loose, fine grained.	
50	SS 26	71	0-4-5-8 (9)		Below 50', very loose. 50.5 — 640.6 Brown SAND (SP), moist to wet, loose, fine to medium grained. 52.0 — 639.1	
	SS 27	75	0-2-5-7 (7)		Brown CLAYEY SAND (SC), moist, very loose to loose, fine grained. 54.0 — 637.1	
55	SS 28	83	0-3-7-9 (10)		Brown SAND (SP), moist, very loose to loose, fine grained. 56.0 — 635.1	2-Inch Solid PVC Riser
	SS 29	79	0-2-5-8 (7)		Brown SAND (SP), moist to wet, very loose, fine grained. 57.2 — 633.9 Orange - Brown SAND (SP), moist, loose, fine to medium grained.	
	SS 30	71	2-4-7-9 (11)		Below 58', very loose. 58.9 — 632.2 Orange - Brown CLAYEY SAND (SC), moist, loose, fine grained.	
60	SS 31	75	2-3-3-4 (6)		60.0 — 631.1 Orange - Brown SAND (SP), moist to wet, very loose, fine grained, trace to some clay.	Bentonite Grout
	SS 32	29	0-6-16-14 (22)		Below 62', wet to moist, loose to medium dense. 64.0 — 627.1	
65	SS 33	79	0-4-10-15 (14)		Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel.	

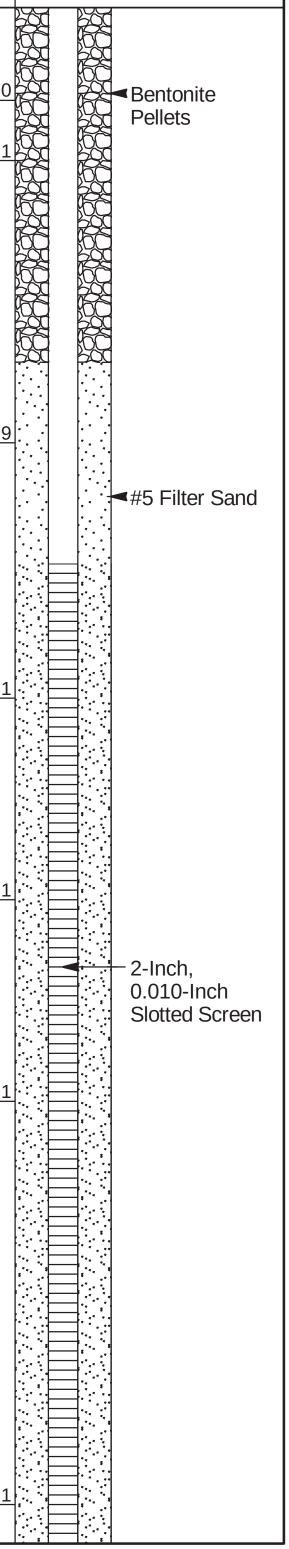
(Continued Next Page)

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION
	SS 34	67	2-5-7-11 (12)	Brown SAND (SP), moist, loose to medium dense, fine to medium grained, trace fine gravel. *(continued)* Below 66', loose.
67.1				624.0
				Brown GRAVELLY SAND (SPG), wet, loose to medium dense, medium to coarse grained, fine gravel.
68.0				623.1
	SS 35	46	2-3-6-11 (9)	Brown SANDY GRAVEL (GWS), wet, very loose to medium dense, medium to coarse, fine to coarse grained sand, some silt.
70	SS 36	71	5-6-8-13 (14)	
72.2				618.9
	SS 37	67	7-7-10-18 (17)	Below 72', loose. Brown SAND (SP), wet, loose to medium dense, medium to coarse grained, trace fine gravel.
75	SS 38	75	11-17-19-26 (36)	Below 74', medium dense, less coarse sand.
76.0				615.1
	SS 39	100	9-17-20-28 (37)	Brown SAND (SP), wet, loose to medium dense, medium to coarse grained, some fine to coarse gravel.
	SS 40	46	10-17-18-21 (35)	
79.0				612.1
80	SS 41	71	13-16-16-24 (32)	Brown SAND (SP), wet, medium dense, fine to medium grained, some fine to coarse gravel. Below 80', gravel content increasing.
82.0				609.1
	SS 42	75	13-12-11-17 (23)	Brown SAND (SP), wet, medium dense, medium to coarse grained, trace silt, trace fine gravel. Below 84', loose to medium dense, some fine to coarse gravel.
85	SS 43	71	6-10-13-21 (23)	
	SS 44	75	11-19-17-20 (36)	Below 86', medium dense, some silt. Note: Sandstone boulder lodged at bottom of SS-44 spoon.
88.0				603.1

WELL DIAGRAM



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CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 45	100	9-14-12-19 (26)	Brown SANDY GRAVEL (GWS), wet, loose to medium dense, fine to coarse, medium to coarse grained sand, some silt, trace coal fragments. *(continued)*	#5 Filter Sand
90	SS 46	83	35-39-38-45 (77)	Below 90', dense. (90.8 / 600.3)	
				Brown SILTY GRAVEL w/ SAND (GM), wet, dense, fine to coarse, medium to coarse grained sand. (92.0 / 599.1)	
	SS 47	75	6-22-30-46 (52)	Brown CLAYEY SAND (SC), moist to wet, loose to medium dense, fine to medium grained, some fine to coarse gravel, silty (92.7 / 598.4)	
				Brown GRAVELLY SAND (SWG), wet, dense, fine to medium grained, some fine gravel.	
95	SS 48	88	18-25-21-25 (46)	Below 94', medium dense, medium to coarse grained. (96.0 / 595.1)	
	SS 49	83	25-25-18-20 (43)	Brown SANDY GRAVEL (GPS), wet, medium dense, coarse to fine, fine to coarse grained sand, some silt.	
100	SS 50	71	25-18-20-28 (38)	Below 98', sand content increasing. Note: Sandstone boulder at 98.5' (100.0 / 591.1)	
	SS 51	75	26-24-26-36 (50)	Brown GRAVELLY SAND (SWG), wet, medium dense to dense, medium to coarse grained, fine to coarse gravel, trace silt. (102.4 / 588.7)	
	SS 52	71	23-17-15-24 (32)	Brown SAND (SP), wet, medium dense, medium to coarse grained, some to trace fine gravel. (104.0 / 587.1)	
105	SS 53	58	23-22-19-17 (41)	Brown GRAVELLY SAND (SWG), wet, medium dense, medium to coarse grained, fine to coarse gravel, some silt. (106.3 / 584.8)	
	SS 54	92	13-19-21-35 (40)	Brown SAND (SP), wet, medium dense to dense, medium to coarse grained, some fine gravel, some silt.	
110	SS 55	67	17-19-20-36 (39)	Below 108', trace coal fragments.	
	SS 56	71	12-16-16-27	Below 110', medium dense.	

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Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1505

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
			(32)			
	SS 57	54	18-19-21-22 (40)		112.0 — Brown GRAVELLY SAND (SWG), wet, medium dense, medium to coarse grained, fine to coarse gravel. Note: Limestone fragments at bottom of SS-57 spoon. — 579.1	
	SS 58	111	11-50/3"		114.5 — 576.6	
					114.8 — Brown LIMESTONE (BEDROCK), moderate hard, moderately weathered, high reaction to HCL. Note: Hard to very hard at 114.8'. — 576.3	

Bottom of hole at 114.8 feet

Boring grouted to surface and monitoring well installed on 10/26/2015 in offset boring.

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia
DATE STARTED 10/20/15 **COMPLETED** 10/23/15
GROUND ELEVATION 691.36 ft **HOLE SIZE** 8.25"
DRILLINGCONTRACTOR AEP
TOP OF PVC ELEVATION 694.26 ft
DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon
GROUND WATER LEVELS:
LOGGED BY D. Follett **CHECKED BY** RAS
AT END OF DRILLING ---
LOCATION Northing: 485633.39 Easting: 1598717.14

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0	SS 1	100	7-8-12-23 (20)		Dark Brown SAND (FILL), dry, loose to medium dense, fine to medium grained, few gravel, trace silt, trace iron stained.	Total Depth of BAP-3 offset boring 96'
	SS 2	92	5-29-23-37 (52)		2.5 — 688.9 Light Brown to Brown SAND & GRAVEL (FILL), dry, loose to dense, fine to medium grained sand, subrounded to subangular, subrounded to well rounded gravel. Below 4', dark brown to brown.	
5	SS 3	88	6-13-18-34 (31)		5.0 — 686.4 Brown SILT (FILL), dry, firm, few subrounded gravel. 5.4 — 686.0 Dark Brown to Brown SAND & GRAVEL (FILL), dry, loose to dense, fine to medium grained sand, subrounded to subangular, subrounded to well rounded gravel.	Bentonite Grout
	SS 4	83	1-12-30-30 (42)		6'-6.5', silty.	
	SS 5	96	6-18-21-32 (39)		8.5 — 682.9 Brown SANDY SILT (FILL), dry to moist, loose to medium dense, trace subrounded gravel, trace coal, moist around gravel clasts.	
10	SS 6	96	6-14-23-33 (37)		11.0 — 680.4 Dark Brown CLAYEY GRAVEL (FILL), dry, medium dense, subrounded, some subrounded coarse sand, some coal. 11.5 — 679.9 Dark Brown to Brown SAND & GRAVEL (FILL), dry, loose to dense, fine to medium grained sand, subrounded to subangular, subrounded to well rounded gravel.	
	SS 7	96	4-19-28-34 (47)		Below 13', moist. Below 14', no coal fragments.	
15	SS 8	96	4-15-19-33 (34)			
	SS 9	100	4-20-24-35 (44)		Below 16', some coal ash.	2-Inch Solid PVC Riser
20	SS 10	96	9-16-14-17 (30)		19.6 — 671.8	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV.	WELL DIAGRAM
20	SS 11	88	7-20-21-16 (41)		Dark Brown to Dark Gray SILT (FILL), dry, medium dense, trace subrounded gravel. *(continued)*		
22.0					Below 21.8', dry to moist, few coarse sand, some subrounded gravel.	669.4	
22.5	SS 12	71	3-12-20-21 (32)		Dark Brown to Brown SAND & GRAVEL (FILL), wet, loose to dense, fine to medium grained sand, subrounded to subangular, subrounded to well rounded gravel.	668.9	
23.0					Dark Brown to Dark Gray SILT (FILL), moist, medium dense, coarse sand, some gravel.	668.4	
25.0	SS 13	88	4-12-20-21 (32)		Dark Brown to Brown SAND & GRAVEL (FILL), wet, medium dense, fine to coarse grained sand, subrounded to subangular, poorly sorted, subrounded gravel. Below 24', moist to wet.	666.4	
26.0					Gray SANDY CLAY (FILL), moist to dry, medium dense, subrounded coarse sand, some subrounded gravel, trace coal fragments.	665.4	
27.0	SS 14	37	9-10-24-50/1"		Dark Brown to Brown SAND & GRAVEL (FILL), wet, medium dense, fine to coarse grained sand, subrounded to subangular, poorly sorted, subrounded gravel.	664.4	
28.0					Gray SANDY CLAY (FILL), moist to dry, medium dense, subrounded coarse sand, some subrounded gravel, trace coal fragments.	663.4	
28.5	SS 15	71	5-26-36-31 (62)		Dark Brown to Brown SAND & GRAVEL (FILL), wet to moist, medium dense, fine to coarse grained sand, subrounded to subangular, poorly sorted, subrounded gravel.	662.9	
29.0					Black SAND (FILL), moist, medium dense, fine to medium grained, some coal.	662.4	
30.5	SS 16	88	4-8-12-22 (20)		Orange - Brown GRAVELLY SAND (FILL), moist, dense, fine to coarse grained, subrounded, subrounded gravel, trace coal. Below 30', moist to wet.	660.9	Bentonite Grout
32.5					Brown SILTY CLAY (CL - ML), dry to moist, medium dense, few fine to coarse subrounded sand, few subrounded gravel.	658.9	
33.0	SS 17	67	7-10-11-18 (21)		Brown CLAYEY SILT (MH), dry, soft to firm, non cohesive, few gray silty laminations.	658.4	
34.0					Gray SILT (ML), dry to moist, firm, non cohesive, trace subrounded gravel, trace coarse sand.	657.4	
34.5	SS 18	58	4-10-12-21 (22)		Dark Brown to Brown SANDY CLAY (CLS), moist, soft to firm, fine to coarse grained sand.	656.9	
36.0					Brown SILTY CLAY (CL - ML), dry to moist, soft to firm, low platicity, few subrounded gravel.	655.4	
37.0	SS 19	83	5-6-8-7 (14)		Gray CLAY (CL), dry, soft to firm, medium plasticity, trace organics, trace silt, cohesive.	654.4	
	SS 20	67	5-6-8-7 (14)		Orange - Brown GRAVELLY SAND (SPG), moist to dry, loose, medium grained, subrounded gravel.		
40	SS 21	88	0-0-6-7 (6)		40' to 41', dark brown to brown. 41' to 42' orange to brown, few clay.		2-Inch Solid PVC Riser
42.0						649.4	
42.5					Brown GRAVELLY SAND (SPG), dry to moist, loose, subrounded gravel.	648.9	

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CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 22	71	3-4-4-6 (8)		Orange - Brown SAND (SP), moist, loose, very fine to coarse grained, poorly sorted, few subrounded gravel. *(continued)*	
45	SS 23	17	7-9-9-12 (18)		Below 44', wet, fine gravel, some silt.	
	SS 24	54	2-3-4-6 (7)		Below 46', moist, no silt.	
	SS 25	46	0-4-5-8 (9)	48.0 / 48.2	Brown SANDY CLAY (CLS), moist to wet, soft, medium plastic, trace subrounded gravel. (643.4 / 643.2) Orange - Brown SAND (SP), dry to moist, loose, very fine to coarse grained, poorly sorted, few subrounded gravel.	
50	SS 26	46	0-5-7-9 (12)		Below 50' trace coal.	
	SS 27	17	0-6-10-17 (16)			
55	SS 28	46	0-7-11-19 (18)			2-Inch Solid PVC Riser
	SS 29	50	3-2-10-7 (12)			
	SS 30	75	5-6-9-11 (15)	58.0 / 58.2	Dark Gray SANDY CLAY (CLS), moist to wet, soft, medium plastic, cohesive, subrounded fine to medium grained sand, trace gravel. (633.4 / 633.2) Orange - Brown SAND (SP), dry to moist, loose to medium dense, very fine to coarse grained, poorly sorted, few subrounded gravel.	
60	SS 31	38	4-8-11-10 (19)			Bentonite Grout
	SS 32	63	5-8-19-21 (27)		Below 60', moist to wet, coarse gravel, trace silt.	
65	SS 33	67	8-10-10-12 (20)		Below 64', fine to medium grained.	Bentonite Pellets

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Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
					Orange - Brown SAND (SP), dry to moist, loose to medium dense, very fine to coarse grained, poorly sorted, few subrounded gravel. *(continued)*		
	SS 34	50	5-6-7-6 (13)		Below 67', moist.		Bentonite Pellets
68.0						623.4	
	SS 35	46	4-3-11-8 (14)		Brown GRAVELLY SAND (SWG), wet, loose to medium dense, fine to coarse grained, subrounded, poorly sorted, fine to coarse subround gravel, trace silt.		
70	SS 36	63	7-6-6-10 (12)				
72.0						619.4	
72.4					Brown SAND (SW), wet, very loose, fine grained, well sorted, trace silt.	619.0	
	SS 37	79	0-9-9-16 (18)		Brown SANDY GRAVEL (GPS), wet, medium dense, fine, subrounded, fine to coarse sand. Coal stringer at 73'.		
74.0						617.4	
74.4					Brown SAND (SW), wet, medium dense, very fine to coarse grained, poorly sorted, trace silt.	617.0	
75	SS 38	83	9-9-8-16 (17)		Brown SANDY GRAVEL (SWG), wet, medium dense, fine, subrounded, fine to coarse sand, grades to brown SAND.		
75.4						616.0	
					Brown SAND (SP), wet, medium dense, fine grained, well sorted, trace coal stringers, no silt, grades to poorly sorted brown sand at 77'.		#5 Filter Sand
77.0	SS 39	79	9-8-9-14 (17)			614.4	
					Brown SAND (SW), wet, medium dense, fine to coarse grained, poorly sorted, trace subrounded gravel. 78'-78.5', increased gravel.		
	SS 40	58	16-11-14-18 (25)				
80 / 80.0						611.4	2-Inch, 0.010-Inch Slotted Screen
	SS 41	100	10-12-15-25 (27)		Brown GRAVELLY SAND (SPG), wet, medium dense, medium to coarse grained, subrounded, fine subrounded gravel.		
81.5						609.9	
	SS 42	100	10-14-15-22 (29)		Brown SAND (SW), wet, medium dense, medium to coarse grained, moderately sorted, trace subrounded gravel. 83.5' to 83.75', some gravel. Below 84', trace to few gravel.		
85	SS 43	67	14-16-18-29 (34)				
	SS 44	63	11-14-11-15 (25)				

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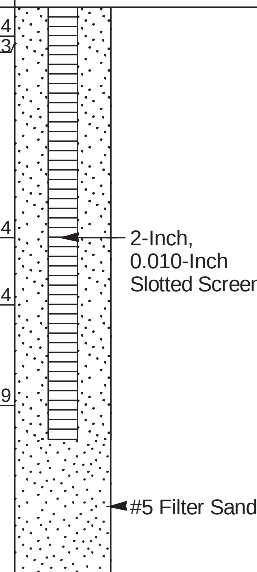
CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
90	SS 45	71	15-17-15-16 (32)
	SS 46	42	21-19-23-44 (42)
	SS 47	83	24-21-18-36 (39)
95	SS 48	83	13-29-39-50/5"
	SS 49	79	11-36-38-43 (74)
100	SS 50	71	12-24-40-36 (64)
	SS 51	71	24-25-18-30 (43)
	SS 52	63	19-14-16-22 (30)
105	SS 53	63	15-17-20-34 (37)
	SS 54	67	10-20-24-22 (44)
110	SS 55	63	19-12-20-34 (32)
	SS 56	63	12-27-25-30

Depth	MATERIAL DESCRIPTION	Elevation
89.0	Dark Brown to Black GRAVELLY CLAY (CL - CH), moist to wet, soft to firm, medium to high plasticity, fine to coarse subrounded gravel.	602.4
89.1	Brown SAND (SW), wet, medium dense, medium to coarse grained, moderately sorted, trace subrounded gravel. At 92', white sandstone cobble in bottom of spoon, fine grained, friable.	602.3
92.0	Brown SANDY CLAY (CLS), moist, firm, medium plastic, very fine to fine sand, few fine subrounded gravel.	599.4
93.0	Brown SAND (SW), wet, medium dense to dense, fine to coarse grained, subrounded to subangular, poorly sorted, some fine subrounded gravel.	598.4
94.5	Brown to Dark Brown CLAYEY GRAVEL (GC), wet, dense to very dense, subrounded, coarse, some fine to coarse sand, some sandstone fragments.	596.9
99.0	Brown GRAVELLY SAND (SPG), wet, dense, fine to coarse grained, fine to coarse subrounded gravel. At 101', orange-brown sand seam, 1" thick, fine grained, subrounded, well sorted.	592.4
102.0	Brown SAND (SW), wet, medium dense, fine to coarse grained, subrounded, poorly sorted, little fine gravel.	589.4
104.0	Gray SAND (SW), wet, medium dense, coarse grained, moderately sorted, graded, subangular to subrounded, trace silt.	587.4
104.2	Brown SAND (SW), moist to wet, medium dense, fine to medium grained, subrounded, moderately sorted, trace fine subrounded gravel. Below 106', trace fine to coarse gravel, coarse gravel clasts composed of micaceous fine grained sandstone. Below 108', brown to gray. 111' to 111.1' Tan sandstone cobble, weak, medium grained, friable, moderately decomposed, subangular to subrounded grains.	587.2

WELL DIAGRAM



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CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
			(52)		Brown SAND (SW), moist to wet, medium dense, fine to medium grained, subrounded, moderately sorted, trace fine subrounded gravel. *(continued)* Below 112', medium grained, well sorted.	
	SS 57	75	14-15-19-29 (34)			
					114.5 — 576.9	
115	SS 58	58	25-40-31-36 (71)		114.6 Orange-Brown SILT (ML) w/ COAL, dry to moist, soft, iron stained. 576.8	
					Gray Brown SILTSTONE (BEDROCK), wet, weak, trace mica.	
					116.0 — 575.4	
	SS 59	75	50/4"		116.2 Dark Gray CLAYSTONE (BEDROCK), dry, weak. 575.2	
					Bottom of hole at 116.2 feet	

Boring grouted to surface and monitoring well installed on 10/23/2015 in offset boring.

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW150

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia
DATE STARTED 10/27/15 **COMPLETED** 10/30/15
GROUND ELEVATION 692.08 ft **HOLE SIZE** 8.25"
DRILLINGCONTRACTOR AEP
TOP OF PVC ELEVATION 694.98 ft
DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon
GROUND WATER LEVELS:
LOGGED BY D. Follett **CHECKED BY** RAS
AT END OF DRILLING ---
LOCATION Northing: 485288.61 Easting: 1598790.27

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
	SS 1	79	14-19-25-33 (44)		0.5 Gray SANDY SILT (FILL), dry, medium hard, few subangular gravel. 691.6	Total Depth of BAP-4 offset boring 96'
					Brown SANDY SILT (FILL), dry, medium hard to hard, some subrounded gravel, trace clay, trace coal. 2.0 690.1	
	SS 2	104	12-20-25-50/5"		Dark Brown to Brown SILTY SAND (FILL), dry, medium dense to very dense, fine to medium grained, moderately sorted, some fine subrounded gravel. 5.0 687.1	
5	SS 3	79	5-23-30-45 (53)		Brown SAND (FILL), dry, dense, medium grained, subrounded to subangular, well sorted, coarse subangular limestone gravel. 6.0 686.1	Bentonite Grout
	SS 4	96	5-19-29-45 (48)		Dark Brown to Brown SANDY SILT (FILL), dry to moist, firm to hard, few subrounded to subangular fine to coarse grained sand, little fine subrounded gravel, trace clay. 7.0 685.1	
					Brown to Reddish Brown SAND (FILL), moist, dense, medium grained, well sorted, subrounded to subangular, trace subrounded coarse sand. 9.0 683.1	
	SS 5	71	1-11-26-36 (37)		Brown to Dark Brown SILTY SAND (FILL), moist, medium dense to dense, medium to coarse grained, subrounded, moderately sorted, trace fine subrounded gravel. 10.0 682.1	
10	SS 6	104	11-13-19-50/5"		Dark Brown to Reddish Brown CLAYEY SAND (FILL), medium dense to very dense, coarse grained, subrounded, poorly sorted, few fine to coarse subrounded gravel, trace coal. 12.0 680.1	
	SS 7	95	7-21-34-50/4"		Dark Brown to Brown SAND (FILL), moist, medium dense to dense, medium grained, subrounded, moderately sorted, trace fine subrounded gravel.	
					Below 14', fine to coarse gravel. 15.5 676.6	
15	SS 8	100	18-23-20-48 (43)		Gray to Brown SILTY CLAY (FILL), dry to moist, very hard, medium plastic, few subrounded coarse sand, trace coal. 16.0 676.1	
	SS 9	79	3-23-29-40 (52)		Dark Brown to Brown SAND (FILL), dry to moist, loose to dense, subrounded, poorly to moderately sorted, few fine to coarse subrounded gravel, trace silt. 18.0 674.1	2-Inch Solid PVC Riser
	SS 10	100	8-12-28-34 (40)		Gray SANDY CLAY (FILL), moist, firm, moderate plastic, subrounded medium to coarse grained sand, trace subrounded gravel. 19.0 673.1	
20					Dark Brown SAND (FILL), dry to moist, dense, medium to coarse grained, moderately sorted, subrounded, few fine subrounded gravel. 20.0 672.1	

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Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20	SS 11	92	3-11-13-18 (24)		Gray SANDY CLAY (FILL), moist, firm, moderate plastic, subrounded medium to coarse grained sand, trace subrounded gravel. 21.0 / 671.1	
					Brown CLAYEY SAND (FILL), moist to dry, medium dense, medium to coarse grained, poorly sorted, few fine subrounded gravel. 22.0 / 670.1	
	SS 12	100	2-11-20-24 (31)		Gray CLAY (FILL), moist, very soft to firm, highly plastic, few subrounded coarse grained sand, trace subrounded fine to coarse gravel, moist to wet around clasts. 23.0 / 669.1	
					Brown SILTY SAND (FILL), moist, medium dense, medium to coarse grained, subrounded, poorly sorted, few fine subrounded gravel. 24.5 / 667.6	
25	SS 13	100	16-19-23-44 (42)		Brown SAND (FILL), moist, medium dense, medium grained, subrounded, well sorted, trace fine gravel. 25.0 / 667.1	
					Brown CLAYEY SAND (FILL), moist, medium dense to dense, fine to coarse grained, subrounded, trace subrounded gravel. At 27', wet.	
	SS 14	71	2-12-24-43 (36)			
	SS 15	58	0-6-29-40 (35)		Below 28', moist to wet.	
30	SS 16	78	2-8-18-50/5"		Below 30', gray, wet. 31.5 / 660.6	Bentonite Grout
					Dark Gray CLAYEY SILT (FILL), wet, hard, few coarse subrounded sand, trace fine subrounded gravel. 32.0 / 660.1	
	SS 17	79	6-24-31-38 (55)		Dark Gray GRAVELIY CLAY (FILL), moist, firm, moderately plastic, subrounded gravel , few coarse grained sand. 33.5 / 658.6	
					Reddish Brown to Brown SILT (ML), dry, very hard, few gray silt laminations with desiccation cracks throughout, trace roots, trace subrounded coarse grained sand. 34.0 / 658.1	
35	SS 18	100	4-6-9-12 (15)		Gray to Dark Gray SILT (ML), dry to moist, soft to firm, trace roots, trace subrounded fine to medium grained sand. 35.0 / 657.1	
					Reddish Brown to Brown SILT (ML), dry, firm, trace roots, trace fine grained sand. 36.0 / 656.1	
	SS 19	79	2-5-10-13 (15)		Gray to Dark Gray SANDY CLAY (CLS), moist, soft to firm, medium plastic, subrounded fine to coarse grained sand, 36.5 / 655.6	
					Reddish Brown SILT (ML), dry, soft to firm, trace fine to coarse grained sand. 38.0 / 654.1	
					At 37.5', grades to GRAVELIY SILT (MLG), dry, firm, subrounded gravel. 38.5 / 653.6	
	SS 20	63	7-7-6-7 (13)		Brown to Reddish Brown SILT (ML), dry, firm, dark gray vertical desiccation cracks 1/2" width throughout, trace coarse subrounded sand.	
40	SS 21	8	8-7-9-10 (16)		Orange-Brown GRAVELLY SAND (SWG), dry to moist, loose, fine to coarse grained, subangular, poorly sorted, fine subrounded gravel. 42.0 / 650.1	2-Inch Solid PVC Riser
					Brown SANDY CLAY (CLS), moist, soft to firm, few subrounded coarse sand, trace subrounded gravel. 42.5 / 649.6	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW150

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION	Elevation
	SS 22	67	5-5-6-8 (11)	Grayish Brown SAND (SW), dry to moist, very loose to loose, medium grained, subrounded, well sorted, few subrounded coarse grained sand, trace subrounded gravel. *(continued)*	
45	SS 23	71	3-3-5-6 (8)	45.5' to 45.8', few coarse subrounded gravel, trace coal.	
46.0					646.1
	SS 24	67	4-5-5-6 (10)	Orange-Brown to Brown GRAVELLY SAND (SWG), dry to moist, very loose to loose, fine to coarse grained, subrounded, moderately sorted, fine subrounded gravel, few coal stringers 1/4" thick throughout.	
	SS 25	63	0-3-6-6 (9)		
50 (50.0)					642.1
	SS 26	67	0-2-4-7 (6)	Orange-Brown SAND (SW), moist, very loose to loose, medium grained, subrounded, well sorted, trace subrounded coarse sand.	
	SS 27	63	0-3-3-5 (6)	52'-54', few thinly bedded coal stringers.	
55	SS 28	63	0-3-6-9 (9)		
56.5					635.6
	SS 29	58	0-5-7-9 (12)	Dark Gray to Black COAL, dry soft.	
57.0					635.1
				Orange-Brown SAND (SW), moist, very loose to loose, medium grained, subrounded, well sorted, trace subrounded coarse sand.	
58.0					634.1
58.3				Gray CLAY (CL), moist, firm, high plasticity, few subrounded fine to coarse grained sand.	633.8
58.5				Dark Gray to Black COAL, dry to moist, soft.	633.6
	SS 30	79	3-9-13-23 (22)	Brown GRAVELLY SAND (SWG), moist, very loose to medium dense, medium grained, subrounded, moderately sorted, fine to coarse subrounded gravel.	
60	SS 31	50	0-6-9-12 (15)	61'-61.25', increased clay.	
	SS 32	54	0-7-10-20 (17)	62.5'-62.75', increased clay.	
65	SS 33	54	11-23-14-19 (37)	64'-66', few cobbles	

WELL DIAGRAM: 2-Inch Solid PVC Riser; Bentonite Grout

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW150

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
66.0						626.1
66.3	SS 34	46	0-17-17-15 (34)		Brown to Dark Brown SAND (SP), dry to moist, very loose, fine grained, well sorted, subrounded.	625.8
					Brown GRAVELLY SAND (SWG), moist, very loose to medium dense, medium grained, subrounded, moderately sorted, fine to coarse subrounded gravel.	Bentonite Pellets
68.0	SS 35	54	5-7-5-10 (12)		Gray SANDY GRAVEL (GWS), wet, loose to medium dense, subrounded, medium to coarse subrounded sand, trace silt.	624.1
70 / 70.0	SS 36	67	9-13-14-15 (27)		Gray SAND (SP), wet, loose to medium dense, coarse grained, subrounded, well sorted, subvertical 1/2" thick coal seam throughout, few silt.	622.1
71.0					Brown GRAVELLY SAND (SWG), wet, medium dense, fine to coarse grained, subrounded, poorly sorted, fine to coarse subrounded gravel.	621.1
	SS 37	63	15-14-12-19 (26)			#5 Filter Sand
74.0					Brown SAND (SP), wet, medium dense, very fine to fine grained, subrounded, well sorted, trace fine subrounded gravel.	618.1
75	SS 38	58	10-13-16-24 (29)			
	SS 39	71	10-18-20-25 (38)		Below 77', very fine to fine sand grades to medium to coarse sand, well sorted to moderately sorted, bedded, trace subrounded coarse gravel.	
	SS 40	58	12-11-15-21 (26)			
80 / 80.0	SS 41	100	14-15-16-22 (31)		Brown SILTY SAND (SM), wet, medium dense, fine to medium grained, subrounded, moderate to poorly sorted, trace subrounded gravel, grades to brown SAND.	612.1; 2-Inch, 0.010-Inch Slotted Screen
81.5					Brown SAND (SW), wet, medium dense, fine to coarse grained, subrounded, poorly sorted, few fine to coarse subrounded gravel, trace silt.	610.6
82.0	SS 42	83	9-14-13-18 (27)		Gray SILTY SAND (SM), wet, medium dense, fine to coarse grained, subrounded, poorly sorted, trace silt, grades to brown SAND.	610.1
83.0					Brown SAND (SW), wet, medium dense, fine to medium grained, moderately sorted, trace fine subrounded gravel, trace silt.	609.1
					Below 84', medium to coarse grained, no silt.	
85	SS 43	79	10-16-21-24 (37)			
	SS 44	63	13-13-15-16 (28)		Below 87', trace fine to coarse gravel.	
					88'-89', gray.	

(Continued Next Page)

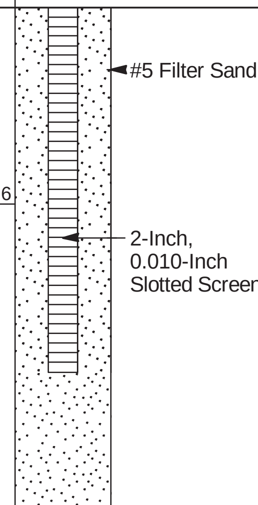
CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
90	SS 45	71	13-12-15-20 (27)
	SS 46	75	18-19-27-37 (46)
	SS 47	83	29-27-19-21 (46)
95	SS 48	83	33-38-35-30 (73)
	SS 49	87	32-37-42-50/5"
100	SS 50	67	19-27-28-38 (55)
	SS 51	58	17-28-27-33 (55)
	SS 52	67	14-23-22-25 (45)
105	SS 53	71	21-30-22-21 (52)
	SS 54	71	13-17-13-17 (30)
110	SS 55	75	13-13-16-21 (29)
	SS 56	79	15-18-18-23

Depth (ft)	MATERIAL DESCRIPTION	Elevation
	Brown SAND (SW), wet, medium dense, fine to medium grained, moderately sorted, trace fine subrounded gravel, trace silt. *(continued)*	
91.5	Brown SILTY SAND (SM), wet, medium dense to dense, very fine to fine grained, subrounded, moderately sorted. Below 93', little fine to coarse subrounded gravel. At 97', some orange-brown silt around gravel clasts.	600.6
99.0	Gray to Brown GRAVELLY SAND (SWG), wet, medium dense to dense, fine to coarse grained, subrounded, poorly sorted, fine to coarse subrounded gravel, trace to little silt, trace coal. Below 103', decreased silt, fine gravel.	593.1
104.0	Gray SAND (SW), wet, medium dense, medium to coarse grained, subrounded, poorly sorted, little gravel.	588.1
104.5	Brown SAND (SP), wet, medium dense, medium grained, subrounded, well sorted, trace fine subrounded gravel.	587.6
107.5	Gray GRAVELLY SAND (SWG), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, fine subrounded gravel.	584.6
108.5	Brown SAND (SP), wet, medium dense, fine to medium grained, subrounded, well sorted, few fine subrounded gravel.	583.6

WELL DIAGRAM



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CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
			(36)		111.5 Dark Gray to Black COAL, wet, soft. 580.6	
	SS 57	67	32-29-27-41 (56)		111.8 Brown SAND (SP), wet, medium dense to dense, fine to medium grained, subrounded, well sorted, few fine subrounded gravel. 580.3	
115	SS 58	83	18-23-29-50/5"		115.5 576.6	
					115.9 Tan to Brown SANDSTONE (BEDROCK), wet, hard, very fine to fine grained, subrounded to subangular grains, moderately cemented. 576.2	

Bottom of hole at 115.9 feet

Boring grouted to surface and monitoring well installed on 10/30/2015 in offset boring.

BORING NUMBER MW150

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DATE STARTED 10/5/15 **COMPLETED** 10/8/15

GROUND ELEVATION 682.72 ft **HOLE SIZE** 8.25"

DRILLINGCONTRACTOR AEP

TOP OF PVC ELEVATION 685.77 ft

DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon

GROUND WATER LEVELS:

LOGGED BY B. Bashore / R. Stanley **CHECKED BY** RAS

AT END OF DRILLING ---

LOCATION Northing: 484971.27 Easting: 1598790.27

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0	SS 1	94	16-22-32 (54)		Gray SILTY SAND & GRAVEL (FILL), dry, very dense.	Total Depth of BAP-5 offset boring 88'
2.0	SS 2	92	2-9-11-15 (20)		Orange-Brown SILT & CLAY (ML), moist to dry, medium stiff, trace fine sand. (680.7)	
5	SS 3	63	3-3-3-4 (6)			Bentonite Grout
	SS 4	33	1-2-3-6 (5)			
8.0	SS 5	71	3-5-5-6 (10)		Orange-Brown SILTY SAND (SM), moist, loose, fine to medium grained, trace clay. (674.7)	
10.0	SS 6	63	3-5-4-7 (9)		Orange-Brown SILTY SAND & GRAVEL (SW), moist, loose. (672.7)	
	SS 7	63	4-4-4-5 (8)		Below 14', more sand, less gravel.	
15	SS 8	75	2-3-4-7 (7)		Below 16', moist to wet, more gravel.	
	SS 9	54	2-3-3-6 (6)			2-Inch Solid PVC Riser
20	SS 10	63	3-2-3-3 (5)		Below 20', wet, very loose. Note: Wet at bottom of sample SS-10.	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20					Orange-Brown SILTY SAND & GRAVEL (SW), moist, loose. *(continued)*	
	SS 11	50	3-2-2-2 (4)			
	SS 12	63	1-3-3-3 (6)		Below 22', fine to coarse sand with gravel, silty, trace clay, loose.	
25	SS 13	50	0-2-3-3 (5)		Below 24', slightly more silty clay, less gravel, loose wet.	
					26.0 656.7	
	SS 14	83	1-1-2-3 (3)		Orange-Brown SILTY SAND (SM), wet, loose, fine to coarse grained, trace clay, trace gravel, slightly cohesive.	
	SS 15	54	2-3-3-4 (6)			
30	SS 16	63	3-3-5-5 (8)		Below 31', less silt and clay.	Bentonite Grout
					32.0 650.7	
	SS 17	88	1-2-3-5 (5)		Orange-Brown SAND (SP), wet, loose, fine to medium grained, some silt.	
35	SS 18	75	0-3-3-5 (6)		Below 34', medium to fine sand, no gravel, clean.	
	SS 19	75	0-3-4-7 (7)		Below 36', wet to moist.	
	SS 20	88	3-3-5-8 (8)			
40	SS 21	96	0-4-5-9 (9)		Below 40', some to trace silt, no clay.	Bentonite Grout
					Below 42', medium dense, moist.	

(Continued Next Page)

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 22	71	0-6-7-11 (13)		Orange-Brown SAND (SP), wet, loose, fine to medium grained, some silt. *(continued)*	
45	SS 23	88	3-3-5-7 (8)		Below 44', loose.	
	SS 24	100	4-6-7-10 (13)		Below 46', medium dense.	
	SS 25	104	4-5-5-9 (10)			
50	SS 26	75	4-4-6-10 (10)		Below 50', loose, trace silt.	Bentonite Grout
	SS 27	96	4-5-6-11 (11)		Below 52', loose to medium dense, becoming more fine.	
55	SS 28	92	4-5-6-9 (11)		Below 54', loose.	2-Inch Solid PVC Riser
	SS 29	92	5-5-3-7 (8)		Below 56.5', some fine to coarse gravel. 57.1 / 625.6	
					57.1 Orange-Brown SANDY CLAY (CL), moist, medium stiff, medium plastic. 57.6 / 625.1	
					57.6 Orange-Brown SAND (SP), wet, loose, fine to medium grained, some fine gravel, trace silt. 58.0 / 624.7	
	SS 30	100	2-4-6-12 (10)		58.0 Brown CLAYEY SILT (MH), moist, very loose, very fine. 58.7 / 624.0	
					58.7 Brown SAND & GRAVEL (SP, GW), wet, loose, medium to fine grained, fine to coarse gravel, some silt. 59.6 / 623.1	
60					59.6 Brown CLAYEY SILT (MH), moist, medium dense, very fine. 60.0 / 622.7	Bentonite Pellets
	SS 31	100	5-3-6-9 (9)		60.0 Brown SANDY GRAVEL (GWS), wet, loose, fine to coarse, fine to medium sand, some silt. 62.0 / 620.7	
	SS 32	88	5-5-4-6 (9)		62.0 Brown GRAVELLY SAND (SWG), wet, loose, fine to medium grained, fine gravel, trace silt. 62.9 / 619.8	
					62.9 Brown SANDY GRAVEL (GWS), wet, loose, fine to coarse, fine to medium sand, trace silt. 64.0 / 618.7	
65	SS 33	88	5-5-6-9 (11)		64.0 Brown GRAVELLY SAND (SWG), wet, loose, fine to medium grained, fine gravel. 65.0 / 617.7	#5 Filter Sand
					65.0 Black COAL, wet, soft, highly weathered, some sand, no odor. 65.3 / 617.4	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power | **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 | **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					66.0 Brown GRAVELLY SAND (SWG), wet, loose, fine to medium grained, fine gravel. *(continued)* 616.7	
	SS 34	33	7-6-7-10 (13)		Brown SAND (SP), wet, loose, medium to coarse grained.	
	SS 35	42	9-9-10-13 (19)		Below 68', loose to medium dense, trace silt, trace fine gravel.	
70	SS 36	100	7-10-8-12 (18)		70.9' to 71', coal seam, highly weathered. 71.4 / 611.3	2-Inch, 0.020-Inch Slotted Screen
	SS 37	100	6-9-12-17 (21)		Brown GRAVELLY SAND (SWG), wet, loose to medium dense, fine to medium grained, fine to coarse gravel. Below 72', some silt. Note: 0.2" coal stringer at 73.4'. 73.4 / 609.3	
75	SS 38	67	8-8-11-13 (19)		Orange-Brown GRAVELLY SAND (SWG), wet, medium dense, fine to medium grained, fine gravel. 76.0 / 606.7	
	SS 39	100	7-10-7-13 (17)		Orange-Brown SAND (SP), wet, loose to medium dense, fine to medium grained, some fine gravel. 78.0 / 604.7	
	SS 40	83	7-7-31-49 (38)		Orange-Brown SANDY CLAY (CLS), moist, medium stiff, low plasticity, trace fine gravel. 78.9 / 603.8 Orange-Brown SANDY GRAVEL (GWS), wet, dense, fine to coarse, medium to coarse sand.	
80	SS 41	88	15-21-25-31 (46)		Below 80', medium dense to dense.	
	SS 42	71	13-28-32-35 (60)		Below 82', medium dense. Note: 82.2'-82.3', completely weathered coal fragments. 83.0 / 599.7 Orange-Brown SANDY GRAVEL (GWS), wet, dense, fine to coarse, medium to coarse sand.	
85	SS 43	83	7-24-18-35 (42)		Below 84', medium dense to dense, some to trace clay. 86.0 / 596.7	
	SS 44	79	25-31-25-25 (56)		Orange-Brown SANDY GRAVEL (GWS), wet to moist, medium dense, fine to coarse, medium to coarse sand, trace clay, trace sandstone fragments. Note: 0.1" thick highly weathered coal stringer at 87.6'. 88.2 / 594.5	#5 Filter Sand

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

BORING NUMBER MW150

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 45	75	18-25-22-26 (47)		Orange-Brown GRAVELLY SAND (SWG), wet to moist, medium dense, fine to coarse grained, fine to coarse gravel, trace medium grained moderately cemented sandstone gravel. *(continued)*	
90	SS 46	71	11-21-35-43 (56)		Below 90', medium dense to dense, medium to coarse grained, trace siltstone fragments.	
	SS 47	75	21-30-40-42 (70)		Below 92', wet to moist, dense, trace sandstone fragments.	
					94.0 — 588.7	
95	SS 48	83	14-17-25-40 (42)		Brown to Orange-Brown GRAVELLY SAND (SWG), wet, medium dense to dense, medium to coarse grained, fine gravel.	
	SS 49	75	10-25-28-38 (53)		Below 96', wet to moist.	
					98.0 — 584.7	
	SS 50	75	14-22-26-42 (48)		Brown SAND (SP), wet to moist, medium dense to dense, fine to medium grained, some fine gravel.	
100	SS 51	75	11-18-25-42 (43)		Below 100', moist to wet, trace fine gravel.	
					102.6 — 580.1	
	SS 52	100	13-22-50/5"		Brown SAND (SP), moist, medium dense, fine grained. Note: coarse gravel at bottom of sample SS-52.	
					104.0 — 578.7	
	SS 53	71	27-34-50/2"		104.3 — 578.4: Gray to Brown CLAYEY SAND w/ GRAVEL (SC), moist to wet, dense, fine grained, fine gravel.	
105					104.6 — 578.1: Gray SILTSTONE (BEDROCK), dry, weak, highly weathered, micaceous.	
	SS 54	107	24-50/3"		Brown to Gray SANDSTONE (BEDROCK), moderate strong to strong, fine to medium grained, moderate to well cemented.	
					106.8 — 575.9	

Bottom of hole at 106.8 feet

Boring grouted to surface and monitoring well installed on 10/8/2015 in offset boring.

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

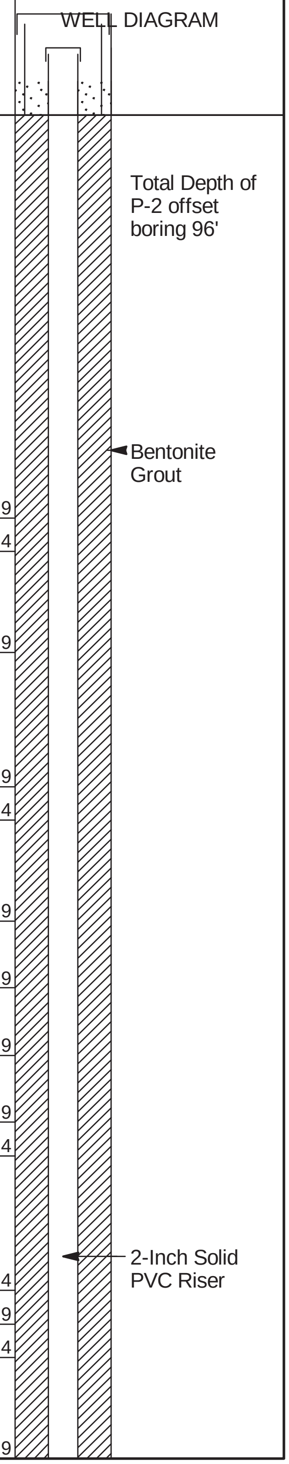
WELL NUMBER MW150 P

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia
DATE STARTED 11/3/15 **COMPLETED** 11/6/15
GROUND ELEVATION 691.86 ft **HOLE SIZE** 8.25"
DRILLINGCONTRACTOR AEP
TOP OF PVC ELEVATION 694.63 ft
DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon
GROUND WATER LEVELS:
LOGGED BY D. Follett **CHECKED BY** RAS
AT END OF DRILLING ---
LOCATION Northing: 484947.44 Easting: 1598889.64

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0–2	SS 1	83	8-14-13-22 (27)
2–4	SS 2	83	7-16-23-33 (39)
4–6	SS 3	88	3-16-14-24 (30)
6–8	SS 4	83	5-14-18-24 (32)
8–10	SS 5	83	3-13-19-36 (32)
10–12	SS 6	92	7-17-28-45 (45)
12–14	SS 7	92	4-21-27-40 (48)
14–16	SS 8	88	2-14-18-21 (32)
16–18	SS 9	100	3-12-14-36 (26)
18–20	SS 10	100	8-23-28-30 (51)

Depth (ft)	MATERIAL DESCRIPTION	Elevation (ft)
0.0–6.0	Dark Brown SILTY SAND (FILL), dry, loose to medium dense, medium to coarse grained, subrounded, moderately sorted, little subrounded gravel.	685.9
6.0–6.5	Dark Brown SILT (FILL), dry to moist, firm, few medium grained sand, subrounded, trace subrouned gravel, trace iron.	685.4
6.5–8.0	Dark Brown SILTY SAND (FILL), dry, loose to medium dense, medium to coarse grained, subrounded, moderately sorted, little subrounded gravel.	683.9
8.0–10.0	Brown SAND (FILL), dry, loose to dense, subrounded, well sorted, trace subrounded gravel.	681.9
10.0–10.5	Dark Brown CLAYEY SAND (FILL), moist, loose, medium grained, moderately sorted, subrounded, trace gravel.	681.4
10.5–12.0	Brown SAND (FILL), dry, loose to dense, subrounded, well sorted, trace subrounded gravel.	679.9
12.0–13.0	Dark Brown SANDY SILT (FILL), dry to moist, firm to hard, nonplastic, medium subrounded sand, trace fine to coarse subrounded gravel.	678.9
13.0–14.0	Brown SAND (FILL), dry, loose to dense, subrounded, well sorted, trace subrounded gravel.	677.9
14.0–15.0	Dark Brown SANDY SILT (FILL), dry to moist, firm to hard, nonplastic, medium subrounded sand, trace coarse subrounded gravel.	676.9
15.0–15.5	Brown SAND (FILL), dry, loose to dense, subrounded, well sorted, trace subrounded gravel.	676.4
15.5–17.5	Dark Brown SANDY SILT (FILL), dry to moist, firm to hard, nonplastic, medium subrounded sand, trace coarse subrounded gravel.	674.4
17.5–18.0	Brown SAND (FILL), dry, loose to dense, subrounded, well sorted, trace subrounded gravel.	673.9
18.0–18.5	Dark Brown SANDY SILT (FILL), dry to moist, firm to hard, nonplastic, medium subrounded sand, trace coarse subrounded gravel.	673.4
18.5–20.0	Brown SAND (FILL), moist, medium dense to dense, subrounded, well sorted, few fine to coarse subrounded gravel.	671.9

WELL DIAGRAM



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CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Top depth	MATERIAL DESCRIPTION	Elevation	WELL DIAGRAM
20	SS 11	92	6-10-10-15 (20)		Dark Brown SANDY SILT (FILL), dry to moist, firm to hard, nonplastic, medium subrounded sand, trace coarse subrounded gravel.		
				21.0	Dark Gray SILTY CLAY (FILL), dry to moist, firm, moderate plasitic, trace fine subrounded gravel.	670.9	
	SS 12	79	3-12-16-30 (28)	22.5	Brown SAND (FILL), wet, loose, subrounded, well sorted, few fine to coarse subrounded gravel.	669.4	
				23.0	Dark Brown GRAVELLY SAND (FILL), moist, medium dense to dense, medium to coarse grained, poorly sorted, fine subrounded gravel, some silt.	668.9	
				24.0	Dark Gray SILTY CLAY (FILL), dry to moist, firm, moderate plastic, trace fine to coarse subrounded gravel.	667.9	
25	SS 13	100	6-19-25-40 (44)	24.5	Dark Brown GRAVELLY SAND (FILL), moist, medium dense to dense, medium to coarse grained, poorly sorted, fine subrounded gravel, some silt, trace coal. Wet at 26'	667.4	
	SS 14	88	13-25-28-29 (53)	27.0	Dark Brown SANDY CLAY (FILL), moist, firm, moderate plastic, subrounded fine to coarse grained sand, trace subrounded gravel.	664.9	
				27.2	Dark Brown GRAVELLY SAND (FILL), moist, medium dense to dense, medium to coarse grained, poorly sorted, fine subrounded gravel, some silt, trace coal.	664.7	
	SS 15	92	4-14-27-40 (41)	28.0	Dark Brown SILT (FILL), dry to moist, firm, some fine grained sand, trace subrounded gravel.	663.9	
30				28.9	Brown SAND (FILL), moist, medium dense to dense, fine to coarse grained, moderately sorted, trace fine subrounded fine gravel. Wet at 30'	663.0	2-Inch Solid PVC Riser
	SS 16	96	10-14-27-45 (41)	31.0	Dark Brown SANDY SILT (FILL), dry to moist, hard to very hard, subrounded medium grained sand, few coarse subrounded gravel.	660.9	
	SS 17	55	26-50/5"	32.0	Dark Brown SANDY CLAY (FILL), moist, hard, moderate plastic, fine grained sand, trace gravel. Dark Gray SILTSTONE cobble stuck in bottom of spoon.	659.9	
35	SS 18	100	5-14-12-17 (26)	34.0	Light Brown to Dark Gray SILT (ML), dry, firm, light colored laminations, below 35' grades to dark gray silt, few coal stringers, some roots, trace clay, trace fine subrounded gravel.	657.9	
	SS 19	96	3-10-19-21 (29)	36.5	Tan SILTY CLAY (CL-ML), dry, hard, laminated with light gray silt, low plasticity, gradational contact.	655.4	
				37.5	Orange-Brown GRAVELLY SAND (SWG), dry, medium dense, fine to coarse grained, poorly sorted, subrounded, fine to coarse subrounded gravel, some clay.	654.4	
	SS 20	67	5-7-7-9 (14)	38.0	Dark Brown SILTY CLAY (CL-ML), dry, firm, low plasticity, trace subrounded coarse sand, trace subrounded gravel.	653.9	
				38.5	Orange-Brown GRAVELLY SAND (SWG), moist, loose, coarse grained, subrounded, moderately sorted, trace silt, few gray sandstone cobbles.	653.4	
40				40.0	Brown SILTY CLAY (CL-ML), dry to moist, firm, low plasticity, some subrounded coarse grained sand, trace subrounded gravel.	651.9	Bentonite Grout
	SS 21	92	2-7-8-11 (15)	40.5	Orange-Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted. At 42', little fine to coarse subrounded gravel.	651.4	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW150 P

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	SS 22	75	5-6-7-8 (13)
45	SS 23	83	3-4-6-8 (10)
	SS 24	92	2-2-4-5 (6)
	SS 25	92	4-2-4-7 (6)
50	SS 26	79	5-4-5-10 (9)
	SS 27	67	2-3-5-12 (8)
55	SS 28	92	7-11-18-35 (29)
	SS 29	92	13-25-19-21 (44)
	SS 30	75	5-16-22-42 (38)
60	SS 31	92	15-18-27-28 (45)
	SS 32	88	9-10-8-20 (18)
65	SS 33	88	8-6-7-9 (13)

Depth (ft)	MATERIAL DESCRIPTION	Elevation
	Orange-Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted. *(continued)* At 44', color change to brown.	
44.9		647.0
45.1	Dark Gray COAL, dry, hard, fissile, moist along fractures, trace plant fossils	646.8
	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted.	
46.0		645.9
46.3	Dark Brown SILTY SAND (SM), dry, loose, medium grained, subrounded.	645.6
	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted, coal stringers throughout.	
48.2		643.7
48.4	Dark Gray COAL, moist, soft.	643.5
49.0	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted, coal stringers throughout.	642.9
49.4	Dark Gray COAL, moist, soft.	642.5
50.0	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted, coal stringers throughout.	641.9
50.3	Dark Gray COAL, moist, soft.	641.6
50.6	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted, coal stringers throughout.	641.3
50.8	Dark Gray COAL, moist, soft.	641.1
52.5	Brown SAND (SW), moist, loose to medium dense, medium grained, subrounded, well sorted, coal stringers throughout. Below 52', wet, very loose.	639.4
	Brown SANDY GRAVEL (GWS), moist, loose to medium dense, subrounded, poorly sorted, some clay. At 56', some coarse gravel. At 58', loose to dense, fine to coarse gravel.	
60.0		631.9
	Brown GRAVELLY SAND (SWG), dry to moist, medium dense, subrounded to subangular, medium to coarse grained, moderately sorted, fine to coarse subrounded gravel.	
63.0		628.9
63.4	Light Brown SILT (ML), wet, firm, trace fine sand.	628.5
	Brown SAND (SW), moist, loose to medium dense, fine to coarse grained, subrounded, poorly sorted, few fine subrounded gravel.	
64.5		627.4
65.0	Brown SAND (SW), moist, loose, medium grained, well sorted.	626.9
	Brown GRAVELLY SAND (SWG), moist, loose, subrounded, medium to coarse grained, moderately sorted, trace silt.	

WELL DIAGRAM: 2-Inch Solid PVC Riser; Bentonite Grout

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION	WELL DIAGRAM
66.0 – 68.0 (Elev. 625.9 – 623.9)	SS 34	67	6-6-10-4 (16)	Light Brown SAND (SW) interbedded with GRAVELY SAND (SWG), moist, loose to medium dense, medium grained, well sorted, fine to coarse subrounded gravel intebeds 0.25' thick.	Bentonite Pellets
68.0 – 70.0 (Elev. 623.9 – 621.9)	SS 35	67	5-5-5-8 (10)	Brown SAND (SW), wet, loose, fine to coarse grained, poorly sorted, grades to little subrounded gravel below 69', trace silt.	
70.0 – 71.0 (Elev. 621.9 – 620.9)	SS 36	67	3-4-7-11 (11)	Brown GRAVEL (GW), wet, loose, subrounded, few subrounded coarse grained sand, few silt.	
71.0 – 72.0 (Elev. 620.9 – 619.9)				Brown SAND (SW), wet, loose, fine grained, well sorted, subrounded, trace coarse grained sand.	
72.0 – 72.5 (Elev. 619.9 – 619.4)	SS 37	67	6-3-3-6 (6)	Brown GRAVEL (GW), wet, subrounded, few, subrounded, coarse grained, sand, few silt.	
72.5				Brown SAND (SW), wet, loose, medium to coarse grained, subrounded, moderately sorted, trace silt.	
75	SS 38	67	4-4-5-9 (9)	74.2' to 74.4', coarse grained.	#5 Filter Sand
	SS 39	67	10-7-10-16 (17)	76.5' to 76.75', coarse grained.	
	SS 40	100	11-7-9-13 (16)		
80	SS 41	54	11-7-13-21 (20)	Below 80', medium grained.	2-Inch, 0.010-Inch Slotted Screen
	SS 42	71	7-8-14-26 (22)		
85	SS 43	58	10-9-14-14 (23)	Below 84', fine to medium grained, poorly sorted, trace fine to coarse gravel.	
	SS 44	67	8-7-13-19 (20)	At 88', limestone cobble.	

(Continued Next Page)

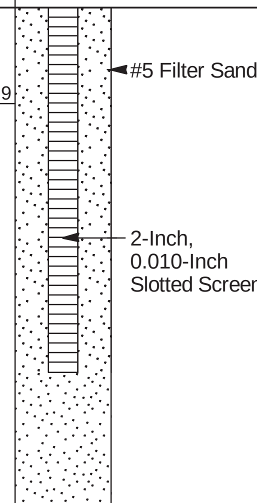
Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 45	50	12-8-8-12 (16)		Brown SAND (SW), wet, loose, medium to coarse grained, subrounded, moderately sorted, trace silt. *(continued)*
90					90.0 / 601.9
	SS 46	75	15-14-18-35 (32)		Brown GRAVELLY SAND (SWG), wet, medium dense to dense, fine to coarse grained, poorly sorted, subrounded, fine to coarse subrounded gravel, grades to fine grained sand.
	SS 47	75	18-17-17-33 (34)		
95	SS 48	71	20-26-29-30 (55)		
	SS 49	92	21-23-28-28 (51)		Below 96', coarse gravel, increased silt.
	SS 50	67	8-10-18-30 (28)		
100	SS 51	71	14-13-16-46 (29)		Below 100', decreased silt.
					102.0 / 589.9
	SS 52	83	5-9-14-23 (23)		Light Brown SAND (SW), wet, loose, very fine to fine grained, well sorted, subrounded.
					103.0 / 588.9
					Gray SAND (SW), wet, medium dense, medium to coarse grained, moderately sorted, subrounded, trace subrounded gravel, gradational contact.
					104.0 / 587.9
105	SS 53	63	8-11-16-25 (27)		Light Brown SAND (SW), wet, loose, very fine to fine grained, well sorted, subrounded.
					105.0 / 586.9
					Gray SAND (SW), wet, medium dense, coarse grained, well sorted, subrounded, trace subrounded gravel, gradational contact.
					106.0 / 585.9
	SS 54	21	22-17-13-15 (30)		Light Brown SAND (SW), wet, loose, very fine to fine grained, well sorted, subrounded.
110	SS 55	54	6-9-14-20 (23)		109' to 110', grades medium to coarse gained, trace gravel.
	SS 56	88	6-11-13-30 (24)		111' to 112', grades medium to coarse gained, trace gravel.

WELL DIAGRAM



(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW150 P

CLIENT American Electric Power

PROJECT NAME Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416

PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					Light Brown SAND (SW), wet, loose, very fine to fine grained, well sorted, subrounded. *(continued)* 112' to 114', loose to medium dense.	
	SS 57	54	4-7-11-20 (18)			
115	SS 58	88	5-14-39-30 (53)			
					115.5 — 576.4	
					Light Brown SILTY CLAY (CL-ML), moist, hard, low plasticity, trace subrounded gravel, limestone cobble in bottom of spoon.	
					116.0 — 575.9	
	SS 59	175	50/4"		116.2 — 575.7	
					Gray LIMESTONE (BEDROCK), wet, hard.	
					Bottom of hole at 116.4 feet	

Boring grouted to surface and monitoringwell installed on 11/6/2015 in offset boring.

WELL NUMBER MW1510 P 1

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia
DATE STARTED 11/9/15 **COMPLETED** 11/12/15
GROUND ELEVATION 678.01 ft **HOLE SIZE** 8.25"
DRILLINGCONTRACTOR AEP
TOP OF PVC ELEVATION 680.77 ft
DRILLING METHOD 4.25" I.D. HSA: Auto Hammer & Split Spoon
GROUND WATER LEVELS:
LOGGED BY D. Follett **CHECKED BY** RAS
AT END OF DRILLING ---
LOCATION Northing: 484569.80 Easting: 1599175.22

SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
SS 1	50	6-5-9-30 (14)
SS 2	83	15-12-19-33 (31)
SS 3	71	9-16-20-28 (36)
SS 4	100	8-13-16-23 (29)
SS 5	96	6-10-15-26 (25)
SS 6	100	10-11-14-12 (25)
SS 7	75	2-4-8-10 (12)
SS 8	79	4-5-5-8 (10)
SS 9	83	3-3-4-6 (7)
SS 10	88	3-4-3-5 (7)

DEPTH (ft)	MATERIAL DESCRIPTION	ELEVATION
0	Gray to Brown SILTY GRAVEL (FILL), dry, loose to dense, subangular to angular.	
3.0	Brown SILTY SAND (FILL), dry, medium dense to dense, fine grained, subrounded, little subrounded gravel.	675.0
5.0	Brown SAND (FILL), dry, medium dense, very fine to fine grained, subangular, well sorted, thinly bedded, trace fine subrounded gravel, trace coal.	673.0
6.0	Dark Brown SILTY SAND (FILL), dry, loose to medium dense, fine to medium grained, subrounded, poorly sorted, trace subrounded gravel.	672.0
9.0		669.0
9.1	Dark Brown SILTY CLAY (FILL), moist, firm, low plasticity, trace coal, moist to wet at 9'.	668.9
	Dark Brown SILTY SAND (FILL), dry, loose to medium dense, fine to medium grained, subrounded, poorly sorted, trace subrounded gravel.	
11.0	Gray SAND (FILL), wet, medium dense, fine grained, subrounded, well sorted, trace subrounded gravel.	667.0
11.8		666.2
12.0	Dark Gray COAL (FILL), moist, soft.	666.0
12.5	Gray SAND (FILL), moist, loose, fine grained, well sorted, subrounded.	665.5
13.0	Gray CLAYEY SAND (FILL), moist, loose, fine grained, trace coal, trace brick.	665.0
	Light Brown to Brown SAND (FILL), dry to moist, loose to medium dense, fine to coarse grained, subrounded to subangular, poorly sorted.	
14.0	Gray to Dark Gray SILTY SAND (FILL), moist, loose, fine to medium grained, subrounded, moderately sorted, some wood.	664.0
14.5	Light Brown SAND (SW), moist, loose, fine grained, subrounded, well sorted, trace fine subrounded gravel.	663.5
	Below 18', light brown to brown, dry to moist, bedded.	
20		

WELL DIAGRAM

Total Depth of P-1 offset boring 82'

Bentonite Grout

2-Inch Solid PVC Riser

(Continued Next Page)

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20	SS 11	88	4-2-3-5 (5)		Light Brown SAND (SW), moist, loose, fine grained, subrounded, well sorted, trace fine subrounded gravel. *(continued)*	
	SS 12	83	2-3-2-5 (5)			
25	SS 13	88	2-3-4-5 (7)		Below 25', coal stringers.	
	SS 14	96	3-3-5-6 (8)		27.0 — 651.0	
					27.5 Light Brown SILT (ML), dry, soft, trace sand. 650.5	
	SS 15	79	3-3-5-7 (8)		Light Brown SAND (SW), moist, loose, fine grained, subrounded, well sorted, trace fine subrounded gravel. 28.2' to 28.4', increased silt.	
30	SS 16	38	4-5-6-9 (11)			Bentonite Grout
	SS 17	75	3-4-8-22 (12)		33.5 — 644.5	
					34.0 Brown SILTY SAND (SM), dry to moist, loose to medium dense, fine grained, moderately sorted, little fine to coarse subrounded gravel. 644.0	
35	SS 18	75	12-22-31-38 (53)		Light Brown GRAVELLY SAND (SPG), dry to moist , medium dense to dense, medium grained, subrounded, well sorted, fine to coarse subrounded gravel.	
	SS 19	88	11-17-31-40 (48)			
	SS 20	88	10-24-29-47 (53)			
40	SS 21	96	19-27-33-45 (60)			2-Inch Solid PVC Riser
			10-17-15-			

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1510 P 1

CLIENT American Electric Power
PROJECT NAME Mitchell Electric Generating Plant
CEC PROJECT NUMBER 110-416
PROJECT LOCATION Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Top depth	MATERIAL DESCRIPTION	Elevation
	SS 22	79	22 (32)	43.5		634.5
					Light Brown SANDY GRAVEL (GWS), dry to moist, medium dense, fine, subrounded, medium grained sand.	
45	SS 23	83	5-3-13-23 (16)	44.5	Below 44', coarse gravel.	633.5
					Brown SILT (ML), moist to wet, soft, trace mica.	
				45.5	Light Brown SAND (SW), dry to moist, medium dense, medium grained, subangular to subrounded, well sorted.	632.5
	SS 24	83	10-9-17-22 (26)	46.0	Light Brown GRAVELLY SAND (SPG), dry to moist, loose to medium dense, subangular to subrounded, medium to coarse grained, modertaley sorted, fine to coarse gravel.	632.0
				47.0	Brown SILT (ML), moist, firm, bedded, trace mica.	631.0
				47.4	Light Brown GRAVELLY SAND (SPG), dry to moist, loose to medium dense, subangular to subrounded, medium to coarse grained, modertaley sorted, fine to coarse gravel.	630.6
	SS 25	83	7-11-12-17 (23)	49.0	Light Brown SAND (SW), dry, medium dense, medium grained, subrounded to subangular, well sorted, bedded, trace fine subrounded gravel.	629.0
50	SS 26	88	6-5-9-29 (14)	51.2	Brown SILT (ML), moist, firm, trace mica.	626.8
				51.6	Light Brown SAND (SW), dry, medium dense, medium grained, subrounded to subangular, well sorted, bedded, trace fine subrounded gravel.	626.4
	SS 27	88	6-3-15-22 (18)	52.5	Brown SILT (ML), moist to wet, firm, trace mica.	625.5
				53.0	Brown SAND (SW), moist to wet, medium dense, medium to coarse grained, subrounded, moderately sorted, trace fine subrounded gravel.	625.0
				54.3	Brown GRAVELLY SAND (SPG), moist, loose to medium dense, fine to medium grained, subrounded, moderately sorted.	623.8
55	SS 28	83	9-12-16-25 (28)	55.0	Gray SANDY GRAVEL (GWS), wet, medium dense, fine to coarse, subrounded, coarse grained sand.	623.0
	SS 29	92	7-14-17-18 (31)	57.0	Brown SAND (SW), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, few fine gravel.	621.0
				58.0	Gray SANDY GRAVEL (GWS), wet, medium dense, fine, subrounded, coarse sand.	620.0
	SS 30	88	10-8-9-13 (17)	59.0	Brown SAND (SW), wet, medium dense, medium grained, subrounded, well sorted.	619.0
				59.5	Brown SILT (ML), wet, firm, trace mica.	618.5
60				60.2	Gray SAND (SW), wet, loose, fine to coarse grained, poorly sorted, subrounded, trace subrounded gravel.	617.8
	SS 31	100	8-10-12-26 (22)	60.5	Brown SILT (ML), wet, firm, trace mica.	617.5
				60.8	Brown SAND (SW), wet, medium dense, medium to coarse grained, subrounded, moderately sorted.	617.3
	SS 32	100	15-8-13-14 (21)			
				64.7		613.3
65	SS 33	100	12-7-7-10 (14)	65.0	Gray SANDY GRAVEL (SPG), wet, loose, subrounded, coarse grained sand, gradational contact.	613.0

WELL DIAGRAM: Bentonite Grout; Bentonite Pellets; 2-Inch Solid PVC Riser; #5 Filter Sand; 2-Inch, 0.010-Inch Slotted Screen

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Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1510 P 1

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 34	67	7-6-13-22 (19)		Brown SAND (SW), wet, loose to medium dense, medium grained, subrounded, well sorted. *(continued)*	
	SS 35	75	10-12-14-23 (26)		Below 68', trace coarse subrounded gravel.	
70	SS 36	83	10-14-16-18 (30)		71.0 — 607.0 Brown GRAVELLY SAND (SWG), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, fine subrounded gravel.	2-Inch, 0.010-Inch Slotted Screen
	SS 37	83	9-14-23-37 (37)		Below 73', increased silt.	
					74.0 — 604.0 Dark Brown SILTY GRAVEL (GM), wet, loose, fine, subrounded. 74.4 — 603.6	
75	SS 38	75	7-18-23-35 (41)		Brown GRAVELLY SAND (SWG), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, fine subrounded gravel.	
	SS 39	63	31-33-23-17 (56)		Below 76', trace coal.	
	SS 40	96	14-17-20-28 (37)			
80	SS 41	79	16-19-18-21 (37)			#5 Filter Sand
	SS 42	87	14-18-22-50/5"		82' to 84', coarse gravel, sandstone fragments.	
85	SS 43	71	24-15-10-15 (25)			
	SS 44	71	11-12-16-24 (28)		86.0 — 592.0 Gray SAND (SW), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, trace subrounded gravel.	
					Below 88', brown to gray.	

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 Old Wilson Bridge Road, Suite 250
Worthington, OH 43085

WELL NUMBER MW1510 P 1

CLIENT American Electric Power **PROJECT NAME** Mitchell Electric Generating Plant

CEC PROJECT NUMBER 110-416 **PROJECT LOCATION** Bottom Ash Pond, Cresap, West Virginia

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 45	54	10-7-11-15 (18)		Gray SAND (SW), wet, medium dense, medium to coarse grained, subrounded, moderately sorted, trace subrounded gravel. *(continued)*	
90	SS 46	75	11-8-12-21 (20)		90' to 91', brown, medium to coarse grained. 91' to 92', brown, medium to coarse grained.	
	SS 47	92	12-12-19-26 (31)		Below 92', medium grained, well sorted.	
95	SS 48	83	32-11-11-23 (22)		94' to 94.5', coarse grained. 94.5' to 94.75', few silt.	
	SS 49	100	20-14-19-31 (33)		96' to 98', medium grained, well sorted, trace subrounded gravel.	
	SS 50	100	20-15-22-34 (37)		98' to 101', grades to fine to medium grained, some silt lens.	
100	SS 51	100	16-28-50/5"		101.0 577.0	
					Gray SANDSTONE (BEDROCK), wet, hard, very fine grained.	
	SS 52	0	50/4"		102.4 575.6	
					Bottom of hole at 102.4 feet	

Boring grouted to surface and monitoring well installed on 11/12/2015 in offset boring.

APPENDIX C

WELL DEVELOPMENT FIELD FORMS

WELL DEVELOPMENT FORM

MW-1504

Well # ~~BAP-1~~ DP

Diameter (in): 2

Initial Static DTW (ft): 70.69

Total Depth (ft): 96.98 soft

Casing Volume (g): 4.47

Date: 10/22/15-10/23/15

Developed By: Follett

Purge Method: Disposable Bailer (Stainless steel) / Grundfos

Total Gallons Removed: 20

Well Volumes Removed: 4.47

	Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
10/22/15	1330	Intial	—	—	—	>1000	70.69	Begin Bail From Bottom Surge w/ Bailer
	1405	5	—	—	—	>1000	71.07	Silt & fine sand in purge water
	1445	10	—	—	—	>1000	71.07	End Bail TD = 97.26. Silt & Fine Sand in Purge water
10/23/15	1040	10	—	—	—	>1000	70.72	TD = 97.26, begin Bail & Surge from Bottom
	1120	15	—	—	—	>1000	71.02	Silt & fine sand in purge water
	1152	20	—	—	—	>1000	71.03	TD = 97.42 End Bail

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WELL DEVELOPMENT FORM

MW-1504

Well #: ~~MW-1501~~ DF
Diameter (in): 2
Initial Static DTW (ft): 70.48
Total Depth (ft): 97.32
Casing Volume (g): 4.38

Date: 12/8/15 - 12/9/15
Developed By: Chelsea Fleming / Dave Follett
Purge Method: Disposable Bailer / Grundfos (circled)
Total Gallons Removed: 667.5
Well Volumes Removed: ~152.40

	Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
12/8/15	1420	Initial	7.21	15.9	1565	>1000	70.48	Pump On Rate 1.5GPM Pump set at 92'
	1500	45	7.10	16.1	1259	117	70.68	Pump set at 88'
	1600	135	7.06	15.9	1236	30.0	70.70	Pump set at 84'
	1640	195	7.07	15.8	1225	64.9	70.74	Pump off
12/9/15	0815	195	7.13	15.1	1241	>1000	70.51	Pump on, Rate 1.5 GPM, Pump Set at 91'
	0845	240	7.19	15.0	1259	170	70.69	Rate 2.0GPM
	0930	307.5	7.19	14.6	1203	31.9	70.65	set pump @ 88'
	0950	337.5	7.23	14.5	1215	12.7	70.65	set pump to 87'
	1030	397.5	7.29	14.4	1220	11.2	70.65	set pump to 86'
	1110	457.5	7.28	14.3	1230	9.1	70.65	set pump to 85'
	1140	502.5	7.29	14.2	1245	25.2	70.65	set pump to 84'
	1320	652.5	7.20	14.3	1250	11.1	70.65	set pump to 87'
	1325	660.0	7.18	14.3	1245	8.1	70.65	
	1330	667.5	7.22	14.3	1240	9.7	70.65	pump off
			7			~~8.8~~		

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* See MW-8 12-9-15 for cal info

* See P-2 12-8-15 for cal. info

WELL DEVELOPMENT FORM

Well #: ~~MW-1502 DA~~ MW-1505
Diameter (in): 2
Initial Static DTW (ft): 69.67
Total Depth (ft): 98.29
Casing Volume (g): 4.87

Cal
pH: 4.01 = 4.01
7.0 = 7.0
10.01 = 10.01
1413 us = 1413 us
10.0 Ntu = 9.5 Ntu

Date: 12/7/15
Developed By: Follett
Purge Method: ~~Disposable Bailer~~ / Grundfos
Total Gallons Removed: ~~DA 585.0~~ 765.0
Well Volumes Removed: ~~DA 120.12~~ 157.1

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
0928	Initial	6.96	18.3	1862	>1000	69.67	Pump In/Pump On Rate. 1.5 gal/min
0943	22.5	6.96	18.6	2020	601	69.68	Surged w/Pump
0958	45.0	—	—	—	—	—	Pump off
1041	45.0	7.00	18.3	1839	>1000	69.75	Pump On Rate 1.5 gal/min Pump top of Screen
1056	67.5	7.00	18.9	1885	927	69.87	
1126	112.5	7.00	18.8	1995	378	69.81	Rate 1.25 gal/min
1140	130.0	—	—	—	—	—	Pump placed middle of Screen/Pump off
1240	130.0	7.10	18.6	1994	>1000	~~[illegible]~~	Grundfos Pump Installed, pump on 1.25 GPM
1310	167.5	6.99	19.4	1981	382	69.81	Rate 1.75 GPM Pump set @ 90' TOC
1400	255.0	7.12	19.3	1983	332	69.84	Rate 2.0 GPM Pump set @ 83' TOC
1430	315.0	7.04	19.3	1994	590	69.87	Pump set at 86' TOC
1445	345.0	7.05	19.5	2010	>1000	69.87	
1500	405.0	7.04	19.8	1996	35	69.87	Pump set at 90'
1515	465.0	7.06	20.0	2000	>1000	69.87	
1530	525.0	7.04	19.7	2000	258	69.87	Pump set at 93'
1545	585.0	7.05	19.8	2000	>1000	69.87	

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WELL DEVELOPMENT FORM

Well #: ~~MW-1502~~ MW-1505 DA
Diameter (in): 2
Initial Static DTW (ft): 69.67
Total Depth (ft): 98.29
Casing Volume (g): 4.87

Date: 12/7/15
Developed By: Follett
Purge Method: Disposable Bailer / Grundfos (circled)
Total Gallons Removed: 765.0
Well Volumes Removed: 157.1

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1600	645.0	7.04	19.9	2010	379	69.88	Pump @ 90' TOC
1615	705.0	7.04	19.9	1996	617	69.88	Pump set @ 85' TOC
1630	765.0	7.05	19.8	1995	736	69.88	Pump off

WELL DEVELOPMENT FORM

Well # ~~BAP-2~~ DA MW-1505
Diameter (in): 2
Initial Static DTW (ft): 69.88
Total Depth (ft): 97.77 soft
Casing Volume (g): 4.74

Date: 10/30/15
Developed By: Follett
Purge Method: Disposable (Bailer) Grundfos — Stainless Steel
Total Gallons Removed: 20
Well Volumes Removed: 4.22

10/30/15

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
0900	Initial	—	—	—	>1000	69.88	Begin Bail from Bottom/Surge w/Bailer
0928	5	—	—	—	>1000	70.45	Silt & Fine Sand in Purge, end Bail
1153	5	—	—	—	>1000	69.91	Begin Bail from Bottom, Surge w/Bailer
1226	10	—	—	—	>1000	70.14	Silt & Fine Sand in purge
1253	15	—	—	—	>1000	70.08	〃 〃
1320	20	—	—	—	>1000	70.05	End Bail

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12-7-15 Calibration @ 0845
pH: 7.00 = 7.06
4.00 = 4.00
10.00 = 10.10
spec cond: 1413 = 1415
turb: 20.00 = 19.00

WELL DEVELOPMENT FORM

Well # ~~MW-1503~~ MW-1506 DA
Diameter (in): 2
Initial Static DTW (ft): 70.02
Total Depth (ft): 99.02
Casing Volume (g): 4.93

Date: 12/7/15
Developed By: Chelsea Fleming
Purge Method: Disposable Bailer / Grundfos / Hurricane
Total Gallons Removed: 505
Well Volumes Removed: ~~≈104.5~~ ≈102.43

29 x 0.17 = 4.93

Time	Purged (Gallons)	pH	(°C)	(uS)	Turb.	DTW	Comments
0925	Initial	7.58	17.0	1860	>1000	70.02	surged pump 1.25 gpm
0929	5.00	7.21	19.9	2400	>1000	70.13	↓
0934	10.00	7.16	19.3	1845	>1000	"	
0939	15.00	7.14	19.9	1754	>1000	"	
0944	20.00	7.15	20.0	1828	>1000	"	
0949	25.00	7.16	20.0	1840	>1000	"	pump stopped working; changed meter
1020	~~40.00~~ 35.00	4.70	18.0	1813	>1000	"	start pump again 1.00 gpm
1043	48.00	7.01	18.8	1819	533	"	
1055	60.00	7.03	18.6	2050	219	"	surge pump
1110	75.00	7.10	18.3	1818	87.0	"	surge pump
1125	90.00	7.12	18.9	2300	78.5	"	"
1140	105.00	7.13	18.9	1789	377	"	
1200	125.00	7.12	19.1	1787	20.8	"	
1240	165.00	7.12	18.8	1788	14.88	"	
1300	185.00	7.12	18.9	1791	7.88	"	remove Monsoon pump / install grundfos
1320	185.00	7.12	18.9	1800	>1000	"	

WELL DEVELOPMENT FORM

Well #: MW-1506 ~~MW-1503 DP~~
Diameter (in): 2
Initial Static DTW (ft): 70.02
Total Depth (ft): 99.02
Casing Volume (g): 4.93

Date: 12-7-15
Developed By: [signature]
Purge Method: Disposable Bailer / Grundfos Hurricane
Total Gallons Removed: 505
Well Volumes Removed: ~102.43

29 x 0.17 = 4.93

Time	Gallons Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1355	220	7.14	19.8	1780	31.2	70.13	
1410	235	7.14	19.9	1798	54.7	"	changed to 2 gallons
1420	255	7.11	19.8	1815	~~7~~540	"	
1450	315	7.14	19.8	1816	6.71	"	moved pump down 5'
1505	345	7.14	20.0	1791	281	"	
1525	385	7.14	20.0	1791	11.80	"	moved pump down 5'
1540	415	7.13	20.1	1793	>1000	"	lower pump 5'
1600	455	7.16	20.1	1787	196	"	
1610	475	7.14	20.1	1790	17.38	"	
1625	505	7.11	20.2	1791	16.99	"	pump off

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WELL DEVELOPMENT FORM

Well # ~~BAP-3 DP~~ MW-1506
Diameter (in): 2
Initial Static DTW (ft): 70.23
Total Depth (ft): 98.11 soft
Casing Volume (g): 4.74

Date: 10/26/15 - 11/5/15
Developed By: Follett
Purge Method: Stainless Steel / Disposable Bailer / Grundfos (circled: Bailer)
Total Gallons Removed: 20
Well Volumes Removed: 4.22

	Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
10/26/15	1205	Intal	—	—	—	>1000	70.23	Begin Bail from Bottom, Surge w/Bailer
	1256	5	—	—	—	>1000	70.51	Silt & Sand in purge water
	1325	10	—	—	—	>1000	70.64	End Bail TD=99.07
11/5/15	1115	10	—	—	—	>1000	70.24	TD=99.06, Begin Bail from Bottom
	1142	15	—	—	—	>1000	70.51	
	1214	20	—	—	—	>1000	70.50	TD=99.08, End Bail

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WELL DEVELOPMENT FORM

Well # ~~BAP-4OP~~ MW-1507
Diameter (in): 2
Initial Static DTW (ft): 70.91
Total Depth (ft): 97.17 soft
Casing Volume (g): 4.46

Date: 11/6/15
Developed By: Follett
Purge Method: Stainless steel / Disposable Bailer / Grundfos (Disposable Bailer circled)
Total Gallons Removed: 20
Well Volumes Removed: 4.48

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
11/6/15 0825	Initial	—	—	—	>1000	70.91	Begin Bail from Bottom, Surge w/ Bailer
0900	5	—	—	—	>1000	71.15	
0944	10	—	—	—	>1000	71.08	
1017	15	—	—	—	>1000	71.06	
1051	20	—	—	—	>1000	71.03	End Bail TD= 97.77

WELL DEVELOPMENT FORM

Well # ~~B-MW-1504~~ OF MW-1507
Diameter (in): 2
Initial Static DTW (ft): 70.69
Total Depth (ft): 97.78
Casing Volume (g): 4.42

97.78 end TD

Date: 12/8/15
Developed By: Chelsea Fleming / Dave Fillett
Purge Method: Disposable Bailer / Grundfos (circled)
Total Gallons Removed: 342.5
Well Volumes Removed: ~ 77.49

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
0820	Initial	6.87	17.6	2370	>1000	70.69	Pump on Rate 1.0 GPM
0840	10	7.04	18.2	2470	~~284~~ 1000	70.69	
0900	30	7.08	17.9	2390	>1000	70.69	
0910	40	7.05	18.0	2500	207	70.69	move pump up 5'
0930	60	7.06	18.1	2400	>1000	70.69	
0950	80	7.11	18.7	2490	370	70.69	Pump off
1020	80	7.17	18.7	2460	586	70.69	Pump on, Rate 1.0 GPM
1100	120	7.08	18.3	2520	>1000	70.69	Move pump down 5'
1135	155	7.07	18.4	2620	>1000	70.69	move pump down 5' (TOP 90.60)
1145	165	7.01	18.6	2620	187	70.69	turned pump up to 1.5 gpm
1225	225	7.03	18.4	2560	>1000	70.69	Move pump to 86'
1300	277.5	7.06	18.5	2580	43.9	70.69	
1315	300.0	7.04	18.5	2580	24.2	70.69	
1320	0327.5	7.07	18.6	2590	22.1	70.69	
1325	335	7.08	18.6	2590	21.9	70.69	
1330	342.5	7.06	18.6	2580	20.8	70.69	pump off

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See P-2 for Cal. Info

WELL DEVELOPMENT FORM

Well # MW-1508 ~~BAR 5~~ DP
Diameter (in): 2
Initial Static DTW (ft): 61.57
Total Depth (ft): 87.78 s.ft
Casing Volume (g): 4.46

Date: 10/22/15 - 11/11/15
Developed By: Follett
Purge Method: Stainless Steel Disposable Bailer / Grundfos
Total Gallons Removed: 30
Well Volumes Removed: 6.73

	Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
10/22/15	1530	Initial	—	—	—	>1000	61.57	Begin Bail From Bottom / Surge w/ Bailer
	1602	5	—	—	—	>1000	62.31	Fine sand & silt in Purge water
	1627	10	—	—	—	>1000	62.29	TD=89.12 End Bail
10/23/15	1222	10	—	—	—	>1000	61.57	TD=89.05 Begin Bail & Surge from Bottom
	1254	15	—	—	—	>1000	62.05	Fine Sand & Silt in purge water
	1321	20	—	—	—	>1000	62.07	TD=89.92 End Bail
11/11/15	1427	20	—	—	—	>1000	61.61	TD=89.82, Begin Bail from Bottom
	1455	25	—	—	—	>1000	62.03	
	1521	30	—	—	—	>1000	62.09	TD=89.95 End Bail

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