Cynthia Vodopivec
Dynegy Zimmer, LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

November 25, 2020

Sent via email

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

Re: Zimmer Power Station Revised Alternative Closure Demonstration

Dear Administrator Wheeler:

Dynegy Zimmer, LLC (Dynegy) submits this revised 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 three surface impoundments (Coal Pile Runoff, Gypsum Recycle Pond, and D Basin) located at the Zimmer Power Station near Moscow, Ohio. Dynegy's request seeks an extension pursuant to 40 C.F.R. § 257.103(f)(1) to allow the three impoundments to continue to receive CCR and non-CCR wastestreams after April 11, 2021, in order to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose as a non-CCR basin, and initiate closure of D Basin. As noted in our submission, the Coal Pile Runoff Pond and Gypsum Recycle Pond are eligible unlined CCR surface impoundments as defined under 40 C.F.R. § 257.53.

The enclosed demonstration prepared by Burns & McDonnell replaces the demonstration that was previously submitted by Dynegy to EPA on October 30, 2020. This demonstration 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. The demonstration is also available on Dynegy's publicly available website: https://www.luminant.com/ccr/

Sincerely,

Cynthia Vodopivec
VP - Environmental Health & Safety

Enclosure

cc: Kirsten Hillyer
Frank Behan
Richard Huggins

Zimmer CCR Surface Impoundments Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Dynegy Zimmer, LLC

William H. Zimmer Power Station
Project No. 122702

Revision 2
November 25, 2020

Zimmer CCR Surface Impoundments Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Prepared for

Dynegy Zimmer, LLC
William H. Zimmer Power Station
Project No. 122702

Moscow, Ohio

Revision 2
November 25, 2020

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Dynegy Zimmer, LLC
Zimmer CCR Surface Impoundments
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Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Ohio, that the information in this document as noted in the above Report Index was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Dynegy Zimmer, LLC or others without specific verification or adaptation by the Engineer.

Matthew D. Bleything, P.E.
Ohio License No. 82440

Date: 11/25/20

STATE OF OHIO
MATTHEW DAVID BLEYTHING
82440
REGISTERED
PROFESSIONAL ENGINEER

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
ASD	Alternate Source Demonstrations
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
CY	Cubic yards
Dynegy	Dynegy Zimmer, LLC
ELG	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	Environmental Protection Agency
FGD	Flue Gas Desulfurization
GCL	Geosynthetic Clay Liner
GWPS	Groundwater Protection Standards
HDPE	High Density Polyethylene
MGD	Million gallons per day
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SSI(s)	Statistically Significant Increases
SSL(s)	Statistically Significant Levels
SWPPP	Stormwater Pollution Prevention Plan
Zimmer	William H. Zimmer Power Station

EXECUTIVE SUMMARY

Dynegy Zimmer LLC (Dynegy) submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate retrofit or closure pursuant to 40 C.F.R. § 257.103(f)(1) for the three CCR surface impoundments located at the William H. Zimmer Power Station (Zimmer), including the Gypsum Recycle Pond, the Coal Pile Runoff Pond, and D Basin.

Zimmer is a single unit 1,450-megawatt coal-fired facility located in Moscow, Ohio. Zimmer utilizes the Gypsum Recycle Pond to collect FGD blowdown and non-CCR wastestreams from multiple sources prior to pumping this water to the site's Mercury Effluent Treatment System, where chemicals are injected to promote the settling of solids and key constituents in the downstream Coal Pile Runoff Pond. The D Basin is periodically used to receive dredging flows, including CCR and non-CCR material from other impoundments onsite. In order to comply with the requirements of the CCR Rule, Dynegy has elected to install an agitated tank and pumps to receive the CCR wastestreams currently routed to the Gypsum Recycle Pond and bypass the pond by diverting these CCR wastestreams directly to the Mercury Effluent Treatment System. Following this diversion, the Gypsum Recycle Pond will be closed by removal of CCR materials and repurposed as a non-CCR impoundment. The Mercury Effluent Treatment System discharge will be temporarily diverted to the D Basin while the Coal Pile Runoff Pond is retrofitted with a CCR-compliant liner system. Once the Coal Pile Runoff Pond retrofit is completed, the flows will be returned to this impoundment and the D Basin will be removed from service and closure will be initiated. This work is forecasted to be completed by the requested site-specific alternative compliance deadline of October 20, 2021.

1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the federal Coal Combustion Residual (CCR) Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fueled electric generating units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 *et seq.*).

On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to cease receipt of CCR and non-CCR waste and initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1), (b)(1) (85 Fed. Reg. 53,516 (Aug. 28, 2020)). Specifically, owners and operators of a CCR surface impoundment may seek and obtain an alternative closure deadline by demonstrating that there is currently no alternative capacity available on or off-site and that it is not technically feasible to complete the development of alternative capacity prior to April 11, 2021. 40 C.F.R. § 257.103(f)(1). To make this demonstration, the facility is required to provide detailed information regarding the process the facility is undertaking to develop the alternative capacity. 40 C.F.R. § 257.103(f)(1). Any extensions granted cannot extend past October 15, 2023, except an extension can be granted until October 15, 2024, if the impoundment qualifies as an "eligible unlined CCR surface impoundment" as defined by the rule. 40 C.F.R. § 257.103(f)(1)(vi). Regardless of the maximum time allowed under the rule, EPA explains in the preamble to the Part A rule that each impoundment "must still cease receipt of waste as soon as feasible, and may only have the amount of time [the owner/operator] can demonstrate is genuinely necessary." 85 Fed. Reg. at 53,546.

This document serves as Dynegy's Demonstration for a site-specific alternative deadline to initiate retrofit or closure pursuant to 40 C.F.R. § 257.103(f)(1) for the CCR surface impoundments at Zimmer, located in Moscow, Ohio, which include the following:

- Gypsum Recycle Pond
- Coal Pile Runoff Pond
- D Basin

The Gypsum Recycle Pond and Coal Pile Runoff are "eligible unlined CCR surface impoundments" as defined under 40 C.F.R. § 257.53. To obtain an alternative closure deadline under 40 C.F.R. § 257.103(f)(1), a facility must meet the following three criteria:

1. **§ 257.103(f)(1)(i) -** There is no alternative disposal capacity available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification;

2. **§ 257.103(f)(1)(ii) -** Each CCR and/or non-CCR wastestream must continue to be managed in that CCR surface impoundment because it was technically infeasible to complete the measures necessary to obtain alternative disposal capacity either on or off-site of the facility by April 11, 2021; and

3. **§ 257.103(f)(1)(iii) -** The facility is in compliance with all the requirements of the CCR Rule.

To demonstrate that the first two criteria above have been met, 40 C.F.R. § 257.103(f)(1)(iv)(A) requires the owner or operator to submit a work plan that contains the following elements:

- A written narrative discussing the options considered both on and off-site to obtain alternative capacity for each CCR and/or non-CCR wastestream, 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:
  - An in-depth analysis of the site and any site-specific conditions that led to the decision to select the alternative capacity being developed;
  - 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
  - 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.
- A detailed schedule of the fastest technically feasible time to complete the measures necessary for alternate capacity to be available, including a visual timeline representation. The visual timeline must clearly show all of the following:
  - How each phase and the steps within that phase interact with or are dependent on each other and the other phases;
  - All of the steps and phases that can be completed concurrently;
  - The total time needed to obtain the alternative capacity and how long each phase and step within each phase will take; and
  - At a minimum, the following phases: engineering and design, contractor selection, equipment fabrication and delivery, construction, and start up and implementation.
- A narrative discussion of the schedule and visual timeline representation, which must discuss the following:
  - Why the length of time for each phase and step is needed and a discussion of the tasks that occur during the specific step;
  - Why each phase and step shown on the chart must happen in the order it is occurring;
  - The tasks that occur during each of the steps within the phase; and
  - Anticipated worker schedules.

- 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.

To demonstrate that the third criterion above has been met, 40 C.F.R. § 257.103(f)(1)(iv)(B) requires the owner or operator to submit the following information:

- A certification signed by the owner or operator that the facility is in compliance with all of the requirements of 40 C.F.R. Part 257, Subpart D;
- 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:
  - Map(s) of groundwater monitoring well locations in relation to the CCR unit(s);
  - Well construction diagrams and drilling logs for all groundwater monitoring wells; and
  - Maps that characterize the direction of groundwater flow accounting for seasonal variations.
- Constituent concentrations, summarized in table form, at each groundwater monitoring well monitored during each sampling event;
- A description of site hydrogeology including stratigraphic cross-sections;
- Any corrective measures assessment conducted as required at § 257.96;
- Any progress reports on corrective action remedy selection and design and the report of final remedy selection required at § 257.97(a);
- The most recent structural stability assessment required at § 257.73(d); and
- The most recent safety factor assessment required at § 257.73(e).

2.0 WORKPLAN

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 non-CCR wastestreams that Dynegy plans to continue to manage in the three surface impoundments and discusses the options considered for obtaining alternative disposal capacity. As discussed in more detail below, **Dynegy has elected to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose as a non-CCR basin, and initiate closure of D Basin**. The workplan provides a detailed schedule for the retrofit 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 retrofit impoundments and an analysis of the adverse impact to plant operations if Dynegy were no longer able to use the CCR surface impoundments.

2.1 No Alternative Disposal Capacity and Approach to Obtain Alternative Capacity - § 257.103(f)(1)(iv)(A)(1)

Dynegy owns and operates Zimmer, a 1,450-megawatt coal-fired facility located in Moscow, Ohio. Zimmer has three CCR surface impoundments (listed in Table 2-1) that receive both CCR and non-CCR wastestreams. The other impoundments onsite (A Basin, B Basin, C Basin, Wastewater Pond and Clear Water Pond) are not authorized to receive CCR material and are not large enough to independently store and/or treat the total volume of the plant non-CCR wastestreams, and specifically coal pile runoff. An aerial view of the Zimmer site and the CCR surface impoundments can be found on Figure 1 in Appendix A, and the impoundments are also shown on the site water balance diagram on Figure 2 in Appendix A. Note, the Gypsum Recycle Pond (also referred to as the Truck Wash Pond) is denoted as the FGD Runoff Pond on the water balance.

Table 2-1: Zimmer CCR Surface Impoundment Summary

CCR Surface Impoundment Name	Alternate Designation (see Figure 2)	Year Placed in Service	Impoundment Size (acres) / Storage Volume (acre-feet)	Lined?	Meets Location Restrictions?	Groundwater Status
Gypsum Recycle Pond	SPD-4 Pond-4 Truck Wash Pond	1995	0.6 / 4.5	Yes[1]	Yes	Assessment Monitoring was initiated in May 2018 and is ongoing. No exceedances of Appendix IV parameters have been identified; therefore, an assessment of corrective measures is not required.
Coal Pile Runoff Pond	SPD-3 Pond-3 Coal Pile Runoff Pond	1987	2.8 / 36.3	Yes[1]	Yes	
D Basin	SPD-5 Pond-5 D Basin Dredge Dewatering Basin	2003	6.1 / 46.6	No	No[2]	

[1]Originally classified as lined per 40 C.F.R. § 257.71(a)(1)(i), which was subsequently vacated by the U.S. Court of Appeals for the D.C. Circuit. This impoundment now qualifies as an eligible unlined CCR surface impoundment per § 257.53.
[2]Meets criteria for wetlands, fault areas, seismic impact zones, and unstable areas but not aquifer separation.

2.1.1 CCR Wastestreams

Dynegy evaluated each CCR wastestream placed in the Zimmer CCR surface impoundments. The existing site water balance is included in Appendix A of this demonstration (see Figure 2). The Zimmer fly ash, economizer ash, and gas recirculation ash systems are dry handled and disposed in the CCR landfill onsite. The bottom ash (and non-CCR pyrites) is sluiced to dewatering bins equipped with surge tanks and a recirculation system. After dewatering, the bottom ash is disposed in the CCR landfill onsite. For the reasons discussed below in Table 2-2, each of the following CCR wastestreams must continue to be placed in the CCR surface impoundments due to lack of alternative capacity both on and off-site.

Table 2-2: Zimmer CCR Wastestreams

CCR Wastestream	Average Flow (MGD)	Description	Dynegy Notes
FGD Wastewater	0.337	The FGD system utilizes a series of thickeners with rakes and centrifuges to remove suspended solids and a magnesium recovery process to remove dissolved solids from the effluent. The Gypsum Recycle Pond receives centrate centrifuge effluent, FGD blowdown that is not recycled back to the scrubber, and mag thickener overflow (FGD wastewater). This pond effluent is forwarded to the Mercury Effluent Treatment System via the FGD area sump. Coal Pile Runoff Pond receives treated flow (including CCR solids) from the Mercury Effluent Treatment System. D Basin is used to dewater dredged CCR and non-CCR material from other ponds onsite (including Gypsum Recycle Pond and Coal Pile Runoff Pond).	The Gypsum Recycle Pond is integral to operation of the FGD and captures large portions of the wet-generated CCR solids from the centrate/mag thickener system overflows and various wash activities before having the water forwarded to the Mercury Effluent Treatment System. The Coal Pile Runoff Pond receives both coal fines from non-CCR wastestreams (specifically coal pile runoff) and the effluent from the Mercury Effluent Treatment System (including landfill leachate, FGD wastewater, and the CCR solids that settle out of the FGD wastewater). Based on the size of this impoundment, dredging (to D Basin) is required to remove CCR and non-CCR materials on a periodic basis to maintain the residence time and treatment capacity provided within the Coal Pile Runoff Pond.

Dynegy evaluated on-site, wet temporary storage options for the CCR wastestreams, in lieu of using the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin while permanent capacity is being developed. Based on our evaluation, we concluded the following:

- The FGD wastewater is currently comingled with non-CCR wastestreams in the Gypsum Recycle Pond and would require significant reconfiguration of piping and valves to segregate these flows and collect the FGD wastewater separately from the floor drains and trenches that collect wash water and other flows around the FGD areas (this segregation requires a bulk of the project schedule outlined later in this demonstration). Once isolated, this flow would need to be pumped to the Mercury Effluent Treatment System and then captured in another set of tanks for treatment to remove the solids. Dynegy estimates that approximately 65 frac tanks would be required to provide the necessary settling time, accounting for reduced settling capacity and reduced residence time due to solid accumulation. Frequent frac tank removal and replacement, due to solid build-up, would be required to maintain the settlement efficiency. Approximately one acre would be required to accommodate the installation of these frac tanks and allow for adequate space for frequent frac tank maintenance and replacement. Furthermore, environmental permitting would be required to install this temporary wet storage option including a general NPDES stormwater construction permit, a construction & operating permit, and a Stormwater Pollution Prevention Plan (SWPPP) at a minimum. The required reconfiguration, design, installation and associated environmental permitting of temporary wet storage would likely extend the overall compliance schedule. Based on the footprint and segregation of flows required and the potential for leaks from this system, Dynegy does not consider wet temporary storage of FGD wastewater to be technically feasible at Zimmer.

2.1.2 Non-CCR Wastestreams

Zimmer discharges non-contact cooling water, reclaim water, and cooling tower blowdown via Outfall 099, cooling tower overboard, sewage treatment plant, and south plant stormwater via Outfall 003, and sewage treatment flows and north plant stormwater via Outfall 004. The CCR surface impoundments, two other coal pile runoff ponds (A and B basins), a stormwater and river dredge pond (C Basin), and one low volume wastewater pond are used to manage all the remaining water process flows and stormwater on the plant site. These ponds are interconnected in series to allow for settling prior to overflowing to the Clear Water Pond for discharge to the Ohio River via Outfall 005. The existing site water balance is included in Appendix A of this demonstration (see Figure 2).

Dynegy evaluated each non-CCR wastestream placed in the Zimmer CCR surface impoundments. For the reasons discussed below in Table 2-3 and Table 2-4, each of the following non-CCR wastestreams must continue to be placed in the Gypsum Recycle Pond and Coal Pile Runoff Pond, respectively, due to lack of alternative capacity both on and off-site. The D Basin only receives wastestreams during dredging of other impoundments onsite.

Table 2-3: Zimmer Gypsum Recycle Pond Non-CCR Wastestreams

<table>
<tr><th>Non-CCR Wastestream</th><th>Average Flow (MGD)</th><th>Description</th><th>Dynegy Notes</th></tr>
<tr><td>Stormwater runoff</td><td>Intermittent (0.76 estimated for 10-year 24-hour storm)</td><td>Stormwater runoff from the FGD pad mix stackout pile</td><td rowspan="2">These flows are intermittent and collected in the impoundment via gravity drainage, where they comingle with CCR wastestreams listed in Table 2-2. Dynegy will need to employ temporary diversion measures to pump this water to the FGD stabilization area sump while the Gypsum Recycle Pond is being closed by removal. Once the CCR wastestreams are modified to bypass the Gypsum Recycle Pond and it has been closed by removal of CCR solids, it will be repurposed as a non-CCR basin and will continue to receive these flows.</td></tr>
<tr><td>Miscellaneous Process Wastewater</td><td>0.229</td><td>Includes wash water from the truck wash system and drainage from the FGD Waste Handling Building, Coal Conveyor 56E/W, and Fly Ash Silo (via the trench system)</td></tr>
</table>

Table 2-4: Zimmer Coal Pile Runoff Pond Non-CCR Wastestreams

<table>
<tr><th>Non-CCR Wastestream</th><th>Average Flow (MGD)</th><th>Description</th><th>Dynegy Notes</th></tr>
<tr><td>Coal Pile Runoff from A and B Basins</td><td>Intermittent (2.117 estimated for 10-year 24-hour storm)</td><td rowspan="2">Flow is pumped from the Basins to the Coal Pile Runoff Pond which overflows to the Wastewater Pond</td><td rowspan="3">These flows will be temporarily rerouted to D Basin until the pond retrofit project is complete. The D Basin effluent will need to be pumped to the Wastewater Pond. Rerouting flows will require installation of temporary piping.

If the Coal Pile Runoff Pond were bypassed, the Wastewater Pond residence time would likely not provide adequate treatment to remove the coal fines and Zimmer would risk violating the discharge limits at Outfall 005.</td></tr>
<tr><td>Decant water and stormwater from C Basin</td><td>Intermittent (0.835 estimated for 10-year 24-hour storm)</td></tr>
<tr><td>Decant water and stormwater from D Basin</td><td>0.09 (1.95 estimated for 10-year 24-hour storm)</td><td>Decant water flow is pumped from D Basin to the Coal Pile Runoff Pond during dredging operations and as needed due to stormwater</td></tr>
<tr><td>Landfill Leachate and Contact Stormwater</td><td>0.271 (0.967 estimated for 10-year 24-hour storm)</td><td>Routed through the Mercury Effluent Treatment System</td><td>The Mercury Effluent Treatment System discharge (including CCR and non-CCR wastestreams) will be redirected to the D-Basin through temporary piping during retrofit of the Coal Pile Runoff Pond.</td></tr>
</table>

Dynegy did evaluate on-site, wet temporary storage options for each of the non-CCR wastestreams, in lieu of using the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin while permanent capacity is being developed. Based on our evaluation, we concluded the following for each non-CCR wastestream:

- Stormwater runoff; wash water; and miscellaneous process wastewaters routed to the Gypsum Recycle Pond: These non-CCR wastestreams are currently comingled with CCR wastestreams in the Gypsum Recycle Pond and would require significant reconfiguration of piping and valves to segregate these flows. Dynegy estimates that approximately 95 frac tanks would be required to provide the necessary settling time, accounting for reduced settling capacity and reduced residence time due to solid accumulation. Approximately 1.5 acres would be required to accommodate the installation of these frac tanks and allow for adequate space for frequent frac tank maintenance and replacement. Furthermore, environmental permitting would be required to install this temporary wet storage option including a general NPDES stormwater construction permit, a construction & operating permit, and a SWPPP at a minimum. The required reconfiguration, design, installation and associated environmental permitting of temporary wet storage would extend the overall compliance schedule. Based on the footprint and segregation of flows required and the potential for leaks from this system, Dynegy does not consider wet temporary storage for these wastestreams to be technically feasible at Zimmer.
- Coal pile runoff from A and B Basins, decant water and stormwater from C Basin, and decant water and stormwater from D Basin are pumped to the Coal Pile Runoff Pond: These flows are heavily dependent on rainfall rates, but the current site discharge permit requires treatment of these wastestreams up to the peak runoff from a 10-year 24-hour storm event. The current Coal Pile Runoff Pond was designed to provide this treatment using 11 million gallons of storage and the associated residence time for these flows, and this treatment must be completed prior to placing the flow in the Wastewater Pond onsite. Dynegy estimates that approximately 525 frac tanks would be required to replace the treatment capacity of the Coal Pile Runoff Pond and provide the necessary settling time. Approximately 8 acres would be required to accommodate the installation of these frac tanks and allow for adequate space for frequent frac tank maintenance and replacement. Furthermore, environmental permitting would be required to install this temporary wet storage option including a general NPDES stormwater construction permit, a construction & operating permit, and a SWPPP at a minimum. The required reconfiguration, design, installation and associated environmental permitting of temporary wet storage would extend the overall compliance schedule. Based on the footprint required and the

potential for leaks from this system, Dynegy does not consider wet temporary storage for these wastestreams to be technically feasible at Zimmer.

- Landfill leachate and contact stormwater pumped to Mercury Effluent Treatment System/Coal Pile Runoff Pond: These non-CCR wastestreams are captured in a non-CCR impoundment before being comingled with CCR wastestreams in the Mercury Effluent Treatment System and discharged to the Coal Pile Runoff Pond. The CCR material settles out in the Coal Pile Runoff Pond before the treated water flows to the Wastewater Pond. An additional treatment system would be required if these flows were segregated and discharged directly to the Wastewater Pond in order to bypass the Coal Pile Runoff Pond. Furthermore, environmental permitting would be required to install this temporary treatment system including an NPDES permit modification (to segregate the streams at internal Outfall 626), a general NPDES stormwater construction permit, a construction & operating permit, and a SWPPP at a minimum. The required reconfiguration, design, installation and associated environmental permitting of temporary treatment would extend the overall compliance schedule. Based on the increased schedule associated with segregation of flows, new equipment lead times, and permitting, Dynegy has not elected to pursue segregated temporary treatment for these wastestreams at Zimmer.

2.1.3 Site-Specific Conditions Supporting Alternative Capacity Approach – § 257.103(f)(1)(iv)(A)(1)(i)

As shown on Figure 3 in Appendix A, Zimmer is bounded by the Ohio River to the west, the village of Moscow to the south, the Ohio River Scenic Byway (US Highway 52) to the east, and residential properties to the north. As illustrated on Figure 3, Zimmer has significant real estate constraints in close proximity to the plant and the existing impoundments (which is already congested with critical infrastructure and floodplain areas). There is available land onsite at Zimmer (see Figure 4 for entire property boundary); however, this space is across US Highway 52 and in areas of rough terrain. Due to the relatively small size of the Zimmer impoundments, a retrofit of these facilities is estimated to occur much faster than the design, permitting, and construction timeline associated with new impoundments located across the highway. Further, the remaining impoundments onsite (A Basin, B Basin, C Basin, Wastewater Pond and Clear Water Pond) are not authorized to receive CCR material and are not large enough to independently store and/or treat the total volume of the plant non-CCR wastestreams, specifically coal pile runoff. Consequently, in order to continue to operate and generate electricity, Zimmer must continue to use the Coal Pile Runoff Pond and Gypsum Recycle Pond for treatment of both CCR and non-CCR wastestreams until the Coal Pile Runoff Pond can be retrofitted and Gypsum Recycle Pond inflows can be rerouted. The D Basin must remain open to receive CCR wastestreams during these modifications and will be closed once these projects are completed.

2.1.4 Impact to Plant Operations if Alternative Capacity Not Obtained – § 257.103(f)(1)(iv)(A)(1)(ii)

Each CCR surface impoundment is essential to plant operations as noted in Table 2-2, Table 2-3, and Table 2-4. The CCR surface impoundments receive CCR flows and a portion of the non-CCR wastewater flows onsite. The other impoundments onsite (A Basin, B Basin, C Basin, Wastewater Pond and Clear Water Pond) are not authorized to receive CCR material and are not large enough to independently store and/or treat the total volume of the plant non-CCR wastestreams, and specifically coal pile runoff. If these impoundments were removed from service prior to the requested site-specific deadline to initiate closure, the plant would be forced to cease operation. Furthermore, many of the non-CCR wastestreams are sourced from storm events and would not be possible to cease routing to these impoundments before April 11, 2021, even if the plant were idled to develop alternative disposal capacity for these wastestreams.

Consequently, in order to continue to operate and generate electricity and meet the discharge permit requirements, Zimmer must continue to use the Gypsum Recycle Pond and Coal Pile Runoff Pond for treatment of both CCR and non-CCR wastestreams until the Coal Pile Runoff Pond can be retrofitted with a CCR-compliant liner system and new effluent tanks can be installed for storage and redirection of the Gypsum Recycle Pond CCR wastestreams. Zimmer must also continue to use the D Basin to receive intermittent CCR and non-CCR wastestreams until the necessary modifications can be completed for the other impoundments onsite.

2.1.5 Options Considered Both On and Off-Site to Obtain Alternative Capacity

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) ("[W]hile it is possible to transport dry ash off-site to [an] alternate disposal facility that is simply not feasible for wet-generated CCR. Nor can facilities immediately convert to dry handling systems."). Based on the following evaluation, Dynegy agrees with EPA in this assessment and confirms that off-site disposal alternatives are not an option for wet-generated CCR and non-CCR wastestreams at Zimmer. Off-site disposal of these sluiced CCR and non-CCR wastestreams would require both on-site temporary storage (as previously discussed in both Section 2.1.1 and 2.1.2) and significant daily tanker truck traffic. The required daily tanker trucks for each of the CCR and non-CCR sluiced wastestreams are summarized as follows:

- FGD Wastewater to Gypsum Recycle Pond (0.337 MGD): Approximately 45 daily trucks would be required, if a Publicly Owned Treatment Works (POTW) could be identified to receive it.
- Stormwater runoff to Gypsum Recycle Pond (0-0.76 MGD): Approximately 100 daily trucks would be required during rain events.
- Miscellaneous process wastewater to Gypsum Recycle Pond (0.229 MGD): Approximately 31 daily trucks would be required.
- Stormwater runoff from A and B Basins; decant water and stormwater from C Basin; and decant water and stormwater from D Basin directed to the Coal Pile Runoff Pond (0-4.902 MGD as shown in Table 2-4): Approximately 650 daily trucks would be required during rain events.
- Landfill leachate and contact stormwater directed to the Mercury Effluent Treatment System/Coal Pile Runoff Pond (0.271-0.967 MGD): Approximately 36 daily trucks would be required, increasing up to 130 daily trucks during rain events.

This tank traffic as well as the significant daily tanker truck volume for offsite disposal (total of 112 trucks per day during normal operations and over 950 trucks per day during rain events) would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a Prevention of Significant Deterioration (PSD) permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions is over the PSD limits. This increased traffic during rain events is also difficult to plan for and reliably perform in this location, regardless of whether suitable disposal locations can be identified. Setting up contractual arrangements for a local POTW to accept the wastewater would prove to be difficult since they also have to meet NPDES discharge limits. Therefore, most POTW's have their own permitting process to allow industry to discharge to their facilities, and they may be required to modify their NPDES discharge permit adding time to the overall compliance schedule. The potential for leaks/spills from the tank system or transportation of the wastewater offsite does exist. Furthermore, and as previously discussed in Section 2.1.1 and 2.1.2, the temporary wet storage needed to accommodate off-site disposal would require reconfiguration, design, installation, and associated environmental permitting that would extend the overall compliance schedule. Consequently, there are no feasible offsite-disposal options for the wet-generated wastestreams at Zimmer.

The current non-CCR impoundments onsite cannot receive CCR materials and cannot provide adequate residence time to treat the non-CCR wastestreams during rain events if the CCR impoundments were removed from service. The only feasible onsite alternatives involve continued use of the CCR surface impoundments for treatment of the flows prior to discharge. The remaining options considered for alternative disposal capacity of the wastestreams currently routed to the CCR surface impoundments are summarized in Table 2-5. Additional details on the CCR and non-CCR wastestreams included in this demonstration request are found in Table 2-2, Table 2-3, and Table 2-4, respectively.

Table 2-5: Alternatives for Disposal Capacity

Alternative Capacity Technology	Average Time to Construct (Months)[1]	Feasible at Zimmer?	Selected?	Dynegy Notes
Conversion to dry handling	33.8	Yes	No	The bottom ash and fly ash wastestreams are dry handled or high recycle rate systems compliant with EPA regulations and not currently routed to the unlined CCR surface impoundments onsite, thus this technology option would not address Zimmer's alternative capacity needs.
Non-CCR wastewater basin	23.5	Yes	No	A new non-CCR basin alone would not provide compliance due to the need to handle the FGD CCR wastestreams at the Zimmer site. Construction of a new non-CCR impoundment would take longer than the selected solution to retrofit the Coal Pile Runoff Pond and redirect the CCR wastestreams to bypass the Gypsum Recycle Pond.
Wastewater treatment facility	22.3	Yes	No	Construction of a new wastewater treatment facility would take longer than the selected solution to retrofit the Coal Pile Runoff Pond and redirect the CCR wastestreams to bypass the Gypsum Recycle Pond.
New CCR surface impoundment	31	No	No	Construction of a new CCR surface impoundment would take longer than the selected solution to retrofit the Coal Pile Runoff Pond and redirect the CCR wastestreams to bypass the Gypsum Recycle Pond.
Retrofit of a CCR surface impoundment	29.8	Yes	Yes	Dynegy plans to pursue this option for the Coal Pile Runoff Pond on a faster schedule than the average timeline identified by EPA.
Multiple technology system	39.1	Yes	Yes	In addition to retrofitting the Coal Pile Runoff Pond, Dynegy plans to reroute CCR flows away from the Gypsum Recycle Pond to a new collection tank. Once the Gypsum Recycle Pond is closed by removal, the pond will be repurposed as a non-CCR basin.

Alternative Capacity Technology	Average Time to Construct (Months)[1]	Feasible at Zimmer?	Selected?	Dynegy Notes
Temporary treatment system	Not defined	No	No	The Coal Pile Runoff pond provides residence time for treatment of the surges from rain events with over eleven million gallons of storage. Dynegy has chosen to focus on implementing the necessary measures for the selected technologies described above rather than try to develop temporary solutions for treatment of the remaining CCR and/or non-CCR wastestreams. Refer to Sections 2.1.1, 2.1.2, and 2.1.5 for further discussion on temporary wet storage options for both CCR and non-CCR wastestreams. Mobilizing a temporary clarifier system or other similar treatment systems would take longer than the remaining schedule to redirect the wastestreams and retrofit the ponds.

[1]From Table 3. *See* 85 Fed. Reg. at 53,534.

2.1.6 Approach to Obtain Alternative Capacity

Dynegy installed monitoring wells in 2015 and performed background groundwater sampling between December of 2015 and July of 2017. During this time, several engineering firms assisted Dynegy in preparing the required CCR compliance documentation which Dynegy posted on its public CCR website. Key information is summarized in Table 2-1. The D Basin was certified as an unlined impoundment; however, the Coal Pile Runoff Pond and the Gypsum Recycle Pond were originally classified as lined per 40 C.F.R. § 257.71(a)(1)(i), which was subsequently vacated by the U.S. Court of Appeals for the D.C. Circuit. Accordingly, pursuant to 40 C.F.R. § 257.101(a)(1), these three ponds are now required to cease receiving CCR and non-CCR flows by April 11, 2021 and either complete a retrofit or initiate closure by that date.

In February of 2020, Dynegy hired Burns & McDonnell to evaluate the impacts to the plant from both the proposed CCR Rule and proposed ELG Rule changes and provide potential compliance options. The potential options examined for CCR Rule compliance included the following:

- Option A: Retrofit Coal Pile Runoff Pond and Gypsum Recycle Pond with a composite liner, removing solids from D Basin and abandoning in place. Install a concrete pad for geotextile tube layout during future dredging efforts. These tubes would receive dredge flows, capture the solids, and the pad would capture the decant water which would be returned to the Coal Pile Runoff Pond.

- Option B: Include Option A scope and retrofit D Basin with a composite liner and a drainage collection layer to support future dredging efforts in place of the concrete pad solution.
- Option C: Include Option A scope without the concrete pad. Future dredging efforts would involve alternate measures such as mobile filter presses or temporary liners for geotextile tube laydown areas.
- Option D: Install a composite liner in the D Basin and the Gypsum Recycle Pond, reroute the flows from the Mercury Effluent Treatment System to the retrofitted D Basin, and clean out the Coal Pile Runoff Pond. The Coal Pile Runoff Pond would no longer be considered a CCR impoundment and would remain in service as a process wastewater pond. Future dredging efforts would be performed similar to Option C; however, the frequency of this dredging is expected to be significantly reduced based on the larger size of D Basin.
- Option E: Reroute the centrate centrifuge effluent and magnesium thickener effluent directly to the Mercury Effluent Treatment System (bypassing the Gypsum Recycle Pond), remove solids from the Gypsum Recycle Pond and close the Gypsum Recycle Pond in accordance with the CCR Rule and construct a non-CCR impoundment in its place, temporarily direct the Mercury Effluent Treatment System effluent to D Basin, retrofit the Coal Pile Runoff Pond with a composite liner, and close the D Basin.

Dynegy investigated the possibility for meeting the alternate liner demonstration allowed under the proposed Part B Rule; however, Dynegy has since elected to proceed with modifying plant operations and retrofitting the Coal Pile Runoff Pond at Zimmer. Dynegy has selected the Option E approach, which includes removal of CCR material and relocation of the CCR flows away from the Gypsum Recycle Pond to allow for Dynegy to close the pond and repurpose the pond as a non-CCR impoundment, retrofit of the Coal Pile Runoff Pond, and closure of the D Basin (once the retrofit of the Coal Pile Runoff Pond is completed). This selection was based on comparison of capital cost, O&M cost, and several business factors. The proposed retrofit project would include the following general scope and sequence:

- Relocate the CCR wastestreams from the Gypsum Recycle Pond:
  - Install a 20,000-gallon agitated tank to receive the magnesium thickener overflow and a set of pumps to pump this water directly to the Mercury Effluent Treatment System through 3,300 feet of new 6” HDPE piping
  - Install 3,300 feet of new 3” HDPE piping to direct the effluent from the centrate system to the Mercury Effluent Treatment System

- Isolate the Coal Pile Runoff Pond to allow for retrofit:
  - Temporarily reroute flows from the Mercury Effluent Treatment System to D Basin. Once the CCR solids are removed, the remaining water can be discharged to the Wastewater Pond.
  - Temporarily route flows from A, B, and C Basins to D Basin, and from D Basin to the Wastewater Pond. This activity allows for storm surges to be contained in the D Basin prior to routing flow to the Wastewater Pond, minimizing impacts to the residence time of that pond.
- Dewater the Coal Pile Runoff and Gypsum Recycle Ponds (removing any free water to the Wastewater Pond)
- Remove any remaining CCR material and other sediment from the ponds. The material will be temporarily staged within the ponds (or the adjacent stackout pad for the Gypsum Recycle Pond) to further dewater prior to being loaded onto trucks for transport to the onsite CCR Landfill.
- Retrofit the Coal Pile Runoff Pond pursuant to the retrofit criteria in 40 C.F.R. § 257.102(k):
  - Remove the existing bottom liner system (3-feet of clay) by excavating and hauling the material to the onsite CCR Landfill.
  - Install a composite liner system including a geosynthetic clay liner (GCL) overlain by a 60-mil high-density polyethylene (HDPE) geomembrane.
  - Install geotextile, 12 inches of crushed rock over the pond bottom, and 15 inches of riprap over the pond slopes.
- Return the Mercury Effluent Treatment System discharge, as well as the discharge from the A, B, and C Basins, to the Coal Pile Runoff Pond and initiate closure of the D Basin. The closure of D Basin is not considered part of this Demonstration, as it will occur after the requested site-specific alternative deadline to initiate closure.
- Close the Gypsum Recycle Pond by removing CCR material in accordance with 40 C.F.R. § 257.102(c). Then repurpose the pond as a non-CCR surface impoundment which will receive stormwater, wash water, and other low-volume wastewater. The new non-CCR surface impoundment discharge will likely bypass the Mercury Effluent Treatment System and be routed directly to the Wastewater Pond.

2.1.7 Technical Infeasibility of Obtaining Alternative Capacity

The Coal Pile Runoff Pond and Gypsum Recycle Pond are “eligible unlined CCR surface impoundments,” and thus were not previously subject to closure. Dynegy began its selected compliance project execution for Zimmer with scoping studies in early 2020 and is in the process of procuring engineering services for detailed design for the preferred compliance approach. Consequently, it is not possible to implement the measures discussed above in a way that would likely be successful by April 11, 2021.

The conditions at Zimmer demonstrate that no alternative disposal capacity is available on-site or off-site, satisfying the requirement of 40 C.F.R. § 257.103(f)(1)(i), and Dynegy respectfully requests a site-specific extension of the deadline to initiate closure of the CCR surface impoundments until the date on which those actions are expected to be completed. Dynegy will need until October 20, 2021 to reroute the CCR wastestreams away from the Gypsum Recycle Pond, complete the closure of the Gypsum Recycle Pond, retrofit the Coal Pile Runoff Pond, and to cease routing all CCR and non-CCR flows to D Basin and initiate its closure.

2.1.8 Justification for Time Needed to Complete Development of Alternative Capacity Approach – § 257.103(f)(1)(iv)(A)(1)(iii)

The schedule for developing alternative disposal capacity is described in more detail in Sections 2.2 and 2.3. The following milestones are critical to the requested Zimmer site-specific alternative deadline of October 20, 2021:

- For the Coal Pile Runoff Pond, Dynegy is pursuing completion of the retrofit by the requested date. This retrofit will require approximately two and a half months of construction (August – October 2021).
- For the Gypsum Recycle Pond, Dynegy is pursuing completion of the CCR wastestream rerouting, the closure by removal efforts, and repurposing this unit as a non-CCR impoundment by the requested date. This construction effort will require just over four months to complete (June-October 2021), primarily associated with the installation of the new agitated tank, pumps, and piping that will be delivered to the site next summer.
- Dynegy will cease receipt of all wastestreams directed to the D Basin by the requested date. These wastestreams cannot be ceased until the Coal Pile Runoff Pond retrofit is completed, and all flows are redirected from D Basin to the retrofitted Coal Pile Runoff Pond.

The installation of temporary wet storage for each of the CCR and non-CCR wastestreams, in lieu of using the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin while permanent capacity is being developed, is not technically feasible based on the required real estate, amount of piping that would be required, volume of the wastestreams, and need for frequent tank removal and replacement due to solids accumulation. In addition, the installation of temporary tanks or new impoundments would take more time than Dynegy's requested schedule to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose this unit as a non-CCR basin, and initiate closure of D Basin. Consequently, Dynegy affirms that the requested schedule represents the fastest technically feasible timeframe for compliance at Zimmer, and these durations are consistent with EPA's assessment that 4-12 months accurately reflects the amount of time needed to retrofit a small surface impoundment. *See* 85 Fed. Reg. at 53,529. The expected milestones for progress are summarized in Table 2-6 below.

Table 2-6: Retrofit Project Progress Milestones

Year or Progress Reporting Period	Status	Milestone Description	Dynegy Notes
2020	Completed	Evaluate retrofit scenarios, choose preferred option, initiate design	Dynegy has initiated design of the selected solution
April 30, 2021	Scheduled	Complete detailed design for the Coal Pile Runoff Pond Retrofit and Gypsum Recycle Pond CCR wastestream reroutes and award equipment contracts for new tank/pumps. Concurrently, apply for Dam Safety Permit and State Water Pollution Control Construction / Operating permit	All pond modification construction is forecasted to be completed within this calendar year
October 20, 2021	Scheduled	Bid/award pond modification construction contract. Receive Dam Safety Permit, State Water Pollution Control Construction / Operating permits, and General NPDES Permit for Storm Water Discharges from Construction Activities and Stormwater Pollution Prevention Plan. Complete reroute of CCR wastestreams to effluent tanks and close Gypsum Recycle Pond by removal, complete retrofit of Coal Pile Runoff Pond.	Dynegy is projecting that reroute activities for the Gypsum Recycle Pond can be completed, the Coal Pile Runoff Pond retrofit construction can be completed, and the flow of CCR and non-CCR wastestreams to D Basin can cease as of October of 2021

2.2 Detailed Schedule to Obtain Alternative Disposal Capacity - § 257.103(f)(1)(iv)(A)(2)

The required visual timeline representation of the schedule is included in Appendix B of this demonstration and described further in Section 2.3 below.

2.3 Narrative of Schedule and Visual Timeline - § 257.103(f)(1)(iv)(A)(3)

The third section for the workplan is a "detailed narrative of the schedule and the timeline discussing all the necessary phases and steps in the workplan, in addition to the overall timeframe that will be required to obtain capacity and cease receipt of waste." 85 Fed. Reg. at 53,544. As EPA explained in the preamble to the Part A rule, this section of the workplan must discuss "why the length of time for each phase and step is needed, including a discussion of the tasks that occur during the specific stage of obtaining alternative capacity. It must also discuss the tasks that occur during each of the steps within the phase." 85 Fed. Reg. at 53,544. In addition, the schedule should "explain why each phase and step shown on the chart must happen in the order it is occurring and include a justification for the overall length of the phase" and the "anticipated worker schedule." 85 Fed. Reg. at 53,544. EPA notes the overall "discussion of the schedule assists EPA in understanding why the time requested is accurate." 85 Fed. Reg. at 53,544.

This section of the demonstration is focused on the remaining work necessary to obtain alternate disposal capacity for the CCR and non-CCR wastestreams and complete the modifications to the two CCR surface impoundments (the Gypsum Recycle Pond and Coal Pile Runoff Pond) at Zimmer prior to initiating closure of the D Basin. Based on the estimated durations shown in the schedule in Appendix B, the impoundment modifications will likely only require one construction season for completion. The following paragraphs outline the scope required for the retrofit of each impoundment.

Design and Permitting Activities: Dynegy has awarded an engineering contract for design of the retrofit for the Coal Pile Runoff Pond and flow modifications to support closure of the Gypsum Recycle Pond so the area may be repurposed as a non-CCR basin. Dynegy has included one month for preliminary design to confirm specification requirements and begin coordination with the necessary permitting authorities, followed by four months for the selected engineering firm to prepare the retrofit plan (per § 257.102(k)(2)) and the bid documents. This is based on typical preparation and review time for the technical documents, lead time for the equipment submittals, and includes Dynegy development of the commercial terms for the construction contract. Once the bid documents are ready to be issued, the construction contract will be bid and awarded. Dynegy has assumed the bid period will be three weeks long and that it will take two weeks to evaluate bids and select the preferred contractor and another four weeks to negotiate the commercial terms for award of the contract. This detailed design phase will be performed concurrently with acquiring the construction/operating permits and the general NPDES stormwater construction permit, dam safety permit modifications (if required), and developing a Stormwater Pollution Prevention Plan, for this project.

<u>Equipment Procurement:</u> Dynegy will procure the new shop-fabricated tank and pump skid(s) necessary to route the magnesium thickener overflow to the Mercury Effluent Treatment System. Based on Burns & McDonnell experience on similar projects, the shop fabricated tank and pumps are expected to have a lead times of 21 and 28 weeks from contract award to delivery, respectively. The specifications will be prepared within one month of selecting the engineering firm, will be bid out over a three-week period, and will be awarded within one month of receiving bids. The design submittals should be received within one month of contract award, allowing the engineering design of the foundations and power supply systems to be completed approximately two months after contract award. The equipment should be onsite in the Summer of 2021 as shown in Appendix B.

<u>Gypsum Recycle Pond Activities:</u> The durations shown on the project schedule are estimates by Burns & McDonnell and are based on an average work schedule of five ten-hour days per week, are subject to delays from periods with significant rain events or from impoundment/CCR dewatering impacts, and are based on the following scope of work which must be performed in the sequence listed below:

- Contractor shall order necessary materials and mobilize to the site. The lead time for the piping materials are shown on the Appendix B schedule and are based on Burns & McDonnell estimates for this scope of work.
- Contractor shall construct the foundation for the new tank and pump skid. This can be completed once the contractor is onsite and the necessary materials have been received. Three weeks were allotted for preparing subgrade, form work, rebar, and pouring this foundation. Burns & McDonnell has assumed that deep foundations and piling will not be required for this equipment.
- Contractor will construct the long runs of HDPE piping for the centrate system effluent and the magnesium thickener effluent. These lines are each approximately 3,300 feet in length and will require fusion of the piping, trenching, and backfill operations. This work is anticipated to require 3 months of effort. It can be started prior to having the tank and pumps in place and available, but not until the initial deliveries of pipe material are completed. The current schedule shows the trenching efforts beginning one month after the pipe material is ordered and two weeks before the final pipe deliveries are completed.
- Contractor will set the tank and pump skid(s) following (1) construction of the foundation and (2) delivery of the equipment.

- Contractor will install the pipe from the current thickener effluent system to the new tank and from the tank to the new pump skids. The Contractor will also install raceway and cable for the new pump and agitator power feeds. These activities are based on one-month durations and are not on the critical path for the project. They cannot be completed until the equipment is set in place.
- Once the tank, pumps, piping, and power systems are installed, the Contractor can start up the new system and divert the CCR wastestreams away from the Gypsum Recycle Pond. The remaining non-CCR wastestreams are intermittent and will continue to be routed to the pond.
- Contractor shall remove the free water and any remaining CCR material and other sediment from the impoundment and haul this material to the Zimmer Landfill.
    - It's estimated approximately 800 cubic yards (CY) of CCR material will be removed from the pond, which should be able to be completed in a single work week with allowance for the pond bottom to be washed down and visually inspected by Dynegy's Consultant to confirm CCR material has been removed. It was assumed the existing concrete liner (approximately 3,100 square yards) will remain in place.
    - Since the impoundment is currently not exceeding a groundwater protection standard, the closure of this impoundment should be complete once the CCR material has been removed (per the standard outlined in § 257.102(c)). The pond footprint will remain and serve as a new non-CCR surface impoundment which will continue to receive intermittent stormwater and low volume wastewater flows.

<u>Coal Pile Runoff Pond Retrofit Activities:</u> The durations shown on the project are estimates by Burns & McDonnell and are based on an average work schedule of five days per week, are subject to delays from periods with significant rain events or from impoundment/CCR dewatering impacts, and are based on the following scope of work which must be performed in the sequence listed below:

- Contractor shall order necessary materials and mobilize to the site. This requires geosynthetic materials as necessary to complete the project scope as well as valves and piping for the water redirection efforts.
- Contractor shall temporarily reroute A, B, and C Basin discharges to D Basin and reroute the D Basin discharge to the Wastewater Pond. This will require the addition of valves and temporary piping to relocate these streams.
- Contractor shall redirect flow from the Mercury Effluent Treatment System to D Basin so that CCR solids from the Coal Pile Runoff Pond may be captured in D Basin during the retrofit activities. Excess water will be pumped to the Wastewater Pond for discharge.

- Contractor shall remove the free water and then remove any CCR material, sediment, and the 3-foot clay liner from the impoundment, and haul and place this material at the Zimmer Landfill.
  - This schedule duration is based on the Contractor removing approximately 24,000 CY of material. The pond bottom will be visually inspected by Dynegy's Consultant to confirm CCR material and bottom liner have been removed. Five days were included in the schedule for the inspection activities to be performed. Once approved, the subgrade will be prepared for the liner placement.
- Contractor shall install a GCL over the sides and floor of the Coal Pile Runoff Pond and secure it in a perimeter anchor trench. Contractor shall install a 60-mil HDPE geomembrane liner directly over the GCL and secure it in a perimeter anchor trench. This will occur at the same time as the GCL placement, lagging slightly behind it but overlapping. Consequently, these activities are shown on the same timeline in Appendix B.
  - This schedule duration is based on the Contractor placing approximately 2.7 acres of material (two layers total) as well as a few days to complete construction quality assurance testing for the geomembrane liner.
- Contractor shall install geotextile fabric over the HDPE geomembrane liner. Again, approximately 2.7 acres of material will be placed. This work must be completed following completion and inspection of the GCL and HDPE liners. Over the fabric layer, Contractor will install at least 12 inches of crushed rock over the pond bottom (approximately 1,700 CY) and 15 inches of riprap over the pond slopes (approximately 2,200 CY).
- The Contractor shall pump off stormwater as necessary from the Coal Pile Runoff Pond to D Basin during construction. This is an ongoing activity that will be required following each rain event during the construction period. Consequently, it is not shown on the construction schedule.
- Once the crushed rock and riprap layers are installed and any remaining punch list items are closed out, Dynegy will post the required notification of retrofit completion and resume operation of the Coal Pile Runoff Pond. Dynegy may then initiate closure of the D Basin.

2.4 Progress Towards Obtaining Alternative Capacity - § 257.103(f)(1)(iv)(A)(4)

In the preamble to the final Part A rule, EPA explains that this "section [of the workplan] must discuss all of the steps taken, starting from when the owner or operator initiated the design phase all the way up to the current steps occurring while the workplan is being drafted." 85 Fed. Reg. at 53,544. The discussion also "must indicate where the facility currently is on the timeline and the processes that are currently being undertaken at the facility to develop alternative capacity." 85 Fed. Reg. at 53,545.

Dynegy has made progress toward preparing a strategy for creating alternative disposal capacity for the CCR and non-CCR wastestreams at Zimmer. Dynegy has evaluated alternatives, selected a retrofit scenario, and initiated the required design and permitting coordination activities for this project. The remaining activities are provided in Appendix B and summarized in Table 2-6.

3.0 DOCUMENTATION AND CERTIFICATION OF COMPLIANCE

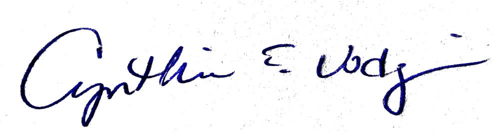
To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(1)(iii) has been met, the following information and submissions are submitted pursuant to 40 C.F.R. § 257.103(f)(1)(iv)(B) to demonstrate that the Zimmer facility is in compliance with the CCR Rule, including the following CCR units:

- Gypsum Recycle Pond
- Coal Pile Runoff Pond
- D Basin
- CCR Landfill

3.1 Owner's Certification of Compliance - § 257.103(f)(1)(iv)(B)(1)

In accordance with 40 C.F.R. § 257.103(f)(1)(iv)(B)(1), I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for Zimmer, the facility is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. Zimmer's CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

DYNEGY ZIMMER, LLC



Cynthia Vodopivec
VP - Environmental Health & Safety
November 25, 2020

3.2 Visual Representation of Hydrogeologic Information - § 257.103(f)(1)(iv)(B)(2)

Consistent with the requirements of § 257.103(f)(1)(iv)(B)(2)(i) – (iii), Dynegy has attached the following items to this demonstration:

- Map(s) of groundwater monitoring well locations in relation to the CCR units (see Attachment C1 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Figure 2 for the CCR Landfill)

- Well construction diagrams and drilling logs for all groundwater monitoring wells (see Attachment C2 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Attachment A for the CCR Landfill)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (see Attachment C3 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Figures 3 and 4 for the CCR Landfill)

3.3 Groundwater Monitoring Results - § 257.103(f)(1)(iv)(B)(3)

Tables summarizing constituent concentrations at each groundwater monitoring well through the first 2020 semi-annual monitoring period are included as Attachment C4. Samples were taken for the second 2020 semi-annual monitoring period, but results are still under review.

3.4 Description of Site Hydrogeology - § 257.103(f)(1)(iv)(B)(4)

A description of site hydrogeology and stratigraphic cross-sections of the site are included as Attachment C5. In addition, see the Hydrogeological Characterization Report (Section 4.2) for relevant information pertaining to the CCR Landfill.

3.5 Corrective Measures Assessment - § 257.103(f)(1)(iv)(B)(5)

Background sampling began at Zimmer in late 2015 and continued for eight consecutive quarters. The first semi-annual detection monitoring samples were collected in November 2017. The first assessment monitoring samples were collected in May 2018. The results, through the first 2020 semi-annual monitoring period, indicate all three CCR surface impoundments at Zimmer are currently in assessment monitoring, with no exceedances of the Appendix IV parameters.

The CCR Landfill has previously detected Lithium at Statistically Significant Levels (SSL), but the CCR Landfill remains in assessment monitoring due to successful Alternate Source Demonstrations (ASDs) from April and October 2019 that set forth the following lines of evidence.

1. Strontium isotopic ratios in groundwater near the CCR Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters.
2. Boron isotopic ratios in groundwater near the CCR Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters.

The most recent groundwater sampling event in April 2020 also identified an SSL for Lithium at well MW-F. In accordance with the Statistical Analyses Plan, this well was resampled and after an evaluation of the analytical data, no SSL remained as set forth in an ASD completed in October 2020 The ASDs for the Zimmer Landfill are included as part of Attachment C4.

Accordingly, an assessment of corrective measures and the associated remedy selection efforts are not currently required at the site.

3.6 Remedy Selection Progress Report - § 257.103(f)(1)(iv)(B)(6)

As noted above, an assessment of corrective measures and the resulting remedy selection efforts are not currently required for the CCR units at Zimmer.

3.7 Structural Stability Assessment - § 257.103(f)(1)(iv)(B)(7)

Pursuant to § 257.73(d), the initial structural stability assessment reports for the Coal Pile Runoff Pond, Gypsum Recycle Pond, and D Basin were prepared in October 2016, and are included as Attachment C6. As required for compliance, additional stability assessments will be completed in October 2021. Periodic structural stability assessments are not required for landfills.

3.8 Safety Factor Assessment - § 257.103(f)(1)(iv)(B)(8)

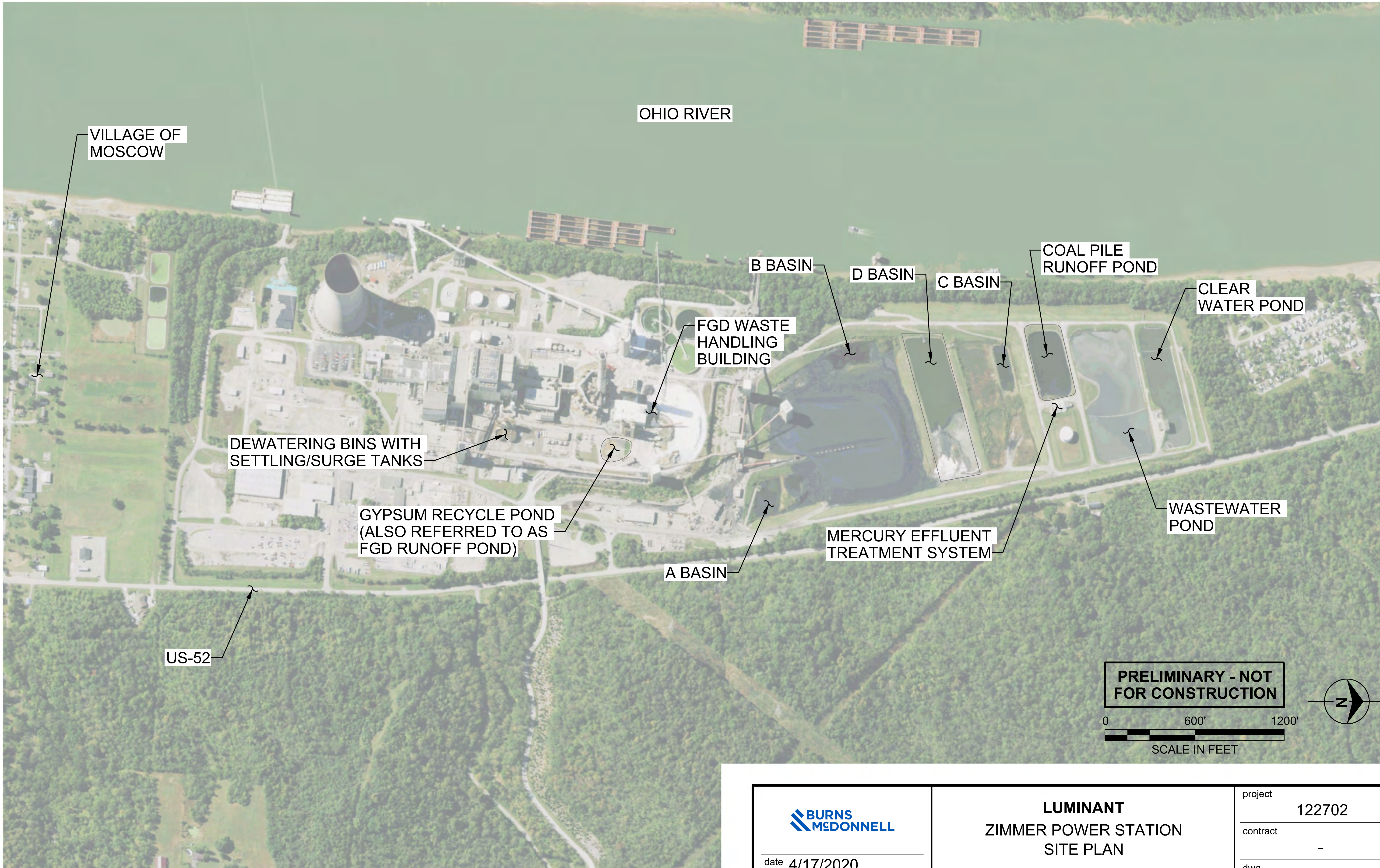
Pursuant to § 257.73(e), the initial safety factor assessment reports for the Coal Pile Runoff Pond, Gypsum Recycle Pond, and D Basin were prepared in October 2016, and are included as Attachment C7. As required for compliance, additional safety factor assessments will be completed in October 2021. Periodic safety factor assessments are not required for landfills.

4.0 CONCLUSION

Based upon the information submitted in this demonstration, the CCR surface impoundments at Zimmer qualify for a site-specific alternative deadline for the initiation of closure as allowed by 40 C.F.R. § 257.103(f)(1).

Therefore, Dynegy requests that EPA approve the demonstration and grant an alternative deadline of October 20, 2021 to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose as a non-CCR basin, and initiate closure of D Basin in accordance with the CCR Rule. As discussed previously, this date is subject to delays from weather during construction or from challenges in CCR material removal and dewatering. Dynegy will update EPA on the project and any potential schedule impacts as part of the semi-annual progress reports required at 40 C.F.R. § 257.103(f)(1)(x), and if a need for a later compliance deadline is determined, Dynegy will seek additional time as described in 40 C.F.R. § 257.103(f)(1)(vii).

APPENDIX A – SITE PLANS AND WATER BALANCE DIAGRAM



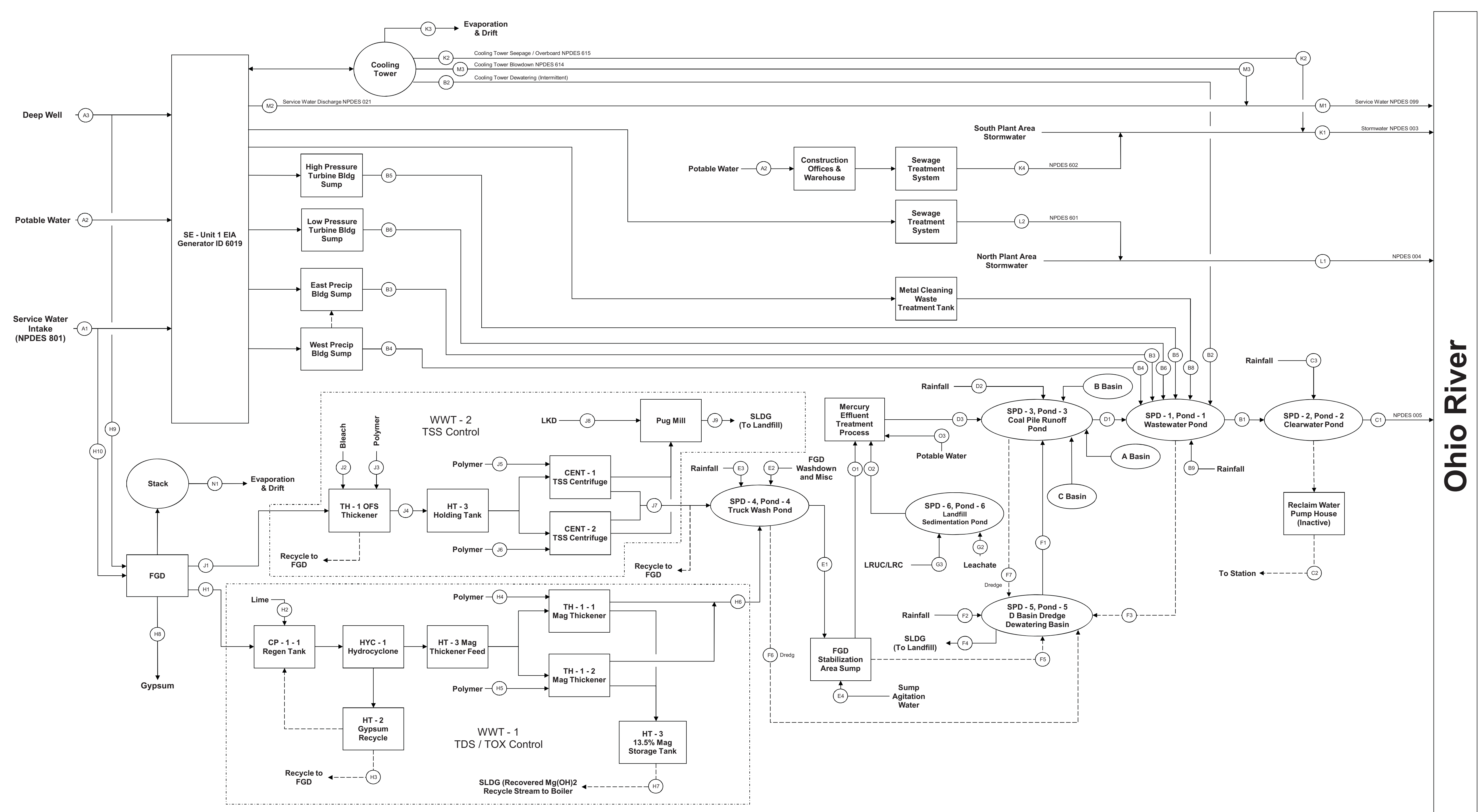
BURNS McDONNELL

date 4/17/2020
designed A. MYERS

LUMINANT
ZIMMER POWER STATION
SITE PLAN

project 122702
contract -
dwg **FIGURE 1** -

4/17/2020 \\bmcd\dfs\Clients\ENR\VistraEnergy\122702_ALTuseDisposal\Design\Civil\Dwgs\Sketches\Zimmer_Figure1 - Conversion.dgn



Flow Label	Block Diagram Name	Station Name	MGD Avg[1] / Max[2]	Flow Data Avg
A1	NPDES801	Service Water Intake (Ohio River)	36.5	36,500,000 GPD 343 DPY
A2	Potable Water	Tate - Monroe Water Association	0.032 / 0.300	32,000 GPD 365 DPY
A3	Deep Well	Station Well Water	1.85	1,850,000 GPD 365 DPY
	SPD - 1, Pond - 1	Wastewater Pond		
B1	Pond - 1 - EFF	Wastewater Pond Discharge	4.29 / 13.85	4,293,000 GPD 365 DPY
B2		Cooling Tower Dewatering (Intermittent)	0 / 2.88	0 GPD
B3	FDW	Sump - East Precipitator[3]	1.44 / 2.41	1,442,000 GPD 340 DPY
B4	FDW	Sump - West Precipitator[3]		Not used during testing
B5	AHCW/FDW	Sump - HP Turbine[3]	1.72 / 2.93	1,720,000 GPD 340 DPY
B6	IXW/FDW	Sump - LP Turbine (Waste Collect Tank)[3]	0.169 / 1.058	169,000 GPD 340 DPY
B8	HAUL	Metal Cleaning Waste Tank (Not Used)		Inactive
B9	GR	Rainfall	0.03 / 1.02	30,000 GPD 126 DPY
	SPD - 2, Pond - 2	Clearwater Pond		
C1	Pond-2-EFF / NPDES 005	Discharge to Ohio River	5.22 / 14.40	5,216,000 GPD
C2		Reclaim Water Pump House		Inactive
C3		Rainfall	0 / 0.55	0 GPD
	SPD - 3, Pond - 3	Coal Pile Runoff Pond		
D1	Pond - 3 - EFF	Gravity Flow to Wastewater Pond	0.934	934,000 GPD 365 DPY
D2		Rainfall (Pond Area)	0.00 / 0.31	0 GPD
D3		Mercury Treatment System to CPR Pond	0.844	844,000 GPD 365 DPY

Flow Label	Block Diagram Name	Station Name	MGD Avg[1] / Max[2]	Flow Data Avg
	SPD - 4, Pond - 4	Truck Wash Pond		
E1	Pond - 4 - EFF	Truck Wash Pond to Sump	0.566 / 0.782	566,000 GPD 340 DPY
E2	FDW	FGD Washdown and Misc.	0.229	160 GPM 340 DPY
E3	GPR	Rainfall / Gypsum Pile Runoff	0 / 0.76	0 GPD
E4		Sump Agitation Water		
	SPD - 5, Pond - 5	D Basin		
F1	Pond - 5 - EFF	D Basin Sump to Coal Pile Runoff	0.09 / 1.95	90,000 GPD 126 DPY
F2	CPR	Coal Pile Rainfall	0 / 6.01	0 GPD
F3	SLDG	Dredge Sludge from WW Pond		128,000 WTPY
F4	SLDG / LANDF	Dewatered Sludge		59,482 WTPY
F5		FGD Sump to Basin		
F6		Dredge Sludge from Truck Wash Pond		
F7		Dredge Sludge from Coal Pile Runoff Pond		
	SPD - 6, Pond - 6	Landfill Sedimentation Pond		
G2	LEACH	Leachate Collection[3]	0.193 / 0.239	193,000 GPD 365 DPY
G3	LRG / LRUC	Landfill Runoff	0.20016	200,160 GPD 126 DPY
		Wastewater Treatment Systems		
H1	WWT - 1 / SCRBP	Influent - Regen Tank from CRW Bleed[3]	0.296 / 0.353	296,000 GPD 340 DPY
H2		Lime - Regen Tank[3]	0.076 / 0.096	76,000 GPD 340 DPY
H3	RECYC - Gypsum	Recovered Gypsum	0.048	33 GPM 340 DPY
H4		Polymer - Mag Thickener		0.432 GPD 340 DPY
H5		Polymer - Mag Thickener		0.432 GPD 340 DPY
H6	WWT - 1 - EFF	Effluent from Mag Thickener Overflow[3]	0.262 / 0.336	262,000 GPD 340 DPY
H7	RECYC - SLDG - MGOH2	Sludge from Mag Thickener Underflow	0.360	42 GPM 340 DPY
H8	Gypsum	Gypsum (Total Produced)[4]	0.040	40,000 GPD 340 DPY5
			-	566,600 WTPY
H9		Gypsum Cake Wash and Pump Seal Water	0.360	250 GPM 340 DPY
H10		FGD Makeup	5.303	1,940 GPM 340 DPY

Flow Label	Block Diagram Name	Station Name	MGD Avg[1] / Max[2]	Flow Data Avg
J1	WWT2 / SCRBP	Influent - OFS Thickener from Gypsum Clarifier[3]	0.457 / 0.471	457,000 GPD 340 DPY
J2		Bleach - Thickener	0.079	55 GPM 150 DPY
J3		Polymer - Thickener		180 LB/DAY 323 DPY
J4		Feed Tank - Centrifuge[3]	0.100 / 0.400	100,000 GPD 240 DPY
J5		Polymer - Centrifuge		298 LB/DAY 230 DPY
J6		Polymer - Centrifuge		298 LB/DAY 230 DPY
J7	WWT - 2 - EFF	Effluent - Centrifuge Centrate (Normally Recycled)[3]	0.075 / 0.243	75,000 GPD / 240 DPY
J8		LKD		60 TPD 240 DPY
J9	LANDF	Sludge - Pug Mill		350 TPD 240 DPY
K1	NPDES 003 / SW/YARDW	Stormwater Outfall - South Plant Area+615+602		34,400 GPD 10 DPY
K2	NPDES 615	Cooling Tower Seepage / Overboard		34,400 GPD 10 DPY
K3	EVAP	Cooling Tower Evaporation and Drift	15.5	15,500,000 GPD 340 DPY
K4	NPDES 602	Sanitary Construction Offices		400 GPD 365 DPY
L1	NPDES 004 / SW/YARDW	Stormwater Outfall - Main Plant Area+601	0.002	2,080 GPD 365 DPY
L2	NPDES 601	Sanitary Main Plant	0.002	2,080 GPD 365 DPY
M1	NPDES 099 / SW	Service Water Outfall Includes NPDES 021, 614	15.5	15,500,000 GPD 343 DPY
M2	NPDES 021	Service Water Discharge	12.1	12,100,000 GPD 343 DPY
M3	NPDES 614 / CTB	Cooling Tower Blowdown	3.37	3,300 GPM 17 HPD 270 DPY
M4	NPDES 625	Reclaim Water		Inactive
N1		Boiler and Stack Evaporation	4.55	4,553,000 GPD 340 DPY
O1		FGD Sump to Mercury Treatment System[3]	0.566 / 0.782	566,000 GPD 340 DPY
O2		Landfill Sump to Mercury Treatment System[3]	0.271 / 0.967	271,000 GPD 126 DPY
O3	Potable Water	Tate - Monroe Water Association	0.0072	5 GPM 365 DPY

EPA and Station Abbreviations
AHCW - Air Heater Cleaning Water
CPR - Coal Pile Runoff
CTB - Cooling Tower Blowdown
EFF - Effluent
EVAP - Evaporation
FDW - Floor Drain Wastewater
GPR - Gypsum Pile Runoff
GR - General Runoff
HAUL - Hauled Off Site for Disposal
IXW - Ion Exchange Wastewater
LANDF - On Site Landfill
LEACH - Leachate
LKD - Lime Kiln Dust
LRC - Landfill Runoff - Capped Landfill
LRUC - Landfill Runoff - Uncapped Landfill
MGD - Million Gallons per Day
MGOH2 - Magnesium Hydroxide
OFS - Inerts
RECYC - Recycle Flow
SCRBP - FGD Scrubber Purge
SLDG - Sludge
SW - Discharge to Surface Water
WTPY - Wet Tons per Year
YARDW - Yard Drain Wastewater

no.	date	by	ckd	description
A	5/24/17	DKE	KAB	Initial Issue
B	10/13/17	ZSF	AAE	Updated with Flow Data
C	9/24/18	DKE	BDH	Updated logo

NOTES:

1. Average flows are based on 30 day average.
2. Max flows are based on 10 year, 24 hour rain event.
3. Average and max flows of streams highlighted in grey were updated based on BMcD flow survey data.
4. Gypsum average daily water flow rate assumes previous value of 566,600 WTPY, at 10% moisture and 340 DPY.
5. Flow diagram is intended to depict plant typical daily flows and usage. Flow rates shown in diagram are not intended to balance. (Total flow in ≠ Total flow out)

PRELIMINARY

BURNS McDONNELL

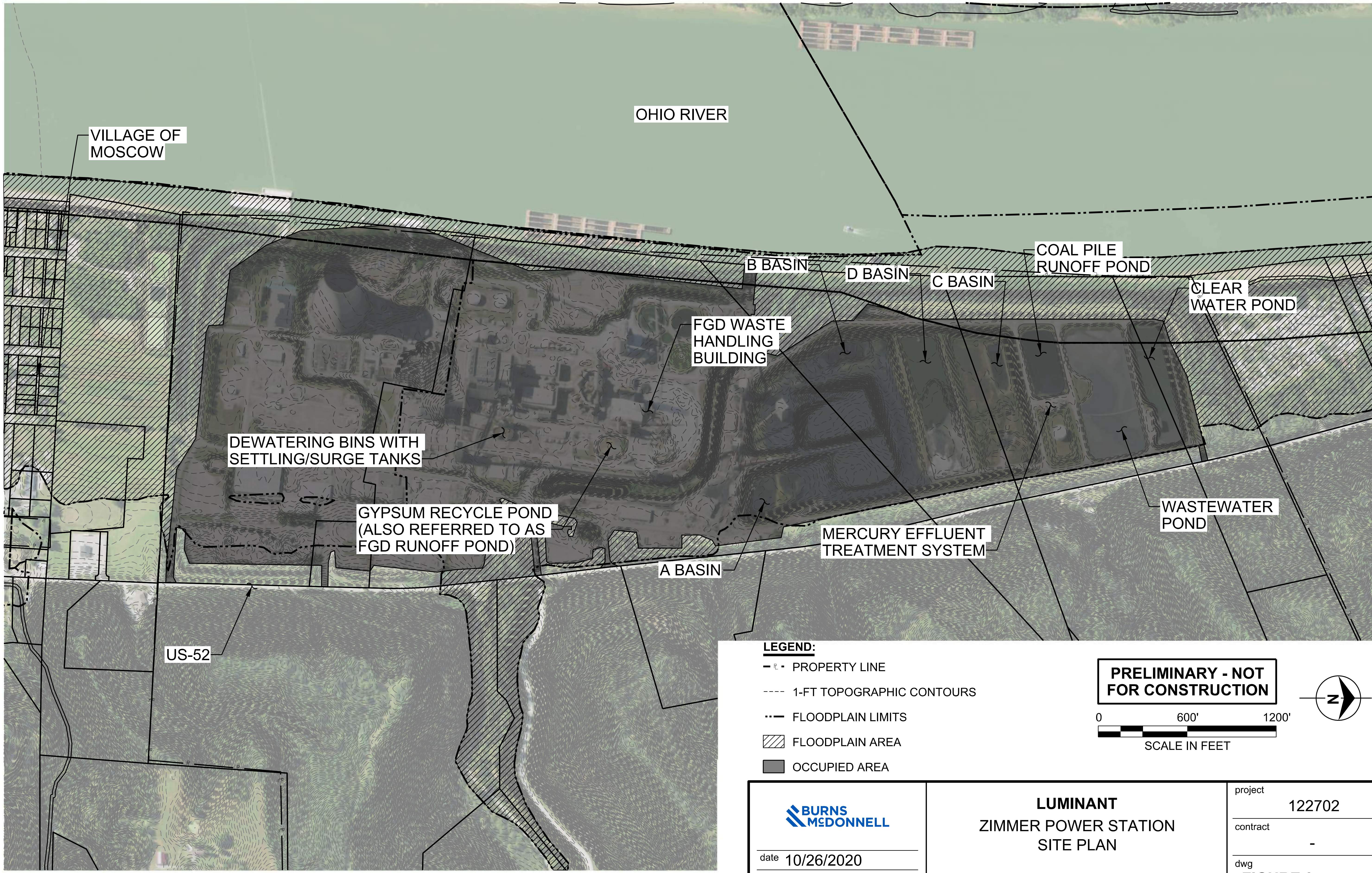
date 5/23/2017 | detailed D. Elliott
designed D. Elliott | checked K. Bland

Luminant

Dynegy
Zimmer Station
Plant Water Flow Diagram

project 99477 | contract
drawing WMB-01 | --- | rev. C
sheet 1 of 1 sheets
file

FIGURE 2



BURNS McDONNELL

date 10/26/2020

designed A. MYERS

LUMINANT

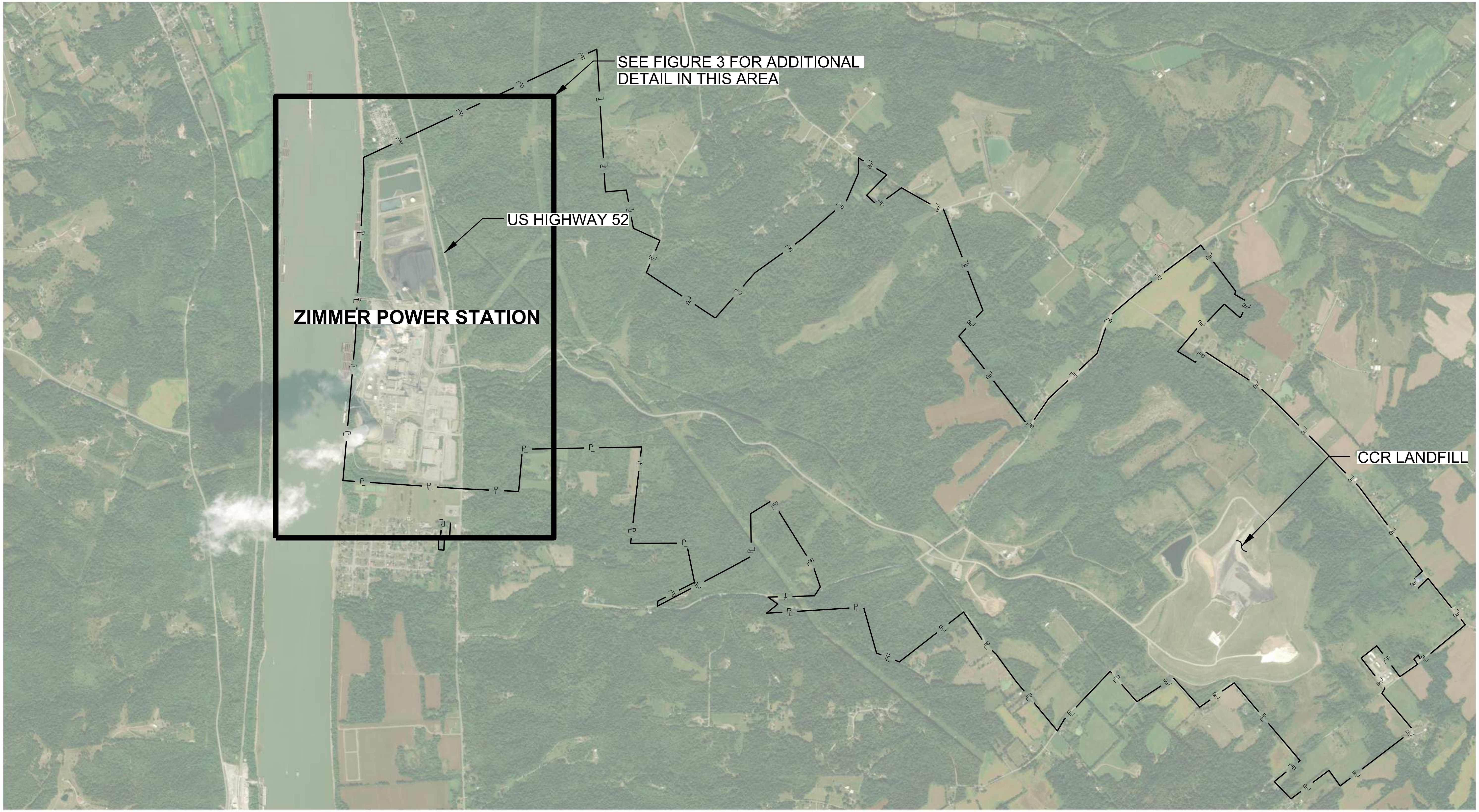
ZIMMER POWER STATION

SITE PLAN

project 122702

contract -

dwg **FIGURE 3** -



LEGEND:

PROPERTY LINE

PRELIMINARY - NOT FOR CONSTRUCTION

0 2000' 4000'

SCALE IN FEET

N

BURNS McDONNELL

date	10/28/2020
designed	A. MYERS

LUMINANT

ZIMMER POWER STATION
PROPERTY PLAN

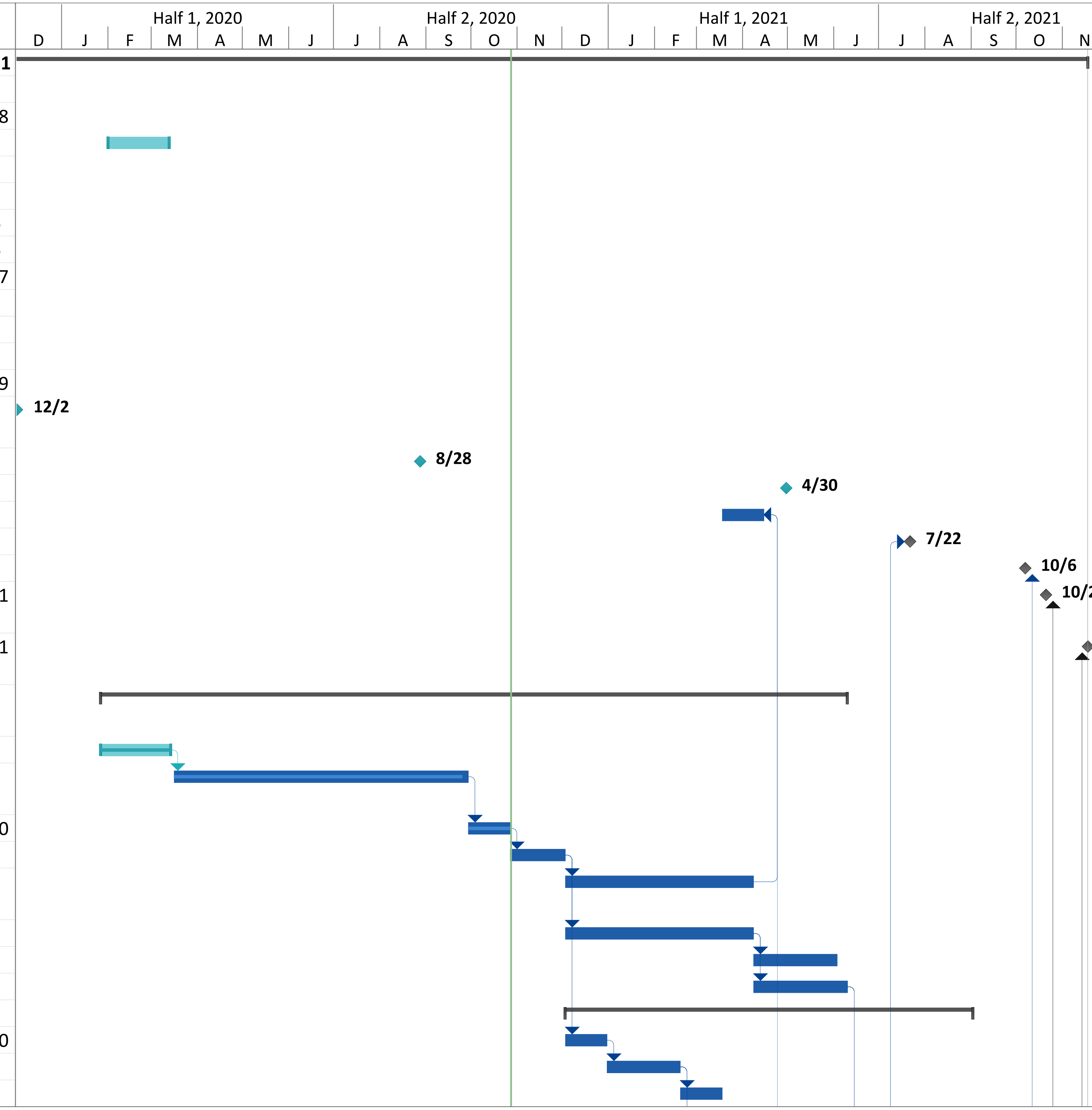
project	122702
contract	-
dwg	**FIGURE 4** -

10/29/2020

Z:\Clients\ENR\VistraEnergy\122702_ALTuseDisposal\Design\Civil\Dwgs\Sketches\Zimmer_Figure4.dgn

APPENDIX B – SCHEDULE

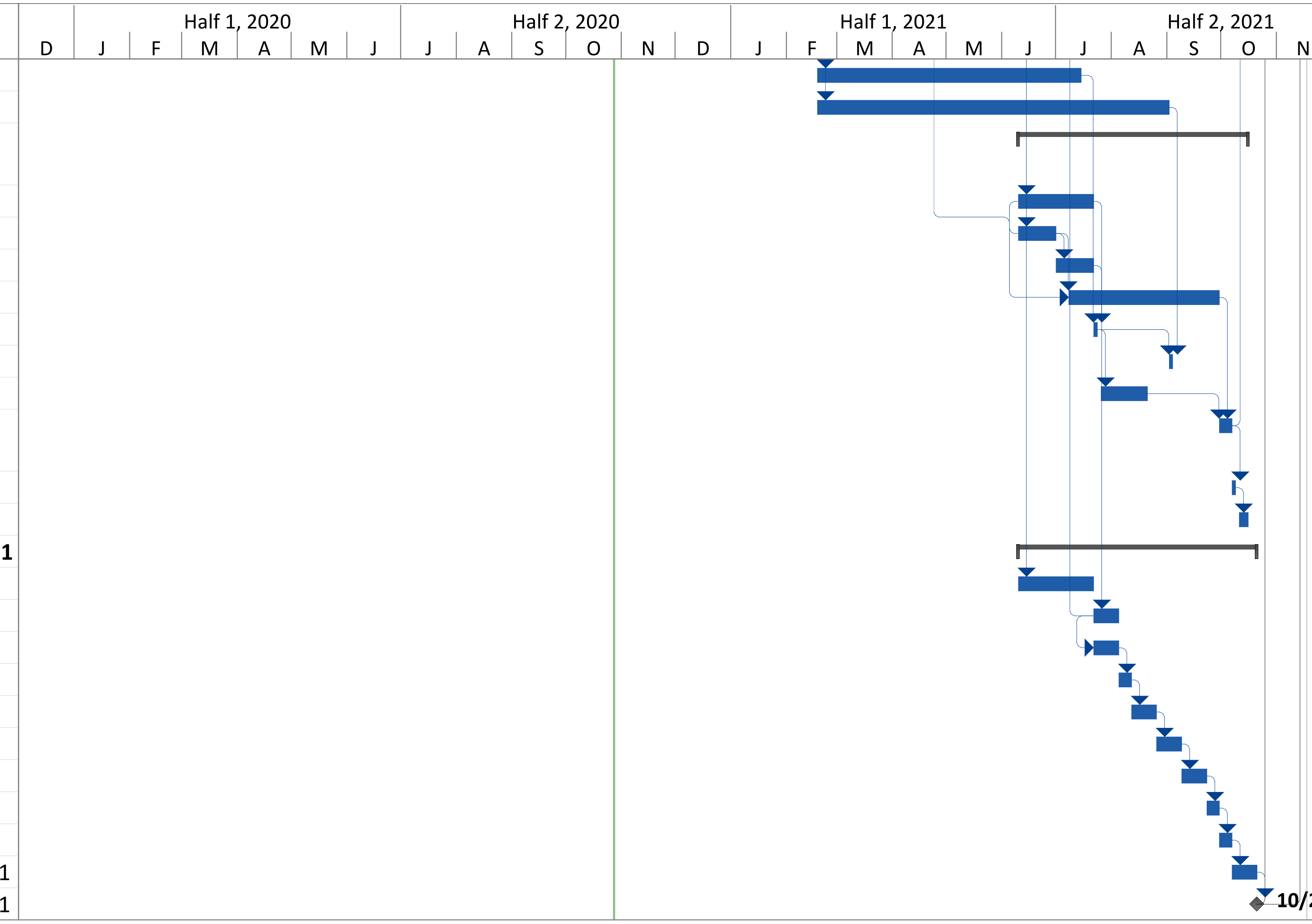
ID	Task Name	Duration	Start	Finish
1	**CCR Compliance Efforts**	**1719 days**	**Fri 4/17/15**	**Wed 11/17/21**
2	Final CCR Rule Published in Federal Register	0 days	Fri 4/17/15	Fri 4/17/15
3	BMcD Retained by Dynegy to Review ELG Compliance Impacts	30 days	Thu 11/1/18	Wed 12/12/18
4	BMcD Retained by Dynegy to Review CCR Compliance Impacts	30 days	Sat 2/1/20	Thu 3/12/20
5	Installed Groundwater Monitoring Wells	12 days	Wed 9/9/15	Thu 9/24/15
6	Background Groundwater Sampling	403 days	Tue 12/29/15	Thu 7/13/17
7	Completed Liner Documentation	0 days	Thu 10/13/16	Thu 10/13/16
8	Prepared Surface Impoundment History of Construction	0 days	Thu 10/13/16	Thu 10/13/16
9	First Detection Monitoring Samples	0 days	Mon 11/13/17	Mon 11/13/17
10	Assessment Monitoring Program - First Round	45 days	Tue 5/8/18	Mon 7/9/18
11	Assessment Monitoring Program - Second Round	15 days	Tue 9/18/18	Mon 10/8/18
12	Assessment Monitoring Program - Third Round	37 days	Wed 3/13/19	Thu 5/2/19
13	Assessment Monitoring Program - Fourth Round	26 days	Wed 9/11/19	Wed 10/16/19
14	EPA Published Proposed Draft ELG Rule and CCR Holistic Approach to Closure Part A Rule	0 days	Mon 12/2/19	Mon 12/2/19
15	EPA Published Final CCR Holistic Approach to Closure Part A Rule	0 days	Fri 8/28/20	Fri 8/28/20
16	Semi-Annual Progress Report #1	0 days	Fri 4/30/21	Fri 4/30/21
17	Prepare Written Retrofit Plan - Coal Pile Runoff Pond	20 days	Thu 3/18/21	Thu 4/15/21
18	Publish Notification of Intent to Retrofit - Coal Pile Runoff Pond	0 days	Thu 7/22/21	Thu 7/22/21
19	Publish Notification of Intent to Close - Gypsum Recycle Pond	0 days	Wed 10/6/21	Wed 10/6/21
20	Cease Placing CCR and non-CCR wastestreams in unlined impoundments	0 days	Wed 10/20/21	Wed 10/20/21
21	Publish Notification of Completion of Retrofit Activities - Coal Pile Runoff Pond	0 days	Wed 11/17/21	Wed 11/17/21
22	**Impoundment Retrofit - Engineering and Construction Procurement Efforts**	**358 days**	**Mon 1/27/20**	**Wed 6/9/21**
23	BMcD Alternatives Analysis	35 days	Mon 1/27/20	Fri 3/13/20
24	Dynegy Review Alternatives, Select Preferred Option, and Prepare Demonstration for Site-Specific Alternate to Intiation of Closure	141 days	Mon 3/16/20	Mon 9/28/20
25	Award Engineering Services for Pond Retrofit Project	20 days	Tue 9/29/20	Mon 10/26/20
26	Preliminary Design for Specifications and Permitting	27 days	Tue 10/27/20	Wed 12/2/20
27	Detailed Design: Prepare Pond (Gypsum Recycle Pond, Coal Pile Runoff Pond) Modfication Bid Documents	90 days	Thu 12/3/20	Wed 4/7/21
28	Environmental Permitting	90 days	Thu 12/3/20	Wed 4/7/21
29	Obtain SWPPP Permit	40 days	Thu 4/8/21	Wed 6/2/21
30	Dynegy Bid/Award Pond Modification Construction Contract	45 days	Thu 4/8/21	Wed 6/9/21
31	**Procurement - Magnesium Thickener Effluent Tank/Pumps**	**195 days**	**Thu 12/3/20**	**Wed 9/1/21**
32	Prepare Equipment Specifications	20 days	Thu 12/3/20	Wed 12/30/20
33	Bid/Award Equipment Contracts	35 days	Thu 12/31/20	Wed 2/17/21
34	Vendors Prepare/Submit Design Submittals	20 days	Thu 2/18/21	Wed 3/17/21



Project: Zimmer CCR Surface Impoundment Extension Demonstration
Date: Wed 10/28/20

Task		External Tasks		Manual Task		Finish-only	
Split		External Milestone		Duration-only		Deadline	
Milestone		Inactive Task		Manual Summary Rollup		Progress	
Summary		Inactive Milestone		Manual Summary		Manual Progress	
Project Summary		Inactive Summary		Start-only			

ID	Task Name	Duration	Start	Finish
35	Shop Fabricated Tank Delivery	105 days	Thu 2/18/21	Wed 7/14/21
36	Pump Skid Delivery	140 days	Thu 2/18/21	Wed 9/1/21
37	**Gypsum Recycle Pond - CCR Wastestream Reroute and Closure by Removal**	**92 days**	**Thu 6/10/21**	**Fri 10/15/21**
38	Pipe Material Acquisition	30 days	Thu 6/10/21	Wed 7/21/21
39	Contractor Mobilization to Site	15 days	Thu 6/10/21	Wed 6/30/21
40	Construct Foundation for Tank and Pump Skid(s)	15 days	Thu 7/1/21	Wed 7/21/21
41	Install HDPE Piping - Trenching/Fusion/Backfill	60 days	Thu 7/8/21	Wed 9/29/21
42	Set Tank	2 days	Thu 7/22/21	Fri 7/23/21
43	Set Pumps	2 days	Thu 9/2/21	Fri 9/3/21
44	Install BOP Piping/Valves/Power Supply	20 days	Mon 7/26/21	Fri 8/20/21
45	Startup Tank/Pumps and Reroute Centrate and Mag Thickener Flows to Mercury Effluent Treatment System	5 days	Thu 9/30/21	Wed 10/6/21
46	Unwatering of Pond to Waste Handling Building Sump	2 days	Thu 10/7/21	Fri 10/8/21
47	Removal of Ponded CCR Material	5 days	Mon 10/11/21	Fri 10/15/21
48	**Coal Pile Runoff Pond Retrofit Construction**	**95 days**	**Thu 6/10/21**	**Wed 10/20/21**
49	Liner Material Acquisition	30 days	Thu 6/10/21	Wed 7/21/21
50	Temporary Reroute of Flows to D Basin (and to Wastewater Pond)	10 days	Thu 7/22/21	Wed 8/4/21
51	Temporarily Redirect Mercury Effluent Treatment System to D Basin	10 days	Thu 7/22/21	Wed 8/4/21
52	Unwatering of Pond to D Basin	5 days	Thu 8/5/21	Wed 8/11/21
53	Removal of Remaining Ponded CCR Material	10 days	Thu 8/12/21	Wed 8/25/21
54	Removal of Clay Bottom Liner and Preparation of Subgrade	10 days	Thu 8/26/21	Wed 9/8/21
55	GCL & HDPE Liner Installation	10 days	Thu 9/9/21	Wed 9/22/21
56	Geotextile & Crushed Rock Layer Installation	5 days	Thu 9/23/21	Wed 9/29/21
57	Riprap Installation	5 days	Thu 9/30/21	Wed 10/6/21
58	Punchlist, Piping Mods, and Contract Closeout	10 days	Thu 10/7/21	Wed 10/20/21
59	Return Flows to Coal Pile Runoff Pond and Initiate Closure of D Basin	0 days	Wed 10/20/21	Wed 10/20/21



Project: Zimmer CCR Surface Impoundment Extension Demonstration
Date: Wed 10/28/20

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress | Manual Progress

APPENDIX C – COMPLIANCE DOCUMENTS

APPENDIX C1 – MAP OF GROUNDWATER MONITORING WELL LOCATIONS

Y:\Mapping\Projects\22\2285\MXD\2019_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_CPRP.mxd

PROJECT: 169000XXXX | DATED: 1/14/2020 | DESIGNER: GALARNMC

UPGRADIENT MONITORING WELL LOCATION
DOWNGRADIENT MONITORING WELL LOCATION
CCR MONITORED UNIT

0 100 200 Feet

MONITORING WELL LOCATION MAP
ZIMMER COAL PILE RUNOFF POND
UNIT ID:125

FIGURE 1

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

UPGRADIENT MONITORING WELL LOCATION
DOWNGRADIENT MONITORING WELL LOCATION
CCR MONITORED UNIT

0 50 100 Feet

MONITORING WELL LOCATION MAP
ZIMMER GYPSUM RECYCLING POND
UNIT ID:124

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\2019_Annual\GWM_CAR\Figure 1_GWS_WellLoc_Zimmer_DBasin.mxd

PROJECT: 169000XXXX | DATED: 1/28/2020 | DESIGNER: BARTELAB

UPGRADIENT MONITORING WELL LOCATION
DOWNGRADIENT MONITORING WELL LOCATION
CCR MONITORED UNIT

0 175 350 Feet

MONITORING WELL LOCATION MAP
ZIMMER D BASIN
UNIT ID:121

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

APPENDIX C2 – WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

FORM. CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY Renamed MW-1
LOG OF BORING

JOB NO.
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N. 5940 W- 520

BORING NO. Z-117 DATE 4-26-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ___ CORE ___
CASING USED ✓ SIZE HW DRILLING MUD USED —
BORING BEGUN 4-26-89 BORING COMPLETED 4-27-89
GROUND ELEVATION 511.1 REFERRED TO ___ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring well
WATER LEVEL	38.0
TIME	11:00
DATE	4-27-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	2	5	8	15"				CL	Clay - Br - moist - med to low plasticity	
2	7.5	9.0	3	5	8	18"		10			Same as 1	
3	12.5	14.0	3	4	5	18"				CL	Silt/Clay - multi-colored Br. med to low plasticity	
4	17.5	19.0	3	4	5	18"		20			Same as 2	

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ___

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY Renamed MW-1
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z117 DATE ______ SHEET 2 OF ______
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	22.5	24.0	2	3	4	19"				CL	Top 9" Clay - yellowish Br - moist to wet - med to low plasticity	
										CL	Bottom 9" Clay - Gray - wet - med to low plasticity	
6	27.5	29.0	2	3	3	18"				CL	Clay - Gray - wet - med to low plasticity	
								30				
7	32.5	34.0	1	2	3	18"					Same as 6	
8	37.5	39.0	20	26	12	16"				GM	Sand + Gravel - Gray - Br - Saturated - Quartz - Rounded ½" max size - w/ Fines	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY Renamed MW-1
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z 117 DATE ______ SHEET 3 OF ______
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	10	15	15	12"				SW	Sand- Br- Quartz- moist	
10	47.5	49.0	8	12	17	12"				SP	Sand- Br- Quart -Saturated	
								50				
11	52.5	54.0	15	17	10	14"				GM	Sand + Gravel- Br- Saturated Quartz- Rounded- 1" max size w/ Fines - Strong Reaction to HCL	
12	57.5	59.0	12	14	16	15"				SP	Sand- Br- Saturated- Quartz- Trace of Pea Gravel Strong Reaction to HCL	
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
Renamed MW-1

LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2117 DATE ____ SHEET 4 OF ____
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	62.5	64.0	16	17	11	13"					Gravelly Silty Sand - Br. - Saturated - Quartz - 3/4" max size - Strong Reaction to HCL	
14	67.5	69.0	29	39	31	16"					Sand + Gravel - Br. Saturated Quartz - 1" max size - w/ Fines - Strong Reaction to HCL	
								70				
15	72.5	74.0	12	28	40	8"				GC	Clayey Sand + Gravel Br. Saturated - 1" max size Rounded - Quartz - Strong Reaction to HCL	
16	77.5	79.0	14	30	38	9"					Same as 15	
								80				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY Renamed MW-1
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. Z-117 DATE ____ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	82.5	84.0	8	11	13	11"					Gravelly Sand - Br. Saturated Quartz 3/4" max size - Rounded w/ Fines + Black Lignite Strong Reaction to HCL	
18	87.5	89.0	12	11	14	13"					Gravelly Sand - Br. Saturated Quartz - Rounded - 3/4" max size w/ Fines - Strong Reaction to HCL	
											Stopped Hole - 89.9 and installed 2" O.B. well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
Renamed MW-3S
LOG OF BORING

JOB NO. ________
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N-5700 W-1400

BORING NO. 2119 DATE 5-2-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 5-2-89 BORING COMPLETED 5-2-89
GROUND ELEVATION 509.9 REFERRED TO ____ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring well	
WATER LEVEL	42.0	30.0
TIME	6:00 PM	7:51 AM
DATE	5-2-89	5-3-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	6	7	9	14"				CL	Clay - Br - moist - med to low plasticity	
2	7.5	9.0	3	4	4	12"		10			Same as 1 w/ trace of v-fine sand	
3	12.5	14.0	3	4	6	10"					Same as 1 w/ trace of v-fine sand	
4	17.5	19.0	3	5	8	16"		20			Same as 1 w/ trace of v-fine sand	

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
Renamed MW-3S
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-119 DATE ______ SHEET 2 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	22.5	24.0	3	5	7	16"				CL	Clay - multi-color Brs - moist med. to low plasticity	
6	27.5	29.0	4	5	7	16"					Same as 5	
								30				
7	32.5	34.0	2	4	5	6"				CL	Sandy Clay - multi-color Brs moist w/ Dr. Br. Sand Lens	
8	37.5	39.0	1	2	3	16"				CL	Sandy Clay - Gray - moist to wet w/ V-Fine Grain Sand Lens	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY Renamed MW-3S
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. 2114 DATE ______ SHEET 3 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	2	2	3	16"				SC	Clayey Sand - Gray saturated w/ organic material (wood) mixture	
10	47.5	49.0	1	1	13	16"				[illegible]	Sand + Gravel - Br - Saturated Quartz - 1/2" max size - w/ Fines	
								50				
11	52.5	54.0	6	5	10	0						
											Started washing out augers	
12	57.5	59.0	6	7	9	8"				SP	Sand - Br - Quartz - Saturated trace of pea gravel -	
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
Renamed MW-3S
LOG OF BORING

Job No.
Company
Project
Coordinates

Boring No. Z-119 Date Sheet 4 of 5
Type of Samples: SPT 3" Tube Core
Casing used Size Drilling mud used
Boring begun Boring Completed
Ground Elevation referred to Datum
Field Party Rig

Location of Boring:	
Water Level	
Time	
Date	

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
								60				
13	62.5	64.0	9	13	19	16"				SP	Sand - Br. Saturated med to Fine Grain - moderate Reaction to HCL	
14	67.5	69.0	14	22	17	6"		70		SP	/ Gravel Sand - Br. Saturated 100% Fine Grain Strong Reaction to HCL	
15	72.5	74.0	13	14	14	12"					Same as 14	
16	77.5	79.0	17	24	32	14"		80			Same as 14 Gray	

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

Recorder

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
Renamed MW-3S
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. Z-119 DATE ____ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	82.5	84.0	9	13	14	14"				SP	Sand - Gray - Saturated Quartz - Strong reaction to HCL. Med to Fine Grain	
18	87.5	89.0	13	13	13	12"					Same as 17	
								90				
19	92.5	94.0	10	12	12	16"					Same as 17	
											Stopped augers 94.9 + installed well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

Project: Dynegy

Project Location: Zimmer Station

Project Number: 60442412

Monitoring Well MW-16

Date(s) Drilled	8/2/16 - 8/3/16	Logged By	J. Alten
Checked By	Mike Wagner		
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling
Total Depth of Borehole	70.0 feet bgs		
Date of Groundwater Measurement	8/9/16	Sampler Type	Sonic Sleeve
Surface Elevation	509.19 feet, msl		
Depth to Groundwater	55.65 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips
Top of PVC Elevation	511.66 feet, msl		
Diameter of Hole (inches)	6.0	Diameter of Well (inches)	2
Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.
Comments			

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0		78		Light brown SILT with abundant fine angular gravel and coarse sand, medium stiff, dry	Riser with protective casing and locking cap
					grades red with tan mottling, less gravel and sand	
505	5					
					grades dark brown with few subrounded medium gravel and coarse sand, very stiff, slightly moist.	
500					grades with rare subrounded gravel and few coarse sand	
	10		78		grades medium brown, medium stiff to stiff	2" I.D. Schedule 40 PVC Riser
495	15				grades with gray mottling, some clay	
					grades with less clay and some fine sand	
490	20		88		grades with more fine sand	Bentonite/Cement Grout
					grades brown with red and gray mottling	
485					grades with few coarse sand, few black inclusions	
	25				grades with more clay and some very fine sand	
480	30		88		grades with increasing fine sand, soft, moist	
475					Brown, red, gray fine SAND with silt, moist, soft	
	35					

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-16

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	35			grades grayish brown	
				2" brown fine to medium sand lens, loose, moist	
470	40		73	2" brownish gray fine to medium sand lens, loose, moist	
				grades very moist, medium stiff	
				grades with some medium sand, soft, wet	
465	45			grades with dark brown mottling	
				grades with gray and red mottling, moist	
				Gray fine to medium SAND, some silt and cobbles, few gravel, wood fragments	Bentonite/Cement Grout
				grades with some rounded gravel	
460				Brown fine to medium subrounded gravel in fine to coarse sand	
	50		49	Brown fine to coarse sand with rounded fine gravel, loose, wet	
				grades reddish brown fine to coarse subrounded to rounded sand and gravel, loose, moist	
				grades to wet	
455	55			Grades with less gravel	
				grades dark brown, medium, rare medium round gravel	Bentonite Seal
				Medium brown medium sand with rare medium subrounded gravel, loose, wet	
450	60		79		#5 Global Silica Sand Filter Pack
					2" I.D. Schedule 40 0.010" Slotted Screen
445	65				
440				grades with more fine to medium gravel	
	70			Boring terminated at 70' bgs.	End Cap
435	75				
430	80				

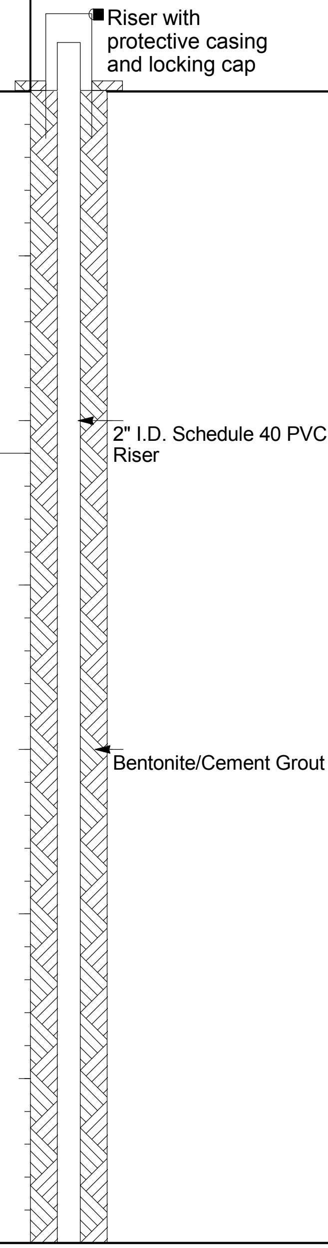
AECOM

Project: Dynegy	**Monitoring Well MW-17**
Project Location: Zimmer Station	
Project Number: 60442412	Sheet 1 of 2

Date(s) Drilled	**8/3/16**	Logged By	**J. Alten**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**70.0 feet bgs**
Date of Groundwater Measurement	**8/9/16**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**508.83 feet, msl**
Depth to Groundwater	**55.22 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**511.25 feet, msl**
Diameter of Hole (inches) **6.0**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		83		Medium brown to reddish brown friable SILT with some angular gravel, dry
					grades with minor fine sand and more subrounded gravel, less angular gravel
505	5				grades stiff with gray mottles and some clay, less sand
					grades with more rounded fine gravel
500	10		90		grades very stiff, no gray mottles
					Medium brown to gray clayey SILT, with few fine gravel, stiff to very stiff, moist
495	15				grades with abundant clay
					grades with minor coarse sand
490	20		96		grades with black inclusions, and some rounded fine gravel, some coarse sand
					grades with no gravel, medium stiff
485	25				grades with fewer gray mottles, less clay, more black inclusions, stiff
					grades medium stiff to soft, trace clay, minor coarse sand
480	30		93		grades very soft, very moist
					grades very light brown to gray silt, some reddish mottles, soft to medium stiff
					grades with some fine sand, less clay
475					grades with more fine sand
	35				2" reddish-brown silty sand seam, loose, moist

WELL CONSTRUCTION DETAILS



Project: Dynegy	Monitoring Well
Project Location: Zimmer Station	MW-17
Project Number: 60442412	Sheet 2 of 2

Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	35			grades with some medium coarse sand and more clay	
470				4" red fine sand lens with some silt, loose, very moist grades gray with some clay and more fine sand	
	40		78	Gray fine SAND with silt, soft, wet	
465	45			grades with less silt	Bentonite/Cement Grout
				Gray fine to medium GRAVEL with fine coarse sand and trace silt, wet	
460				Brownish red fine to coarse SAND with fine to medium gravel, very moist to wet	
	50		50	grades dark brownish red	
455				grades with fewer gravel, more medium sand	
	55				Bentonite Seal
				Light brown medium SAND, loose, wet	
450				Brownish red medium to coarse GRAVEL seam with medium sand	
	60		38	Light brown medium SAND with red mottles, loose, wet grades with minor fine to medium gravel and minor fine to coarse sand	#5 Global Silica Sand Filter Pack
445	65				2" I.D. Schedule 40 0.010" Slotted Screen
440	70			Boring terminated at 70' bgs.	End Cap
435	75				
430	80				

Project: Dynegy

Project Location: Zimmer Station

Project Number: 60442412

Monitoring Well MW-18

Date(s) Drilled	8/4/16	Logged By	J. Alten	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	70.0 feet bgs
Date of Groundwater Measurement	8/9/16	Sampler Type	Sonic Sleeve	Surface Elevation	509.22 feet, msl
Depth to Groundwater	55.59 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	511.63 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0		80		Brownish red SILT with some fine to medium angular to subrounded gravel and trace medium to coarse sand, friable, very dense, dry	Riser with protective casing and locking cap
					grades with tan mottles grades with few gray mottles and some black mottles	
505	5				grades with fewer gravels	
					grades with brown and tan mottles, rare coarse sand	
500					grades with more clay, dry to slightly moist	
	10		97.5		grades medium stiff	2" I.D. Schedule 40 PVC Riser
495	15				grades with gray clayey mottles	
					grades with abundant gray clayey mottles	
490	20		97.5		grades with tan to brown mottles grades stiff, moist	Bentonite/Cement Grout
					grades with less sand and gravel	
485	25				grades medium stiff with few gray clayey mottles	
480					grades soft with more clay	
	30		100			
					grades with few gray mottles and wood fragments	
475	35					

AECOM

DYNEGY ZIMMER ZIMMER STATION CCR WELLS.GPJ 11/23/16

Project: Dynegy Project Location: Zimmer Station Project Number: 60442412	Monitoring Well MW-18 Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION
	35			grades very soft, very moist grades gray with some fine sand
470				grades with more fine sand
	40		86	Gray fine SAND with silt, loose, very moist grades very silty, soft, wet
				grades with few coarse sand and fine gravel
465				grades with less silt
	45			grades with abundant wood fragments and medium sand
				Subrounded gray medium to coarse GRAVEL in gray medium sand, few fine gravel and coarse sand
460				Fine to coarse brownish red SAND with fine to medium rounded gravel, loose, very moist
	50		39	
455	55			
				grades coarse with fine to coarse rounded gravel, loose, wet
				grades with medium sand and less coarse sand, few gravel
				Brown medium SAND with few coarse sand and medium to coarse gravel, trace cobble, loose, wet
450	60		83	
445	65			
440				grades with dark brown inclusions
	70			Terminate boring at 70' bgs.
435	75			
430	80			

WELL CONSTRUCTION DETAILS

- Bentonite/Cement Grout
- Bentonite Seal
- #5 Global Silica Sand Filter Pack
- 2" I.D. Schedule 40 0.010" Slotted Screen
- End Cap

DYNEGY ZIMMER ZIMMER STATION CCR WELLS.GPJ 11/23/16

JOB NO. ____

COMPANY Zimmer Plant

PROJECT ____

COORDINATES N-5940 W-520

DATE 5/2/89 TIME ____

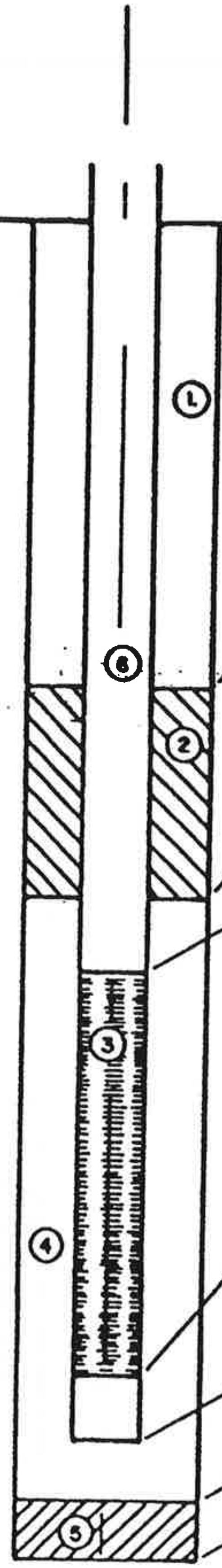
WELL CONSTRUCTION
SUMMARY ELEVATIONS
(FL NGVD)

WELL No. 1

REF. DATUM PT. 511.8

Renamed MW-1

GRADE 509.9



1. GROUT SEAL Volclay Group
509.9 to 470.9
2. BENTONITE SEAL
3. SCREEN 20' x 2" x .02 PVC
4. GRAVEL PACK natural sand
5. N. A.
6. RISER PIPE 2" PVC

Water level 470.5
5/2/89

TOP OF BENTONITE SEAL	NA
TOP OF GRAVEL PACK	470.9
TOP OF SCREEN	442.5
BOTTOM OF SCREEN	423.4
BOTTOM OF BLANK SECTION	422.4
BOTTOM OF GRAVEL PACK	422.4
BOTTOM OF BOREHOLE	422.4

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION	OBSERVATION WELL
APPROVED	DR.	CH.	
AMERICAN ELECTRIC POWER SVC. CORP.			CDS-04 SH.

Company Zimmer Plant

Project

Coordinates N-5710 W-1400

Date 5/4/89 Time

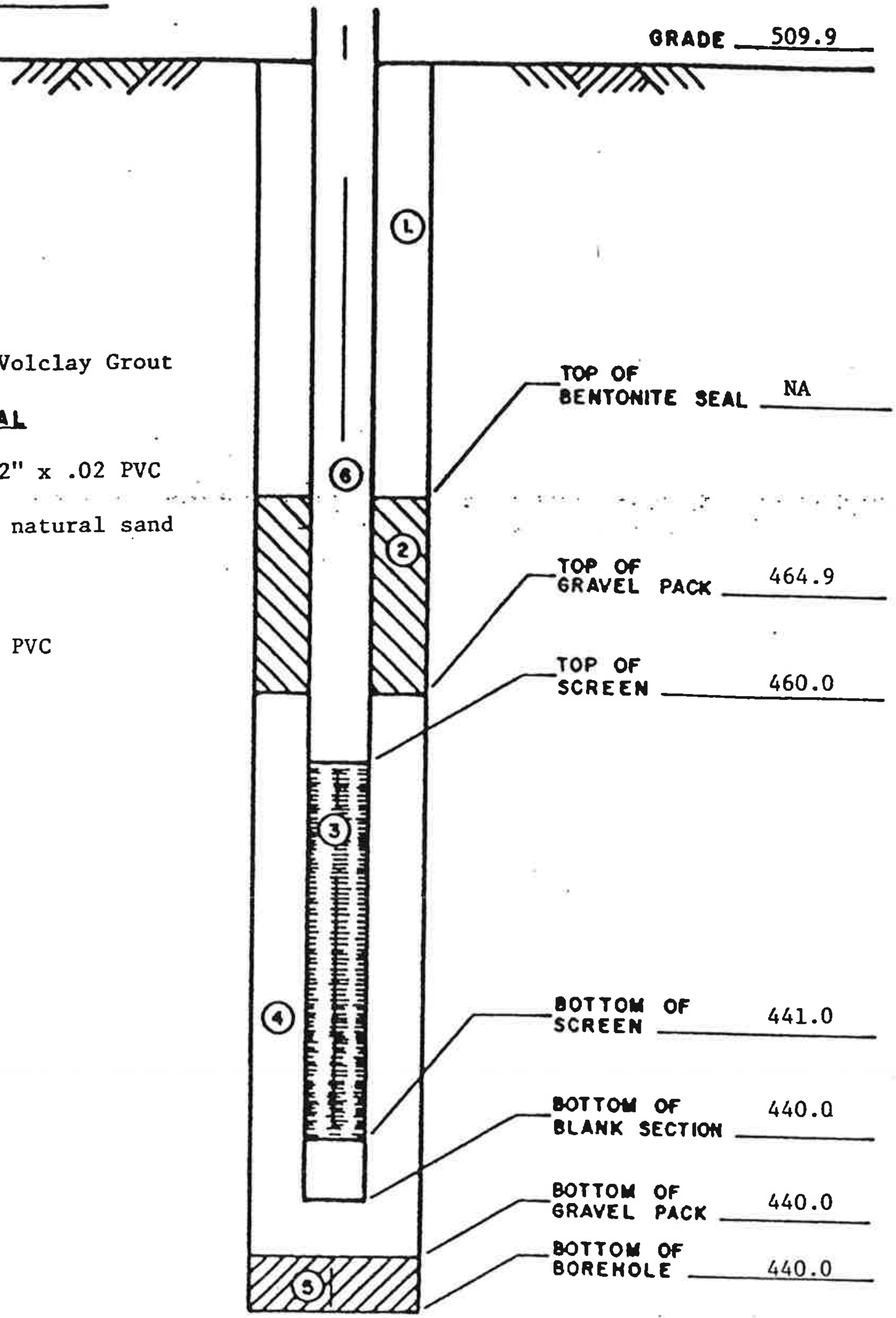
SUMMARY ELEVATIONS (ILNGVD)

WELL No. 3S

REF. DATUM PT. 511.9

Renamed MW-3S

GRADE 509.9



1. GROUT SEAL Volclay Grout 509.9 to 464.9
2. BENTONITE SEAL
3. SCREEN 20' x 2" x .02 PVC
4. GRAVEL PACK natural sand
5. N. A.
6. RISER PIPE 2" PVC

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION		OBSERVATION WELL
APPROVED	DR.	CH.		
AMERICAN ELECTRIC POWER SVC. CORP.				CDS-04 SH.

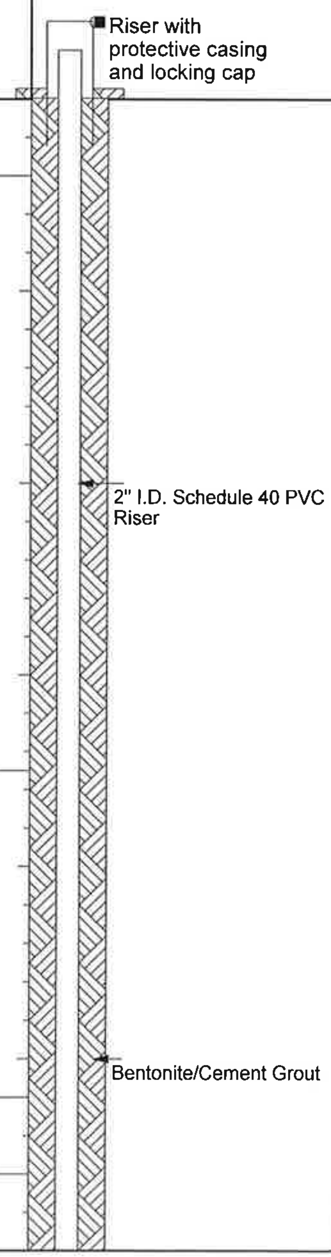
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-7A

Date(s) Drilled	12/1/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	64.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.53 feet, msl
Depth to Groundwater	54.32 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	511.79 feet, msl
Diameter of Hole (inches)	6.0 / Diameter of Well (inches): 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION
	0		100	Brown sandy SILT, with fine to coarse angular to subrounded gravel, hard, dry
				Brown SAND with silt and fineto coarse angular to subrounded gravel, dense, dry
505	5		100	
				grades without fines, subrounded to round gravel, medium dense to loose, moist
500	10		99	
				grades clayey
495	15			grades gray
				grades with trace black wood fragments
				Gray clayey SILT with trace fine to coarse subrounded gravel with trace black mottling and trace wood fragments, medium stiff to stiff, slightly moist
490	20		100	grades very stiff to hard
				grades with fine to medium sand
485	25			
				Brown fine to coarse SAND with fines and trace fine subrounded gravel, loose, moist
				Brown SILT with sand and trace fine subrounded gravel, very hard, dry
480	30		100	large wood fragment

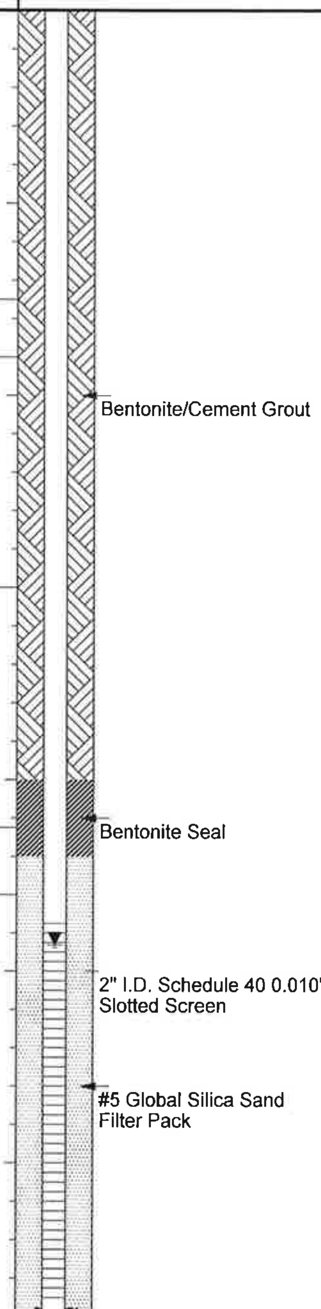
WELL CONSTRUCTION DETAILS



Project: Dynegy	**Monitoring Well**
Project Location: Zimmer Station	**MW-7A**
Project Number: 60442412	Sheet 2 of 2

Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	Samples: Graphic Log	MATERIAL DESCRIPTION
	30				grades clayey and without sand with trace gray and black mottling, very hard, dry to slightly moist
475	35				grades stiff to very stiff, slightly moist to moist
					grades medium stiff to stiff, moist
					Brown silty CLAY with trace fine subrounded gravel, medium stiff, wet grades gray with wood fragments
470	40		70		Brown clayey fine SAND, soft, moist
465	45				Brown sandy fine to coarse subrounded GRAVEL with clay, medium dense, wet
460	50		100		
					Brown clayey fine SAND with trace fine to coarse subrounded gravel, medium dense, wet grades fine to medium
					Brown clayey fine to coarse SAND with trace fine to coarse subrounded gravel, medium dense, wet
455	55				grades without clay and with black lamina
					grades more coarse, with more fine to coarse angular to subrounded gravel
450	60		50		grades with trace gravel
445	65				End of boring at 64' bgs
440	70				

WELL CONSTRUCTION DETAILS



FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ______
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N-3270 E-130

BORING NO. 2124 DATE 4-20-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 4-20-89 BORING COMPLETED 4-25-89
GROUND ELEVATION 511.1 REFERRED TO ____ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring wells
WATER LEVEL	28.5
TIME	10:00
DATE	4-20-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	3.0	4.5	4	5	5	0					Limestone road base	
2	8.0	9.5	20	29	42	12"				SP	Sand - Br - moist - Quartz strong reaction to HCL	
								10				
3	13.0	14.5	16	29	50/4	14"				SC	Clayey sand Br. moist Quartz - trace of gravel strong reaction to HCL	
4	18.0	19.5	17	29	45	16"				SP	Sand - Br - moist - strong reaction to HCL - 90% fine grain - quartz	
								20				

6" x 3.25 HSA		✓
HW CASING ADVANCER	4"	
NQ CORE ROCK		
NW CASING	3"	
SW CASING	6"	

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2-124 DATE ____ SHEET 2 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	23.0	24.5	12	19	35	15"					Sand- BR- moist. Strong Reaction to HCL Quartz 80% Fine Grain	
										SP		
6	28.0	29.5	50/.4			6"					Sand- Br. Saturated- Quartz w/ Broken Lime Stone Frag- Strong Reaction to HCL-	
								30		SP		
7	33.0	34.5	18	15	21	14"					Clay- Br- moist. med to Low plasticity	
										CL		
8	38.0	39.5	7	9	12	16"					Same as - 7 Trace of V-Fine Sand	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO.
COMPANY
PROJECT
COORDINATES

BORING NO. Z-124 DATE SHEET 3 OF 5
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO
DATUM
FIELD PARTY RIG

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
											TOP-6"	
9	43.0	44.5	5	6	8	16"					CLAY- BR- WET- MED TO LOW PLASTICITY	
										CL		
											BOTTOM 10" CLAYEY SAND- BR- SATURATED 100% FINE GRAIN - QUARTZ	
										SC		
10	48.0	49.5	5	10	16	18"					CLAYEY SAND- BR- SATURATED QUARTZ	
										SC		
								50				
11	53.0	54.5	12	15	15	16"					SAND- BR- SATURATED QUARTZ- MED TO FINE GRAIN	
										SP		
12	58.0	59.5	12	15	23	15"					SAND- BR- QUARTZ- SATURATED W/ TRACE OF PEA GRAVEL	
										SW		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO.
COMPANY
PROJECT
COORDINATES

BORING NO. Z-124 DATE SHEET 4 OF 5
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO
DATUM
FIELD PARTY RIG

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	63.0	64.5	8	10	12	10"				SP	Sand- Br- Saturated med to Fine Grain - Quartz	
14	68.0	69.5	8	10	15	14"					Same as 13 - Strong Reaction to HCL	
								70				
15	73.0	74.5	6	10	16	12"					Sand- Br- Quartz - Saturated 100% Fine Grain	
16	78.0	79.5	6	16	29	15"					Same as 15	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2424 DATE ____ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	83.0	84.5	16	27	43	13"				GM	Silt/ Sand + Gravel - Br saturated - Quartz - 1" max size - Angular -	
18	88.0	89.5	11	14	15	12"					Sand - Br - Saturated - Trace of Fines - Strong Reaction to HCL - Trace of Fines	
								90		SW		
19	93.0	94.5	10	14	16	14"					Same as 18"	
											Stopped Hole 96.1 installed well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

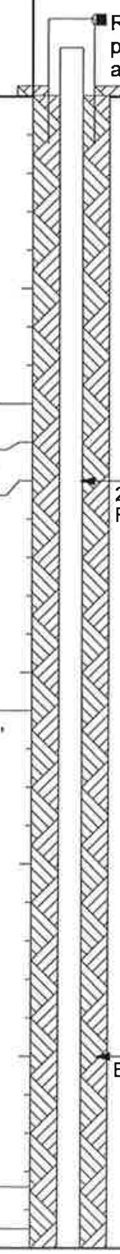
RECORDER ____

Project: Dynegy **Project Location:** Zimmer Station **Project Number:** 60442412	**Monitoring Well MW-10** Sheet 1 of 2

Date(s) Drilled	12/10/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	65.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.36 feet, msl
Depth to Groundwater	52.5 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	512.18 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown clayey SILT, with fine to coarse, angular to subrounded gravel, very stiff to hard, dry
					grades with dark gray mottling
505	5		100		grades without mottling
					Bluish gray and brown clayey medium to coarse SAND with fine to coarse gravel, medium dense, wet
500	10		100		Brown clayey SILT with fine to coarse, angular to subrounded gravel, stiff to very stiff, dry
					Brown clayey fine to coarse SAND with fine to coarse subrounded gravel, medium dense, moist grades with trace fines
495	15				Orangish brown clayey SILT with fine to coarse subrounded sand and gravel, gray mottling, and trace black wood fragments, medium stiff to stiff, dry
490	20		100		grades sandy
485	25				grades with trace sand and gravel
					Brown fine to coarse SAND with trace fine subrounded gravel, loose, moist
480	30				Orangish brown sandy CLAY with trace fine to coarse subrounded gravel,

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-10

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		100	gray mottling, medium stiff, slightly moist	
				Brown fine to coarse SAND with trace fine to coarse subrounded to rounded gravel, loose, moist	
475	35				
				Brownish gray clayey SILT with trace fine subrounded gravel, medium stiff to stiff, slightly moist	
470	40		100	grades brown	Bentonite/Cement Grout
				grades with sand	
				Brown clayey fine to coarse SAND with fine to coarse subrounded gravel, medium dense, moist	
465	45				
				grades wet grades gravelly	
460	50		80	grades fine to medium, without gravel, less clay grades without fines, and with trace fine to coarse subrounded to rounded gravel	Bentonite Seal
				grades with abundant black fine gravel grades without black fine gravel	
455	55				2" I.D. Schedule 40 0.010" Slotted Screen
				grades with trace black mottling and wood fragments	
				grades fine to medium	#5 Global Silica Sand Filter Pack
450	60		80		
				grades medium dense, with fines	
445	65				End Cap Natural Collapse
				End of boring at 65' bgs	
440	70				

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-11

Date(s) Drilled	12/2/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	64.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.18 feet, msl
Depth to Groundwater	51.5 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	508.87 feet, msl
Diameter of Hole (inches)	6.0 / Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

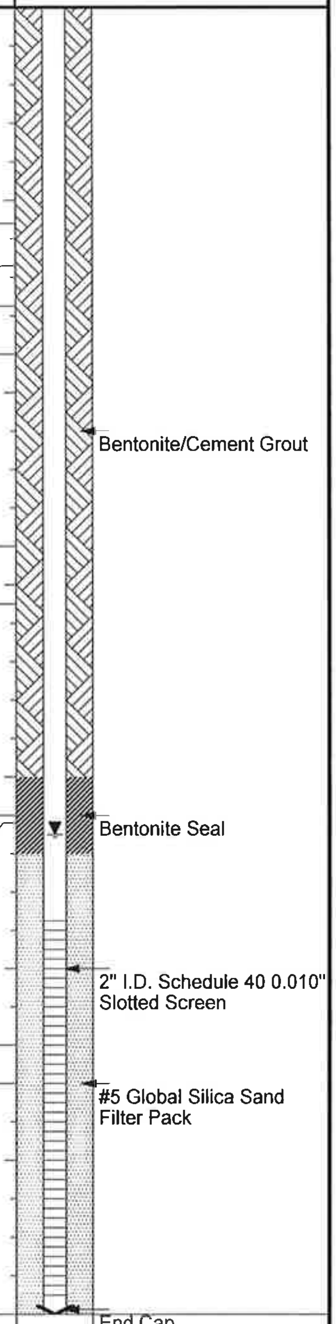
Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0		100	Dark brown clayey fine to coarse SAND with silt and fine to coarse subrounded gravel, mottled gray and yellowish brown, dense, slightly moist	Flush-mounted casing with locking expansion cap
505	5		100	Gray sandy CLAY with fine to coarse subrounded gravel, soft to medium stiff, slightly moist grades brown	
				Gray clayey fine to coarse SAND with fine to coarse subrounded to rounded gravel, brown mottling, black wood fragments	
500	10		100		2" I.D. Schedule 40 PVC Riser
495	15			grades brown with trace gray mottling	
490	20		90	Brown and gray mottled sandy CLAY with fine to coarse subrounded to rounded gravel, trace wood fragments, medium stiff, slightly moist large wood fragment	
				Gray clayey fine to coarse SAND with fine to coarse subrounded to rounded gravel, medium dense, moist	
485	25			Brown CLAY with silt and trace fine to coarse subrounded to rounded gravel, trace wood fragments, medium stiff, moist grades soft to medium stiff	Bentonite/Cement Grout
480	30		100	Orangish brown clayey fine SAND with trace fine subrounded gravel, trace	

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-11

Elevation, feet	Depth, feet	Type	Percent Recovery	MATERIAL DESCRIPTION
	30			gray mottling, medium dense, moist
475	35			grades to medium sand with trace coarse sand, and fine subrounded gravel, without clay, loose, moist
				Dark brown fine to coarse SAND with fines and fine to coarse subrounded gravel, very dense, dry
				Light brown sandy fine to coarse subrounded GRAVEL with fines, dense, dry
				Brown to orangish brown gravelly fine to coarse SAND with fines, subrounded to rounded, medium dense to loose, moist
470	40		75	Brown sandy fine subrounded GRAVEL with fines and trace coarse gravel, loose, wet
				grades dark brown
465	45			Orangish brown medium SAND, dense, wet
				Light brown to brown SAND with trace fine subrounded gravel, trace black lamina, loose, wet
				grades dark brown with more gravel and fines, medium dense to dense
460	50		64	grades brown with trace gravel and without fines
				Brown fine sand layer, loose, wet
				Brown fine to coarse SAND, with trace fines and subrounded gravel, medium dense to dense, wet
455	55			3" black fine angular to subrounded gravel layer grades with trace black gravel
				Brown fine SAND, loose, wet
				Brown fine to coarse SAND with trace fine subrounded gravel, loose, wet
450	60		0	No recovery, lithology inferred
445	65			End of boring at 64' bgs
440	70			

WELL CONSTRUCTION DETAILS



Job No. ____________

Company Zimmer Plant

Project Flood plain monitoring well

Coordinates N-3270 E-130

Date 4/26/89 **Time** ________

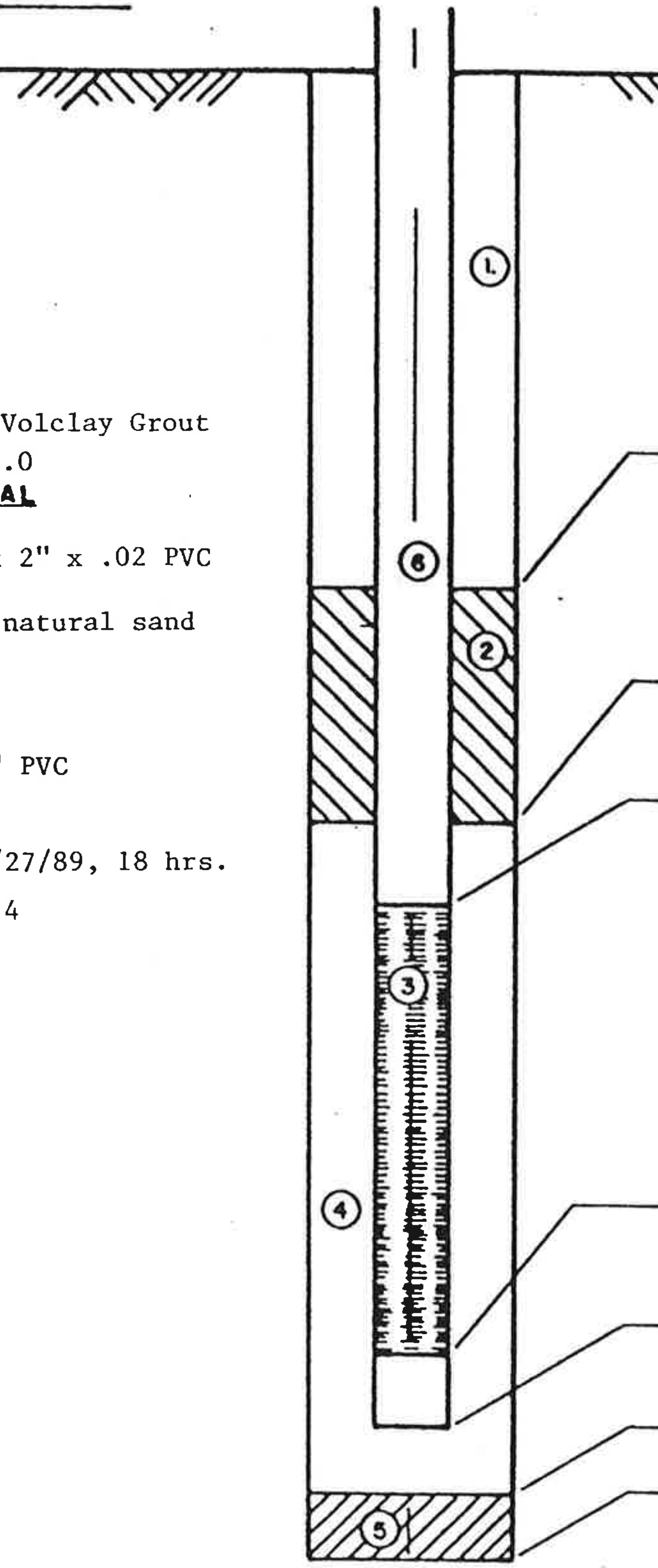
WELL CONSTRUCTION SUMMARY ELEVATIONS (ft NGVD)

WELL No. 8

REF. DATUM PT. 513.1

Renamed MW-8

GRADE 511.1



1. **GROUT SEAL** Volclay Grout
   511.1 to 441.0
2. **BENTONITE SEAL**
3. **SCREEN** 20' x 2" x .02 PVC
4. **GRAVEL PACK** natural sand
5. **N. A.**
6. **RISER PIPE** 2" PVC

Water level 4/27/89, 18 hrs.

Elevation 464.4

TOP OF BENTONITE SEAL	NA
TOP OF GRAVEL PACK	441.0
TOP OF SCREEN	435.1
BOTTOM OF SCREEN	416.0
BOTTOM OF BLANK SECTION	415.0
BOTTOM OF GRAVEL PACK	415.0
BOTTOM OF BOREHOLE	415.0

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION	OBSERVATION WELL
APPROVED	DR.	CH.	
AMERICAN ELECTRIC POWER SVC. CORP.			CDS-04 / SH.

FORM. CE-5
REV. 1/87

AMERIC[A]N ELECTRIC POWER SERVICE CO[RPO]RATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

Renamed MW-1

JOB NO. ______
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N. 5940 W- 520

BORING NO. Z-117 DATE 4-26-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ______ CORE ______
CASING USED ✓ SIZE HW DRILLING MUD USED ——
BORING BEGUN 4-26-89 BORING COMPLETED 4-27-89
GROUND ELEVATION 511.1 REFERRED TO ______ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring well
WATER LEVEL	38.0
TIME	11:00
DATE	4-27-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	2	5	8	15"				CL	Clay - Br - moist - med to low plasticity	
2	7.5	9.0	3	5	8	18"					Same as 1	
								10				
3	12.5	14.0	3	4	5	18"				CL	Silt / Clay - multi-colored Br. med to low plasticity	
4	17.5	19.0	3	4	5	18"					Same as 2	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-1

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z117 DATE ______ SHEET 2 OF ___
TYPE OF SAMPLES: SPT ___ 3" TUBE ___ CORE ___
CASING USED ___ SIZE ___ DRILLING MUD USED ___
BORING BEGUN ___ BORING COMPLETED ___
GROUND ELEVATION ___ REFERRED TO ___ DATUM
FIELD PARTY ___ RIG ___

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	22.5	24.0	2	3	4	19"				CL	Top 9" Clay - yellowish Br - moist to wet - med to low plasticity	
										CL	Bottom 9" Clay - Gray - wet - med to low plasticity	
6	27.5	29.0	2	3	3	18"				CL	Clay - Gray - wet - med to low plasticity	
								30				
7	32.5	34.0	1	2	3	18"					Same as 6	
8	37.5	39.0	20	26	12	16"				GM	Sand + Gravel - Gray - Br - Saturated - Quartz - Rounded ½" max size - w/ Fines	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-1

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2117 DATE ____ SHEET 3 OF ____
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	10	15	15	12"				SW	Sand- Br- Quartz- moist	
10	47.5	49.0	8	12	17	12"				SP	Sand- Br- Quart -Saturated	
								50				
11	52.5	54.0	15	17	10	14"				GM	Sand + Gravel- Br- Saturated Quartz- Rounded- 1" max Size w/ Fines - Strong Reaction to HCl	
12	57.5	59.0	12	14	16	15"				SP	Sand- Br- Saturated- Quartz- Trace of Pea Gravel Strong Reaction to HCl	
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

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

Renamed MW-1

JOB NO.
COMPANY
PROJECT
COORDINATES

BORING NO. 2117 DATE SHEET 4 OF
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO DATUM
FIELD PARTY RIG

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	62.5	64.0	16	17	11	13"					Gravelly Silty Sand- Br- Saturated- Quartz- 3/4" max size - Strong Reaction to HCL	
14	67.5	69.0	29	39	31	16"					Sand + Gravel- Br. Saturated Quartz- 1" max size - w/ Fines - Strong Reaction to HCL	
								70				
15	72.5	74.0	12	28	40	8"				GC	Clayey Sand + Gravel Br. Saturated - 1" max size Rounded- Quartz - Strong Reaction to HCL	
16	77.5	79.0	14	30	38	9"					Same as 15	
								80				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER

FORM CE-5
REV. 1/87

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

Renamed MW-1

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-117 DATE ______ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	82.5	84.0	8	11	13	11"					Gravelly Sand - Br. Saturated Quartz 3/4" max size - Rounded w/ Fines + Black Lignite Strong Reaction to HCL	
18	87.5	89.0	12	11	14	13"					Gravelly Sand - Br. Saturated Quartz - Rounded - 3/4" max size w/ Fines - Strong Reaction to HCL	
											Stopped Hole - 89.9 and Installed 2" O.B. well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ____
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N-3270 E-130

BORING NO. 2124 DATE 4-20-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 4-20-89 BORING COMPLETED 4-25-89
GROUND ELEVATION 511.1 REFERRED TO ____ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring wells
WATER LEVEL	28.5
TIME	10:00
DATE	4-20-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	3.0	4.5	4	5	5	0					Limestone road base	
2	8.0	9.5	20	29	42	12"				SP	Sand - Br - moist - Quartz strong reaction to HCL	
								10				
3	13.0	14.5	16	29	50/.4	14"				SC	Clayey sand Br. moist Quartz - trace of gravel strong reaction to HCL	
4	18.0	19.5	17	29	45	16"				SP	Sand - Br - moist - strong reaction to HCL - 90% fine grain - Quartz	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ____

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. 2-124 DATE ______ SHEET 2 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	23.0	24.5	12	19	35	15"				SP	Sand - BR - moist - Strong reaction to HCL quartz 80% fine grain	
6	28.0	29.5	50/.4			6"		30		SP	Sand - BR - saturated - quartz w/ broken lime stone frag - strong reaction to HCL -	
7	33.0	34.5	18	15	21	14"				CL	Clay - BR - moist - med to low plasticity	
8	38.0	39.5	7	9	12	16"		40			Same as - 7 trace of v-fine sand	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-124 DATE ______ SHEET 3 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
											TOP 6"	
9	43.0	44.5	5	6	8	16"					CLAY - BR - WET - MED TO LOW PLASTICITY	
										CL		
											BOTTOM 10" CLAYEY SAND - BR - SATURATED 100% FINE GRAIN - QUARTZ	
										SC		
10	48.0	49.5	5	10	16	18"					CLAYEY SAND - BR - SATURATED QUARTZ	
										SC		
								50				
11	53.0	54.5	12	15	15	16"					SAND - BR - SATURATED QUARTZ - MED TO FINE GRAIN	
										SP		
12	58.0	59.5	12	15	23	15"					SAND - BR - QUARTZ - SATURATED W/ TRACE OF PEA GRAVEL	
										SW		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-124 DATE ______ SHEET 4 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	63.0	64.5	8	10	12	10"				SP	Sand - Br - Saturated med to Fine Grain - Quartz	
14	68.0	69.5	8	10	15	14"					Same as 13 - Strong Reaction to HCL	
								70				
15	73.0	74.5	6	10	16	12"					Sand - Br - Quartz - saturated 100% Fine Grain	
16	78.0	79.5	6	16	29	15"					Same as 15	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

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

Renamed MW-8

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2-124 DATE ____ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

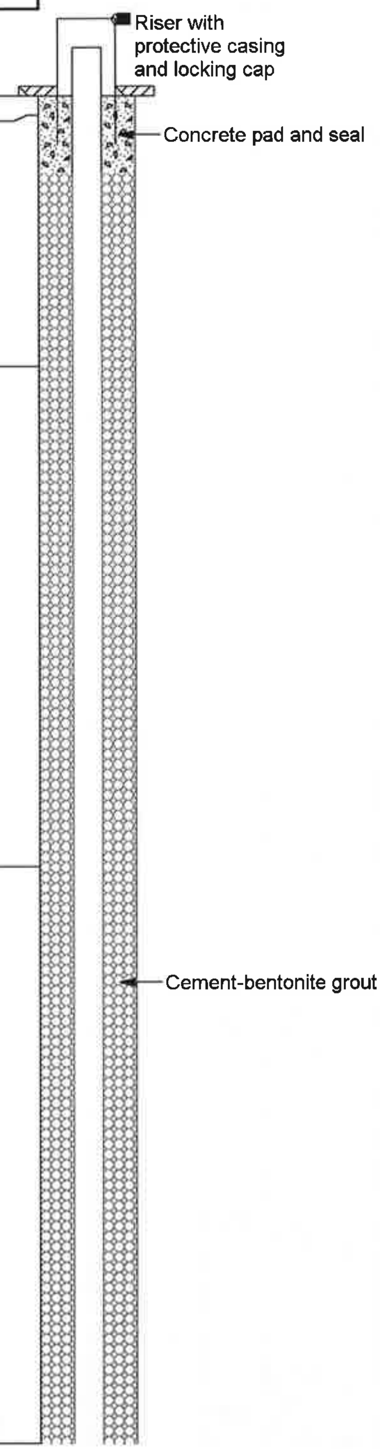
SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	83.0	84.5	16	27	43	13"				GM	Silt/ Sand + Gravel - Br Saturated - Quartz - 1" max size - Angular -	
18	88.0	89.5	11	14	15	12"		90		SW	Sand - Br - Saturated - Trace of Fines - Strong Reaction to HCL - Trace of Fines	
19	93.0	94.5	10	14	16	14"					Same as 18"	
											Stopped Hole 96.1 Installed well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

Depth (Feet)	Sample Location	% Recovery	PID Headspace Reading, ppm	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0					Gravel
					Grayish-brown clayey SILT with fine sand, moist
5	X	50			
					Brown fine SAND with clay lenses (1-2" thick, stiff), moist
10	X	50			
15	X	75			grades with medium gravel
20	X	50			Brown clayey SILT with fine gravel, moist, medium stiff
	X	88			grades brownish-gray with occassional medium gravel
25					
	X	96			grades wet
30					
	X	83			grades without clay
35					

WELL CONSTRUCTION DETAIL



Cinergy - 02580-214-121 - Moscow, Ohio

URS

JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station
Moscow, Ohio

SOIL BORING
MW-9

Depth (Feet)	Sample Location	% Recovery	PID Headspace Reading, ppm	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS	WELL CONSTRUCTION DETAIL
35						
	X	83			Gray fine SAND with silt, wet	
40						
					grades with wood fragments	
	X	92				
45						Bentonite seal
					Brown medium SAND, wet	
	X	88				
50						
	X	100				
55						
					grades with fine sand	
	X	100				
60						
					grades with coarse sand and fine gravel	
	X	100				
65						
	X	100			grades without fine gravel	
70						

Cinergy - 02580-214-121 - Moscow, Ohio

URS

JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station

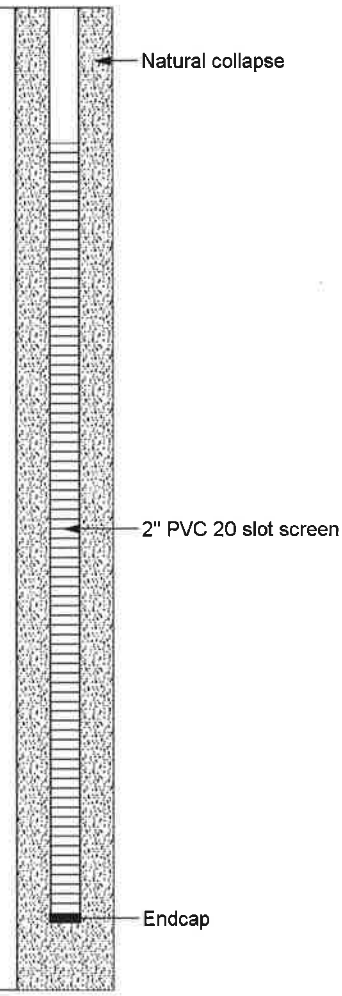
Moscow, Ohio

SOIL BORING
MW-9

Depth (Feet)	Sample Location	% Recovery	PID Headspace Reading, ppm	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
70					grades with fine sand
75	Split Spoon	100			
80	Split Spoon	100			grades with occassional gravel
85					
90	Split Spoon	100			grades with coarse sand
95					

End of boring at 95.2 ft. bgs.
Monitoring well installed to 93.5 ft. bgs. on 10/15/2003.

WELL CONSTRUCTION DETAIL



LEGEND:

Auger Cuttings

Split Spoon

PID Photoionization Detector

bgs Below ground surface

Cinergy - 02580-214-121 - Moscow, Ohio

GEFF ZIMMER.GPJ 11/11/05

URS

JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station

Moscow, Ohio

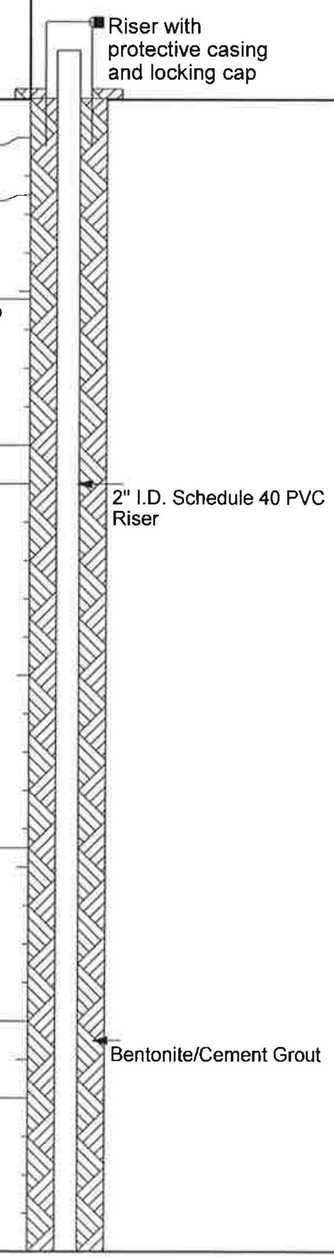
SOIL BORING
MW-9

Project: Dynegy	Monitoring Well MW-12
Project Location: Zimmer Station	Sheet 1 of 2
Project Number: 60442412	

Date(s) Drilled	11/20/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	64.0 feet
Date of Groundwater Measurement	12/08/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.34 feet, msl
Depth to Groundwater	53.19 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	511.92 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown silty SAND with trace fine angular gravel, trace roots, loost, moist grades with angular fine to coarse gravel
					Light brown fine to coarse angular sandy GRAVEL with fines, loose, moist grades silty and sandy
505					Brown SILT with clay and trace fine angular to subrounded gravel, medium dense, slightly moist grades sandy with trace fine to coarse subrounded gravel 1" fine to coarse sand layer
	5		100		Brown fine to coarse SAND with fines and trace fine to coarse subrounded to rounded GRAVEL, loose, slightly moist
500					Brown to tan CLAY with silt and sand, very stiff, slightly moist
	10		100		Brown to tan CLAY and SILT with sand, very stiff, moist grades with less sand, slightly less stiff
495	15				grades reddish brown with gray mottling, more silt and less clay, less stiff grades with trace medium gravel
490	20		90		Gray SILT with clay and very fine to fine sand, very soft, moist grades with abundant fine sand
485	25				Gray very fine to fine SAND and SILT, soft, moist
					Gray fine to coarse SAND with fine to coarse subrounded gravel, loose, slightly moist grades brown to red mottled with fine to medium gravel and black mottles
480	30		80		grades dark brown, subrounded to rounded

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-12

Elevation, feet	Depth, feet	Samples: Percent Recovery	Material Description	Well Construction Details
	30		grades with some coarse angular to subrounded gravel	
475			grades brown to tan	
	35		Medium brown medium SAND with trace fine rounded gravel, dry	
			grades to tan fine sand, loose	
			Brown medium SAND and brown to gray silty CLAY lens, soft to medium stiff	
470		89	Brown fine to coarse subrounded GRAVEL with sand, silt, and clay, medium dense, slightly moist	
	40			Bentonite/Cement Grout
			Brown gravelly fine SAND with fines and angular to subrounded gravel, medium dense, slightly moist	
465	45		grades clayey with trace gravel	
460		88		
	50		Brown SILT with fine sand with trace black mottling, soft, wet	Bentonite Seal
			Brown silty fine SAND with trace black mottling, soft, wet	
455	55		grades with medium sand layers	2" I.D. Schedule 40 0.010" Slotted Screen
				#5 Global Silica Sand Filter Pack
450	60	38	grades medium grained	
				End Cap
				Natural Collapse
445			End of boring at 64' bgs	
440				

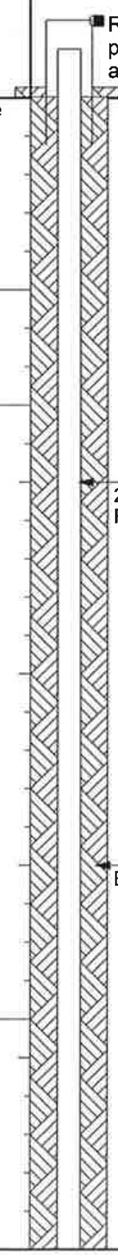
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-13

Date(s) Drilled	11/24/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	54.0 feet
Date of Groundwater Measurement	12/08/15	Sampler Type	Sonic Sleeve	Surface Elevation	497.21 feet, msl
Depth to Groundwater	39.51 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	499.4 feet, msl
Diameter of Hole (inches)	6.0 / Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION
	0		100	Brown to reddish brown clayey SILT with trace fine to coarse sand, and trace fine subrounded gravel, medium stiff to stiff, dry
495				grades very hard
	5		100	Brown medium to coarse SAND with trace fine subrounded gravel, loose, wet
490				Brown clayey SILT with trace fine angular to subrounded gravel, trace gray and black mottling, hard, dry
	10		92	grades without gravel, slightly moist to moist
485				grades with more sand, medium stiff
				grades sandy, fine
	15			
480				grades soft, very moist
			92	grades with black mottling
	20			
475				
				Brown clayey fine SAND, soft, wet
	25			
470				
			98	grades grayish brown
	30			

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-13

Elevation, feet: 465, 460, 455, 450, 445, 440, 435, 430

Depth, feet: 30, 35, 40, 45, 50, 55, 60, 65, 70

SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
		grades gray	
		Gray sandy SILT, medium stiff, moist	
		Gray clayey SAND, soft, wet	
		Gray coarse sandy subrounded to rounded GRAVEL with fines and some fine gravel, loose, wet	
		Orangish brown fine SAND, dense, moist	Bentonite/Cement Grout
		grades gravelly with fine to coarse angular to subrounded gravel with fines, very dense, dry	
	50	grades brown, without gravel, medium grained, loose, wet	
			Bentonite Seal
		grades coarse grained	2" I.D. Schedule 40 0.010" Slotted Screen
		grades medium grained with trace fine to coarse subrounded gravel	
			#5 Global Silica Sand Filter Pack
	0	No recovery, lithology inferred from above	
		End of boring at 54' bgs.	End Cap

DYNEGY ZIMMER ZIMMER STATION CCR WELLS.GPJ 4/19/16

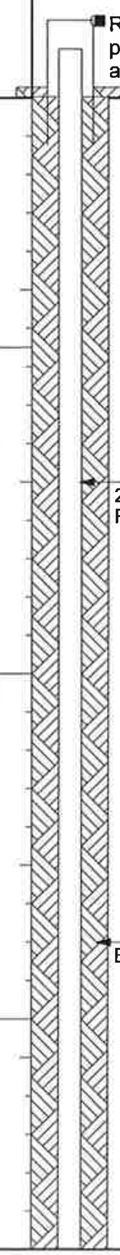
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-14

Date(s) Drilled	12/9/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	60.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	502.06 feet, msl
Depth to Groundwater	46.27 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	503.81 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		76		Brown fine sandy SILT with fine subrounded gravel, hard, dry
500					
	5		100		
495					Brown fine to coarse SAND with fines and trace fine subrounded gravel, dense, slightly moist
					grades without fines and with trace fine to coarse subrounded gravel, loose, moist
	10		100		grades grayish with fines
490					
	15				Grayish brown clayey SILT with trace fine subrounded gravel and trace plant stems/roots, medium stiff, slightly moist
485					grades gray with black mottling, soft grades brown to reddish brown, medium stiff to stiff
	20		100		grades sandy
480					
					Reddish brown clayey fine SAND, soft, moist to very moist
	25				
475					
					grades with trace black mottling
	30				

WELL CONSTRUCTION DETAILS



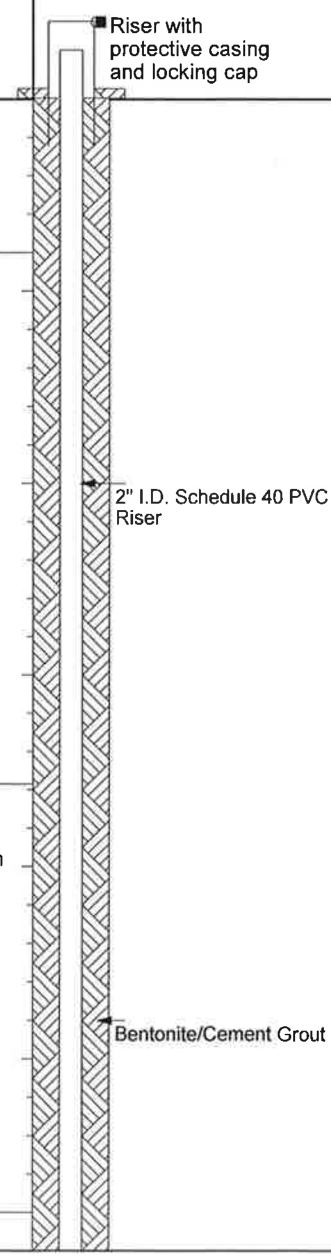
Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	Samples: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		100		grades medium brown, wet	
470					grades with gray mottling, trace oxidation staining	
	35				grades very soft to soft	
465					grades grayish brown	
					grades bluish gray with trace fine subrounded gravel and trace black wood fragments	Bentonite/Cement Grout
					Bluish gray sandy fine to coarse, subrounded to rounded GRAVEL with fines, loose, wet	
	40		43		Brown fine to coarse SAND, loose, wet	
460						
	45				grades with trace fine to coarse subrounded gravel	Bentonite Seal
455					Brown medium SAND with trace fines, medium dense, wet	
	50		70		Brown fine to coarse SAND with trace subrounded gravel, loose, wet	2" I.D. Schedule 40 0.010" Slotted Screen
450						#5 Global Silica Sand Filter Pack
	55				grades fine to medium	
					grades fine to coarse	
445					grades coarse, with fine to coarse subrounded gravel	End Cap
						Natural Collapse
	60				End of boring at 60' bgs	
440						
	65					
435						
	70					

Project: Dynegy **Project Location: Zimmer Station** **Project Number: 60442412**	**Monitoring Well** **MW-15** Sheet 1 of 2

Date(s) Drilled	**11/25/15**	Logged By	**Becky Smolenski**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**62.0 feet**
Date of Groundwater Measurement	**12/18/15**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**508.04 feet, msl**
Depth to Groundwater	**52.77 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**510.58 feet, msl**
Diameter of Hole (inches) **6.0**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown clayey SILT with trace sand and fine subrounded gravel, oxidation and black mottling, stiff, slightly moist to dry
505					grades sandy with more fine to coarse gravel
	5		100		Brown fine to coarse SAND with trace fine to coarse subrounded gravel, loose, dry
500					grades dark brown
	10		100		grades moist
495					grades with fines, dense
	15				grades medium dense to loose
490					Gray clayey SILT with trace black wood fragments, medium stiff, slightly moist
			100		grades orangish brown, very stiff
	20				grades brown without wood fragments, light gray and black mottling, medium stiff to stiff, slightly moist
485					
	25				
480					grades medium stiff
			100		Brown sandy CLAY with black mottling, soft, moist
	30				

WELL CONSTRUCTION DETAILS



DYNEGY ZIMMER_ZIMMER STATION CCR WELLS.GPJ 4/19/16

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-15

Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	Samples: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
475						
	35				Brown clayey fine SAND, soft, wet	
470					Brown sandy CLAY with black mottling, soft, moist	
	40		100			
					grades gray	Bentonite/Cement Grout
465					Gray clayey fine SAND, soft, wet	
	45				Gray sandy fine to coarse subrounded to rounded GRAVEL with fines, medium dense, wet	
460					Brown subrounded gravelly fine to coarse SAND with fines, medium dense, wet	
	50		46			Bentonite Seal
455						2" I.D. Schedule 40 0.010" Slotted Screen
	55					#5 Global Silica Sand Filter Pack
450						
	60		66			
					End of boring at 62' bgs	End Cap
445						
	65					
440						
	70					

JOB NO. ______

COMPANY Zimmer Plant

PROJECT ______

COORDINATES N-5940 W-520

DATE 5/2/89 TIME ______

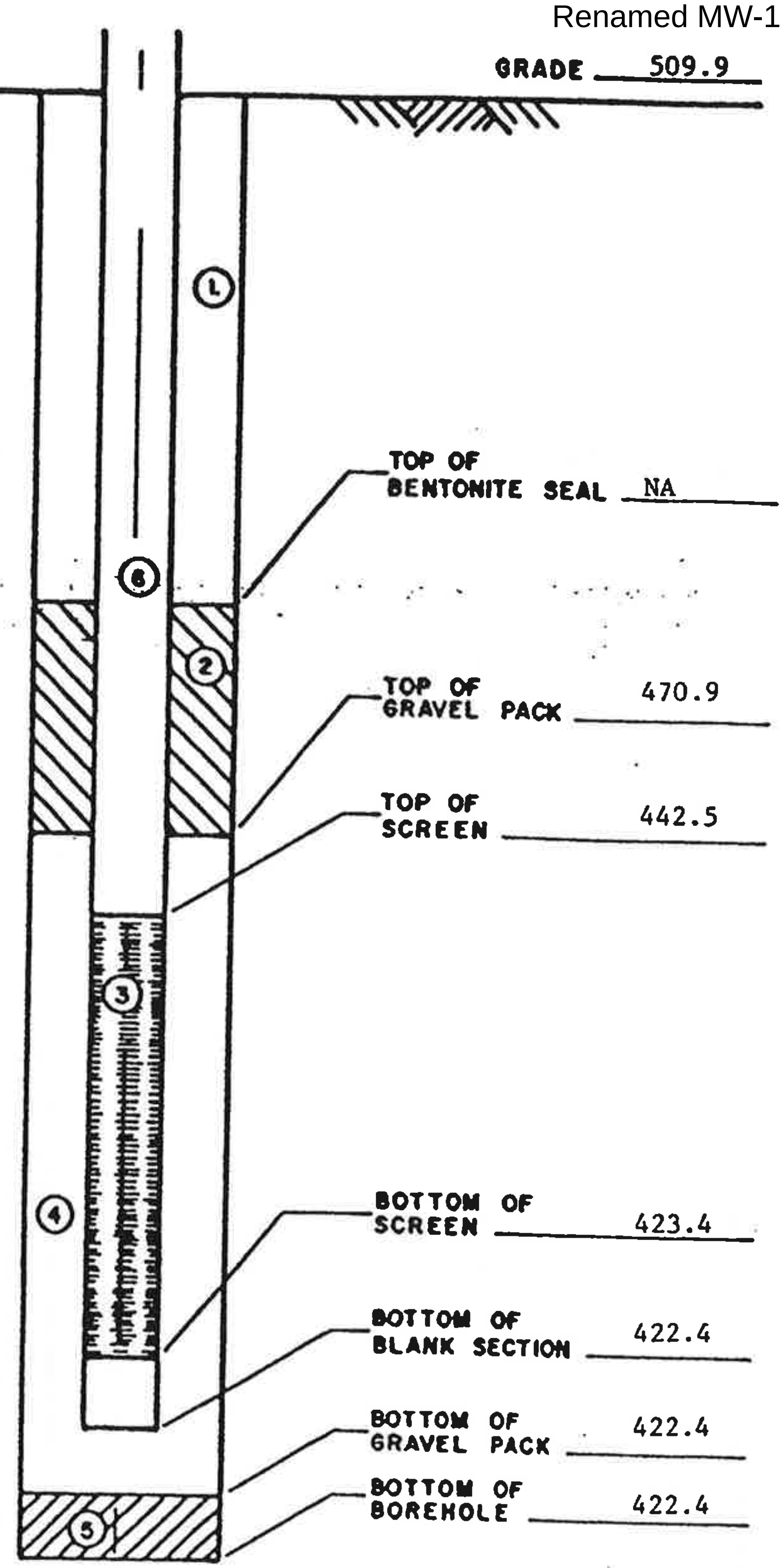
WELL CONSTRUCTION
SUMMARY ELEVATIONS
(FL NGVD)

WELL No. 1

REF. DATUM PT. 511.8

Renamed MW-1

GRADE 509.9



1. GROUT SEAL Volclay Group 509.9 to 470.9
2. BENTONITE SEAL
3. SCREEN 20' x 2" x .02 PVC
4. GRAVEL PACK natural sand
5. N. A.
6. RISER PIPE 2" PVC

Water level 470.5
5/2/89

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION		OBSERVATION WELL
APPROVED	DR.	CH.		
AMERICAN ELECTRIC POWER SVC. CORP.				CDS-04 SH.

JOB No. ____________

COMPANY Zimmer Plant

PROJECT Flood plain monitoring well

COORDINATES N-3270 E-130

DATE 4/26/89 TIME ____________

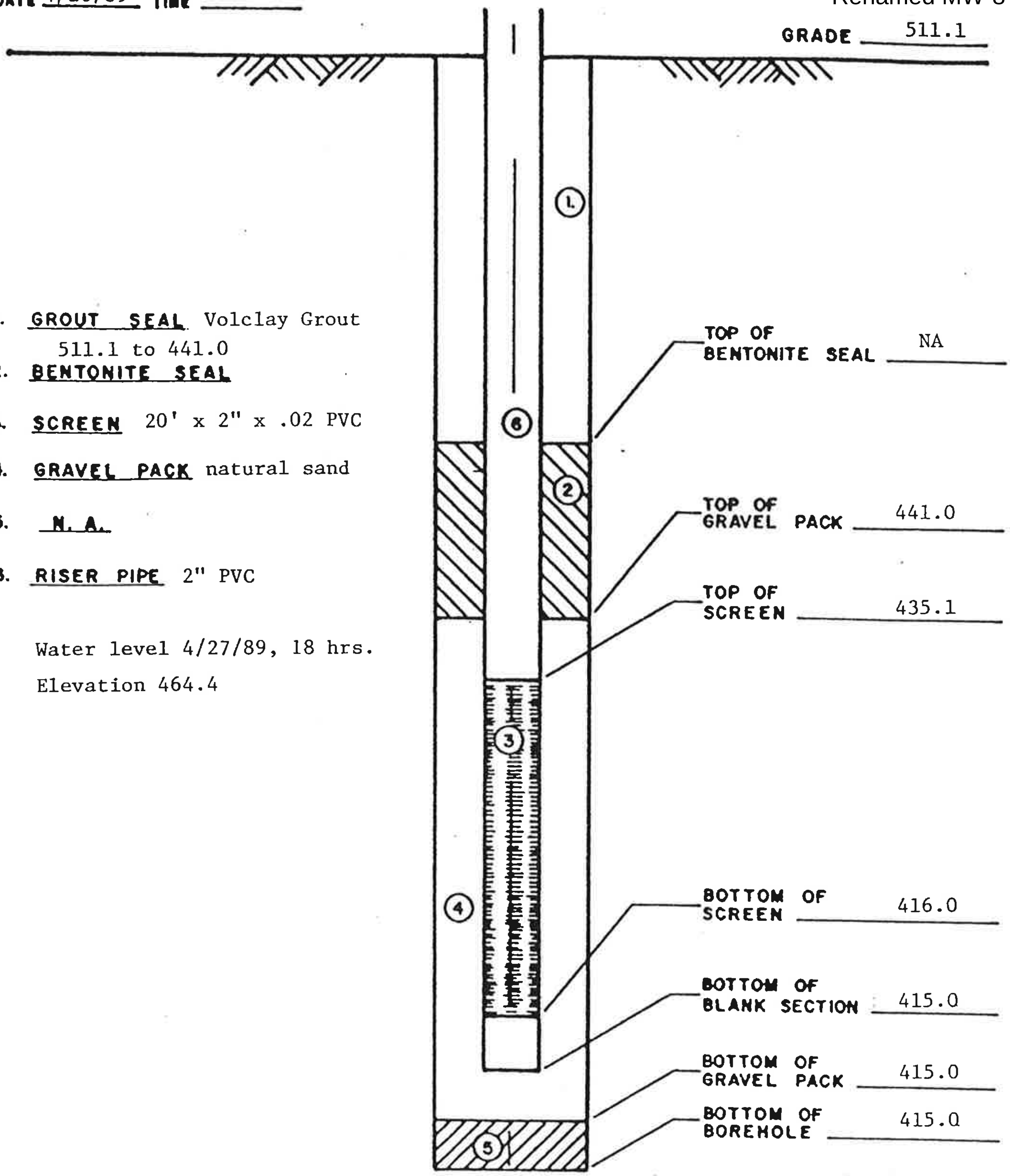
WELL CONSTRUCTION SUMMARY ELEVATIONS (ft NGVD)

WELL No. 8

REF. DATUM PT. 513.1

Renamed MW-8

GRADE 511.1



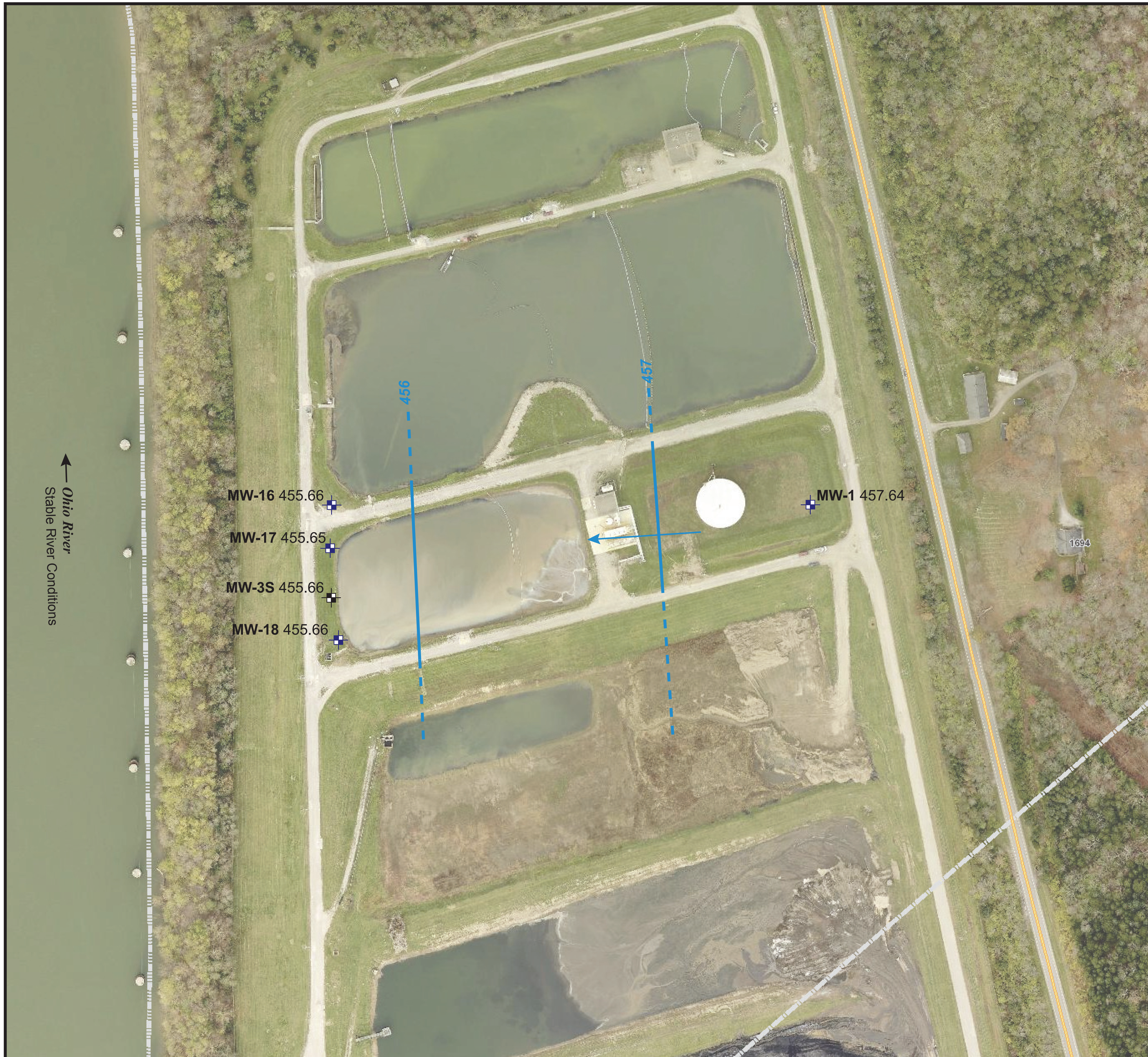
1. GROUT SEAL Volclay Grout 511.1 to 441.0
2. BENTONITE SEAL
3. SCREEN 20' x 2" x .02 PVC
4. GRAVEL PACK natural sand
5. N. A.
6. RISER PIPE 2" PVC

Water level 4/27/89, 18 hrs.

Elevation 464.4

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD	REVISION	OBSERVATION WELL
APPROVED	DR.	CH.
AMERICAN ELECTRIC POWER SVC. CORP.	CDS-04	SH.

APPENDIX C3 – MAPS OF THE DIRECTION OF GROUNDWATER FLOW



UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

457.64 GROUNDWATER ELEVATION (FEET, MSL), MEASURED AUGUST 31, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

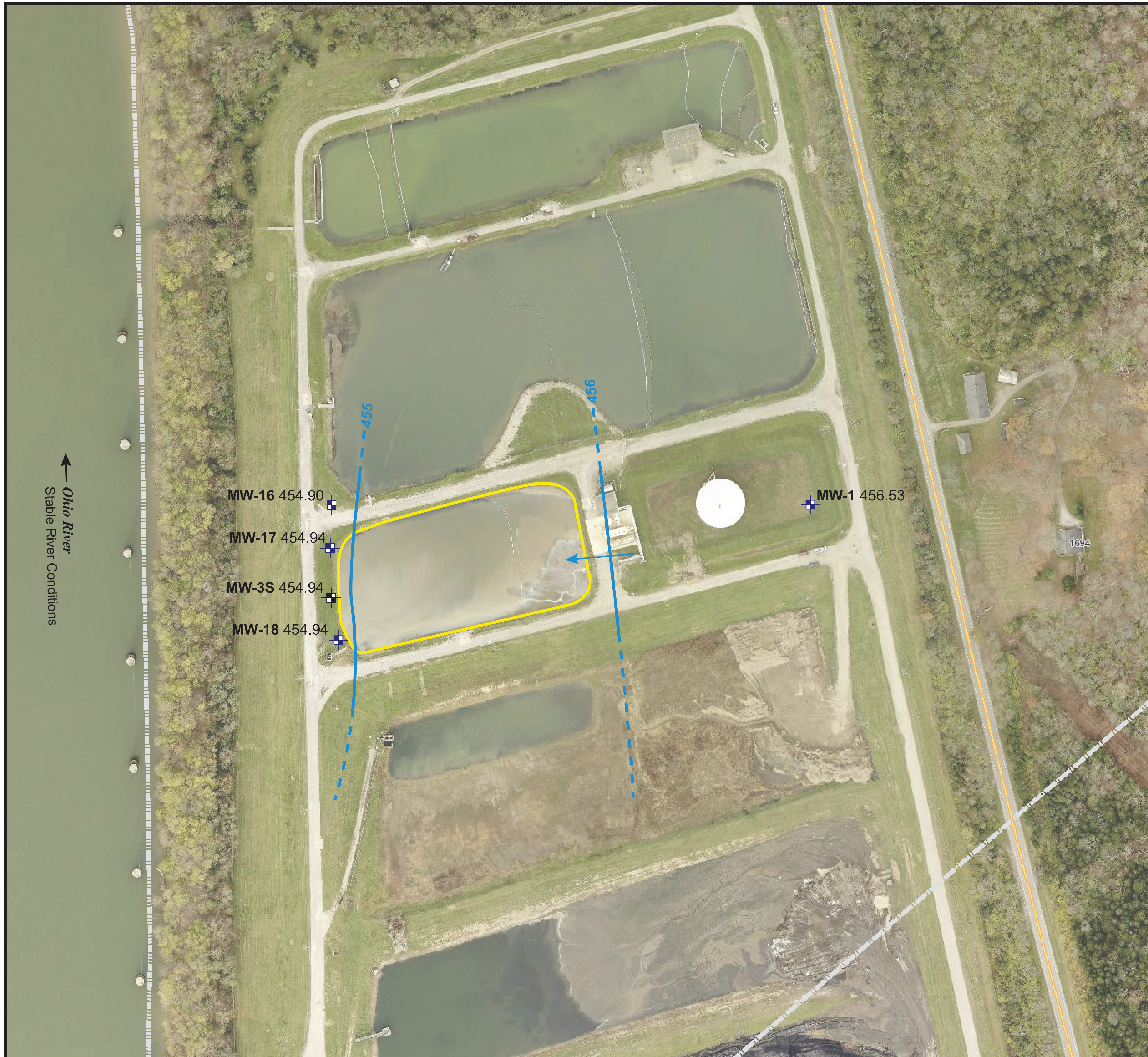
FIGURE 1
GROUNDWATER SURFACE MAP-
AUGUST 31, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/16/16	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TIZ\ZIM\ZIM PIEZ\coal pile fig1_08-16.ai



UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.53 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED SEPTEMBER 26, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/15/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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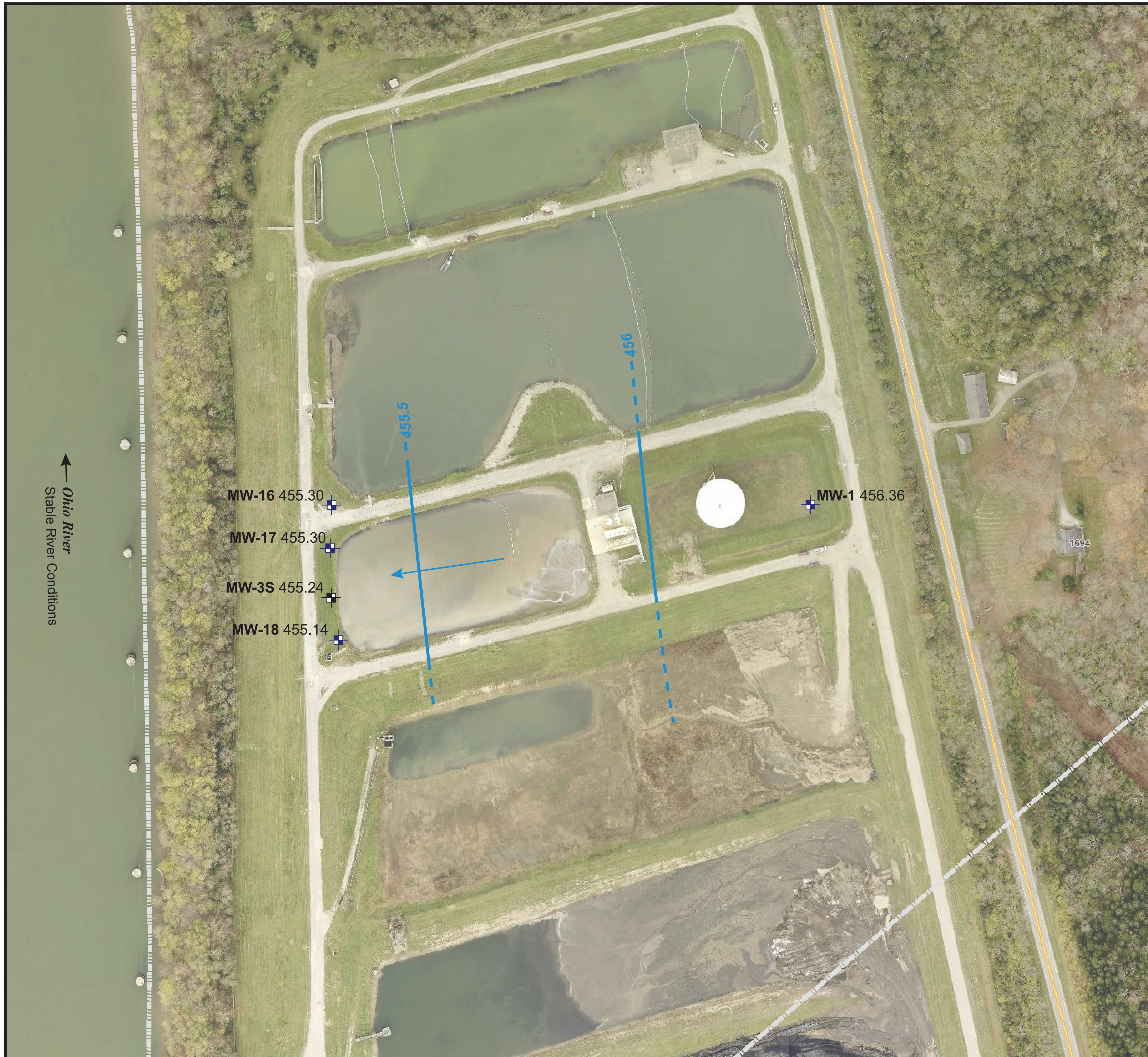

UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.36 GROUNDWATER ELEVATION (FEET, MSL), MEASURED OCTOBER 12, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
OCTOBER 12, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/16/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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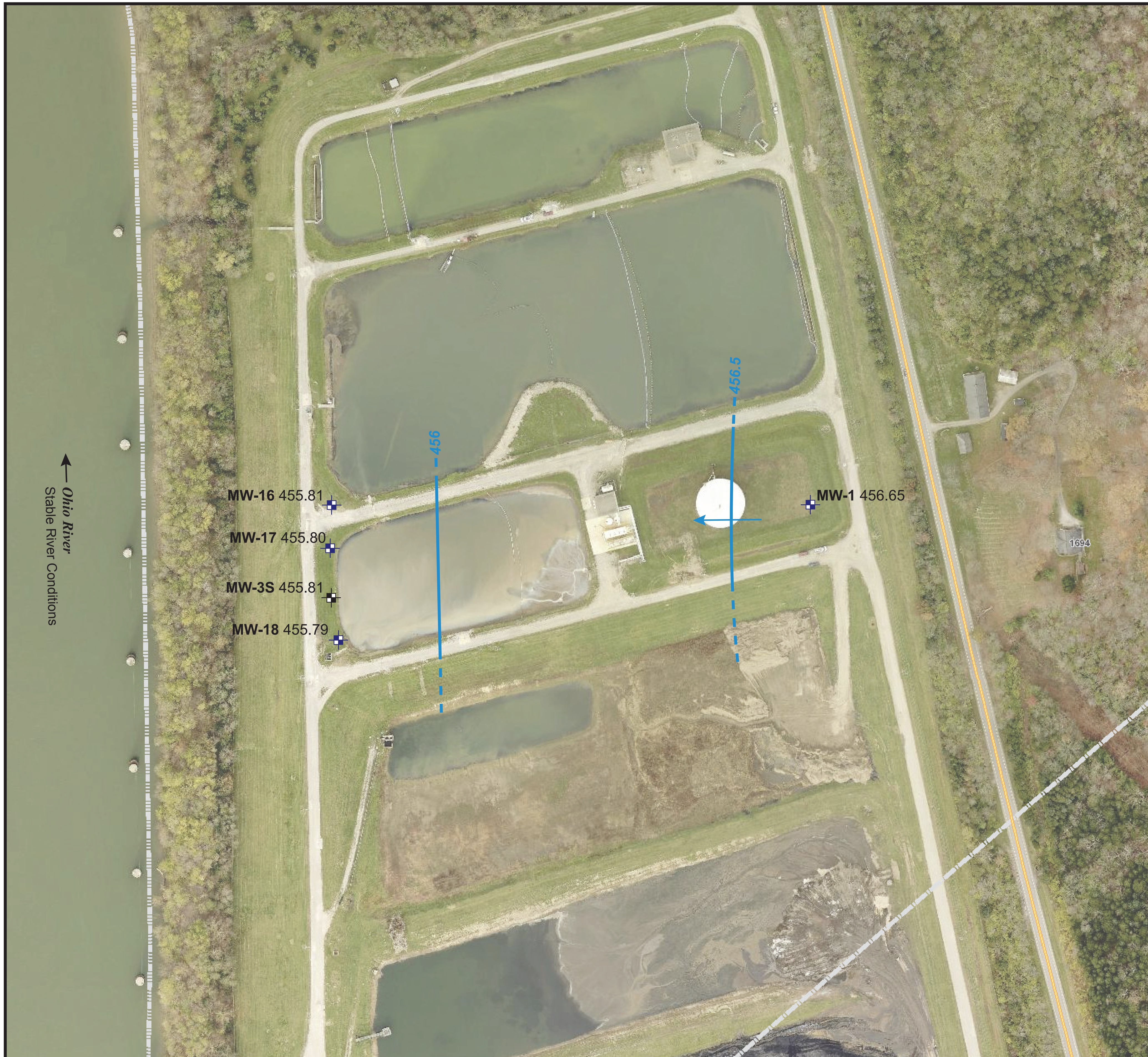

UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.65 GROUNDWATER ELEVATION (FEET, MSL), MEASURED NOVEMBER 16, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
NOVEMBER 16, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/16/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.88 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED DECEMBER 12, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

AECOM

UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

468.39 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 8, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

465.65 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JUNE 8, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

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UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

462.42 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

AECOM

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

O'BRIEN & GERE ENGINEERS, INC.

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7-9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 13, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

O'BRIEN & GERE ENGINEERS, INC.

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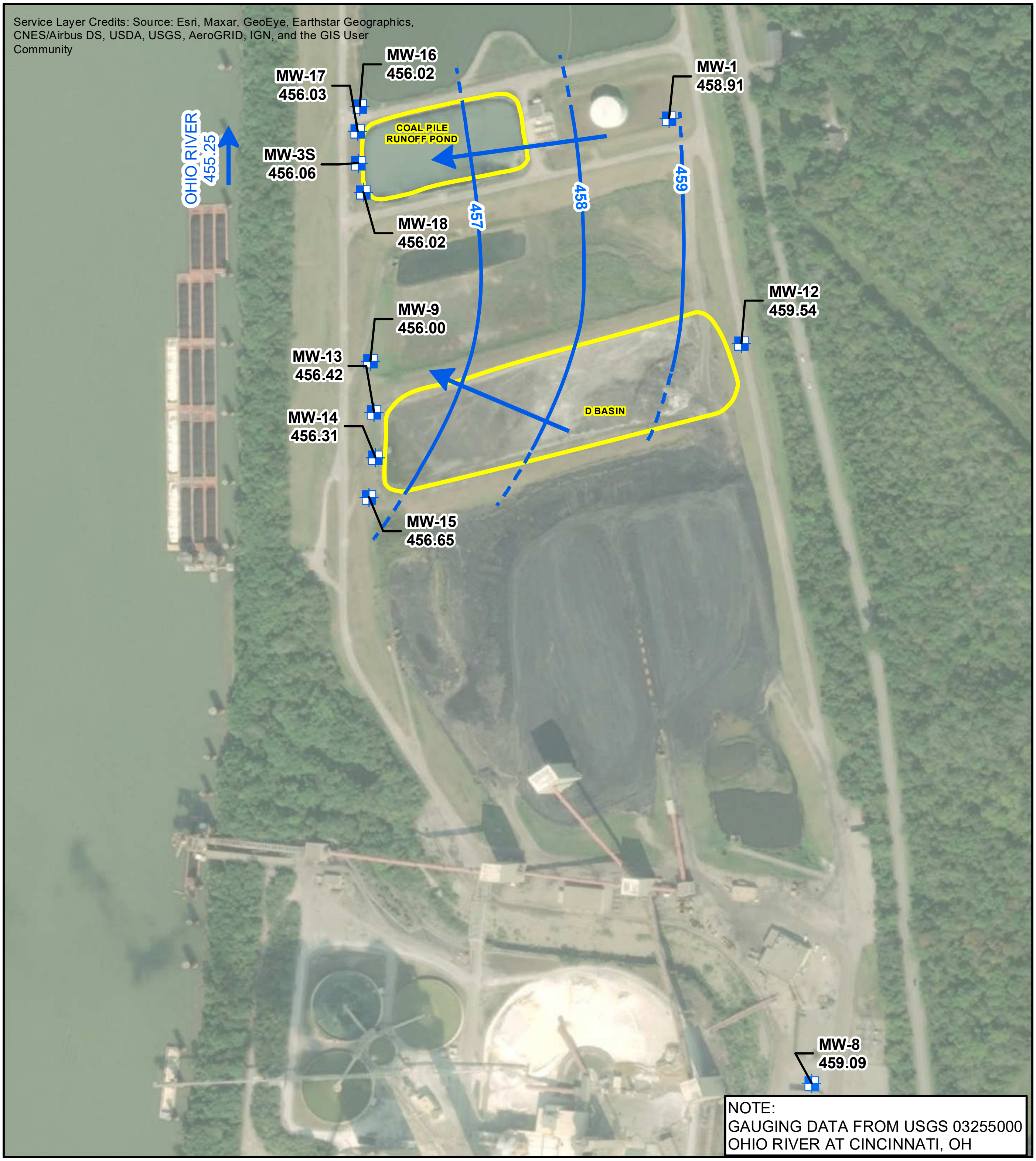

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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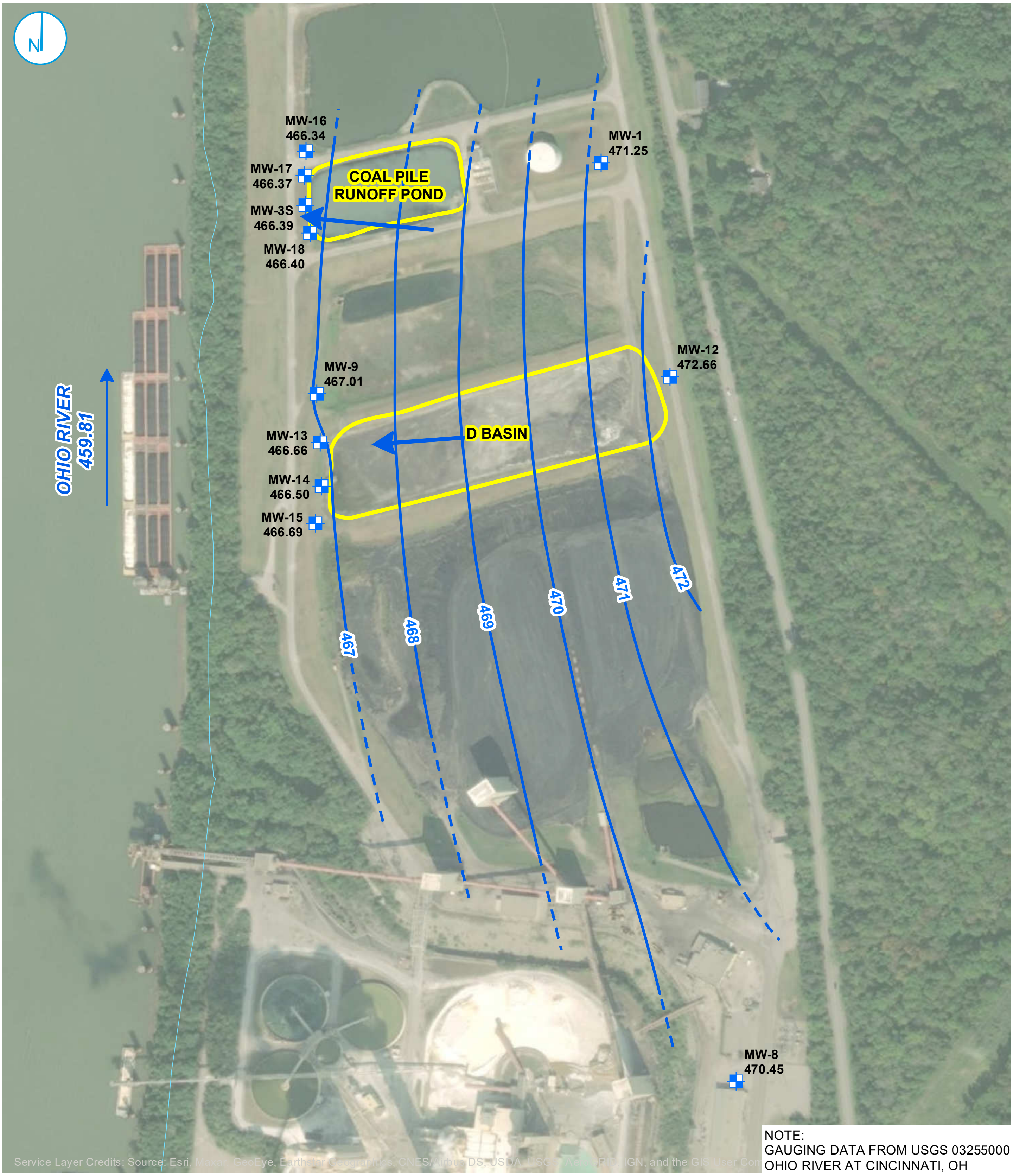

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PROJECT: 72799 | DATED: 8/13/2020 | DESIGNER: galarmmc

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

SURFACE WATER FEATURE

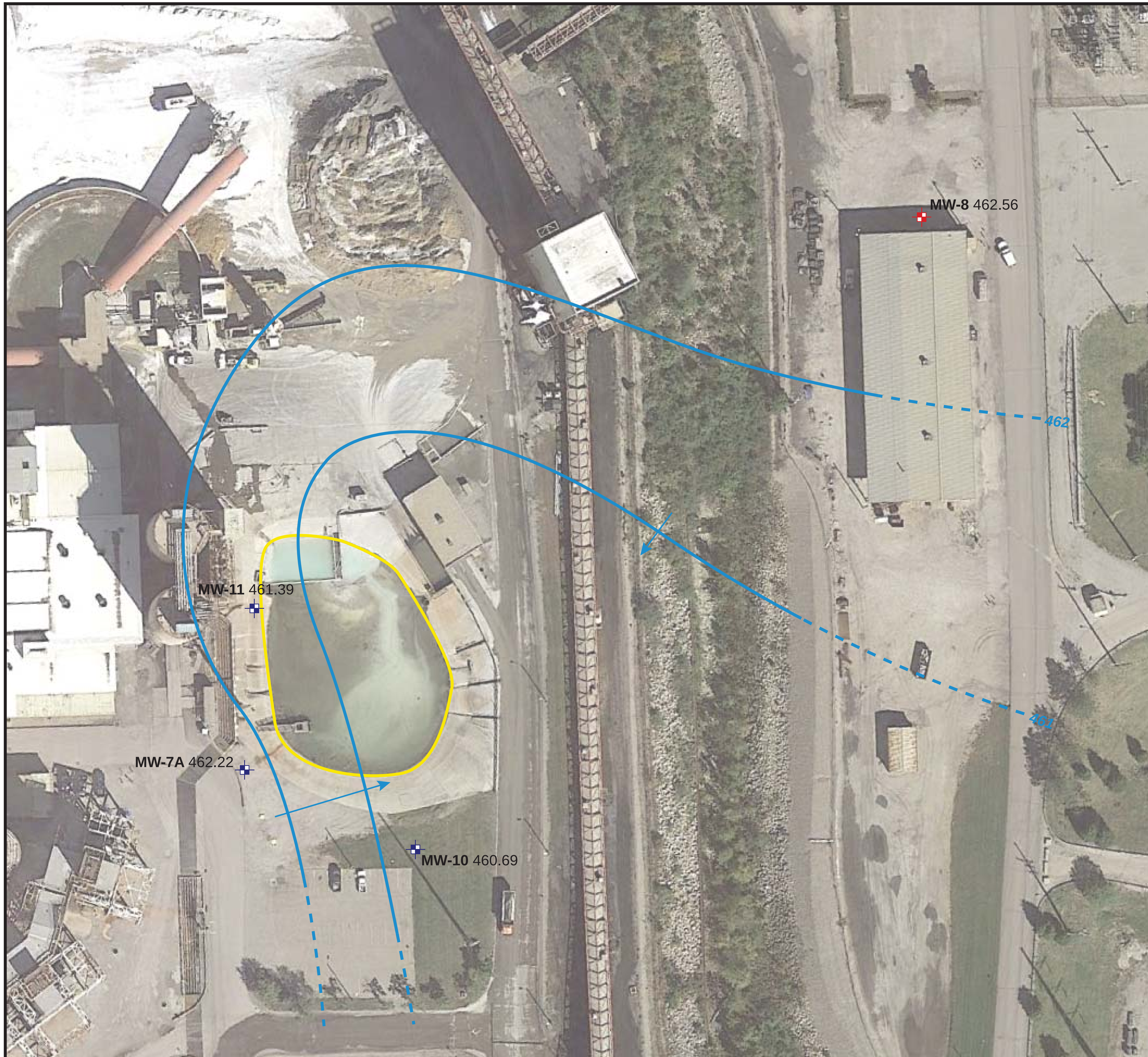
CCR MONITORED UNIT

0 200 400 Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 9, 2020

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

462.56 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED DECEMBER 29, 2015

NOTE- RISING OHIO RIVER CONDITIONS TO
NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE ____________

DATE ____________

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 29, 2015
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

468.40 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 16, 2016

NOTE- RAPID RISING OHIO RIVER CONDITIONS FOLLOWING RAPID DECENDING CONDITIONS FROM NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80

SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 16, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

461.68 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JUNE 15, 2016

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 15, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.20 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED SEPTEMBER 26, 2016

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/44/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.44 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED DECEMBER 12, 2016

NOTE- SHORT-TERM FALLING RIVER STAGE DURING
RISING LONG-TERM OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

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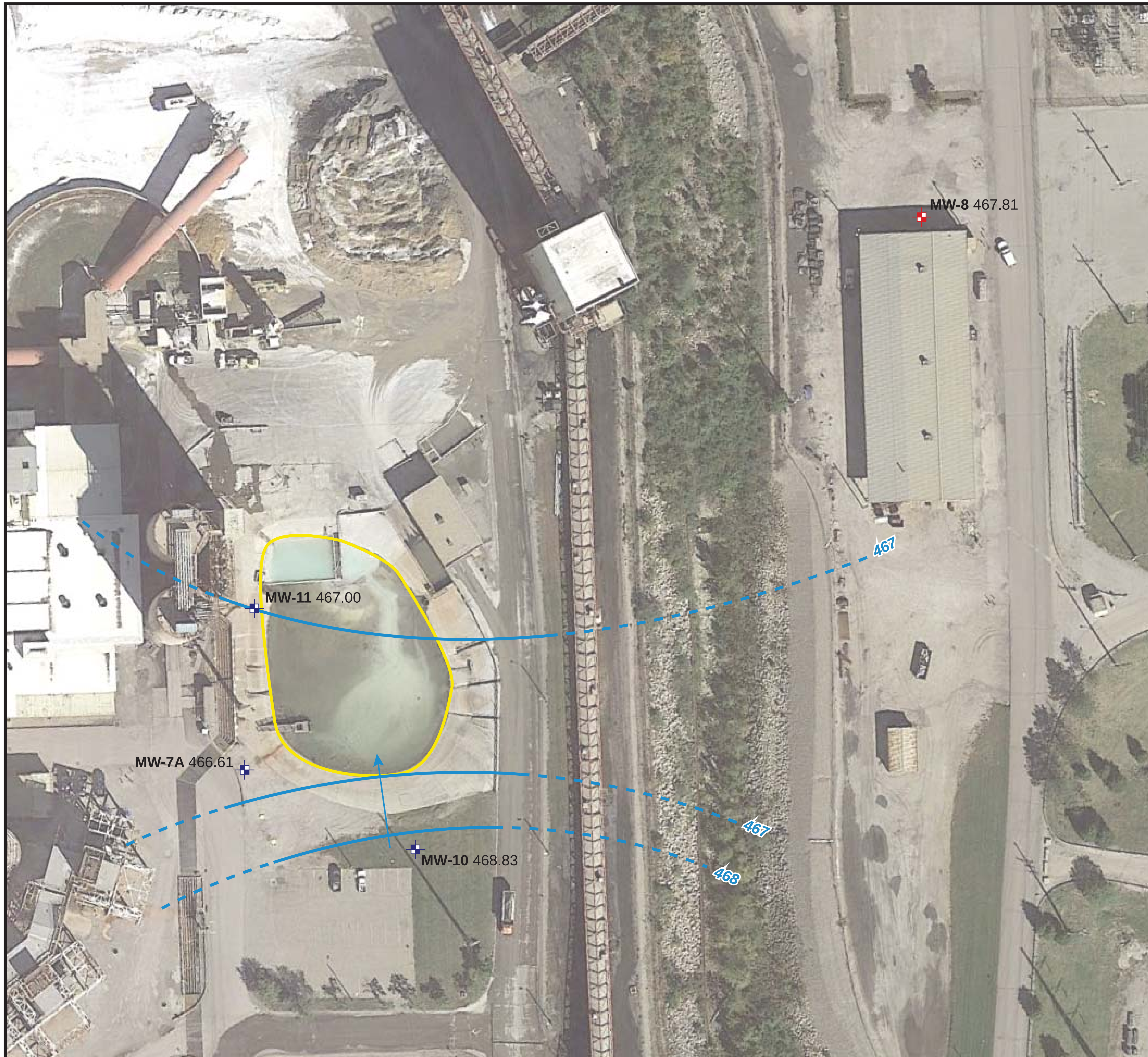

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

467.81 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 8, 2017

NOTE- FALLING OHIO RIVER CONDITIONS FROM NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

465.09 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 8, 2017

NOTE- FALLING OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

462.21 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

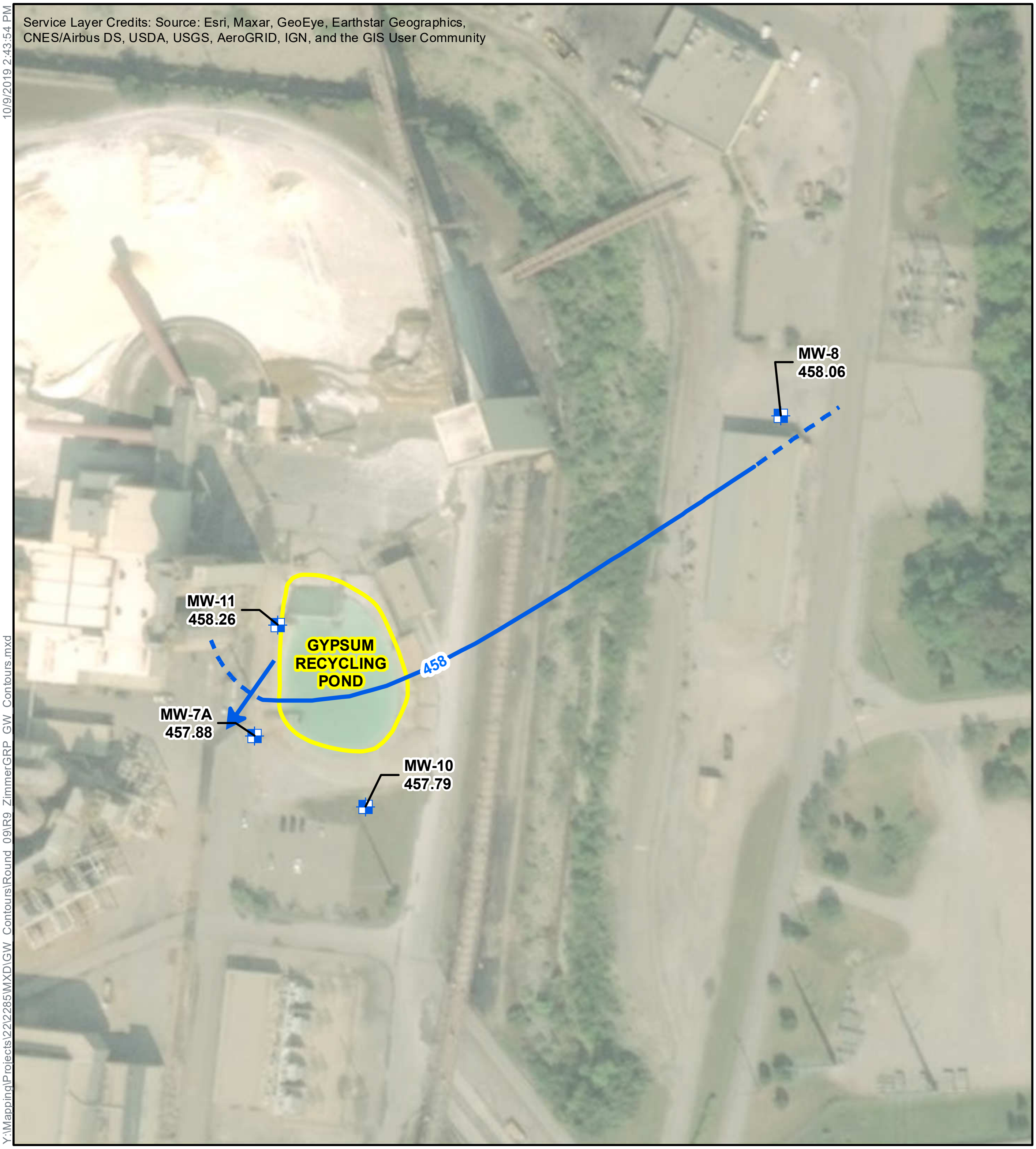
Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	0	ALW	MAW

JOB NO. 60442412

AECOM



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CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

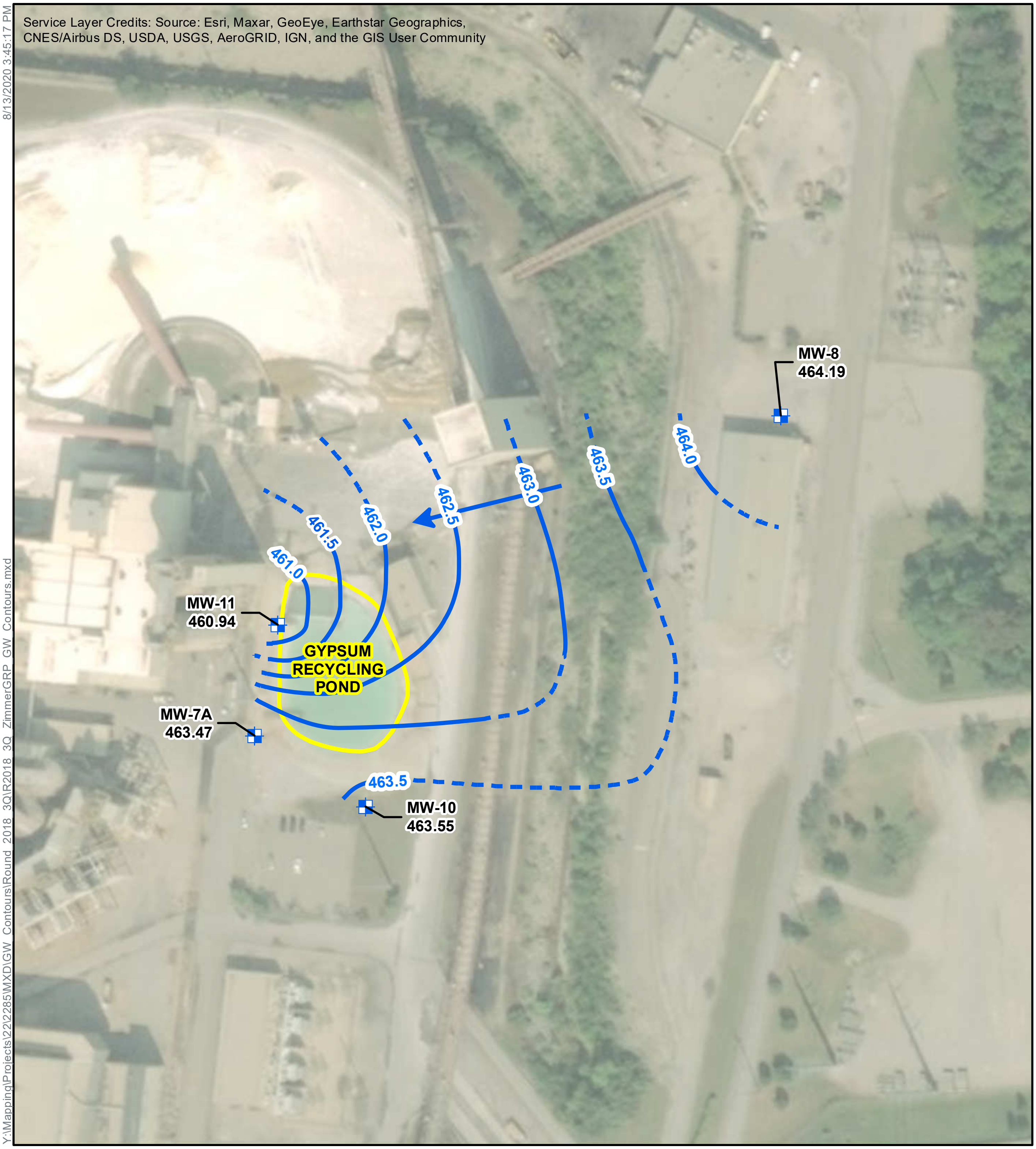
ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 9, 2018

N

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

O'BRIEN & GERE ENGINEERS, INC.

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CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (0.25-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

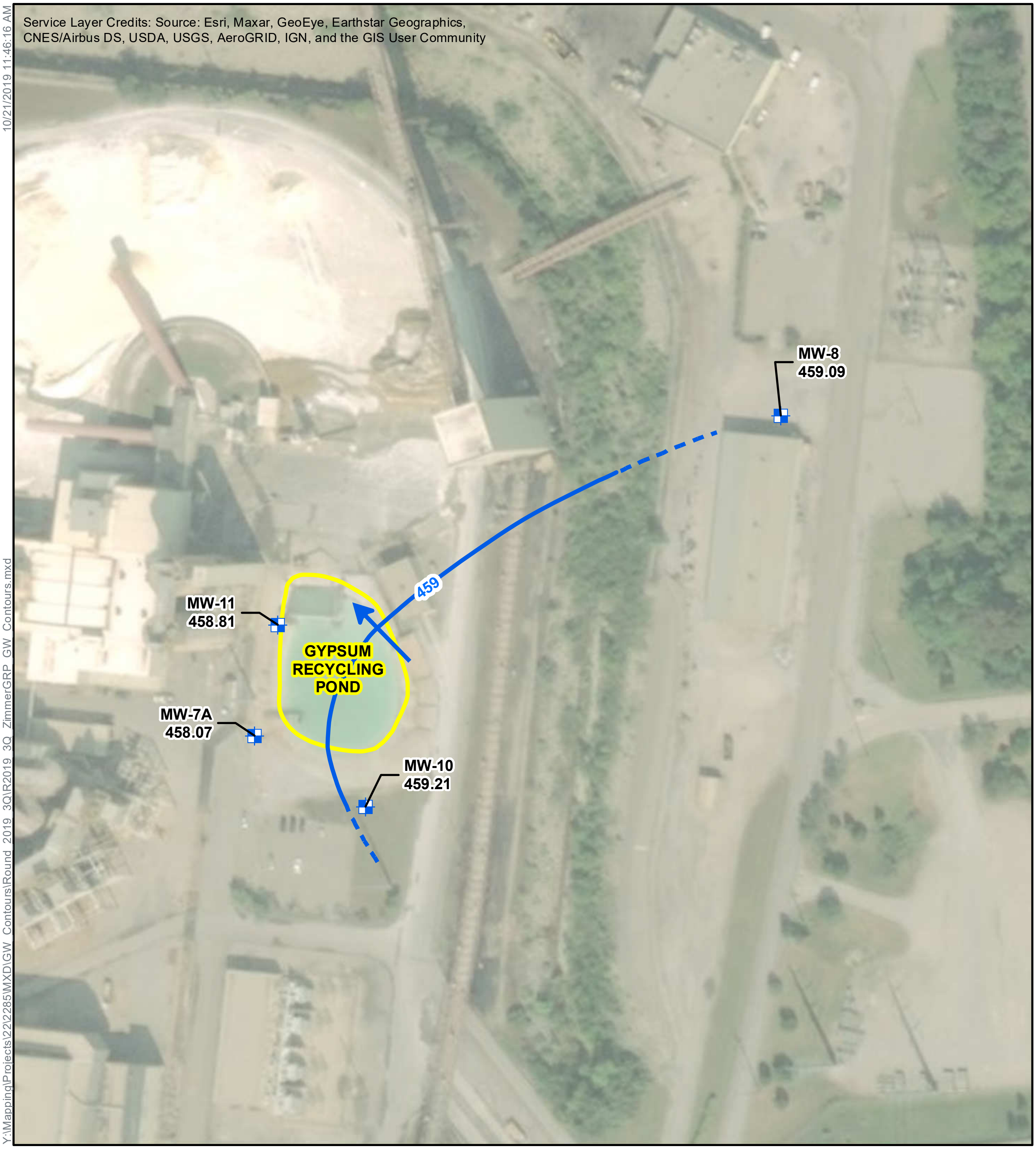
ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 12, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



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CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2020_1Q\R2020_1Q_ZimmerGRP_GW_Contours.mxd

PROJECT: 72799 | DATED: 8/14/2020 | DESIGNER: galarmmc

- CCR MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

0 50 100 Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 9, 2020

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

463.65 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 29, 2015

AERIAL SOURCE: CAGIS

N

0 200 400

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 29, 2015
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM PIEZ\basin d fig1_12-15.ai

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM PIEZ\basin d fig1_3-16.ai

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

469.30 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 16, 2016

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 16, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

461.87 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 15, 2016

AERIAL SOURCE: CAGIS

N

0 200 400

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 15, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM PIEZ\basin d fig1_9-16.ai

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.53 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED SEPTEMBER 26, 2016

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/14/16	0	ALW	MAW

JOB NO. 60442412

AECOM

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

456.77 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

468.36 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 8, 2017

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/08/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

466.54 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 8, 2017

AERIAL SOURCE: CAGIS

N

0 200 400

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/08/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM PIEZ\basin d fig1_7-17.ai

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

463.14 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

AERIAL SOURCE: CAGIS

N

0 200 400

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/08/17	0	ALW	MAW

JOB NO. 60442412

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CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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CCR MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7-9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

1/28/2020 6:07:38 PM

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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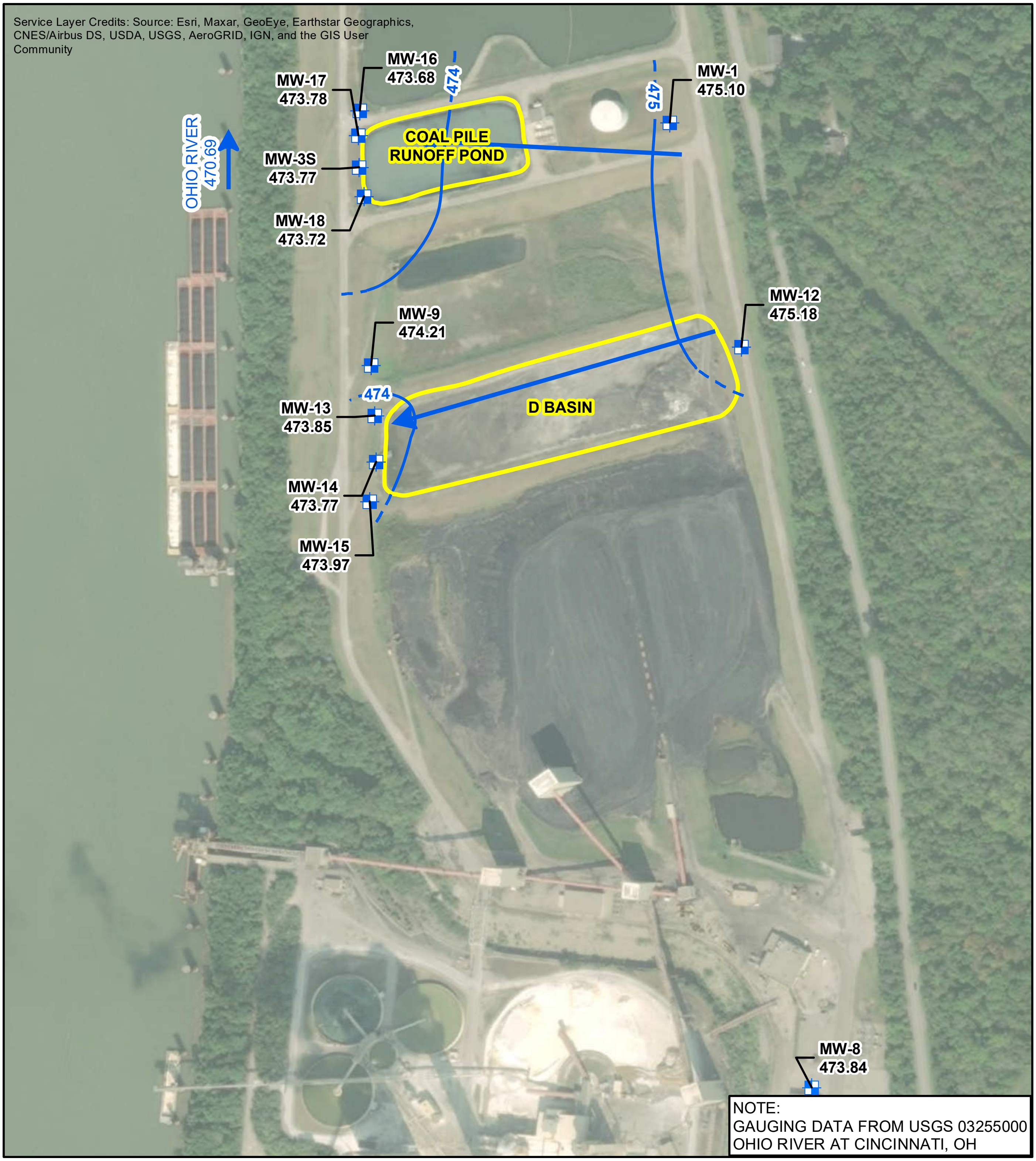

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 13, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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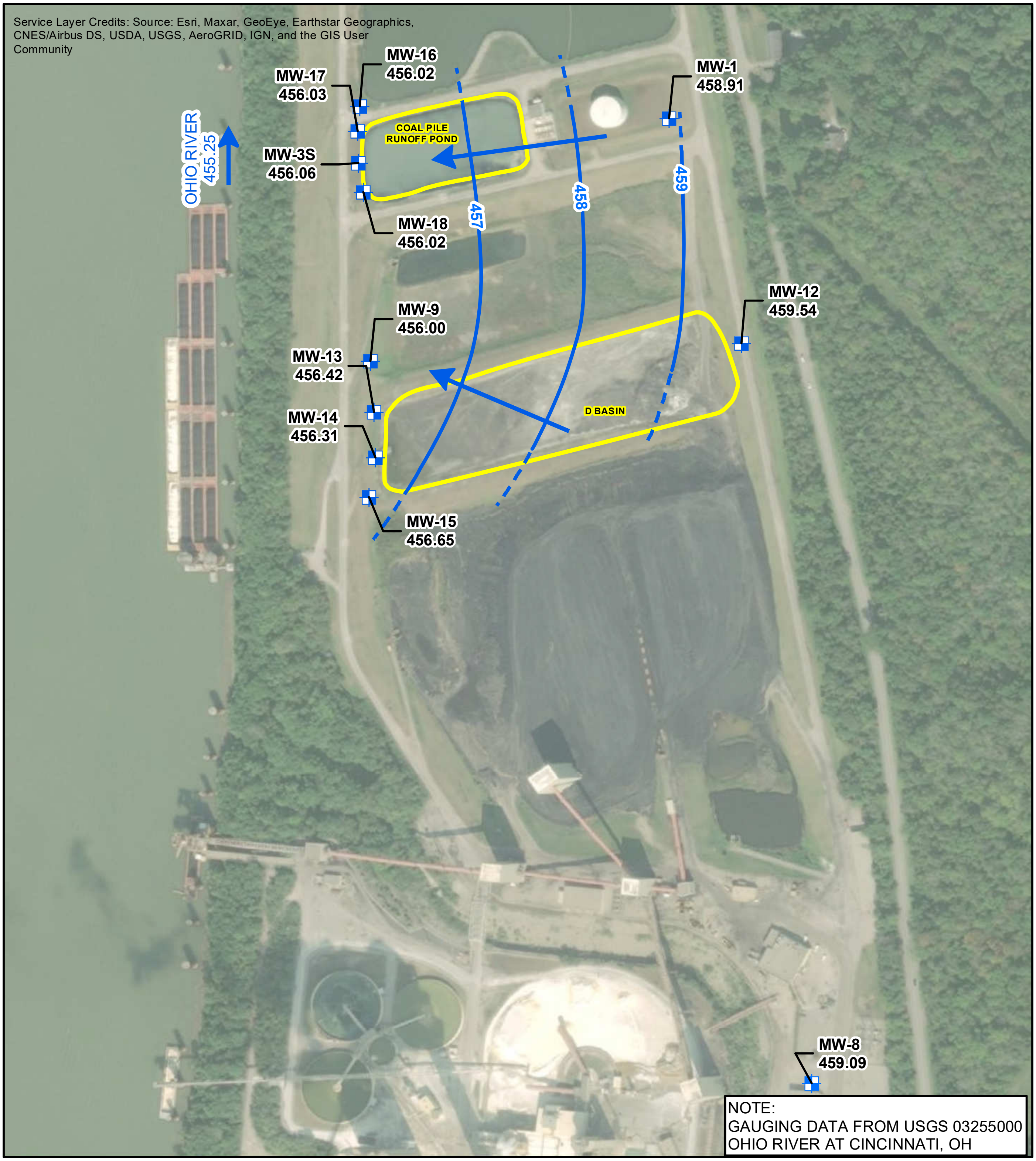

CCR MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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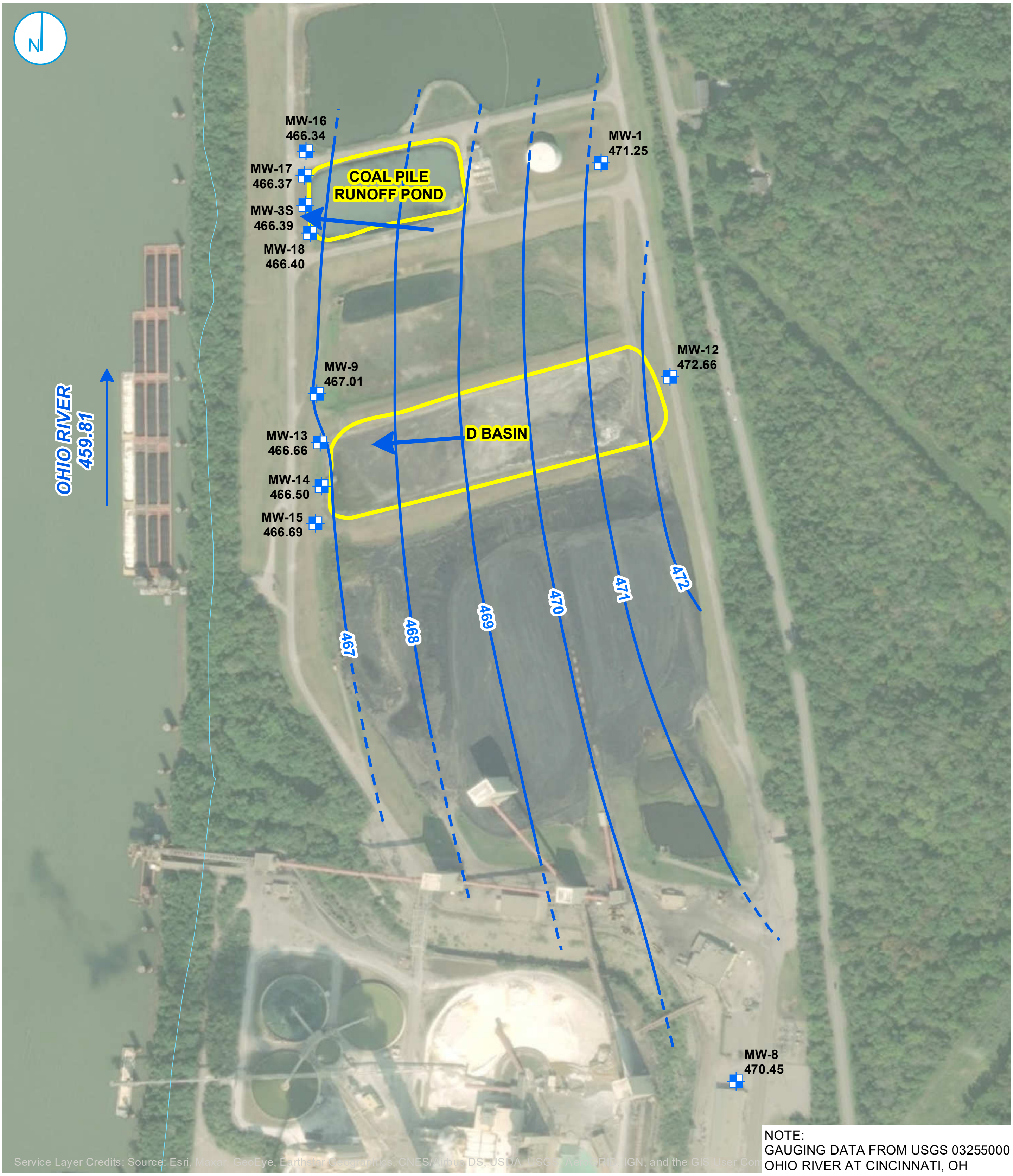

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

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PROJECT: 72799 | DATED: 8/13/2020 | DESIGNER: galarnmc

- CCR MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- CCR MONITORED UNIT

0 200 400
Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 9, 2020

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

APPENDIX C4 – TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

Analytical Results - Appendix III
Zimmer Coal Pile Runoff Pond

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-1	12/30/2015	0.0720	155	48.5	0.200	7.2	90.1	544
MW-1	3/16/2016	0.0233	206	59.1	0.146	7.1	85.2	583
MW-1	6/16/2016	0.0389	154	59.6	<1	7.0	95.3	648
MW-1	8/31/2016	0.0431	168	73.4	<1	6.4	113	612
MW-1	9/26/2016	0.0349	160	64.9	<1	7.1	93.1	621
MW-1	10/12/2016	0.0634	156	79.2	<1	7.2	112	571
MW-1	11/16/2016	0.0304	162	57.7	<1	6.4	90.6	596
MW-1	12/13/2016	0.0322	165	52.4	<1	7.0	93.3	561
MW-1	3/9/2017	<0.08	150	58.2	<1	8.3	85.9	589
MW-1	6/8/2017	<0.08	171	65.5	<1	7.1	87.0	582
MW-1	7/13/2017	<0.08	144	61.3	<1	7.0	79.0	608
MW-1	11/13/2017	<0.08	150	53.1	<1	6.9	89.1	571
MW-1	5/9/2018	<1	157	71.0	<1	7.0	88.9	631
MW-1	9/27/2018	<0.08	163	62.7	<1	6.9	113	578
MW-1	3/14/2019	<0.08	152	78.7	<1	7.0	90.2	617
MW-1	9/11/2019	<0.08	167	63.1	<1	7.0	90.6	637
MW-1	4/9/2020	0.123	170	80.5	<0.15	6.7	92.3	592
Downgradient Wells								
MW-3S	8/31/2016	0.109	194	<60	<1	6.9	371	860
MW-3S	9/26/2016	0.209	188	54.7	<1	6.9	338	830
MW-3S	10/12/2016	0.0983	168	66.3	<1	6.9	328	779
MW-3S	11/16/2016	0.0710	169	44.0	<1	7.5	268	706
MW-3S	12/12/2016	0.0567	131	36.4	<1	6.7	179	559
MW-3S	3/9/2017	<0.08	139	37.2	<1	8.3	242	665
MW-3S	6/8/2017	<0.08	208	69.5	<1	7.0	384	892
MW-3S	7/13/2017	0.0984	201	<60	<1	7.2	399	934
MW-3S	11/13/2017	<0.08	127	33.8	<1	6.5	176	560
MW-3S	5/9/2018	<1	115	32.1	<1	6.7	151	568
MW-3S	9/19/2018	0.188	162	41.3	<1	6.7	251	720
MW-3S	3/15/2019	0.143	160	37.3	<1	6.9	199	683
MW-3S	9/11/2019	1.91	228	39.2	<1	7.6	532	1090
MW-3S	4/10/2020	1.03	221	43.0	<0.15	7.0	447	949
MW-16	8/31/2016	0.0506	143	41.8	<1	6.4	198	642
MW-16	9/26/2016	0.102	163	42.2	<1	6.8	173	639
MW-16	10/12/2016	0.0689	149	51.6	<1	7.2	172	609
MW-16	11/16/2016	0.0446	151	38.8	<1	6.4	168	628
MW-16	12/12/2016	0.0527	151	37.8	<1	7.0	175	612
MW-16	3/9/2017	<0.08	106	28.0	<1	8.5	121	484
MW-16	6/8/2017	<0.08	132	31.8	<1	7.1	155	541
MW-16	7/13/2017	<0.08	135	36.1	<1	7.2	161	605
MW-16	11/13/2017	<0.08	139	38.8	<1	7.0	169	592
MW-16	5/9/2018	<1	128	32.3	<1	7.0	145	571
MW-16	9/19/2018	<0.08	153	38.5	<1	6.9	175	640
MW-16	3/15/2019	<0.08	153	39.4	<1	7.0	160	621
MW-16	9/12/2019	0.130	156	45.5	<1	6.8	187	686
MW-16	4/10/2020	0.0621	162	47.6	0.151	6.9	197	687

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-17	8/31/2016	0.0584	128	36.3	<1	7.1	190	646
MW-17	9/26/2016	0.0757	147	32.0	<1	7.1	181	622
MW-17	10/12/2016	0.0478	126	39.5	<1	7.4	174	596
MW-17	11/16/2016	0.0447	142	38.7	<1	6.4	167	615
MW-17	12/12/2016	0.0569	145	37.6	<1	7.2	184	608
MW-17	3/9/2017	<0.08	112	<30	<1	8.4	159	528
MW-17	6/8/2017	<0.08	135	31.7	<1	7.1	182	602
MW-17	7/13/2017	<0.08	137	70.2	<1	7.1	390	626
MW-17	11/13/2017	<0.08	145	39.4	<1	7.1	180	627
MW-17	5/9/2018	<1	125	34.9	<1	7.1	167	603
MW-17	9/19/2018	<0.08	152	35.8	<1	6.9	187	659
MW-17	3/15/2019	<0.08	144	38.3	<1	7.1	174	620
MW-17	9/12/2019	0.0889	177	47.8	<1	7.0	280	776
MW-17	4/10/2020	0.0608	178	51.1	0.162	7.0	283	767
MW-18	8/31/2016	4.54	312	67.4	<1	7.0	973	1640
MW-18	9/26/2016	4.11	321	70.6	<1	7.2	874	1660
MW-18	10/12/2016	3.78	287	66.2	<1	7.3	924	1570
MW-18	11/16/2016	4.46	307	<60	<1	7.7	1130	1570
MW-18	12/12/2016	5.14	336	63.3	<1	7.1	918	1570
MW-18	3/9/2017	4.43	287	77.9	<1	8.3	844	1510
MW-18	6/8/2017	3.27	311	59.1	<1	7.0	883	1440
MW-18	7/13/2017	4.85	318	70.8	<1	7.2	1170	1760
MW-18	11/13/2017	3.72	322	54.0	<1	6.9	931	1520
MW-18	5/9/2018	2.62	249	56.5	<1	7.0	748	1450
MW-18	9/19/2018	4.32	306	52.1	<1	6.9	795	1600
MW-18	3/15/2019	2.77	262	49.0	<1	7.0	711	1370
MW-18	9/12/2019	3.00	226	30.8	<1	7.1	612	1210
MW-18	4/10/2020	3.56	272	43.2	0.161	7.0	771	1300

Notes:
1. Abbreviations: mg/L - milligrams per liter; s.u. - standard units.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-1	12/30/2015	<0.0005	0.00142	0.0655	<0.001	<0.0004	0.00191	<0.0005	0.200	<0.0002	<0.008	<0.0001	<0.0005	0.348	<0.0006	<0.0005
MW-1	3/16/2016	<0.00418	<0.00295	0.0863	<0.000875	<0.00025	<0.0025	<0.000543	0.146	<0.000433	0.0101	<0.0001	<0.0025	0.453	<0.00398	<0.00138
MW-1	6/16/2016	<0.002	<0.001	0.0601	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.603	<0.005	<0.001
MW-1	8/31/2016	<0.002	<0.001	0.0660	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0102	<0.0002	<0.005	0.0844	<0.005	<0.001
MW-1	9/26/2016	<0.002	<0.001	0.0627	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.168	<0.005	<0.001
MW-1	10/12/2016	<0.002	<0.001	0.0639	<0.001	<0.001	<0.002	<0.0005	<1	0.00268	<0.01	<0.0002	<0.005	0.489	<0.005	<0.001
MW-1	11/16/2016	<0.002	<0.001	0.0670	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0097	<0.0002	<0.005	0.339	<0.005	<0.001
MW-1	12/13/2016	<0.002	<0.001	0.0629	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.422	<0.005	<0.001
MW-1	3/9/2017	<0.002	<0.001	0.0587	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	<0.0002	<0.005	0.426	<0.005	<0.001
MW-1	6/8/2017	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	<0.005	0.349	<0.005	<0.001
MW-1	7/13/2017	<0.002	<0.001	0.0566	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.144	<0.005	<0.001
MW-1	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-1	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.370	<0.01	<0.002
MW-1	9/27/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.231	NA	NA
MW-1	3/14/2019	<0.002	<0.001	0.0665	<0.001	<0.001	0.0023	<0.0005	<1	<0.001	0.00665	<0.0002	<0.005	0.171	<0.005	<0.001
MW-1	9/11/2019	NA	<0.001	0.0770	<0.001	NA	<0.002	<0.0005	<1	<0.001	0.0109	NA	<0.005	0.110	<0.005	NA
MW-1	4/9/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
Downgradient Wells																
MW-3S	8/31/2016	<0.002	<0.001	0.0519	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.138	<0.005	<0.001
MW-3S	9/26/2016	<0.002	<0.001	0.0515	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.364	0.00588	<0.001
MW-3S	10/12/2016	<0.002	<0.001	0.0508	<0.001	<0.001	<0.002	<0.0005	<1	0.00182	<0.00959	<0.0002	<0.005	0.249	<0.005	<0.001
MW-3S	11/16/2016	<0.002	0.0019	0.0491	<0.001	<0.001	<0.002	0.00254	<1	0.00134	<0.00959	<0.0002	<0.005	0.520	0.00557	<0.001
MW-3S	12/12/2016	<0.002	<0.001	0.0393	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0391	0.00529	<0.001
MW-3S	3/9/2017	<0.002	<0.001	0.0383	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.329	<0.005	<0.001
MW-3S	6/8/2017	<0.002	<0.001	0.0507	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.315	<0.005	<0.001
MW-3S	7/13/2017	<0.002	<0.001	0.0513	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.441	<0.005	<0.001
MW-3S	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-3S	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.346	<0.01	<0.002
MW-3S	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.491	NA	NA
MW-3S	3/15/2019	<0.002	<0.001	0.0517	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.262	<0.005	<0.001
MW-3S	9/11/2019	NA	<0.001	0.0715	NA	<0.001	0.00275	<0.0005	<1	<0.001	0.0118	NA	<0.005	0.338	0.0111	NA
MW-3S	4/10/2020	<0.004	<0.002	0.0576	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00548	<0.0002	<0.005	0.888	0.00390	<0.002
MW-16	8/31/2016	<0.002	<0.001	0.0371	<0.001	<0.001	<0.002	0.00402	<1	<0.001	<0.00959	<0.0002	0.00679	0.371	<0.005	<0.001
MW-16	9/26/2016	<0.002	<0.001	0.0414	<0.001	<0.001	<0.002	0.00416	<1	<0.001	<0.00959	<0.0002	0.00517	0.402	<0.005	<0.001
MW-16	10/12/2016	<0.002	0.00124	0.0432	<0.001	<0.001	<0.002	0.00417	<1	0.00383	<0.00959	<0.0002	0.00508	0.311	<0.005	<0.001
MW-16	11/16/2016	<0.002	<0.001	0.0466	<0.001	<0.001	<0.002	0.00322	<1	<0.001	<0.00959	<0.0002	0.00572	0.489	<0.005	<0.001
MW-16	12/12/2016	<0.002	<0.001	0.0453	<0.001	<0.001	<0.002	0.00461	<1	<0.001	<0.00959	<0.0002	0.00674	0.664	<0.005	<0.001
MW-16	3/9/2017	<0.002	<0.001	0.0314	<0.001	<0.001	<0.002	0.00204	<1	<0.001	<0.00959	<0.0002	<0.005	0.317	<0.005	<0.001
MW-16	6/8/2017	<0.002	<0.001	0.0348	<0.001	<0.001	<0.002	0.00246	<1	<0.001	<0.00959	<0.0002	<0.005	0.439	<0.005	<0.001
MW-16	7/13/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	0.00252	<1	<0.001	<0.00959	<0.0002	<0.005	0.566	<0.005	<0.001
MW-16	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-16	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.240	<0.01	<0.002
MW-16	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.554	NA	NA
MW-16	3/15/2019	<0.002	<0.001	0.114	<0.001	<0.001	<0.002	0.00203	<1	<0.001	0.00677	<0.0002	<0.005	0.233	<0.005	<0.001
MW-16	9/12/2019	NA	<0.001	0.0538	NA	<0.001	0.00218	0.00201	<1	<0.001	0.0111	NA	<0.005	0.969	<0.005	NA
MW-16	4/10/2020	<0.004	<0.002	0.0474	<0.002	<0.001	<0.002	0.00208	0.151	<0.005	0.00522	<0.0002	<0.005	1.85	<0.002	<0.002

Analytical Results - Appendix IV
Zimmer Coal Pile Runoff Pond

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-17	8/31/2016	<0.002	<0.001	0.0489	<0.001	<0.001	<0.002	0.00177	<1	<0.001	<0.00959	<0.0002	0.00715	0.533	<0.005	<0.001
MW-17	9/26/2016	<0.002	<0.001	0.0537	<0.001	<0.001	<0.002	0.00189	<1	<0.001	<0.00959	<0.0002	0.00825	0.802	<0.005	<0.001
MW-17	10/12/2016	<0.002	<0.001	0.0532	<0.001	<0.001	<0.002	0.00203	<1	0.0015	<0.00959	<0.0002	0.009	0.363	<0.005	<0.001
MW-17	11/16/2016	<0.002	<0.001	0.0642	<0.001	<0.001	<0.002	0.00159	<1	<0.001	<0.00959	<0.0002	0.0096	0.403	<0.005	<0.001
MW-17	12/12/2016	<0.002	<0.001	0.0599	<0.001	<0.001	<0.002	0.00188	<1	<0.001	<0.00959	<0.0002	0.0095	0.781	<0.005	<0.001
MW-17	3/9/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	0.00102	<1	<0.001	<0.00959	<0.0002	<0.005	0.264	<0.005	<0.001
MW-17	6/8/2017	0.00232	<0.001	0.0498	<0.001	<0.001	<0.002	0.00109	<1	<0.001	<0.00959	<0.0002	<0.005	0.266	<0.005	<0.001
MW-17	7/13/2017	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	0.00117	<1	<0.001	<0.00959	<0.0002	<0.005	0.246	<0.005	<0.001
MW-17	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-17	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.650	<0.01	<0.002
MW-17	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.359	NA	NA
MW-17	3/15/2019	<0.002	<0.001	0.0619	<0.001	<0.001	<0.002	0.000964	<1	<0.001	<0.005	<0.0002	<0.005	0.150	<0.005	<0.001
MW-17	9/12/2019	NA	<0.001	0.0815	NA	<0.001	0.00243	0.00139	<1	<0.001	0.0175	NA	<0.005	0.658	<0.005	NA
MW-17	4/10/2020	<0.004	<0.002	0.0602	<0.002	<0.001	<0.002	<0.002	0.162	<0.005	0.00536	<0.0002	<0.005	0.806	0.00204	<0.002
MW-18	8/31/2016	<0.002	<0.001	0.0494	<0.001	<0.001	<0.002	0.00369	<1	<0.001	0.00973	<0.0002	<0.005	0.975	0.0112	<0.001
MW-18	9/26/2016	<0.002	<0.001	0.0471	<0.001	<0.001	<0.002	0.00279	<1	<0.001	<0.00959	<0.0002	<0.005	1.55	0.0142	<0.001
MW-18	10/12/2016	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	0.00240	<1	0.00106	<0.00959	<0.0002	<0.005	0.394	0.00520	<0.001
MW-18	11/16/2016	<0.002	<0.001	0.0524	<0.001	<0.001	<0.002	0.00231	<1	<0.001	<0.00959	<0.0002	<0.005	0.65	0.0128	<0.001
MW-18	12/12/2016	<0.002	<0.001	0.0550	<0.001	<0.001	<0.002	0.00358	<1	<0.001	<0.00959	<0.0002	<0.005	0.89	0.0134	<0.001
MW-18	3/9/2017	<0.002	<0.001	0.0416	<0.001	<0.001	<0.002	0.00168	<1	<0.001	0.0111	<0.0002	<0.005	0.531	<0.005	<0.001
MW-18	6/8/2017	<0.002	<0.001	0.0475	<0.001	<0.001	<0.002	0.00203	<1	<0.001	0.0121	<0.0002	<0.005	0.489	<0.005	<0.001
MW-18	7/13/2017	<0.002	<0.001	0.0407	<0.001	<0.001	<0.002	0.00172	<1	<0.001	<0.00959	<0.0002	<0.005	0.728	0.00697	<0.001
MW-18	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-18	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.405	<0.01	<0.002
MW-18	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.699	NA	NA
MW-18	3/15/2019	<0.002	<0.001	0.0398	<0.001	<0.001	<0.002	0.00131	<1	<0.001	0.00562	<0.0002	<0.005	0.501	0.0143	<0.001
MW-18	9/12/2019	NA	<0.001	0.0411	NA	<0.001	0.00252	0.00176	<1	<0.001	0.0134	NA	<0.005	0.328	0.0157	NA
MW-18	4/10/2020	<0.004	<0.002	0.0317	<0.002	<0.001	<0.002	<0.002	0.161	<0.005	0.00537	<0.0002	<0.005	0.568	0.0120	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter;

Analytical Results - Appendix III
Zimmer Gypsum Recycle Pond

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-8	12/30/2015	0.0783	108	10.3	0.0766	7.3	52.0	370
MW-8	3/16/2016	0.0359	165	32.4	0.106	7.1	59.1	468
MW-8	6/15/2016	0.0455	114	13.8	<1	7.1	64.4	474
MW-8	9/27/2016	0.0413	119	13.1	<1	7.0	66.0	446
MW-8	12/13/2016	0.0405	128	19.2	<1	7.0	65.2	455
MW-8	3/9/2017	<0.08	114	21.1	<1	8.6	57.3	474
MW-8	6/8/2017	<0.08	118	31.6	<1	7.5	63.4	534
MW-8	7/13/2017	<0.08	109	27.5	<1	6.9	61.1	491
MW-8	11/13/2017	<0.08	113	15.0	<1	6.8	<50	434
MW-8	5/8/2018	<1	127	33.8	<1	7.0	62.8	491
MW-8	9/27/2018	<0.08	121	14.5	<1	7.0	66.5	439
MW-8	3/14/2019	<0.08	117	23.8	<1	6.9	62.5	462
MW-8	9/11/2019	<0.08	129	34.0	<1	6.8	59.5	508
MW-8	4/9/2020	<0.03	122	16.0	<0.15	6.8	65.2	421
Downgradient Wells								
MW-7A	12/30/2015	1.63	135	81.4	0.206	7.0	259	737
MW-7A	3/16/2016	2.82	180	134	0.0655	6.6	444	1090
MW-7A	6/16/2016	0.840	122	90.7	<1	6.8	261	765
MW-7A	9/27/2016	4.51	198	108	<1	6.7	512	1180
MW-7A	12/13/2016	1.41	121	160	<1	6.7	553	721
MW-7A	3/10/2017	6.14	260	156	<1	7.7	682	1870
MW-7A	6/8/2017	1.58	146	78.6	<1	6.7	311	854
MW-7A	7/13/2017	1.22	116	69.1	<1	6.8	247	725
MW-7A	11/14/2017	1.40	118	64.7	<1	6.7	277	718
MW-7A	5/8/2018	1.54	135	63.7	<1	6.8	318	923
MW-7A	9/27/2018	1.57	119	55.7	<1	6.7	205	667
MW-7A	3/13/2019	3.03	175	111	<1	6.5	517	1170
MW-7A	9/11/2019	3.38	159	62.8	<1	7.3	376	912
MW-7A	4/10/2020	2.43	156	62.8	<0.15	7.2	366	876
MW-10	12/29/2015	5.42	135	57.3	0.218	7.7	234	1050
MW-10	3/16/2016	9.05	189	122	0.181	7.1	550	1230
MW-10	6/16/2016	4.91	81.5	146	<1	7.2	409	960
MW-10	9/27/2016	0.270	137	149	<1	7.1	606	1400
MW-10	12/13/2016	6.63	127	221	<1	6.8	527	1190
MW-10	3/10/2017	6.00	103	77.9	<1	7.9	426	1160
MW-10	6/8/2017	5.87	99.7	99.5	<1	6.9	452	1050
MW-10	7/13/2017	4.87	79.1	75.7	<1	7.1	367	883
MW-10	11/14/2017	4.07	126	<150	1.44	6.9	582	1210
MW-10	5/8/2018	5.72	249	146	2.49	6.9	1070	2180
MW-10	9/27/2018	4.89	150	113	1.77	6.9	534	1230
MW-10	3/13/2019	5.90	308	176	2.38	6.7	1420	2390
MW-10	9/12/2019	2.79	140	73.3	1.41	6.8	513	1100
MW-10	4/10/2020	4.38	108	60.5	1.92	7.3	372	845

Analytical Results - Appendix III
Zimmer Gypsum Recycle Pond

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-11	12/29/2015	0.581	176	70.4	0.175	7.0	252	768
MW-11	3/16/2016	0.489	270	126	0.0952	6.8	447	1140
MW-11	6/16/2016	0.572	130	81.1	<1	6.9	170	640
MW-11	9/27/2016	0.444	137	74.8	<1	6.9	196	703
MW-11	12/13/2016	1.45	225	131	<1	6.8	545	1110
MW-11	3/10/2017	0.434	147	66.9	<1	8.1	209	736
MW-11	6/8/2017	0.508	167	69.9	<1	6.8	248	767
MW-11	7/13/2017	0.825	149	66.7	<1	6.8	195	728
MW-11	11/14/2017	0.498	133	68.1	<1	6.8	188	634
MW-11	5/8/2018	<1	139	75.1	<1	7.0	197	793
MW-11	9/27/2018	0.921	164	78.1	<1	6.8	<250	771
MW-11	3/13/2019	0.458	181	58.2	<1	6.7	352	959
MW-11	9/12/2019	0.450	119	45.1	<1	6.9	145	590
MW-11	4/10/2020	0.719	110	48.9	0.170	7.4	135	510

Notes:
1. Abbreviations: mg/L - milligrams per liter; s.u. - standard units.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-8	12/30/2015	<0.0005	0.00115	0.0378	<0.001	<0.0004	<0.0005	<0.0005	0.0766	<0.0002	<0.008	<0.0001	<0.0005	0.173	<0.0006	<0.0005
MW-8	3/16/2016	<0.00418	<0.00295	0.0681	<0.000875	<0.00025	<0.0025	<0.000543	0.106	<0.000433	0.00635	<0.0001	<0.0025	0.408	<0.00398	<0.00138
MW-8	6/15/2016	<0.002	<0.001	0.0418	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0694	<0.005	<0.001
MW-8	9/27/2016	<0.002	<0.001	0.0430	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.214	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0458	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.710	<0.005	<0.001
MW-8	3/9/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.361	<0.005	<0.001
MW-8	6/8/2017	<0.002	<0.001	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0283	<0.005	<0.001
MW-8	7/13/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.269	<0.005	<0.001
MW-8	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-8	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.182	<0.01	<0.002
MW-8	9/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	0.215	NA	NA
MW-8	3/14/2019	<0.002	<0.001	0.0454	<0.001	<0.001	0.00201	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.0807	<0.005	<0.001
MW-8	9/11/2019	NA	<0.001	0.0552	<0.001	NA	0.00206	<0.0005	<1	<0.001	0.00754	NA	<0.005	0.261	<0.005	NA
MW-8	4/9/2020	<0.004	<0.002	0.0460	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
Downgradient Wells																
MW-7A	12/30/2015	<0.0005	0.00217	0.0597	<0.001	<0.0004	<0.0005	0.0126	0.206	<0.0002	<0.008	<0.0001	0.00369	0.174	<0.0006	<0.0005
MW-7A	3/16/2016	0.000634	0.0978	0.0543	<0.001	<0.0004	0.0123	0.00783	0.0655	<0.0002	0.00136	<0.0001	0.0014	0.645	0.00267	<0.0005
MW-7A	6/16/2016	<0.002	<0.001	0.0377	<0.001	<0.001	<0.002	0.00291	<1	<0.001	<0.00959	<0.0002	<0.005	0.256	<0.005	<0.001
MW-7A	9/27/2016	<0.002	<0.001	0.0544	<0.001	<0.001	<0.002	0.00411	<1	<0.001	<0.00959	<0.0002	<0.005	0.471	<0.005	<0.001
MW-7A	12/13/2016	<0.002	<0.001	0.0319	<0.001	<0.001	<0.002	0.00298	<1	<0.001	<0.00959	<0.0002	<0.005	0.377	<0.005	<0.001
MW-7A	3/10/2017	<0.002	<0.001	0.0437	<0.001	<0.001	<0.002	0.00528	<1	<0.001	<0.00959	<0.0002	<0.005	0.190	<0.005	<0.001
MW-7A	6/8/2017	<0.002	<0.001	0.0287	<0.001	<0.001	<0.002	0.00149	<1	<0.001	<0.00959	<0.0002	<0.005	0.347	<0.005	<0.001
MW-7A	7/13/2017	<0.002	<0.001	0.0263	<0.001	<0.001	<0.002	0.00113	<1	<0.001	<0.00959	<0.0002	<0.005	0.821	<0.005	<0.001
MW-7A	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-7A	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	0.00755	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.522	<0.01	<0.002
MW-7A	9/27/2018	NA	<0.001	NA	NA	NA	0.00207	NA	<1	NA	NA	NA	NA	0.411	NA	NA
MW-7A	3/13/2019	<0.002	<0.001	0.0483	<0.001	<0.001	<0.002	0.00245	<1	<0.001	<0.005	<0.0002	<0.005	0.310	<0.005	<0.001
MW-7A	9/11/2019	NA	<0.001	0.0458	NA	<0.001	<0.002	0.00101	<1	<0.001	0.0124	NA	<0.005	0.436	<0.005	NA
MW-7A	4/10/2020	<0.004	<0.002	0.0371	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	<0.002	<0.0002	<0.005	0.785	0.00204	<0.002
MW-10	12/29/2015	<0.0005	0.00228	0.130	<0.001	<0.0004	0.00293	0.0100	0.218	<0.0002	<0.008	<0.0001	0.0146	0.434	<0.0006	<0.0005
MW-10	3/16/2016	<0.0005	0.00263	0.114	<0.001	<0.0004	<0.0005	0.00835	0.181	<0.0002	0.00132	<0.0001	0.00750	0.382	<0.0006	<0.0005
MW-10	6/16/2016	<0.002	0.00139	0.0729	<0.001	<0.001	<0.002	0.00410	<1	<0.001	<0.00959	<0.0002	0.00793	0.787	<0.005	<0.001
MW-10	9/27/2016	<0.002	0.00203	0.0577	<0.001	<0.001	<0.002	0.00756	<1	<0.001	0.0103	<0.0002	0.0109	0.521	<0.005	<0.001
MW-10	12/13/2016	<0.002	0.00127	0.0436	<0.001	<0.001	<0.002	0.00883	<1	<0.001	<0.00959	<0.0002	0.00590	0.135	<0.005	<0.001
MW-10	3/10/2017	<0.002	0.00164	0.0564	<0.001	<0.001	<0.002	0.00593	<1	<0.001	<0.00959	<0.0002	0.00513	0.446	<0.005	<0.001
MW-10	6/8/2017	<0.002	0.00286	0.0618	<0.001	<0.001	<0.002	0.00417	<1	<0.001	<0.00959	<0.0002	0.00752	0.487	<0.005	<0.001
MW-10	7/13/2017	<0.002	<0.001	0.0453	<0.001	<0.001	<0.002	0.00371	<1	<0.001	<0.00959	<0.0002	0.00731	1.41	<0.005	<0.001
MW-10	11/14/2017	NA	NA	NA	NA	NA	NA	NA	1.44	NA	NA	NA	NA	NA	NA	NA
MW-10	5/8/2018	<0.003	0.00535	<0.2	<0.004	<0.005	<0.005	<0.005	2.49	<0.005	<0.04	<0.0002	<0.01	0.246	<0.01	<0.002
MW-10	9/27/2018	NA	0.00153	NA	NA	NA	<0.002	NA	1.77	NA	NA	NA	NA	0.294	NA	NA
MW-10	3/13/2019	<0.002	0.00407	0.021	<0.001	<0.001	<0.002	0.00112	2.38	<0.001	0.0187	<0.0002	<0.005	0.363	<0.005	<0.001
MW-10	9/12/2019	NA	0.00501	0.0127	NA	<0.001	<0.002	0.00464	1.41	<0.001	0.0144	NA	0.0105	0.336	<0.005	NA
MW-10	4/10/2020	<0.004	0.00201	<0.02	<0.002	<0.001	<0.002	<0.002	1.92	<0.005	0.00934	<0.0002	0.00628	1.29	<0.002	<0.002

Analytical Results - Appendix IV
Zimmer Gypsum Recycle Pond

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-11	12/29/2015	<0.0005	0.00194	0.00977	<0.001	<0.0004	0.000794	0.00920	0.175	<0.0002	<0.008	<0.0001	0.00471	0.471	<0.0006	<0.0005
MW-11	3/16/2016	<0.0005	0.00350	0.116	<0.001	<0.0004	<0.0005	0.00422	0.0952	<0.0002	0.0014	<0.0001	0.00219	0.523	<0.0006	<0.0005
MW-11	6/16/2016	<0.002	<0.001	0.0539	<0.001	<0.001	<0.002	0.00192	<1	<0.001	<0.00959	<0.0002	<0.005	0.525	<0.005	<0.001
MW-11	9/27/2016	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	0.00147	<1	<0.001	<0.00959	<0.0002	<0.005	0.891	<0.005	<0.001
MW-11	12/13/2016	<0.002	<0.001	0.0921	<0.001	<0.001	<0.002	0.0019	<1	<0.001	<0.00959	<0.0002	<0.005	0.600	<0.005	<0.001
MW-11	3/10/2017	<0.002	<0.001	0.0585	<0.001	<0.001	<0.002	0.00176	<1	<0.001	<0.00959	<0.0002	<0.005	0.525	<0.005	<0.001
MW-11	6/8/2017	<0.002	0.00166	0.0643	<0.001	<0.001	<0.002	0.00200	<1	<0.001	<0.00959	<0.0002	<0.005	0.347	<0.005	<0.001
MW-11	7/13/2017	<0.002	<0.001	0.0589	<0.001	<0.001	<0.002	0.00172	<1	<0.001	<0.00959	<0.0002	<0.005	0.569	<0.005	<0.001
MW-11	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-11	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.457	<0.01	<0.002
MW-11	9/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	0.294	NA	NA
MW-11	3/13/2019	<0.002	0.00123	0.0764	<0.001	<0.001	<0.002	0.00175	<1	<0.001	<0.005	<0.0002	<0.005	0.531	<0.005	<0.001
MW-11	9/12/2019	NA	0.00109	0.0493	NA	<0.001	<0.002	0.00136	<1	<0.001	0.00609	NA	<0.005	0.105	<0.005	NA
MW-11	4/10/2020	<0.004	<0.002	0.0443	<0.002	<0.001	<0.002	<0.002	0.170	<0.005	<0.002	<0.0002	<0.005	0.955	<0.002	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter;

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-1	12/30/2015	0.0720	155	48.5	0.200	7.2	90.1	544
MW-1	3/16/2016	0.0233	206	59.1	0.146	7.1	85.2	583
MW-1	6/16/2016	0.0389	154	59.6	<1	7.0	95.3	648
MW-1	8/31/2016	0.0431	168	73.4	<1	6.4	113	612
MW-1	9/26/2016	0.0349	160	64.9	<1	7.1	93.1	621
MW-1	10/12/2016	0.0634	156	79.2	<1	7.2	112	571
MW-1	11/16/2016	0.0304	162	57.7	<1	6.4	90.6	596
MW-1	12/13/2016	0.0322	165	52.4	<1	7.0	93.3	561
MW-1	3/9/2017	<0.08	150	58.2	<1	8.3	85.9	589
MW-1	6/8/2017	<0.08	171	65.5	<1	7.1	87.0	582
MW-1	7/13/2017	<0.08	144	61.3	<1	7.0	79.0	608
MW-1	11/13/2017	<0.08	150	53.1	<1	6.9	89.1	571
MW-1	5/9/2018	<1	157	71.0	<1	7.0	88.9	631
MW-1	9/27/2018	<0.08	163	62.7	<1	6.9	113	578
MW-1	3/14/2019	<0.08	152	78.7	<1	7.0	90.2	617
MW-1	9/11/2019	<0.08	167	63.1	<1	7.0	90.6	637
MW-1	4/9/2020	0.123	170	80.5	<0.15	6.7	92.3	592
MW-8	12/30/2015	0.0783	108	10.3	0.0766	7.3	52.0	370
MW-8	3/16/2016	0.0359	165	32.4	0.106	7.1	59.1	468
MW-8	6/15/2016	0.0455	114	13.8	<1	7.1	64.4	474
MW-8	9/27/2016	0.0413	119	13.1	<1	7.0	66.0	446
MW-8	12/13/2016	0.0405	128	19.2	<1	7.0	65.2	455
MW-8	3/9/2017	<0.08	114	21.1	<1	8.6	57.3	474
MW-8	6/8/2017	<0.08	118	31.6	<1	7.5	63.4	534
MW-8	7/13/2017	<0.08	109	27.5	<1	6.9	61.1	491
MW-8	11/13/2017	<0.08	113	15.0	<1	6.8	<50	434
MW-8	5/8/2018	<1	127	33.8	<1	7.0	62.8	491
MW-8	9/27/2018	<0.08	121	14.5	<1	7.0	66.5	439
MW-8	3/14/2019	<0.08	117	23.8	<1	6.9	62.5	462
MW-8	9/11/2019	<0.08	129	34.0	<1	6.8	59.5	508
MW-8	4/9/2020	<0.03	122	16.0	<0.15	6.8	65.2	421
MW-12	12/30/2015	0.300	179	27.3	0.145	7.1	127	608
MW-12	3/18/2016	0.220	200	66.0	0.172	6.8	99.8	666
MW-12	6/15/2016	0.273	159	42.4	<1	7.0	137	649
MW-12	9/27/2016	0.276	160	29.5	<1	7.1	110	600
MW-12	12/13/2016	0.241	151	31.0	<1	6.9	88.8	555
MW-12	3/9/2017	0.246	160	42.9	<1	8.4	113	610
MW-12	6/8/2017	0.215	168	39.6	<1	7.0	110	606
MW-12	7/13/2017	0.199	154	35.6	<1	6.9	105	579
MW-12	11/13/2017	0.199	146	30.0	<1	6.8	95.5	550
MW-12	5/9/2018	<1	143	30.7	<1	6.9	104	584
MW-12	9/19/2018	0.272	163	31.9	<1	6.8	104	577
MW-12	3/14/2019	0.256	147	33.2	<1	6.9	106	596
MW-12	9/11/2019	0.204	148	26.6	<1	7.7	90.0	557
MW-12	4/9/2020	0.210	162	32.5	<0.15	6.9	98.3	598

Analytical Results - Appendix III
Zimmer D Basin

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Downgradient Wells								
MW-9	12/30/2015	3.31	331	106	0.152	7.2	944	1770
MW-9	3/17/2016	1.98	363	111	0.139	7.0	789	1680
MW-9	6/15/2016	1.12	235	55.6	<1	7.2	630	1170
MW-9	9/27/2016	0.628	213	38.3	<1	7.2	512	989
MW-9	12/12/2016	1.96	280	71.8	<1	7.0	740	1430
MW-9	3/9/2017	2.65	300	104	<1	8.3	837	1680
MW-9	6/8/2017	0.521	262	72.6	<1	7.0	658	1240
MW-9	7/13/2017	1.30	291	<150	<1	7.1	729	1380
MW-9	11/13/2017	0.869	264	50.7	<1	7.0	650	1190
MW-9	5/9/2018	2.47	360	110	<1	6.9	905	1870
MW-9	9/19/2018	1.62	277	53.5	<1	6.8	658	1320
MW-9	3/14/2019	2.29	299	111	<1	7.0	995	1840
MW-9	9/11/2019	0.737	236	30.7	<1	8.3	495	1190
MW-9	4/9/2020	0.511	270	32.3	<0.15	6.9	589	1160
MW-13	12/29/2015	0.0968	220	13.9	0.280	7.2	328	710
MW-13	3/17/2016	0.0482	165	20.7	0.294	7.2	276	667
MW-13	6/15/2016	0.0739	134	39.9	<1	7.1	256	685
MW-13	9/27/2016	0.0594	163	21.9	<1	7.2	215	672
MW-13	12/13/2016	0.0612	162	19.6	<1	7.1	239	678
MW-13	3/9/2017	<0.08	140	17.3	<1	8.5	267	705
MW-13	6/8/2017	<0.08	154	17.2	<1	7.1	256	683
MW-13	7/13/2017	<0.08	149	15.9	<1	7.2	302	722
MW-13	11/13/2017	<0.08	151	19.0	<1	6.9	<250	667
MW-13	5/9/2018	<1	147	17.2	<1	7.1	236	674
MW-13	9/19/2018	<0.08	167	19.2	<1	6.9	260	732
MW-13	3/14/2019	0.0830	141	18.5	<1	7.1	260	717
MW-13	9/11/2019	<0.08	144	14.4	<1	7.6	146	616
MW-13	4/9/2020	0.0597	166	20.4	0.165	7.0	281	715

Analytical Results - Appendix III

Zimmer D Basin

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-14	12/29/2015	0.110	262	<0.7	<0.06	7.3	467	1010
MW-14	3/17/2016	0.0453	245	33.7	0.225	7.2	470	992
MW-14	6/15/2016	0.0595	172	<30	<1	7.1	348	837
MW-14	9/27/2016	0.0661	183	29.6	<1	7.1	303	814
MW-14	12/13/2016	0.0702	196	33.4	<1	7.0	365	905
MW-14	3/9/2017	<0.08	192	29.9	<1	8.4	408	916
MW-14	6/8/2017	<0.08	181	<30	<1	7.0	354	843
MW-14	7/13/2017	<0.08	198	30.8	<1	7.2	477	1020
MW-14	11/13/2017	<0.08	194	30.6	<1	7.0	340	893
MW-14	5/9/2018	<1	199	27.9	<1	7.1	398	947
MW-14	9/19/2018	<0.08	207	31.6	<1	6.9	416	1000
MW-14	3/14/2019	<0.08	186	29.5	<1	7.1	420	946
MW-14	9/11/2019	0.139	181	28.8	<1	7.4	287	836
MW-14	4/9/2020	0.116	213	40.0	0.179	7.4	427	939
MW-15	12/30/2015	0.110	296	31.1	0.298	7.1	505	1100
MW-15	3/18/2016	0.0557	233	34.0	0.290	6.9	447	1110
MW-15	6/15/2016	0.0737	213	34.9	<1	6.9	606	1120
MW-15	9/27/2016	0.0833	237	38.0	<1	7.1	493	1160
MW-15	12/13/2016	0.0816	247	38.2	<1	7.0	522	1140
MW-15	3/9/2017	<0.08	212	32.8	<1	8.4	505	1100
MW-15	6/8/2017	<0.08	226	32.4	<1	7.0	524	1090
MW-15	7/13/2017	<0.08	217	36.6	<1	7.1	549	1120
MW-15	11/13/2017	<0.08	224	36.5	<1	6.8	498	1110
MW-15	5/9/2018	<1	203	31.1	<1	7.0	414	1000
MW-15	9/19/2018	0.0939	240	38.7	<1	6.9	529	1170
MW-15	3/14/2019	0.0807	198	38.6	<1	6.9	486	1090
MW-15	9/11/2019	0.120	241	36.2	<1	7.4	535	1170
MW-15	4/9/2020	0.0790	258	41.1	0.175	7.4	567	1090

Notes:

1. Abbreviations: mg/L - milligrams per liter; s.u. - standard units.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium,total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-1	12/30/2015	<0.0005	0.00142	0.0655	<0.001	<0.0004	0.00191	<0.0005	0.200	<0.0002	<0.008	<0.0001	<0.0005	0.348	<0.0006	<0.0005
MW-1	3/16/2016	<0.00418	<0.00295	0.0863	<0.000875	<0.00025	<0.0025	<0.000543	0.146	<0.000433	0.0101	<0.0001	<0.0025	0.453	<0.00398	<0.00138
MW-1	6/16/2016	<0.002	<0.001	0.0601	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.603	<0.005	<0.001
MW-1	8/31/2016	<0.002	<0.001	0.0660	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0102	<0.0002	<0.005	0.0844	<0.005	<0.001
MW-1	9/26/2016	<0.002	<0.001	0.0627	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.168	<0.005	<0.001
MW-1	10/12/2016	<0.002	<0.001	0.0639	<0.001	<0.001	<0.002	<0.0005	<1	0.00268	<0.01	<0.0002	<0.005	0.489	<0.005	<0.001
MW-1	11/16/2016	<0.002	<0.001	0.0670	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0097	<0.0002	<0.005	0.339	<0.005	<0.001
MW-1	12/13/2016	<0.002	<0.001	0.0629	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.422	<0.005	<0.001
MW-1	3/9/2017	<0.002	<0.001	0.0587	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	<0.0002	<0.005	0.426	<0.005	<0.001
MW-1	6/8/2017	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	<0.005	0.349	<0.005	<0.001
MW-1	7/13/2017	<0.002	<0.001	0.0566	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.144	<0.005	<0.001
MW-1	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-1	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.370	<0.01	<0.002
MW-1	9/27/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.231	NA	NA
MW-1	3/14/2019	<0.002	<0.001	0.0665	<0.001	<0.001	0.0023	<0.0005	<1	<0.001	0.00665	<0.0002	<0.005	0.171	<0.005	<0.001
MW-1	9/11/2019	NA	<0.001	0.0770	<0.001	NA	<0.002	<0.0005	<1	<0.001	0.0109	NA	<0.005	0.110	<0.005	NA
MW-1	4/9/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
MW-8	12/30/2015	<0.0005	0.00115	0.0378	<0.001	<0.0004	<0.0005	<0.0005	0.0766	<0.0002	<0.008	<0.0001	<0.0005	0.173	<0.0006	<0.0005
MW-8	3/16/2016	<0.00418	<0.00295	0.0681	<0.000875	<0.00025	<0.0025	<0.000543	0.106	<0.000433	0.00635	<0.0001	<0.0025	0.408	<0.00398	<0.00138
MW-8	6/15/2016	<0.002	<0.001	0.0418	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0694	<0.005	<0.001
MW-8	9/27/2016	<0.002	<0.001	0.0430	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.214	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0458	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.710	<0.005	<0.001
MW-8	3/9/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.361	<0.005	<0.001
MW-8	6/8/2017	<0.002	<0.001	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0283	<0.005	<0.001
MW-8	7/13/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.269	<0.005	<0.001
MW-8	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-8	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.182	<0.01	<0.002
MW-8	9/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	0.215	NA	NA
MW-8	3/14/2019	<0.002	<0.001	0.0454	<0.001	<0.001	0.00201	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.0807	<0.005	<0.001
MW-8	9/11/2019	NA	<0.001	0.0552	<0.001	NA	0.00206	<0.0005	<1	<0.001	0.00754	NA	<0.005	0.261	<0.005	NA
MW-8	4/9/2020	<0.004	<0.002	0.0460	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
MW-12	12/30/2015	<0.0005	0.00169	0.0697	<0.001	<0.0004	0.000518	<0.0005	0.145	<0.0002	<0.008	<0.0001	<0.0005	0.318	0.00131	<0.0005
MW-12	3/18/2016	<0.00418	<0.00295	0.0813	<0.000875	<0.00025	<0.0025	<0.000543	0.172	<0.000433	0.00875	<0.0001	<0.0025	0.510	<0.00398	<0.00138
MW-12	6/15/2016	<0.002	<0.001	0.0605	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.130	<0.005	<0.001
MW-12	9/27/2016	<0.002	<0.001	0.0614	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	1.11	<0.005	<0.001
MW-12	12/13/2016	<0.002	<0.001	0.0588	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.375	<0.005	<0.001
MW-12	3/9/2017	<0.002	<0.001	0.0563	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.429	<0.005	<0.001
MW-12	6/8/2017	<0.002	<0.001	0.0618	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.182	<0.005	<0.001
MW-12	7/13/2017	<0.002	<0.001	0.0579	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.288	<0.005	<0.001
MW-12	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-12	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.411	<0.01	<0.002
MW-12	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.522	NA	NA
MW-12	3/14/2019	<0.002	<0.001	0.0631	<0.001	<0.001	0.00218	<0.0005	<1	<0.001	0.00543	<0.0002	<0.005	0.247	<0.005	<0.001
MW-12	9/11/2019	NA	<0.001	0.0692	<0.001	NA	0.00249	<0.0005	<1	<0.001	0.0114	NA	<0.005	0.118	<0.005	NA
MW-12	4/9/2020	<0.004	<0.002	0.0657	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00591	<0.0002	<0.005	3.90	<0.002	<0.002

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium,total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Downgradient Wells																
MW-9	12/30/2015	<0.0005	0.00454	0.0450	<0.001	0.000721	0.00159	0.00327	0.152	0.00021	0.00836	<0.0001	0.00145	0.649	<0.0006	<0.0005
MW-9	3/17/2016	<0.00418	<0.00295	0.0567	<0.000875	<0.00025	<0.0025	0.00406	0.139	<0.000433	0.011	<0.0001	<0.0025	0.637	<0.00398	<0.00138
MW-9	6/15/2016	<0.002	0.00127	0.0253	<0.001	<0.001	<0.002	0.00253	<1	<0.001	<0.00959	<0.0002	<0.005	0.573	<0.005	<0.001
MW-9	9/27/2016	<0.002	0.00140	0.0239	<0.001	<0.001	<0.002	0.00202	<1	<0.001	<0.00959	<0.0002	<0.005	0.841	<0.005	<0.001
MW-9	12/12/2016	<0.002	0.00151	0.0269	<0.001	<0.001	<0.002	0.00299	<1	<0.001	<0.00959	<0.0002	<0.005	1.07	<0.005	<0.001
MW-9	3/9/2017	<0.002	0.00161	0.0330	<0.001	<0.001	<0.002	0.00403	<1	<0.001	0.0126	<0.0002	<0.005	0.358	<0.005	<0.001
MW-9	6/8/2017	<0.002	0.00257	0.0337	<0.001	<0.001	<0.002	0.00219	<1	<0.001	0.0124	<0.0002	<0.005	0.32	<0.005	<0.001
MW-9	7/13/2017	<0.002	0.00178	0.0308	<0.001	<0.001	<0.002	0.00292	<1	<0.001	0.0116	<0.0002	<0.005	0.729	<0.005	<0.001
MW-9	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-9	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.446	<0.01	<0.002
MW-9	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.342	NA	NA
MW-9	3/14/2019	<0.002	0.00171	0.0333	<0.001	<0.001	<0.002	0.00351	<1	<0.001	0.00779	<0.0002	<0.005	0.323	<0.005	<0.001
MW-9	9/11/2019	NA	0.00188	0.0261	<0.001	NA	0.00237	0.00267	<1	<0.001	0.0135	NA	<0.005	0.372	<0.005	NA
MW-9	4/9/2020	<0.004	<0.002	0.0260	<0.002	<0.001	<0.002	0.00286	<0.15	<0.005	0.00709	<0.0002	<0.005	6.29	<0.002	<0.002
MW-13	12/29/2015	0.000841	0.00260	0.0564	<0.001	<0.0004	<0.0005	0.00653	0.280	<0.0002	<0.008	<0.0001	0.00495	0.574	0.000664	<0.0005
MW-13	3/17/2016	<0.00418	0.00480	0.0691	<0.000875	<0.00025	<0.0025	0.00516	0.294	<0.000433	0.00426	<0.0001	0.00674	0.425	<0.00398	<0.00138
MW-13	6/15/2016	<0.002	0.00264	0.0521	<0.001	<0.001	<0.002	0.00641	<1	<0.001	<0.00959	<0.0002	<0.005	0.459	<0.005	<0.001
MW-13	9/27/2016	<0.002	0.00460	0.0524	<0.001	<0.001	<0.002	0.00514	<1	<0.001	<0.00959	<0.0002	<0.005	0.612	<0.005	<0.001
MW-13	12/13/2016	<0.002	0.00324	0.0536	<0.001	<0.001	<0.002	0.00477	<1	<0.001	<0.00959	<0.0002	0.005	0.646	<0.005	<0.001
MW-13	3/9/2017	<0.002	0.00348	0.0516	<0.001	<0.001	<0.002	0.00348	<1	<0.001	<0.00959	<0.0002	<0.005	0.235	<0.005	<0.001
MW-13	6/8/2017	<0.002	0.00319	0.0503	<0.001	<0.001	<0.002	0.00237	<1	<0.001	<0.00959	<0.0002	<0.005	0.284	<0.005	<0.001
MW-13	7/13/2017	<0.002	0.00222	0.0446	<0.001	<0.001	<0.002	0.00244	<1	<0.001	<0.00959	<0.0002	<0.005	0.841	<0.005	<0.001
MW-13	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-13	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.565	<0.01	<0.002
MW-13	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.478	NA	NA
MW-13	3/14/2019	<0.002	0.0183	0.0540	<0.001	<0.001	<0.002	0.00295	<1	<0.001	<0.005	<0.0002	<0.005	0.284	<0.005	<0.001
MW-13	9/11/2019	NA	0.00525	0.0461	<0.001	NA	0.00231	0.00368	<1	<0.001	0.00811	NA	<0.005	0.449	<0.005	NA
MW-13	4/9/2020	<0.004	0.00261	0.0477	<0.002	<0.001	<0.002	0.00297	0.165	<0.005	0.00266	<0.0002	<0.005	3.43	<0.002	<0.002

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium,total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-14	12/29/2015	0.00067	0.00263	0.0509	<0.001	<0.0004	<0.0005	0.00857	<0.06	0.000291	<0.008	<0.0001	0.00142	0.594	<0.0006	<0.0005
MW-14	3/17/2016	<0.00418	<0.00295	0.0641	<0.000875	<0.00025	<0.0025	0.00514	0.225	<0.000433	0.00379	<0.0001	0.00276	0.957	<0.00398	<0.00138
MW-14	6/15/2016	<0.002	0.00171	0.0480	<0.001	<0.001	<0.002	0.00547	<1	<0.001	<0.00959	<0.0002	<0.005	0.534	<0.005	<0.001
MW-14	9/27/2016	<0.002	0.00163	0.0464	<0.001	<0.001	<0.002	0.00435	<1	<0.001	<0.00959	<0.0002	<0.005	0.496	<0.005	<0.001
MW-14	12/13/2016	<0.002	0.00173	0.0535	<0.001	<0.001	<0.002	0.00563	<1	<0.001	<0.00959	<0.0002	<0.005	1.36	<0.005	<0.001
MW-14	3/9/2017	<0.002	0.00168	0.0465	<0.001	<0.001	<0.002	0.00367	<1	<0.001	<0.00959	<0.0002	<0.005	0.444	<0.005	<0.001
MW-14	6/8/2017	<0.002	0.00158	0.0465	<0.001	<0.001	<0.002	0.00278	<1	<0.001	<0.00959	<0.0002	<0.005	0.318	<0.005	<0.001
MW-14	7/13/2017	<0.002	0.00124	0.0440	<0.001	<0.001	<0.002	0.00231	<1	<0.001	<0.00959	<0.0002	<0.005	0.689	<0.005	<0.001
MW-14	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-14	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.618	<0.01	<0.002
MW-14	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	0.933	NA	NA
MW-14	3/14/2019	<0.002	<0.001	0.0507	<0.001	<0.001	0.00213	0.00229	<1	<0.001	<0.005	<0.0002	<0.005	0.229	<0.005	<0.001
MW-14	9/11/2019	NA	0.00155	0.0554	<0.001	NA	0.00254	0.00239	<1	<0.001	0.00843	NA	<0.005	1.94	<0.005	NA
MW-14	4/9/2020	<0.004	<0.002	0.0501	<0.002	<0.001	<0.002	0.00223	0.179	<0.005	0.00236	<0.0002	<0.005	1.6	<0.002	<0.002
MW-15	12/30/2015	0.000823	0.00265	0.0896	<0.001	<0.0004	<0.0005	0.0109	0.298	<0.0002	<0.008	<0.0001	0.00554	0.59	<0.0006	<0.0005
MW-15	3/18/2016	<0.00418	<0.00295	0.0835	<0.000875	<0.00025	<0.0025	0.00798	0.290	<0.000433	0.00298	<0.0001	0.00495	0.419	<0.00398	<0.00138
MW-15	6/15/2016	<0.002	<0.001	0.0687	<0.001	<0.001	<0.002	0.00751	<1	<0.001	<0.00959	<0.0002	<0.005	0.735	<0.005	<0.001
MW-15	9/27/2016	<0.002	<0.001	0.0773	<0.001	<0.001	<0.002	0.00778	<1	<0.001	<0.00959	<0.0002	<0.005	1.26	<0.005	<0.001
MW-15	12/13/2016	<0.002	<0.001	0.0767	<0.001	<0.001	<0.002	0.00701	<1	<0.001	<0.00959	<0.0002	0.00524	0.936	<0.005	<0.001
MW-15	3/9/2017	<0.002	<0.001	0.0677	<0.001	<0.001	<0.002	0.00593	<1	<0.001	<0.00959	<0.0002	<0.005	0.556	<0.005	<0.001
MW-15	6/8/2017	<0.002	<0.001	0.0663	<0.001	<0.001	<0.002	0.00353	<1	<0.001	<0.00959	<0.0002	<0.005	0.474	<0.005	<0.001
MW-15	7/13/2017	<0.002	<0.001	0.0676	<0.001	<0.001	<0.002	0.00427	<1	<0.001	<0.00959	<0.0002	<0.005	0.554	<0.005	<0.001
MW-15	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-15	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.707	<0.01	<0.002
MW-15	9/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	1.08	NA	NA
MW-15	3/14/2019	<0.002	<0.001	0.0600	<0.001	<0.001	<0.002	0.00318	<1	<0.001	<0.005	<0.0002	<0.005	0.783	<0.005	<0.001
MW-15	9/11/2019	NA	<0.001	0.0836	<0.001	NA	0.00257	0.00381	<1	<0.001	0.00845	NA	<0.005	0.756	<0.005	NA
MW-15	4/9/2020	<0.004	<0.002	0.0663	<0.002	<0.001	<0.002	0.00374	0.175	<0.005	0.00213	<0.0002	<0.005	3.26	<0.002	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter;

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-3	1/27/2016	0.0275	244	181	0.127	7.1	47.2	777
MW-3	3/14/2016	0.0397	274	185	0.115	6.9	51.6	689
MW-3	6/14/2016	0.0191	168	159	<1	6.9	54.2	771
MW-3	9/29/2016	0.0276	174	161	<1	6.9	56.4	698
MW-3	12/20/2016	0.0453	170	201	<1	6.9	69.4	739
MW-3	4/18/2017	<0.08	178	195	<1	NA	53.1	792
MW-3	6/7/2017	<0.08	185	175	<1	7.3	<100	912
MW-3	7/12/2017	0.115	167	167	<1	6.9	<100	798
MW-3	3/12/2019	<0.08	195	206	<1	6.8	50	827
MW-3	9/11/2019	<0.08	176	154	<1	6.6	56.3	827
MW-3	4/7/2020	0.0416	191	193	<0.15	6.9	52.7	875
MW-13S	1/28/2016	0.03	148	142	0.278	7.2	34.3	479
MW-13S	3/16/2016	0.0122	124	128	0.761	7.0	35.1	482
MW-13S	4/20/2017	<0.08	94.2	154	<1	NA	37.4	526
MW-13S	6/7/2017	<0.08	105	136	<1	6.9	36.5	561
MW-13S	7/12/2017	<0.08	105	125	<1	6.9	<50	526
MW-13S	11/14/2017	<0.08	101	141	NA	7.0	<50	505
MW-13S	5/7/2018	<1	87.4	92.2	<1	7.1	31.3	448
MW-13S	9/17/2018	<0.08	108	99.4	<1	6.7	30.9	517
MW-13S	3/12/2019	<0.08	109	140	<1	7.1	36.9	499
MW-13S	4/7/2020	<0.03	72	81.9	0.209	7.1	27	308
MW-18	1/26/2016	0.101	138	19.8	0.259	7.2	187	670
MW-18	3/17/2016	0.0837	128	111	0.269	6.8	NA	679
MW-18	4/20/2017	0.0844	104	19.7	<1	NA	176	675
MW-18	6/7/2017	0.106	95.3	<30	<1	7.2	167	653
MW-18	7/12/2017	0.111	86.5	<30	<1	7.1	160	649
MW-18	11/15/2017	<0.08	78.9	18.1	NA	7.3	132	574
MW-18	5/7/2018	<1	83.6	17.4	<1	7.2	142	594
MW-18	9/27/2018	0.125	111	19.4	<1	7.1	219	676
MW-18	3/12/2019	<0.08	90.3	19.9	<1	7.2	153	595
MW-18	4/7/2020	<0.03	88.8	18.8	0.238	7.1	147	597
MW-21	1/28/2016	1.36	151	170	0.57	7	58.9	760
MW-21	3/14/2016	1.41	115	114	0.454	6.9	64.1	652
MW-21	6/13/2016	1.45	92.3	122	<1	7	93.7	687
MW-21	9/29/2016	1.23	93.6	134	<1	7.1	64.8	703
MW-21	12/20/2016	1.65	89.9	125	<1	7.0	64.3	704
MW-21	4/19/2017	1.34	81.4	148	<1	NA	69.8	698
MW-21	6/7/2017	1.88	74.2	153	<1	6.6	68.8	751
MW-21	7/12/2017	1.23	83	152	<1	7.2	65.9	748
MW-21	3/12/2019	1.22	85.2	168	<1	7.1	68.4	759
MW-21	9/11/2019	1.4	93	129	<1	7.2	66.4	687
MW-21	4/7/2020	1.36	90.2	174	0.635	7.3	73	1460
Downgradient Wells								
MW-9D	1/26/2016	0.576	130	197	0.212	7.2	0.6	773
MW-9D	3/16/2016	0.584	91.2	237	0.244	7.2	0.413	809
MW-9D	6/13/2016	0.6	92.5	207	<1	7.1	<5	781
MW-9D	9/29/2016	0.523	93.8	260	<1	7.2	<5	794
MW-9D	12/20/2016	0.81	101	270	<1	7.1	<5	827
MW-9D	4/19/2017	0.493	85.9	238	<1	NA	<5	793
MW-9D	6/7/2017	1.29	64.2	384	<1	6.4	<5	1080
MW-9D	7/12/2017	0.728	75.3	351	<1	7.2	<5	1080
MW-9D	11/14/2017	1.05	73.1	638	<1	7.0	<5	1020

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-9D	5/8/2018	<1	75.1	301	<1	7.2	<5	852
MW-9D	9/18/2018	1.64	71.7	337	<1	7.1	<5	909
MW-9D	3/13/2019	0.499	90.4	206	<1	7.1	<5	790
MW-9D	9/11/2019	0.73	84.4	193	<1	7.1	<5	849
MW-9D	4/7/2020	0.618	93.4	233	0.308	7.1	<5	812
MW-11D	1/27/2016	0.197	100	7.02	0.264	7.3	10.7	369
MW-11D	3/16/2016	0.174	76	5.84	0.285	7.2	10.1	364
MW-11D	6/13/2016	0.172	74	6.11	<1	7.3	13.3	364
MW-11D	9/29/2016	0.147	80.3	6.5	<1	7.1	11.4	363
MW-11D	12/20/2016	0.221	78.3	11.9	<1	7.2	9.29	402
MW-11D	4/18/2017	0.156	74.1	5.2	<1	NA	11.9	360
MW-11D	6/7/2017	0.205	72.4	5.14	<1	7.4	12.1	361
MW-11D	7/12/2017	0.163	70.5	5.01	<1	7.1	11.3	355
MW-11D	11/14/2017	0.179	76.6	6.17	<1	6.8	8	381
MW-11D	5/8/2018	<1	71.5	5.15	<1	7.2	11.8	389
MW-11D	9/18/2018	0.207	78.2	5.56	<1	7.0	12.8	367
MW-11D	3/13/2019	0.156	76.3	5.06	<1	7.2	11.3	385
MW-11D	9/11/2019	0.169	75.2	3.67	<1	7.3	11.9	352
MW-11D	4/7/2020	0.172	76.6	5.4	0.286	7.3	11.4	367
MW-16D	1/28/2016	1.01	70.2	62.5	0.546	7.4	0.6	516
MW-16D	3/15/2016	1.06	59.9	57	0.456	7.2	0.18	505
MW-16D	6/14/2016	1.11	51.1	56.7	<1	7.3	<5	522
MW-16D	9/29/2016	0.934	50.9	64	<1	7.2	<5	530
MW-16D	12/20/2016	1.28	50.6	57	<1	7.3	<5	528
MW-16D	4/18/2017	0.91	45.9	57	<1	NA	<5	504
MW-16D	6/7/2017	1.11	48.7	53.3	<1	6.7	<5	521
MW-16D	7/12/2017	0.839	48	53.5	<1	7.3	<5	520
MW-16D	11/15/2017	1.02	48.7	61.2	<1	7.2	<5	533
MW-16D	5/7/2018	<1	50.2	57.9	<1	7.3	<5	537
MW-16D	9/18/2018	1.2	54.4	60.2	<1	7.1	<5	520
MW-16D	3/12/2019	0.895	51.5	59.5	<1	7.3	<5	541
MW-16D	9/11/2019	0.979	51	56.6	<1	7.0	<5	514
MW-16D	4/7/2020	0.922	51.7	58.2	0.502	7.3	<5	536
MW-20D	1/28/2016	0.256	136	39.9	0.273	7.2	17.6	368
MW-20D	3/15/2016	0.446	95.1	34.6	0.224	7.1	19.4	375
MW-20D	6/14/2016	0.241	71.2	13.7	<1	7.3	<25	326
MW-20D	9/29/2016	0.225	83	24.5	<1	7.1	19.6	344
MW-20D	12/20/2016	0.323	84.7	44	<1	7.1	17.8	399
MW-20D	4/18/2017	0.207	71.7	12.3	<1	NA	20.1	328
MW-20D	6/7/2017	0.261	77.2	13.3	<1	7.1	19.6	332
MW-20D	7/13/2017	0.221	73.1	17.9	<1	7.0	<25	347
MW-20D	11/15/2017	0.266	76.5	16.1	<1	7.1	20.9	330
MW-20D	5/7/2018	<1	72.8	14.6	<1	7.2	20.7	337
MW-20D	9/17/2018	0.29	80.2	24.1	<1	6.9	19.3	371
MW-20D	3/12/2019	0.224	81.5	23.4	<1	7.2	18.9	353
MW-20D	9/12/2019	0.274	85.3	23	<1	6.7	19	362
MW-20D	4/7/2020	0.245	80.2	22.8	0.272	7.3	18.9	347
MW-22	1/26/2016	0.532	180	45.5	0.06	7.0	106	621
MW-22	3/16/2016	0.4	107	31.9	0.333	7.0	81.9	550
MW-22	6/13/2016	0.372	108	25.9	<1	7.0	79.5	531
MW-22	9/29/2016	0.364	114	35.4	<1	7.0	94	557
MW-22	12/20/2016	0.575	112	38.7	<1	6.9	91.9	601
MW-22	4/19/2017	0.457	112	38.9	<1	NA	94.2	584

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-22	6/7/2017	0.443	113	<30	<1	7.2	83.1	547
MW-22	7/25/2017	0.448	99.7	34.6	<1	6.9	92.9	569
MW-22	11/14/2017	0.522	121	39	<1	6.7	101	604
MW-22	5/8/2018	<1	114	32.1	<1	7.0	99.7	585
MW-22	9/18/2018	0.521	122	37.3	<1	6.9	91	595
MW-22	3/13/2019	0.392	118	36.9	<1	7.0	96.1	590
MW-22	9/11/2019	0.466	117	36.4	<1	6.9	93.7	589
MW-22	4/8/2020	0.431	118	35	0.289	6.9	93.4	558
MW-24	1/27/2016	0.175	75.6	4.46	0.418	7.8	17.2	248
MW-24	3/15/2016	0.178	57.2	5.84	0.348	7.4	19	233
MW-24	6/14/2016	0.144	45.4	5.89	<1	7.5	<25	242
MW-24	9/29/2016	0.15	50.4	6.3	<1	7.4	22.3	245
MW-24	12/20/2016	0.213	49.4	6.61	<1	7.5	23	252
MW-24	4/18/2017	0.146	43.3	5.66	<1	NA	21.8	236
MW-24	6/7/2017	0.164	46.2	5.65	<1	7.6	22.8	232
MW-24	7/12/2017	0.139	47.1	6.22	<1	7.6	<25	246
MW-24	11/14/2017	0.183	51.4	6.84	<1	7.1	26.5	260
MW-24	5/7/2018	<1	46.3	6.74	<1	7.5	25.1	245
MW-24	9/27/2018	0.217	53.4	6.46	<1	7.4	25.2	251
MW-24	3/12/2019	0.13	54.9	9.41	<1	7.4	36.3	269
MW-24	9/11/2019	0.184	53.4	5.8	<1	7.4	27.1	246
MW-24	4/8/2020	0.172	54.5	6.33	0.35	7.2	24.4	238
MW-D	1/28/2016	4.26	5.1	23.5	2.11	8.7	12.8	532
MW-D	3/15/2016	5	5.18	23.9	1.86	8.5	13.8	528
MW-D	6/14/2016	5.99	4.01	25.6	1.82	8.7	13	518
MW-D	9/30/2016	4.31	3.51	29.4	1.99	7.2	12.7	524
MW-D	12/21/2016	5.92	8.19	32.1	1.91	8.5	12.9	562
MW-D	4/18/2017	4.72	3.09	39	2.11	NA	13.9	565
MW-D	6/7/2017	5.22	2.75	35.4	2.19	6.9	13.3	559
MW-D	7/12/2017	4.03	2.81	29.9	2.1	8.2	13.2	545
MW-D	11/14/2017	5.69	3.55	26.2	2.63	8.2	14.1	527
MW-D	5/8/2018	4.62	3.17	32.5	2.01	8.2	12.2	544
MW-D	9/18/2018	5.3	3.43	30.7	1.9	7.7	12.6	532
MW-D	3/13/2019	4.18	2.93	29.6	2.2	8.4	14.4	533
MW-D	9/11/2019	4.41	3.42	22.3	1.95	8.2	12.3	508
MW-D	4/8/2020	4.29	3.84	28.7	2.04	8.2	12.5	517
MW-E	1/27/2016	3.8	141	338	1.25	8.4	78.1	978
MW-E	3/17/2016	3.03	74.9	152	0.28	8.1	96.8	819
MW-E	6/14/2016	2.03	58.8	131	<1	7.4	<50	572
MW-E	9/30/2016	1.9	59.7	96.9	1.03	7.6	34.1	475
MW-E	12/21/2016	3.74	56.6	114	<1	7.4	36.7	596
MW-E	4/18/2017	0.999	46.5	21.4	<1	NA	30	376
MW-E	6/7/2017	1.08	46.9	<30	<1	6.9	24.8	372
MW-E	7/25/2017	0.934	48.2	21.5	<1	7.5	25.9	385
MW-E	11/14/2017	2.08	51	43.1	<1	7.1	27.4	448
MW-E	5/8/2018	<1	45.2	14.8	<1	7.3	20	345
MW-E	9/18/2018	0.968	55.8	19.9	<1	7.2	19.5	361
MW-E	3/13/2019	0.805	50.7	17.6	<1	7.3	20.5	361
MW-E	9/11/2019	1.01	51.2	25.6	<1	7.3	40	450
MW-E	4/8/2020	0.758	55.3	14.2	0.782	7.3	18.4	330
MW-F	1/28/2016	4.11	265	515	1.02	7.4	164	1440
MW-F	3/18/2016	4.78	134	483	0.674	6.9	165	1440
MW-F	6/14/2016	8.38	139	561	<1	7.1	159	1490

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-F	9/30/2016	4.37	114	572	1.05	7.2	167	1440
MW-F	12/21/2016	6.64	133	685	<1	7.1	177	1760
MW-F	4/18/2017	5.05	106	522	<1	NA	206	1580
MW-F	6/7/2017	5.36	103	582	<1	6.6	<250	1610
MW-F	7/25/2017	4.88	100	766	<1	7.2	<250	1500
MW-F	11/15/2017	5.83	113	531	<1	7.0	185	1420
MW-F	5/8/2018	6.14	93.1	628	<1	7.3	181	1620
MW-F	9/18/2018	4.79	105	568	<1	6.9	158	1510
MW-F	3/13/2019	4.04	92.3	548	<1	7.3	169	1490
MW-F	9/11/2019	4.42	98.4	506	<2.5	7.3	151	1390
MW-F	4/8/2020	1.16	72.7	120	0.607	7.2	105	564
MW-G	1/27/2016	0.79	97.1	131	0.597	7.3	6.66	671
MW-G	3/15/2016	1.22	88.1	156	0.359	7.2	2.98	659
MW-G	6/14/2016	1.04	65.2	158	<1	7.3	<5	674
MW-G	9/30/2016	0.738	67.6	155	<1	7.2	<5	672
MW-G	12/14/2016	0.979	66.9	158	<1	7.2	<5	685
MW-G	4/18/2017	0.94	65.5	155	<1	NA	<5	699
MW-G	6/7/2017	1.08	64.7	162	<1	7.2	<5	707
MW-G	7/13/2017	0.892	63.1	166	<1	7.1	<5	719
MW-G	11/15/2017	1.22	70.6	189	<1	7.2	<5	712
MW-G	5/7/2018	<1	60.1	167	<1	7.2	<5	711
MW-G	9/17/2018	1.24	69.1	173	<1	6.9	<5	744
MW-G	3/12/2019	0.875	68.3	180	<1	7.2	<5	704
MW-G	9/11/2019	1.03	70.2	151	<1	7.2	<5	693
MW-G	4/8/2020	0.869	68.4	172	0.502	7.1	<5.	665
MW-H	1/27/2016	0.481	148	95.8	0.679	7.3	25.1	622
MW-H	3/15/2016	0.563	134	124	0.384	7.0	40.1	640
MW-H	6/14/2016	0.617	129	127	<1	7.0	<50	705
MW-H	9/30/2016	0.469	111	119	<1	7.0	26	621
MW-H	12/20/2016	0.65	107	116	<1	7.0	21.9	624
MW-H	4/18/2017	0.494	105	110	<1	NA	25.9	671
MW-H	6/7/2017	0.576	103	129	<1	6.8	38.5	726
MW-H	7/25/2017	0.56	120	159	<1	6.8	37.1	724
MW-H	11/15/2017	0.678	121	138	<1	7.0	32.8	677
MW-H	5/7/2018	<1	105	123	<1	7.1	36.2	729
MW-H	9/18/2018	0.674	122	120	<1	6.9	39	722
MW-H	3/12/2019	0.548	114	132	<1	7.0	39.6	671
MW-H	9/12/2019	0.627	118	105	<1	6.7	29	629
MW-H	4/8/2020	0.58	114	126	0.443	6.9	34.4	637
Sequence 1 leac	2/26/2019	9.53	1040	1420	1.77	NA	1830	6370
Sequence 1 leac	4/9/2020	4.81	363	1420	0.845	NA	1780	5820

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; s.u. - standard units.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-3	1/27/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.127	<0.005	0.0093	0.0002	<0.01	<0.384	<0.01	<0.001
MW-3	3/14/2016	0.000743	0.00594	0.0464	<0.002	<0.001	<0.003	<0.005	0.115	<0.005	0.00807	0.0002	<0.01	0.632	<0.01	0.00159
MW-3	6/14/2016	<0.002	<0.001	0.042	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.499	<0.005	<0.001
MW-3	9/29/2016	<0.002	<0.001	0.0455	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.514	<0.005	<0.001
MW-3	12/20/2016	<0.002	<0.001	0.0482	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-3	4/18/2017	<0.002	<0.001	0.0413	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-3	6/7/2017	<0.002	<0.001	0.0495	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-3	7/12/2017	<0.002	<0.001	0.0455	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-3	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	NA	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-3	3/12/2019	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0134	0.0002	<0.005	<5	<0.005	<0.001
MW-3	9/17/2018	NA	<0.001	0.0637	NA	NA	<0.002	NA	NA	NA	0.014	NA	NA	<5	NA	NA
MW-3	9/11/2019	NA	<0.001	0.0595	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0161	NA	<0.005	<5	<0.005	NA
MW-3	4/7/2020	<0.004	<0.002	0.0515	<0.002	<0.001	<0.002	<0.002	<0.150	<0.005	0.00844	<0.0002	<0.005	1.16	<0.002	<0.002
MW-13S	1/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.278	<0.005	0.0123	0.0002	<0.01	0.421	<0.01	<0.001
MW-13S	3/16/2016	<0.01	<0.025	0.0519	<0.01	<0.005	<0.015	<0.025	0.761	<0.025	0.0138	0.0002	<0.05	0.853	<0.05	<0.005
MW-13S	4/20/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-13S	6/7/2017	<0.002	<0.001	0.0325	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-13S	7/12/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-13S	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-13S	3/12/2019	<0.002	<0.001	0.0349	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0138	0.0002	<0.005	<5	<0.005	<0.001
MW-13S	9/17/2018	NA	<0.001	0.0579	NA	NA	0.00216	NA	<1	NA	0.0121	NA	NA	<5	NA	NA
MW-13S	4/7/2020	<0.004	<0.002	0.0331	<0.002	<0.001	<0.002	<0.002	0.209	<0.005	0.00424	<0.0002	<0.005	0.273	<0.002	<0.002
MW-18	1/26/2016	<0.02	<0.005	<0.2	<0.02	<0.01	0.00782	0.0005	0.259	<0.005	0.101	0.0002	<0.01	<0.747	<0.01	<0.001
MW-18	3/17/2016	<0.01	<0.025	0.02	<0.01	<0.005	<0.015	0.000605	0.269	<0.025	0.112	0.0002	<0.05	1.1	<0.05	<0.005
MW-18	4/20/2017	<0.002	<0.001	0.016	<0.001	<0.001	<0.002	0.00101	<1	0.00147	0.0898	0.0002	<0.005	<5	<0.005	<0.001
MW-18	6/7/2017	<0.002	<0.001	0.019	<0.001	<0.001	0.00263	0.00333	<1	0.00224	0.0877	0.0002	<0.005	<5	<0.005	<0.001
MW-18	7/12/2017	0.00309	<0.001	0.0124	<0.001	<0.001	<0.002	0.00103	<1	<0.001	0.0886	0.0002	<0.005	<5	<0.005	<0.001
MW-18	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.0747	0.0002	<0.01	<5	<0.01	<0.002
MW-18	9/27/2018	NA	<0.001	0.0213	NA	NA	0.00203	NA	<1	NA	0.099	NA	NA	<5	NA	NA
MW-18	3/12/2019	<0.002	<0.001	<0.01	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0816	0.0002	<0.005	<5	<0.005	<0.001
MW-18	4/7/2020	<0.004	<0.002	<0.02	<0.002	<0.001	<0.002	<0.002	0.238	<0.005	0.066	<0.0002	<0.005	0.309	<0.002	<0.002
MW-21	1/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.57	<0.005	0.0773	0.0002	<0.01	1.39	<0.01	<0.001
MW-21	3/14/2016	<0.002	0.00362	0.0717	<0.002	<0.001	0.00113	<0.005	0.454	<0.005	0.0626	0.0002	<0.01	1.18	<0.01	0.00132
MW-21	6/13/2016	<0.002	<0.001	0.0663	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0639	0.0002	<0.005	1.49	<0.005	<0.001
MW-21	9/29/2016	<0.002	<0.001	0.0694	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0669	0.0002	<0.005	1.43	<0.005	<0.001
MW-21	12/20/2016	<0.002	<0.001	0.0612	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0684	0.0002	<0.005	<5	<0.005	<0.001
MW-21	4/19/2017	<0.002	<0.001	0.0631	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0722	0.0002	<0.005	<5	<0.005	<0.001
MW-21	6/7/2017	<0.002	<0.001	0.0909	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0895	0.0002	<0.005	<5	<0.005	<0.001
MW-21	7/12/2017	0.00238	<0.001	0.0733	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0783	0.0002	<0.005	<5	<0.005	<0.001
MW-21	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	NA	<0.005	0.0773	0.0002	<0.01	<5	<0.01	<0.002
MW-21	9/27/2018	NA	<0.001	0.0768	NA	NA	<0.002	NA	NA	NA	0.07	NA	NA	<5	NA	NA
MW-21	3/12/2019	<0.002	<0.001	0.0777	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0752	0.0002	<0.005	<5	<0.005	<0.001
MW-21	9/11/2019	NA	<0.001	0.0833	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0735	NA	<0.005	<5	<0.005	NA
MW-21	4/7/2020	<0.004	<0.002	0.0944	<0.002	<0.001	<0.002	<0.002	0.635	<0.005	0.0707	<0.0002	<0.005	0.596	<0.002	<0.002
Downgradient Wells																
MW-9D	1/26/2016	<0.02	<0.005	0.622	<0.02	<0.01	<0.003	0.0005	0.212	<0.005	0.0414	0.0002	<0.01	2.98	<0.01	<0.001
MW-9D	3/16/2016	<0.002	0.0635	0.581	<0.002	4e-04	0.0114	0.0024	0.244	0.000638	0.0427	0.0002	<0.01	3.35	0.00262	<0.001
MW-9D	6/13/2016	<0.002	0.00434	0.551	<0.001	<0.001	<0.002	0.00209	<1	0.0012	<0.05	0.0002	<0.005	2.47	<0.005	<0.001
MW-9D	9/29/2016	<0.002	0.00485	0.6	<0.001	<0.001	<0.002	0.002	<1	<0.001	<0.05	0.0002	<0.005	2.64	<0.005	<0.001
MW-9D	12/20/2016	<0.002	0.00506	0.642	<0.001	<0.001	0.00936	0.00827	<1	0.00498	0.0585	0.0002	<0.005	5.02	<0.005	<0.001
MW-9D	4/19/2017	<0.002	0.00447	0.503	<0.001	<0.001	0.00278	0.00256	<1	0.00187	<0.05	0.0002	<0.005	<5	<0.005	<0.001

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-9D	6/7/2017	<0.002	0.00164	0.773	<0.001	<0.001	0.0021	0.00365	<1	0.00155	0.075	0.0002	<0.005	<5	<0.005	<0.001
MW-9D	7/12/2017	<0.002	0.00139	0.613	<0.001	<0.001	<0.002	0.00176	<1	<0.001	0.0567	0.0002	<0.005	<5	<0.005	<0.001
MW-9D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-9D	5/8/2018	<0.003	<0.005	0.677	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.0526	0.0002	<0.01	<5	<0.01	<0.002
MW-9D	9/18/2018	NA	0.00319	0.757	NA	NA	0.00953	NA	<1	NA	0.0995	NA	NA	<5	NA	NA
MW-9D	3/13/2019	<0.002	0.00408	0.501	<0.001	<0.001	<0.002	0.000887	<1	<0.001	0.0396	0.0002	<0.005	<5	<0.005	<0.001
MW-9D	9/11/2019	NA	0.00265	0.608	<0.001	<0.001	<0.002	0.00193	<1	<0.001	0.0523	NA	<0.005	<5	<0.005	NA
MW-9D	4/7/2020	<0.004	0.00423	0.627	<0.002	<0.001	<0.002	<0.002	0.308	<0.005	0.0364	<0.0002	<0.005	2.9	<0.002	<0.002
MW-11D	1/27/2016	<0.02	<0.005	0.202	0.01	0.004	0.00351	0.0005	0.264	<0.005	0.00852	0.0002	<0.01	0.519	<0.01	<0.001
MW-11D	3/16/2016	<0.002	0.0577	0.174	<0.002	4e-04	0.0106	0.000505	0.285	<0.005	0.00711	0.0002	<0.01	0.403	0.00174	<0.001
MW-11D	6/13/2016	<0.002	0.0019	0.16	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.823	<0.005	<0.001
MW-11D	9/29/2016	<0.002	0.00155	0.181	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.265	<0.005	<0.001
MW-11D	12/20/2016	<0.002	<0.001	0.171	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-11D	4/18/2017	<0.002	0.00201	0.149	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-11D	6/7/2017	<0.002	0.00186	0.164	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-11D	7/12/2017	<0.002	0.00227	0.154	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-11D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-11D	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-11D	9/18/2018	NA	0.00221	0.188	NA	NA	<0.002	NA	<1	NA	0.00938	NA	NA	<5	NA	NA
MW-11D	3/13/2019	<0.002	0.00191	0.161	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0103	0.0002	<0.005	<5	<0.005	<0.001
MW-11D	9/11/2019	NA	0.00255	0.174	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	NA	<0.005	<5	<0.005	NA
MW-11D	4/7/2020	<0.004	0.00223	0.175	<0.002	<0.001	<0.002	<0.002	0.286	<0.005	0.00696	<0.0002	<0.005	1.12	<0.002	<0.002
MW-16D	1/28/2016	<0.02	0.0052	<0.2	<0.02	<0.01	<0.003	0.0005	0.546	<0.005	0.0394	0.0002	<0.01	<0.368	<0.01	<0.001
MW-16D	3/15/2016	<0.002	0.00787	0.126	<0.002	<0.001	<0.003	<0.005	0.456	<0.005	0.0439	0.0002	0.00146	0.35	<0.01	0.000731
MW-16D	6/14/2016	<0.002	0.00579	0.109	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.254	<0.005	<0.001
MW-16D	9/29/2016	<0.002	0.00539	0.108	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.563	<0.005	<0.001
MW-16D	12/20/2016	<0.002	0.00513	0.104	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-16D	4/18/2017	<0.002	0.00837	0.105	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-16D	6/7/2017	<0.002	0.00859	0.121	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-16D	7/12/2017	<0.002	0.00529	0.106	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.25	0.0002	<0.005	<5	<0.005	<0.001
MW-16D	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-16D	5/7/2018	<0.003	0.0105	<0.2	<0.004	<0.005	0.00519	<0.005	<1	<0.005	0.0416	0.0002	<0.01	<5	<0.01	<0.002
MW-16D	9/18/2018	NA	0.00724	0.13	NA	NA	<0.002	NA	<1	NA	0.0435	NA	NA	<5	NA	NA
MW-16D	3/12/2019	<0.002	0.00904	0.106	<0.001	0.00265	<0.002	<0.0005	<1	<0.001	0.0471	0.0002	<0.005	<5	<0.005	<0.001
MW-16D	9/11/2019	NA	0.00654	0.112	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0448	NA	<0.005	<5	<0.005	NA
MW-16D	4/7/2020	<0.004	0.00891	0.119	<0.002	<0.001	<0.002	<0.002	0.502	<0.005	0.0363	<0.0002	<0.005	0.413	<0.002	<0.002
MW-20D	1/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.273	<0.005	0.017	0.0002	<0.01	0.395	<0.01	<0.001
MW-20D	3/15/2016	0.000643	0.00432	0.152	<0.002	<0.001	0.000585	<0.005	0.224	<0.005	0.0169	0.0002	0.00662	0.819	<0.01	0.00133
MW-20D	6/14/2016	<0.002	0.00103	0.116	<0.001	<0.001	<0.002	<0.0005	<1	0.001	<0.05	0.0002	<0.005	0.462	<0.005	<0.001
MW-20D	9/29/2016	<0.002	<0.001	0.142	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	0.00573	0.714	<0.005	<0.001
MW-20D	12/20/2016	<0.002	0.00116	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	0.0052	<5	<0.005	<0.001
MW-20D	4/18/2017	<0.002	0.00111	0.114	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-20D	6/7/2017	<0.002	0.00113	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	0.00515	<5	<0.005	<0.001
MW-20D	7/13/2017	<0.002	0.00123	0.128	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-20D	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-20D	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-20D	9/17/2018	NA	0.00124	0.149	NA	NA	<0.002	NA	<1	NA	0.0147	NA	NA	<5	NA	NA
MW-20D	3/12/2019	<0.002	0.00125	0.14	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0163	0.0002	0.00525	<5	<0.005	<0.001
MW-20D	9/12/2019	NA	0.00187	0.162	<0.001	<0.001	0.0026	0.000771	<1	<0.001	0.0201	NA	0.00565	<5	<0.005	NA
MW-20D	4/7/2020	<0.004	<0.002000	0.147	<0.002	<0.001	<0.002	<0.002	0.272	<0.005	0.0129	<0.0002	0.00587	0.349	<0.002	<0.002
MW-22	1/26/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.06	<0.005	0.0275	0.0002	<0.01	0.92	<0.01	<0.001
MW-22	3/16/2016	<0.002	0.0737	0.0535	<0.002	4e-04	0.0113	0.000745	0.333	<0.005	0.0207	0.0002	0.00075	0.485	0.00231	<0.001

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-22	6/13/2016	<0.002	0.00204	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.849	<0.005	<0.001
MW-22	9/29/2016	<0.002	0.00348	0.0563	<0.001	<0.001	<0.002	<0.0005	<1	0.00349	<0.05	0.0002	<0.005	0.92	<0.005	<0.001
MW-22	12/20/2016	<0.002	0.00325	0.0549	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-22	4/19/2017	<0.002	0.00305	0.0489	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-22	6/7/2017	<0.002	0.00266	0.0478	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-22	7/25/2017	<0.002	0.00283	0.0567	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-22	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-22	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-22	9/18/2018	NA	0.00379	0.0544	NA	NA	<0.002	NA	<1	NA	0.0243	NA	NA	<5	NA	NA
MW-22	3/13/2019	<0.002	0.00182	0.0484	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0239	0.0002	<0.005	<5	<0.005	<0.001
MW-22	9/11/2019	NA	0.00294	0.0526	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0246	NA	<0.005	<5	<0.005	NA
MW-22	4/8/2020	<0.004	0.00262	0.0491	<0.002	<0.001	<0.002	<0.002	0.289	<0.005	0.0202	<0.0002	<0.005	0.292	<0.002	<0.002
MW-24	1/27/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.418	<0.005	0.0166	0.0002	<0.01	<0.326	<0.01	<0.001
MW-24	3/15/2016	<0.002	0.00261	0.0444	<0.002	<0.001	<0.003	<0.005	0.348	<0.005	0.0155	0.0002	<0.01	<0.341	<0.01	<0.001
MW-24	6/14/2016	<0.002	<0.001	0.0359	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.348	<0.005	<0.001
MW-24	9/29/2016	<0.002	<0.001	0.0407	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.905	<0.005	<0.001
MW-24	12/20/2016	<0.002	<0.001	0.0392	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-24	4/18/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-24	6/7/2017	<0.002	<0.001	0.0411	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-24	7/12/2017	<0.002	<0.001	0.0374	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-24	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-24	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-24	9/27/2018	NA	<0.001	0.0467	NA	NA	<0.002	NA	<1	NA	0.0177	NA	NA	<5	NA	NA
MW-24	3/12/2019	<0.002	<0.001	0.0394	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0186	0.0002	<0.005	<5	<0.005	<0.001
MW-24	9/11/2019	NA	<0.001	0.0452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0194	NA	<0.005	<5	<0.005	NA
MW-24	4/8/2020	<0.004	<0.002000	0.0449	<0.002	<0.001	<0.002	<0.002	0.35	<0.005	0.0151	<0.0002	<0.005	0.788	<0.002	<0.002
MW-D	1/28/2016	<0.1	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	2.11	<0.005	0.12	0.0002	<0.01	<0.621	<0.01	<0.001
MW-D	3/15/2016	<0.002	0.00224	0.0247	<0.002	<0.001	0.000694	<0.005	1.86	<0.005	0.12	0.0002	0.000631	0.296	<0.01	<0.001
MW-D	6/14/2016	<0.002	<0.001	0.0225	<0.001	<0.001	<0.002	<0.0005	1.82	<0.001	0.116	0.0002	<0.005	0.0247	<0.005	<0.001
MW-D	9/30/2016	<0.002	<0.001	0.0235	<0.001	<0.001	<0.002	<0.0005	1.99	<0.001	0.118	0.0002	<0.005	0.682	<0.005	<0.001
MW-D	12/21/2016	<0.002	<0.001	0.0273	<0.001	<0.001	0.00292	0.000997	1.91	<0.001	0.125	0.0002	<0.005	<5	<0.005	<0.001
MW-D	4/18/2017	<0.002	<0.001	0.0257	<0.001	<0.001	<0.002	<0.0005	2.11	<0.001	0.119	0.0002	<0.005	<5	<0.005	<0.001
MW-D	6/7/2017	<0.002	<0.001	0.0273	<0.001	<0.001	<0.002	<0.0005	2.19	<0.001	0.113	0.0002	<0.005	<5	<0.005	<0.001
MW-D	7/12/2017	<0.002	<0.001	0.0239	<0.001	<0.001	<0.002	<0.0005	2.1	<0.001	0.123	0.0002	<0.005	<5	<0.005	<0.001
MW-D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	2.63	NA	NA	NA	NA	NA	NA	NA
MW-D	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	2.01	<0.005	0.125	0.0002	<0.01	<5	<0.01	<0.002
MW-D	9/18/2018	NA	<0.001	0.0282	NA	NA	<0.002	NA	1.9	NA	0.125	NA	NA	<5	NA	NA
MW-D	3/13/2019	<0.002	<0.001	0.0281	<0.001	<0.001	<0.002	<0.0005	2.2	<0.001	0.125	0.0002	<0.005	<5	<0.005	<0.001
MW-D	9/11/2019	NA	<0.001	0.027	<0.001	<0.001	0.00646	<0.0005	1.95	<0.001	0.119	NA	<0.005	<5	<0.005	NA
MW-D	4/8/2020	<0.004	<0.002000	0.0299	<0.002	<0.001	<0.002	<0.002	2.04	<0.005	0.107	<0.0002	<0.005	0.611	<0.002	<0.002
MW-E	1/27/2016	<0.1	0.00507	0.462	<0.02	<0.01	0.0229	0.0141	1.25	0.00625	0.163	0.0002	<0.01	2.49	<0.01	<0.05
MW-E	3/17/2016	<0.01	<0.025	0.441	<0.01	<0.005	0.00386	0.00331	0.28	0.00147	0.132	0.0002	0.00367	1.79	<0.05	<0.005
MW-E	6/14/2016	<0.002	0.00224	0.251	<0.001	<0.001	0.00728	0.00447	<1	0.00255	0.0651	0.0002	0.0117	0.637	<0.005	<0.001
MW-E	9/30/2016	<0.002	0.00162	0.353	<0.001	<0.001	0.00314	0.00451	1.03	0.00263	0.0623	0.0002	0.00515	1.39	<0.005	<0.001
MW-E	12/21/2016	<0.002	0.00412	0.421	<0.001	<0.001	0.0144	0.00958	<1	0.00457	0.101	0.0002	0.0101	<5	<0.005	<0.001
MW-E	4/18/2017	<0.002	<0.001	0.214	<0.001	<0.001	<0.002	0.00123	<1	<0.001	<0.05	0.0002	0.0103	<5	<0.005	<0.001
MW-E	6/7/2017	<0.002	<0.001	0.271	<0.001	<0.001	0.00293	0.00272	<1	0.00115	<0.05	0.0002	0.00652	<5	<0.005	<0.001
MW-E	7/25/2017	<0.002	<0.001	0.193	<0.001	<0.001	<0.002	0.000653	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-E	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-E	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-E	9/18/2018	NA	<0.001	0.166	NA	NA	<0.002	NA	<1	NA	0.0324	NA	NA	<5	NA	NA
MW-E	3/13/2019	<0.002	<0.001	0.186	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0344	0.0002	<0.005	<5	<0.005	<0.001

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-E	9/11/2019	NA	0.00106	0.246	<0.001	<0.001	0.00351	0.00232	<1	0.00131	0.0416	NA	<0.005	<5	<0.005	NA
MW-E	4/8/2020	<0.004	<0.002000	0.175	<0.002	<0.001	<0.002	<0.002	0.782	<0.005	0.0292	<0.0002	<0.005	0.861	<0.002	<0.002
MW-F	1/28/2016	<0.1	0.0106	0.264	<0.02	<0.01	0.0337	0.0222	1.02	0.0233	0.26	0.0002	<0.01	<1.37	<0.01	<0.05
MW-F	3/18/2016	<0.01	<0.025	0.146	<0.01	<0.005	0.00665	0.00423	0.674	0.00393	0.328	0.0002	<0.05	1.06	<0.05	<0.005
MW-F	6/14/2016	<0.002	0.00602	0.0938	<0.001	<0.001	0.0187	0.00944	<1	0.0103	0.249	0.0002	<0.005	2.72	<0.005	<0.001
MW-F	9/30/2016	<0.002	0.00118	0.071	<0.001	<0.001	0.00307	0.00243	1.05	0.00253	0.261	0.0002	<0.005	6.36	<0.005	<0.001
MW-F	12/21/2016	<0.002	0.00801	0.0901	0.00113	<0.001	0.0301	0.0142	<1	0.0124	0.289	0.0002	<0.005	<5	<0.005	<0.001
MW-F	4/18/2017	<0.002	<0.001	0.039	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.232	0.0002	<0.005	<5	<0.005	<0.001
MW-F	6/7/2017	<0.002	<0.001	0.0426	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.224	0.0002	<0.005	<5	<0.005	<0.001
MW-F	7/25/2017	<0.002	<0.001	0.0404	<0.001	<0.001	<0.002	0.000653	<1	<0.001	0.235	0.0002	<0.005	<5	<0.005	<0.001
MW-F	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-F	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.265	0.0002	<0.01	<5	<0.01	<0.002
MW-F	9/18/2018	NA	<0.001	0.039	NA	NA	<0.002	NA	<1	NA	0.249	NA	NA	<5	NA	NA
MW-F	3/13/2019	<0.002	<0.001	0.0326	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.231	0.0002	<0.005	<5	<0.005	<0.001
MW-F	9/11/2019	NA	0.00103	0.0423	<0.001	<0.001	<0.002	<0.0005	<2.5	<0.001	0.232	NA	<0.005	<5	<0.005	NA
MW-F	4/8/2020	<0.004	<0.002000	0.0284	<0.002	<0.001	<0.002	<0.002	0.607	<0.005	0.0613	<0.0002	<0.005	2.24	<0.002	<0.002
MW-G	1/27/2016	<0.02	0.00747	0.496	<0.02	<0.01	<0.003	0.0005	0.597	<0.005	0.0341	0.0002	<0.01	1.31	<0.01	<0.001
MW-G	3/15/2016	<0.002	0.00788	0.466	<0.002	<0.001	<0.003	<0.005	0.359	<0.005	0.0362	0.0002	0.00252	1.07	<0.01	0.000537
MW-G	6/14/2016	<0.002	0.00352	0.406	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	1.42	<0.005	<0.001
MW-G	9/30/2016	<0.002	0.00295	0.425	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	1.05	<0.005	<0.001
MW-G	12/14/2016	<0.002	0.00315	0.438	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-G	4/18/2017	<0.002	0.00293	0.387	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-G	6/7/2017	<0.002	0.00257	0.432	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-G	7/13/2017	<0.002	0.00276	0.392	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-G	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-G	5/7/2018	<0.003	<0.005	0.417	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-G	9/17/2018	NA	0.00202	0.441	NA	NA	<0.002	NA	<1	NA	0.0425	NA	NA	<5	NA	NA
MW-G	3/12/2019	<0.002	0.00171	0.53	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0391	0.0002	<0.005	<5	<0.005	<0.001
MW-G	9/11/2019	NA	0.00196	0.452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0416	NA	<0.005	<5	<0.005	NA
MW-G	4/8/2020	<0.004	<0.002000	0.445	<0.002	<0.001	<0.002	<0.002	0.502	<0.005	0.0324	<0.0002	<0.005	1.89	<0.002	<0.002
MW-H	1/27/2016	<0.02	<0.005	0.0005	<0.02	<0.01	<0.003	<0.05	0.679	<0.005	0.03	0.0002	<0.01	0.454	<0.01	<0.001
MW-H	3/15/2016	<0.002	0.00548	0.127	<0.002	<0.001	0.000966	<0.005	0.384	<0.005	0.0303	0.0002	<0.01	0.622	<0.01	<0.001
MW-H	6/14/2016	<0.002	0.00129	0.126	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.599	<0.005	<0.001
MW-H	9/30/2016	<0.002	0.00132	0.103	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	0.601	<0.005	<0.001
MW-H	12/20/2016	<0.002	0.00131	0.0974	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-H	4/18/2017	<0.002	0.00126	0.0837	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-H	6/7/2017	<0.002	<0.001	0.11	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-H	7/25/2017	<0.002	0.00101	0.121	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	0.0002	<0.005	<5	<0.005	<0.001
MW-H	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-H	5/7/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	0.0002	<0.01	<5	<0.01	<0.002
MW-H	9/18/2018	NA	<0.001	0.135	NA	NA	<0.002	NA	<1	NA	0.0376	NA	NA	<5	NA	NA
MW-H	3/12/2019	<0.002	0.00107	0.111	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0376	0.0002	<0.005	<5	<0.005	<0.001
MW-H	9/12/2019	NA	0.00105	0.124	<0.001	<0.001	0.00216	<0.0005	<1	<0.001	0.04	NA	<0.005	<5	<0.005	NA
MW-H	4/8/2020	<0.004	<0.002000	0.119	<0.002	<0.001	<0.002	<0.002	0.443	<0.005	0.0337	<0.0002	<0.005	0.673	<0.002	<0.002
Sequence 1 leac	2/26/2019	0.00527	0.356	0.0684	<0.001	<0.001	<0.002	<0.0005	1.77	<0.001	2.61	0.000935	0.143	NA	0.00838	<0.001
Sequence 1 leac	4/9/2020	0.00817	0.269	0.0706	<0.002	<0.001	0.261	0.258	0.845	<0.005	2.33	0.00151	0.143	0.493	0.0135	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter

April 8, 2019

Title 40 of the Code of Federal Regulations (C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of statistically significant levels (SSLs) over groundwater protection standards of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (alternate source demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Zimmer, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll, to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Zimmer Landfill located near the Zimmer Power Station and Moscow, OH.

The first Assessment Monitoring sampling event was completed on May 7, 2018, and May 8, 2018. As stipulated in 40 C.F.R. § 257.95(d)(1), all wells were resampled on September 17, 2018, and September 18, 2018, for all Appendix III parameters and Appendix IV parameters detected during the first Assessment Monitoring sampling event. Due to shipping delays, samples from monitoring wells MW-18, MW-21, and MW-24 arrived at the analytical laboratory above the temperature allowable by the analysis method. These three wells were resampled on September 27, 2018 and submitted for analysis. Analytical data from all sampling events from December 2015 through the resampling event on September 27, 2018, were evaluated in accordance with the statistical analysis plan[1] to determine any statistically significant levels (SSLs) of Appendix IV parameters over the Groundwater Protection Standards (GWPSs) established in accordance with 40 C.F.R. § 257.95(h). That evaluation identified SSLs at downgradient monitoring wells as follows:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the SSL listed above. This alternate source demonstration (ASD) was completed within 90 days of determination of the SSLs (January 9, 2019), as required by 40 C.F.R. § 257.95(g)(3)(ii).

ISOTOPIC EVALUATION

Isotopes are commonly used in age dating, provenance studies, and to differentiate between sources of groundwater. Multiple studies have shown that boron and strontium isotope ratios can be successfully used in identifying CCR impacts to groundwater[2-3]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as boron and strontium isotopes, make good groundwater tracers. This ASD compares boron and strontium isotope ratios to published ranges for CCR impacted groundwater and CCR leachate.

Boron

Boron isotopes do not fractionate during combustion, meaning the isotopic ratio in the coal and in the subsequent CCR are similar, regardless of the total boron in the coal and the combusted coal[2]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[2].

Because variations in boron isotope ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\delta^{11}B = \left[\frac{(^{11}B/^{10}B)_{sample} - (^{11}B/^{10}B)_{std}}{(^{11}B/^{10}B)_{std}}\right] \times 1000$$

Strontium

One of the four stable isotopes (^{87}Sr) is subject to long-term radiogenic ingrowth by radioactive decay of rubidium (^{87}Rb). The isotopic ratio, $^{87}Sr/^{86}Sr$, is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[6].

ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

Lines of evidence supporting this ASD include the following:

1. Boron isotope ratios in downgradient groundwater are not consistent with boron isotope ratios in CCR and CCR-impacted waters.
2. Strontium isotope ratios in groundwater are lower than the typical range for CCRs.

These lines of evidence are described and supported in greater detail below.

LOE #1: BORON ISOTOPE RATIOS DOWNGRADIENT ARE WITHIN THE TYPICAL RANGE FOR GROUNDWATER.

Strontium isotope ratios ($^{87}Sr/^{86}Sr$) for groundwater and leachate are plotted against boron isotope ratios ($\delta^{11}B$) in Figure 2. The $\delta^{11}B$ range for typical groundwater, shaded green, is 10‰ to 40‰ [7]. The area shaded orange represents $\delta^{11}B$ range for CCR-impacted water, which has a distinctive negative $\delta^{11}B$ signature ranging from -70 ‰ to -1‰[2, 8].

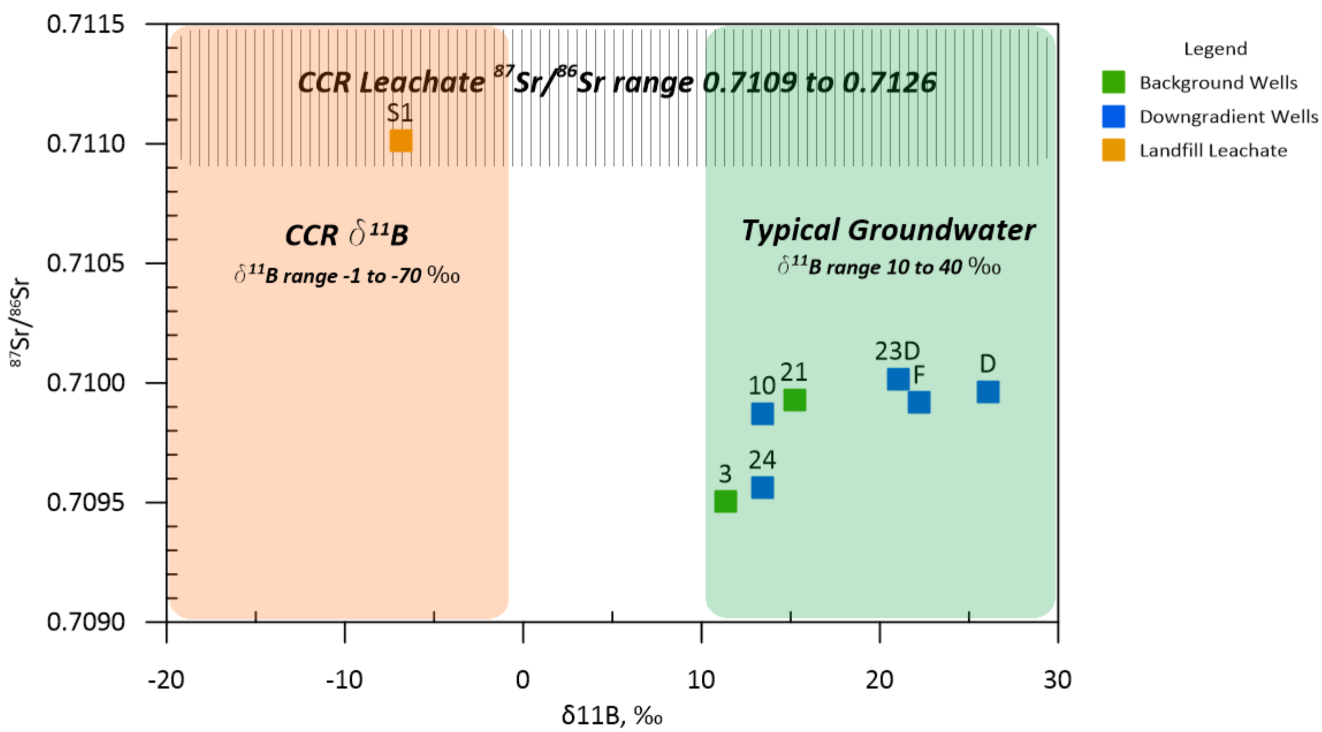


Figure 2. Strontium isotope ratio vs boron isotope ratio[2]

All groundwater results are within the typical $\delta^{11}B$ range for groundwater[2]. The leachate results, S1, are within the typical negative $\delta^{11}B$ range for CCR leachates[2]. Figure 2 shows that $\delta^{11}B$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

LOE #2: STRONTIUM ISOTOPE RATIOS DOWNGRADIENT ARE LOWER THAN THE TYPICAL RANGE FOR CCR IMPACTED WATERS.

Strontium isotope ratios in coal, fly ash, and bottom ash range from 0.7109 to 0.7126, indicated by the vertical hatching in Figure 2.

The groundwater results are within the typical groundwater range[2]. The leachate sample is within the typical $^{87}Sr/^{86}Sr$ range for CCR leachates[2]. Figure 2 shows that $^{87}Sr/^{86}Sr$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

Based on these two lines of evidence, it has been demonstrated that the Zimmer Landfill has not caused the Lithium SSL in MW-F.

This information serves as the written ASD, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the lithium SSL observed during the assessment monitoring program was not due to Zimmer Landfill, but naturally-occurring conditions. Therefore, a corrective measures assessment is not required, and the Zimmer Landfill will remain in assessment monitoring.

REFERENCES

1. Natural Resource Technology, Statistical Analysis Plan. 2017.
2. Ruhl, L. S.; Dwyer, G. S.; Hsu-Kim, H.; Hower, J. C.; Vengosh, A., Boron and Strontium Isotopic Characterization of Coal Combustion Residuals; Validation of New Environmental Tracers. *Environmental Science & Technology* **2014**, 9.
3. Harkness, J. S.; Ruhl, L. S.; Millot, R.; Kloppman, W.; Hower, J. C.; Hsu-Kim, H.; Vengosh, A., Lithium Isotope Fingerprints in Coal and Coal Combusion Residuals from the United States. *Procdia Earth and Planetary Science* **2015**, 4.
4. Hensel, B. R. *Groundwater Quality Signatures for Assessing Potential Impacts from Coal Combustion Product Leachate*; 2012.
5. Vengosh, A.; Heumann, K. G.; Juraske, S.; Kasher, R., Boron Isotope Application for Tracing Sources of Contamination in Grounwater. *Environmental Science & Technology* **1994,** *26* (11), 7.
6. Bataille, C. P.; Bowen, G. J., Mapping 87Sr/86Sr Variations in Bedrock and Water for Large Scale Provenance Studies. *Chemical Geology* **2012**, 14.
7. Kloppman, W.; Petelet-Giraud, E.; Guerrot, C.; Cary, L.; Pauwels, H., Extreme Boron Isotope Ratios in Groundwater. *Procedia Earth and Planetary Science* **2015**, 5.
8. Williams, L. B.; Hervig, R. L., Boron isotope composition of coals: a potential tracer of organic contaminated fluids. *Applied Geochemistry* **2004,** *19* (10), 1625-1636.

I, Nicole M. Pagano, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

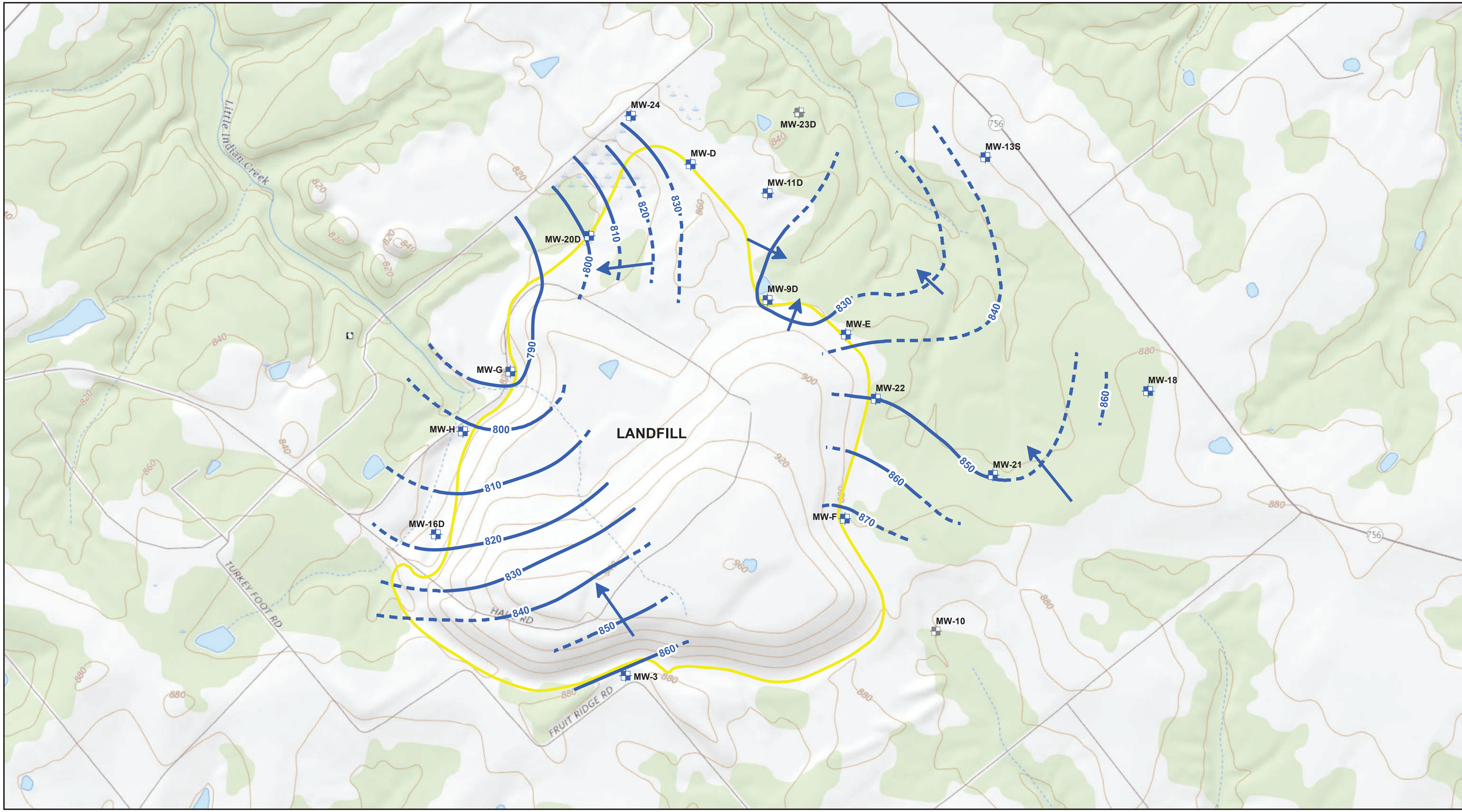
Nicole M. Pagano
Senior Managing Engineer
OBG, part of Ramboll
Date: April 8, 2019

I, Richard H. Weber, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Richard H. Weber
Qualified Professional Engineer
71678
Ohio
OBG, part of Ramboll
Date: April 8, 2019

STATE OF OHIO
RICHARD H. WEBER
71678
REGISTERED
PROFESSIONAL ENGINEER

FIGURE NO. 1



LEGEND

- NON-CCR MONITORING WELL LOCATION
- CCR MONITORING WELL LOCATION
- CCR MONITORED UNIT

VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

0 175 350 700 1,050 1,400
Feet

N

ZIMMER LANDFILL (UNIT ID: 122)
MONITORING WELL MAP WITH GROUNDWATER DIVIDE
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14, 2017

O'BRIEN & GERE ENGINEERS, INC.

October 28, 2019

Title 40 of the Code of Federal Regulations (C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of statistically significant levels (SSLs) over groundwater protection standards of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (alternate source demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Zimmer, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll, to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Zimmer Landfill located near the Zimmer Power Station and Moscow, OH.

The second Assessment Monitoring sampling event (A2) was completed on March 13, 2019 and analytical data were received on April 29, 2019. Analytical data from all sampling events, from December 2015 through A2, were evaluated in accordance with the Statistical Analysis Plan[1] to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over Groundwater Protection Standards (GWPSs). That evaluation identified SSLs at downgradient monitoring wells as follows:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the SSL listed above. This alternate source demonstration (ASD) was completed within 90 days of determination of the SSLs (July 29, 2019), as required by 40 C.F.R. § 257.95(g)(3)(ii).

ISOTOPIC EVALUATION

Isotopes are commonly used in age dating, provenance studies, and to differentiate between sources of groundwater. Multiple studies have shown that boron and strontium isotope ratios can be successfully used in identifying CCR impacts to groundwater[2-3]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as boron and strontium isotopes, make good groundwater tracers. This ASD compares boron and strontium isotope ratios to published ranges for CCR impacted groundwater and CCR leachate.

Boron

Boron isotopes do not fractionate during coal combustion, meaning the isotopic ratio in the coal is preserved, regardless of the total boron in the coal and the combusted coal[2]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[2].

Because variations in boron isotope ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\delta^{11}B = \left[\frac{(^{11}B/^{10}B)_{sample} - (^{11}B/^{10}B)_{std}}{(^{11}B/^{10}B)_{std}}\right] \times 1000$$

Strontium

One of the four stable isotopes (^{87}Sr) is subject to long-term radiogenic ingrowth by radioactive decay of rubidium (^{87}Rb). The isotopic ratio, $^{87}Sr/^{86}Sr$, is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[4].

ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

Lines of evidence (LOE) supporting this ASD include the following:

1. Strontium isotope ratios in groundwater are lower than the typical range for CCR impacted waters.
2. Boron isotope ratios in downgradient groundwater are not consistent with boron isotope ratios in CCR and CCR impacted waters.

These lines of evidence are described and supported in greater detail below.

LOE #1: STRONTIUM ISOTOPE RATIOS DOWNGRADIENT ARE LOWER THAN THE TYPICAL RANGE FOR CCR IMPACTED WATERS.

Strontium isotope ratios ($^{87}Sr/^{86}Sr$) for groundwater and leachate are plotted against total lithium in Figure 1. Strontium isotope ratios in coal, fly ash, and bottom ash impacted waters range from 0.7109 to 0.7126[2], indicated by the area shaded orange in Figure 1.

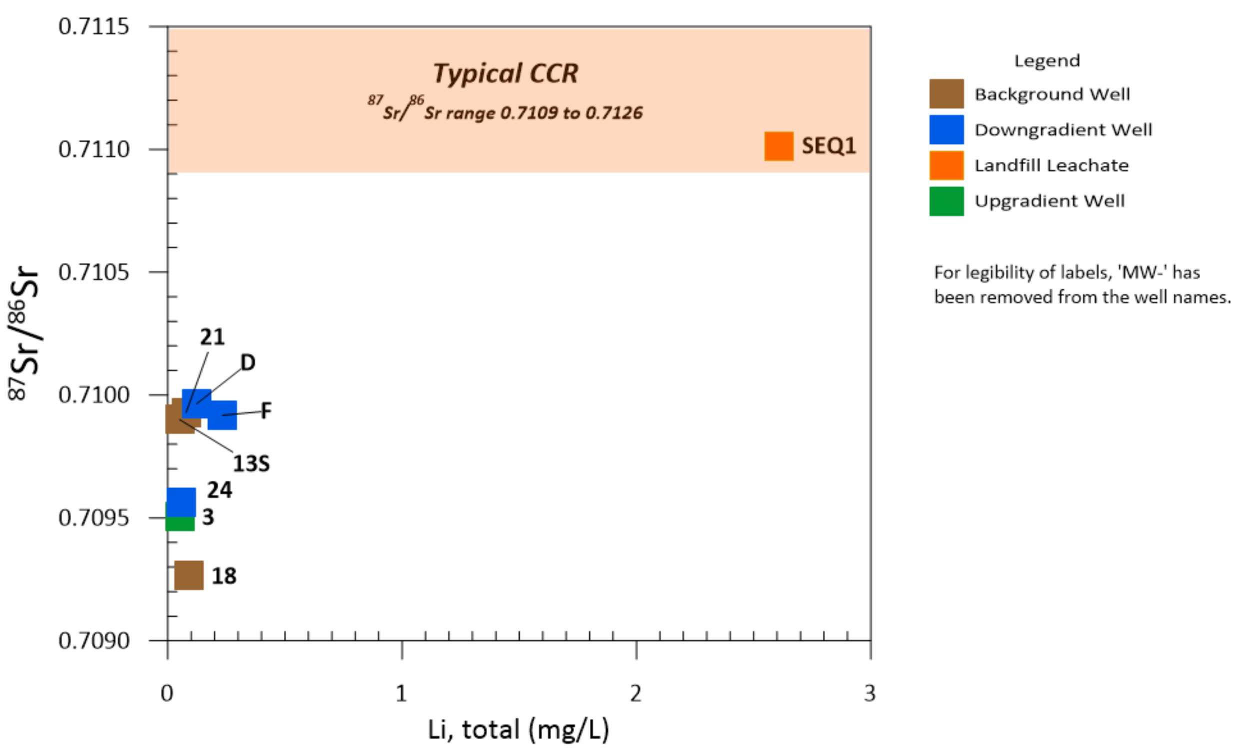


Figure 1. Strontium isotope ratio vs total lithium[2]

The groundwater results are within the typical groundwater range[2]. The leachate sample is within the typical $^{87}Sr/^{86}Sr$ range for CCR impacted waters[2]. Figure 2 shows that $^{87}Sr/^{86}Sr$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

LOE #2: BORON ISOTOPE RATIOS DOWNGRADIENT ARE WITHIN THE TYPICAL RANGE FOR GROUNDWATER.

Total boron (B) for groundwater and leachate are plotted against boron isotope ratios ($\delta^{11}B$) in Figure 2. The $\delta^{11}B$ range for typical groundwater, shaded green, is 10‰ to 40‰ [5]. The area shaded orange represents $\delta^{11}B$ range for CCR impacted water, which has a distinctive negative $\delta^{11}B$ signature ranging from -70 ‰ to -1‰[2, 6].

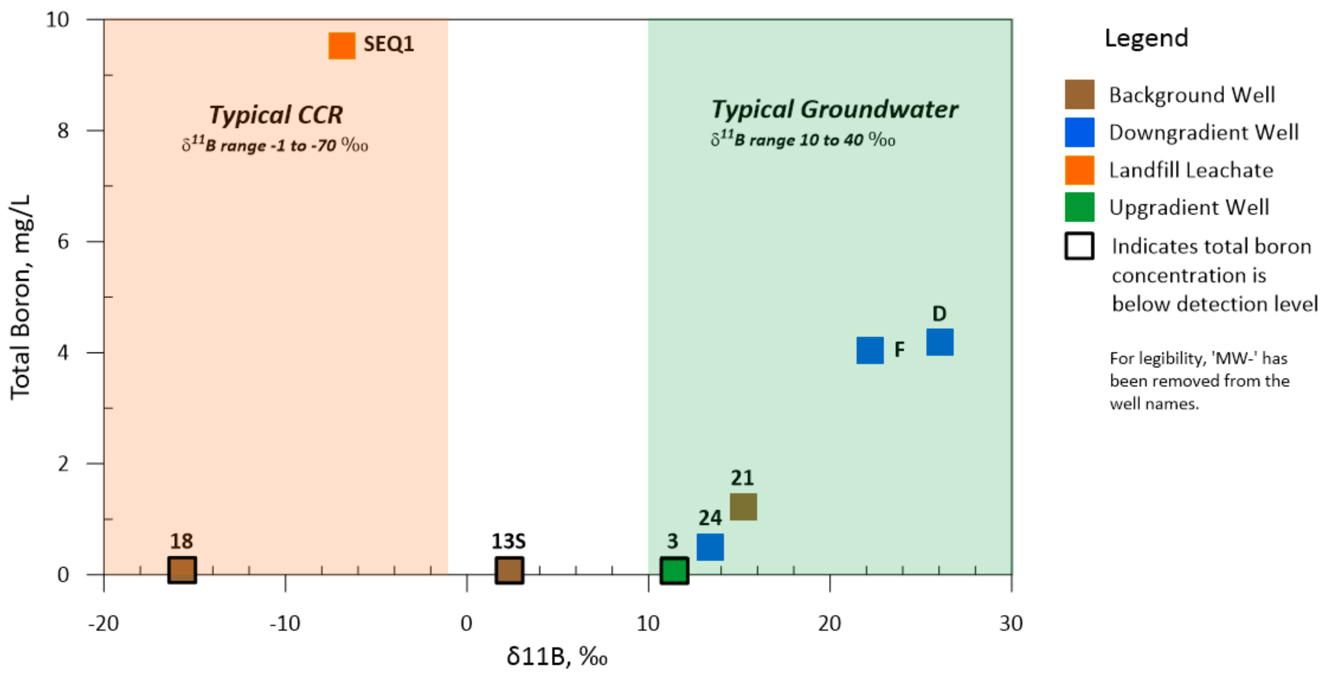


Figure 2. Total boron vs boron isotope ratio[2]

All groundwater results are within the typical $\delta^{11}B$ range for groundwater[2] at wells with total boron concentration above the detection limit. The leachate results, SEQ1, are within the typical negative $\delta^{11}B$ range for CCR leachates[2]. Figure 2 shows that $\delta^{11}B$ groundwater results are well grouped, except for background wells MW-13S and MW-18, which did not have detectable concentrations of total boron, and that the leachate is not mixing with the groundwater. The landfill is not influencing MW-13S and MW-18 as evidenced by groundwater flow shown on Figure 3.

Based on these two lines of evidence, it has been demonstrated that the Zimmer Landfill has not caused the Lithium SSL in MW-F.

This information serves as the written ASD, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the lithium SSL observed during the assessment monitoring program was not due to Zimmer Landfill. Therefore, a corrective measures assessment is not required, and the Zimmer Landfill will remain in assessment monitoring.

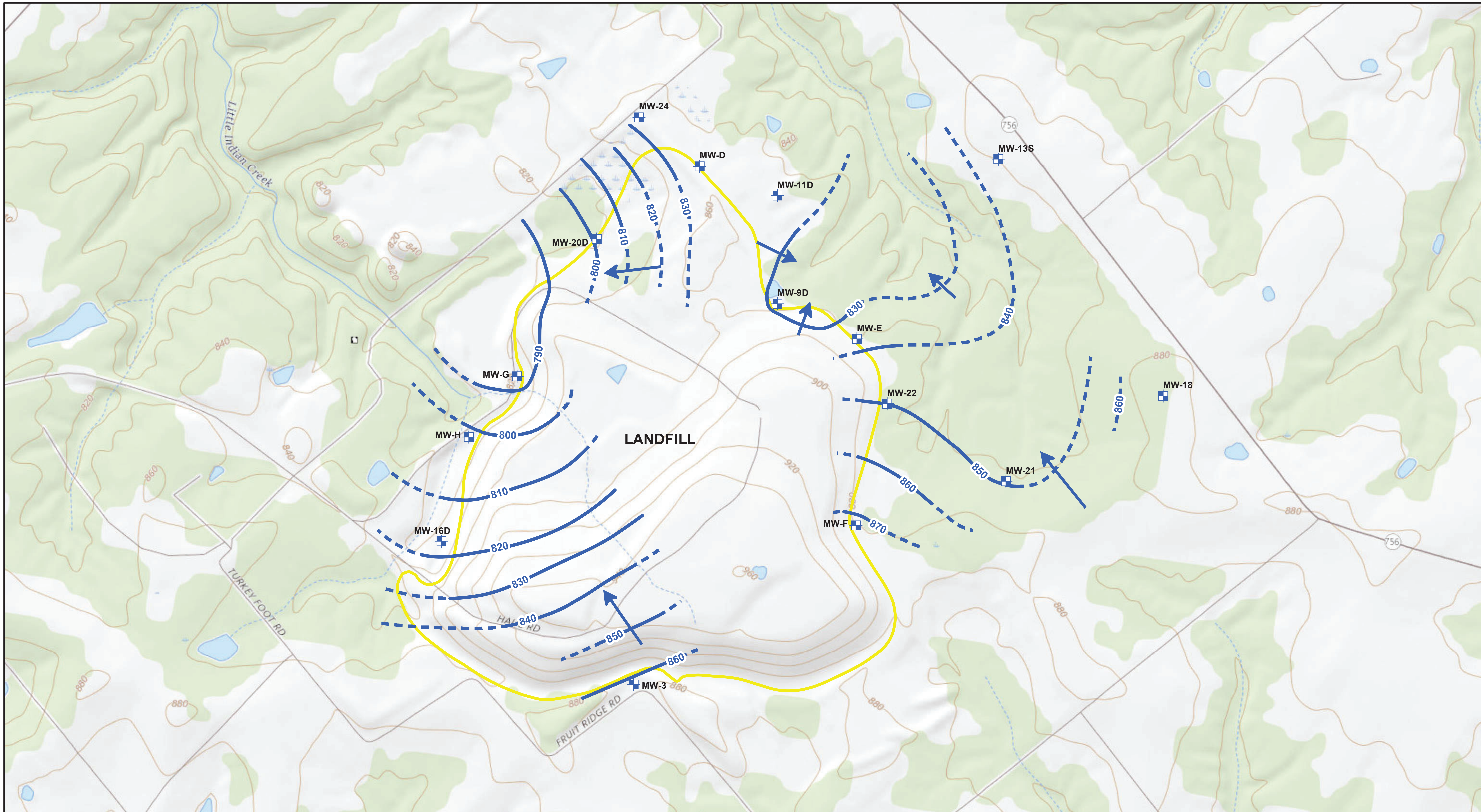
REFERENCES

1. Natural Resource Technology, Statistical Analysis Plan. 2017.
2. Ruhl, L. S.; Dwyer, G. S.; Hsu-Kim, H.; Hower, J. C.; Vengosh, A., Boron and Strontium Isotopic Characterization of Coal Combustion Residuals; Validation of New Environmental Tracers. *Environmental Science & Technology* **2014**, 9.
3. Harkness, J. S.; Ruhl, L. S.; Millot, R.; Kloppman, W.; Hower, J. C.; Hsu-Kim, H.; Vengosh, A., Lithium Isotope Fingerprints in Coal and Coal Combustion Residuals from the United States. *Procdia Earth and Planetary Science* **2015**, 4.
4. Bataille, C. P.; Bowen, G. J., Mapping 87Sr/86Sr Variations in Bedrock and Water for Large Scale Provenance Studies. *Chemical Geology* **2012**, 14.
5. Kloppman, W.; Petelet-Giraud, E.; Guerrot, C.; Cary, L.; Pauwels, H., Extreme Boron Isotope Ratios in Groundwater. *Procedia Earth and Planetary Science* **2015**, 5.
6. Williams, L. B.; Hervig, R. L., Boron isotope composition of coals: a potential tracer of organic contaminated fluids. *Applied Geochemistry* **2004,** *19* (10), 1625-1636.

ATTACHMENTS

Figure 3 Groundwater Elevation Contour Map

FIGURE NO. 3



LEGEND

CCR MONITORING WELL LOCATION

CCR MONITORED UNIT

VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

0 175 350 700 1,050 1,400
Feet

N

ZIMMER LANDFILL (UNIT ID: 122)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14, 2017

O'BRIEN & GERE ENGINEERS, INC.

I, Nicole M. Pagano, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Senior Managing Engineer
OBG, part of Ramboll
Date: October 28, 2019

I, Richard H. Weber, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Richard H. Weber
Qualified Professional Engineer
71678
Ohio
OBG, part of Ramboll
Date: October 28, 2019

STATE OF OHIO
RICHARD H. WEBER
71678
REGISTERED
PROFESSIONAL ENGINEER

Intended for
Dynegy Zimmer, LLC

Date
May 4, 2020

Project No.
74924

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

ZIMMER LANDFILL

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

____
Jacob J. Walczak
Senior Hydrogeologist
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: May 4, 2020

I, Nicole M. Pagano, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

____
Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: May 4, 2020

LICENSED PROFESSIONAL GEOLOGIST
NICOLE M. PAGANO
196-000750
ILLINOIS

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T 414-837-3607
F 414-837-3608
https://ramboll.com

CONTENTS

FIGURES (IN TEXT)

FIGURES

ACRONYMS AND ABBREVIATIONS

‰	parts per thousand or *per mil* variations
^{10}B	boron-10
^{11}B	boron-11
^{86}Sr	strontium-86
^{87}Sr	strontium-87
$^{87}Sr/^{86}Sr$	isotopic ratio of strontium-87 to strontium-86
40 C.F.R.	Title 40 of the Code of Federal Regulation
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
C.F.R.	Code of Federal Regulations
ft	feet
GWPS	Groundwater Protection Standard
LOE	line of evidence
mg/L	milligrams per liter
msl	above Mean Sea Level
NRT/OBG	Natural Resource Technology, an OBG Company
PTI	permit-to-install
Site	Zimmer Power Station Landfill
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
std	standard

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of Statistically Significant Levels (SSLs) over Groundwater Protection Standards (GWPSs) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Zimmer, LLC, by O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for Zimmer Landfill located near Moscow, Ohio.

The most recent Assessment Monitoring sampling event (A2D) was completed on September 11 and September 12, 2019 and analytical data were received on November 4, 2019. Analytical data from all sampling events, from December 2015 through A2D, were evaluated in accordance with the Statistical Analysis Plan.[1] to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPSs. That evaluation identified one SSL at downgradient monitoring wells as follows:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the lithium SSL listed above. This ASD was completed by May 4, 2020, within 90 days of determination of the SSLs (February 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

The W. H. Zimmer Power Station is located in southwest Ohio, approximately 30 miles southeast of Cincinnati, Ohio. The Zimmer Power Station Landfill (Site) is located approximately 3 miles east of the power station and is bounded by State Route 756 on the northeast, Turkeyfoot Road on the northwest, and Fruit Ridge Road on the southwest (Figure 1).

2.2 Description of Landfill CCR Unit

The landfill footprint covers approximately 288 acres (Figure 1). CCR generated at the station is trucked to the landfill for disposal. Materials approved for disposal include fly ash, dewatered bottom ash, dewatered and stabilized flue gas desulfurization wastes, and gypsum. Disposal activities commenced in January 1991 and have progressed through a series of fill areas or phases.

2.3 Groundwater Flow

The Uppermost Aquifer is continuous beneath the Site and is comprised of the upper 20 feet (ft) or less of the fractured and weathered bedrock. Bedrock is typically encountered 15 to 25 ft below ground surface and overlain by clay, although it may be deeper in the two major surface drainage channels at the Site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The bedrock unit is the interbedded shale and limestone of the Fairview and Kope Formations.

In order to collect all groundwater elevations within the same day, as required by the Sampling and Analysis Plan[2], groundwater measurements during A2D were collected on September 10, 2019, the day prior to the first day of analytical sampling at the Site (September 11, 2019). Groundwater elevations across the Site ranged from approximately 787 to 873 ft above Mean Sea Level (msl) during A2D (Figure 2). Groundwater in the Uppermost Aquifer generally flows from bedrock highs towards the drainage channels, paralleling the direction of topographic slope, in a manner similar to the flow of surface runoff. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns, as groundwater movement may be controlled by preferential pathways created by open fractures and their degree of interconnection.

2.4 Isotopic Evaluation

Stable isotope analysis is commonly used in age dating, provenance studies and to differentiate between sources of groundwater. Multiple studies have shown that strontium and boron isotopic ratios can be successfully used in identifying CCR impacts to groundwater[3,4]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as strontium and boron isotopes, make good groundwater tracers, therefore, strontium and boron isotopic ratios can be used to identify CCR impacted groundwater and CCR leachate[3]. This ASD compares strontium and boron isotopic ratios of groundwater in the vicinity of Zimmer Landfill and landfill leachate to typical published ranges for groundwater and CCR impacted waters.

2.4.1 Strontium

The ratio of stable strontium isotopes, strontium-87 to strontium-86[5] ($^{87}Sr/^{86}Sr$), is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[6].

Strontium isotopic ratios are typically expressed and reported as an absolute ratio (i.e., $^{87}Sr/^{86}Sr$) due to strontium-86 (^{86}Sr) being a stable isotope with a constant abundance[7,8]. This is the exception for stable isotope analysis, since most results are reported relative to a standard, as described in further detail for boron below in Section 2.3.

2.4.2 Boron

Boron isotopes do not fractionate during coal combustion, meaning the isotopic ratio in the coal is preserved, between the coal and the combusted coal[3]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[3].

Because variations in boron isotopic ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\boldsymbol{\delta}^{11}\mathrm{B} = \left[\frac{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{sample}} - (^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}\right] \times \mathbf{1000}$$

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following lines of evidence (LOEs):

1. Strontium isotopic ratios in groundwater near the Zimmer Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters.
2. Boron isotopic ratios in groundwater near the Zimmer Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters.

These LOEs are described and supported in greater detail below. Monitoring wells and landfill leachate sample locations are shown on Figure 1.

3.1 LOE #1: Strontium Isotopic Ratios in Groundwater Near the Zimmer Landfill are Lower Than the Published Typical Range of Strontium Isotopic Ratios for CCR Impacted Waters.

Strontium isotopic ratios ($^{87}Sr/^{86}Sr$) for samples collected from groundwater monitoring wells and landfill leachate (SEQ1) on September 17, 18 and 27, 2018 are plotted in Figure A below. Published $^{87}Sr/^{86}Sr$ in coal, fly ash, and bottom ash impacted waters range from 0.7109 to 0.7126[3], as indicated by the area shaded orange in Figure A.

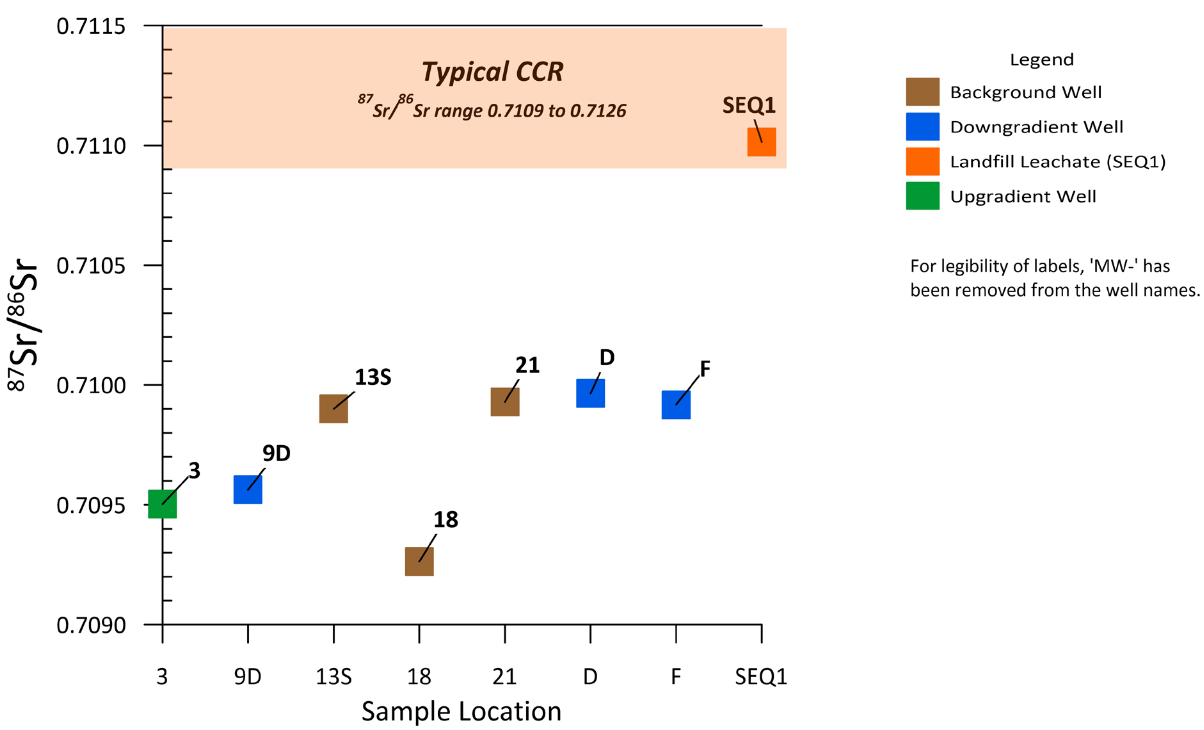


Figure A. Strontium Isotopic Ratios for Monitoring Well and Sampling Locations[3].

The range of $^{87}Sr/^{86}Sr$ found in groundwater, 0.70926 to 0.70996, near Zimmer Landfill are below the published typical range of $^{87}Sr/^{86}Sr$ for CCR impacted waters indicating groundwater near Zimmer Landfill is not impacted by CCR[3] The $^{87}Sr/^{86}Sr$ found in the landfill leachate sample (SEQ1), 0.71101, is within the published typical range of $^{87}Sr/^{86}Sr$ for CCR impacted waters (0.7109 to 0.7126) indicating leachate collected at location SEQ1 is impacted by CCR[3]. Figure A also shows that $^{87}Sr/^{86}Sr$ in groundwater near Zimmer Landfill are well grouped, and that the $^{87}Sr/^{86}Sr$ in landfill leachate (SEQ1) is distinctly different than groundwater near Zimmer Landfill. The $^{87}Sr/^{86}Sr$ in groundwater near Zimmer Landfill indicate that groundwater is not influenced by CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

3.2 LOE #2: Boron Isotopic Ratios in Groundwater Near the Zimmer Landfill are Within the Published Typical Range of Boron Isotopic Ratios for Groundwater and are Not Consistent With the Published Typical Boron Isotopic Ratios in CCR and CCR Impacted Waters.

Boron isotopic ratios (δ11B) for samples collected from groundwater monitoring wells and landfill leachate (SEQ1) on September 17, 18 and 27, 2018 are plotted in Figure B below. The published typical range of $\delta^{11}B$ for groundwater, shaded green in Figure B, is 10‰ to 40‰[3]. The area shaded orange in Figure B represents the published typical range of $\delta^{11}B$ for CCR and CCR impacted water, which has a distinctive negative $\delta^{11}B$ signature ranging from -70 ‰ to -1‰[3,9].

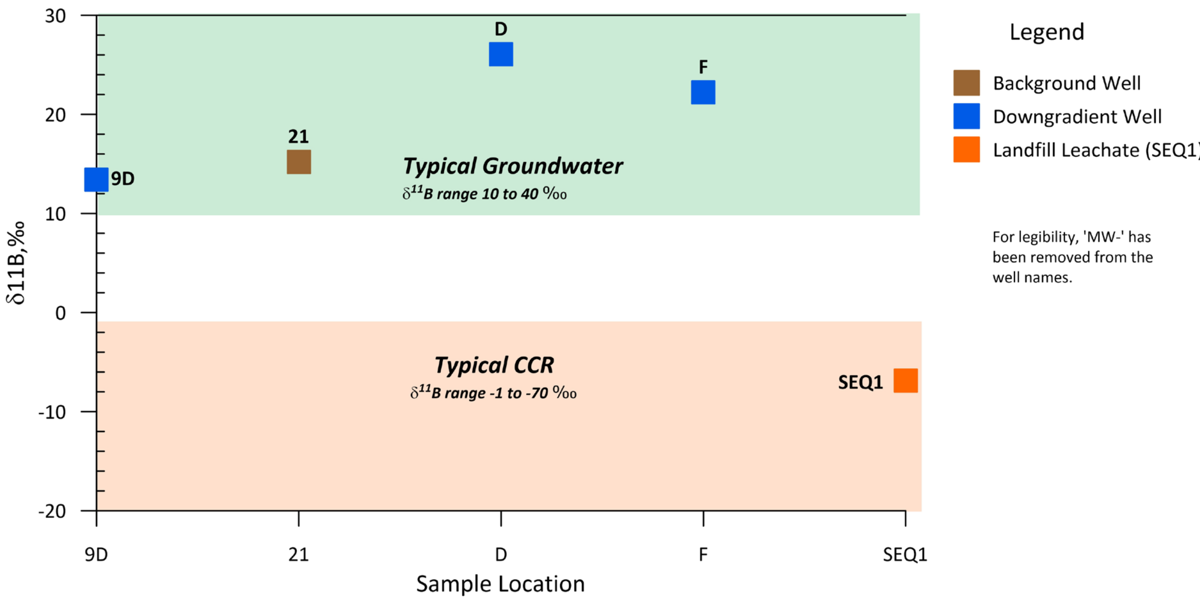


Figure B. Boron Isotopic Ratios for Monitoring Well and Sampling Locations[3] (note: total boron concentrations at sample locations MW-3, MW-13S and MW-18 were below detection level and were not included).

The range of $\delta^{11}B$ found in groundwater, 13.43 to 26.07‰, near Zimmer Landfill are within the published typical range of $\delta^{11}B$ for groundwater (10‰ to 40‰), and are not consistent with the published typical range of $\delta^{11}B$ for CCR and CCR impacted water (-70 ‰ to -1‰) indicating groundwater near Zimmer Landfill is not impacted by CCR [3]. The $\delta^{11}B$ found in the landfill leachate sample (SEQ1), -6.86‰, is within the published typical range of $\delta^{11}B$ for CCR and CCR impacted waters (-70 ‰ to -1‰) indicating leachate collected at location SEQ1 is impacted by CCR[3]. Figure B also shows that $\delta^{11}B$ in groundwater near Zimmer Landfill are well grouped, and that the $\delta^{11}B$ in landfill leachate (SEQ1) is distinctly different than groundwater near Zimmer Landfill. The $\delta^{11}B$ in groundwater near Zimmer Landfill indicate that groundwater is not influenced by CCR or CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

4. CONCLUSIONS

Based on the following two lines of evidence, it has been demonstrated that the lithium SSL at MW-F is not due to Zimmer Landfill but is from a source other than the CCR unit being monitored:

1. Strontium isotopic ratios in groundwater near the Zimmer Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters. This indicates that groundwater is not influenced by CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.
2. Boron isotopic ratios in groundwater near the Zimmer Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters. This indicates that groundwater is not influenced by CCR or CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSL observed during the A2D sampling event was not due to Zimmer Landfill. Therefore, a corrective measures assessment is not required, and Zimmer Landfill will remain in assessment monitoring.

5. REFERENCES

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2 AECOM, 2017, Sampling and Analysis Plan, Zimmer Power Station Landfill, Dynegy Zimmer, LLC, October 17, 2017.

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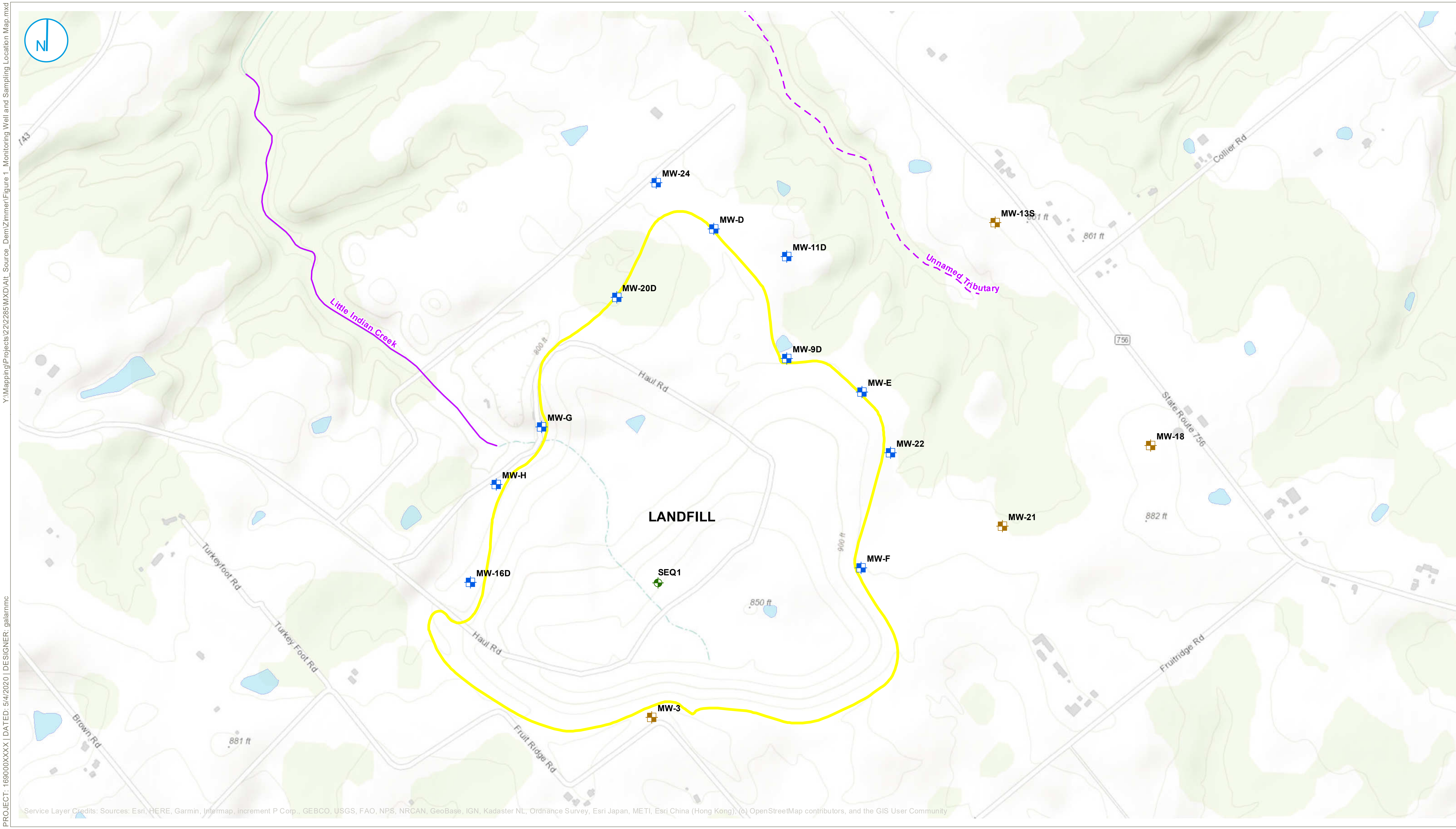
FIGURES

PROJECT: 169000XXXX | DATED: 5/4/2020 | DESIGNER: galarmmc

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Zimmer\Figure 1_Monitoring Well and Sampling Location Map.mxd



ZIMMER LANDFILL CCR MONITORING WELL LOCATION
ZIMMER LANDFILL BACKGROUND CCR MONITORING WELL LOCATION
ZIMMER LANDFILL LEACHATE SAMPLE LOCATION
CCR MONITORED UNIT

NATIONAL HYDROGRAPHY DATASET
PERENNIAL STREAM
INTERMITTENT STREAM
WATERBODY

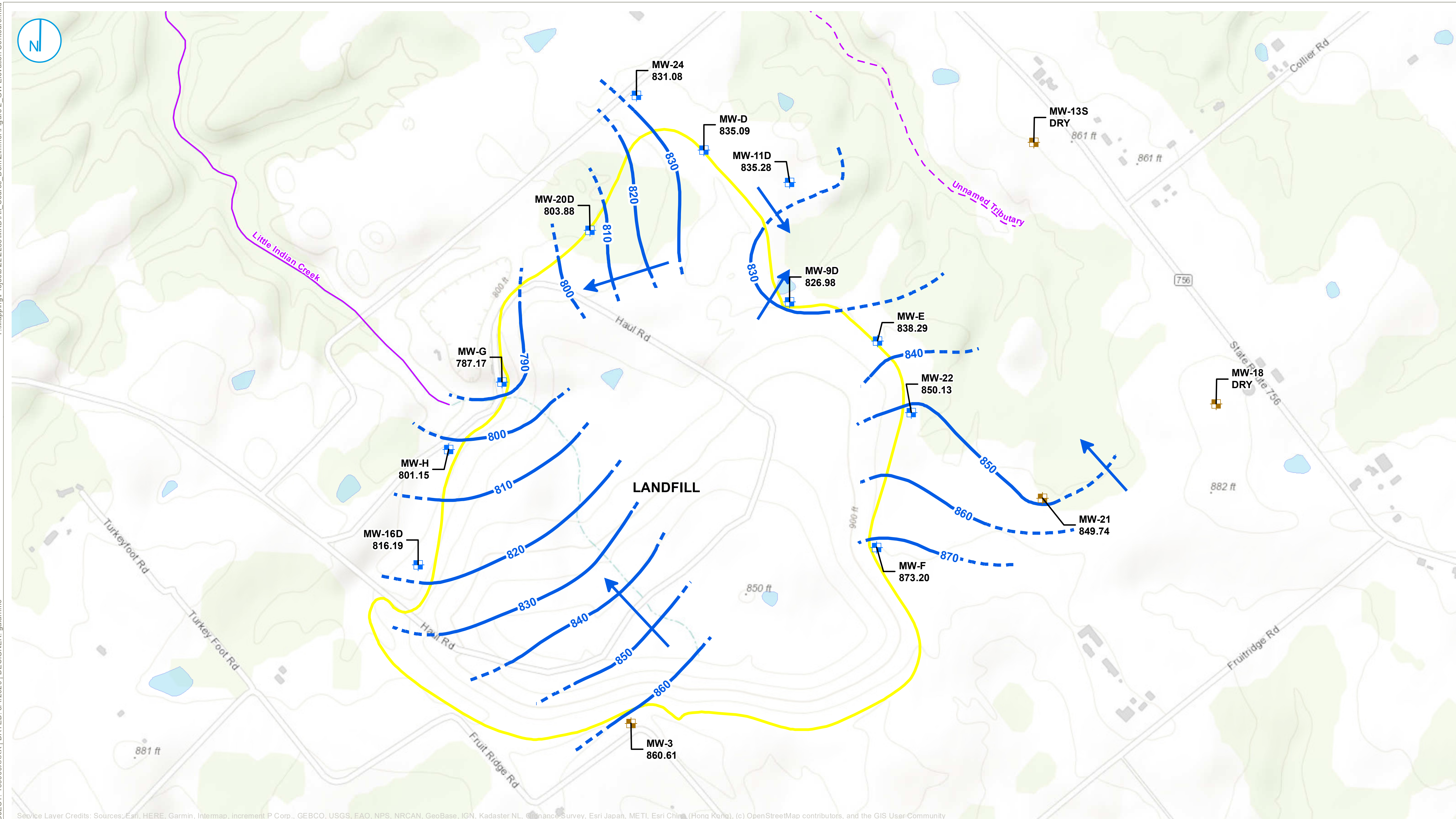
0 350 700 Feet

MONITORING WELL AND SAMPLING LOCATION MAP

ZIMMER LANDFILL (UNIT ID: 122)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



PROJECT: 169000XXXX | DATED: 5/4/2020 | DESIGNER: galarmmc

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Zimmer\Figure 2_GW Elevation Contours.mxd

ZIMMER LANDFILL CCR MONITORING WELL LOCATION
ZIMMER LANDFILL BACKGROUND CCR MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (10-FT INTERVAL)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

0 300 600 Feet

NATIONAL HYDROGRAPHY DATASET
PERENNIAL STREAM
INTERMITTENT STREAM
WATERBODY

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

ZIMMER LANDFILL (UNIT ID: 122)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Intended for
Dynegy Zimmer, LLC

Date
October 26, 2020

Project No.
1940074924

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

ZIMMER LANDFILL

Bright ideas. Sustainable change.

CERTIFICATIONS

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

____

Jacob J. Walczak
Senior Hydrogeologist
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 26, 2020

I, Nicole M. Pagano, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

____

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 26, 2020

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T 414-837-3607
F 414-837-3608
https://ramboll.com

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
f/k/a	formerly known as
GWPS	Groundwater Protection Standard
NRT/OBG	Natural Resource Technology, an OBG Company
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

ALTERNATE SOURCE DEMONSTRATION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of Statistically Significant Levels (SSLs) over Groundwater Protection Standards (GWPSs) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Zimmer, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc. to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for Zimmer Landfill located near Moscow, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 8, 2020, and analytical data were received on April 27, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan[1] to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPSs. That evaluation identified one SSL, as determined on July 27, 2020 and included in the Notification for Statistically Significant Levels of 40 C.F.R. Part 257 Appendix IV Constituents Above Groundwater Protection Standards for Zimmer Landfill dated August 13, 2020, at a downgradient monitoring well as follows:

- Lithium at well MW-F

In accordance with the Statistical Analysis Plan, MW-F was resampled on July 1, 2020 and analyzed for lithium to confirm the SSL. Following evaluation of analytical data from the resample event, no SSL remained. This ASD was completed by October 26, 2020, within 90 days of determination of the SSLs, as required by 40 C.F.R. § 257.95(g)(3)(ii).

[1] Natural Resource Technology, an OBG Company (NRT/OBG), 2017, Statistical Analysis Plan, Zimmer Power Station, Dynegy Zimmer, LLC, October 17, 2017.

APPENDIX C5 – SITE HYDROGEOLOGY AND STRATIGRAPHIC CROSS-SECTIONS OF THE SITE

CONCEPTUAL SITE MODEL AND DESCRIPTION OF SITE HYDROGEOLOGY (ASH POND AREAS)

The Zimmer Power Station (Zimmer Station) conceptual site model (CSM) and Description of Site Hydrogeology for the D Basin, the Gypsum Recycling Pond, and the Coal Pile Runoff Pond, hereinafter referred to as the 'Site', located near Moscow, Ohio are described in the following sections.

REGIONAL SETTING

The Ohio River Valley generally separates the Till Plains Section of the Central Lowlands Physiographic Province from the Lexington Plain Section of the Interior Low Plateaus Physiographic Province. The Central Lowlands Physiographic Province is characterized by plains of low relief with youthful to mature dissection developed on soil and rock deposits. The Till Plains Section is generally north of the Ohio River and is characterized by hills of low relief that are developed on nearly horizontal, Paleozoic sedimentary strata. Continental glaciation has affected most of the province so that bedrock is almost entirely concealed by glacial drift. Common valley fill material consists of coarse-grained outwash deposits, fine-grained lacustrine and overbank deposits, and glacial till. The bedrock consists of interbedded shales and limestones typical of the Cincinnatian Series.

SITE GEOLOGY

Zimmer Station is located on the relatively flat floor of the Ohio River Valley and is underlain by valley-fill glacial deposits. Glacial deposits directly beneath Zimmer Station consist of fine-grained fluvial and lacustrine deposits (clay and silt) to a maximum depth of 45 feet below the present ground surface. These deposits are underlain by coarser alluvial deposits that are composed of well-graded to poorly-graded sands having greater amounts of gravel with increasing depth. Bedrock beneath the unconsolidated sediments belongs to the Fairview and Kope formations. Depth to bedrock beneath the site varies between 60 and 90 feet below the ground surface.

Cross-sections showing the subsurface materials encountered at the Site are included in an attachment to this demonstration.

SITE HYDROGEOLOGY

The CCR groundwater monitoring system consists of the follow:

- Seven monitoring wells are installed in the uppermost aquifer and adjacent to the D Basin (MW-1, MW-8, MW-9, MW 12, MW-13, MW-14 and MW-15). The unit utilizes three background monitoring wells (MW-1, MW-8 and MW-12) as part of the CCR groundwater monitoring system.

- Four monitoring wells are installed in the uppermost aquifer and adjacent to the Gypsum Recycling Pond (MW-7A, MW-8, MW-10 and MW-11). The unit utilizes one background monitoring wells (MW-8) as part of the CCR groundwater monitoring system.

- Five monitoring wells are installed in the uppermost aquifer and adjacent to the Coal Pile Runoff Pond (MW-1, MW-3S, MW-16, MW-17 and MW-18). The unit utilizes one background monitoring wells (MW-1) as part of the CCR groundwater monitoring system.

See Monitoring Well Location Map, and Well Construction Diagrams and Drilling Logs attached to this demonstration.

Groundwater is encountered in the Ohio River valley aquifer. The aquifer consists primarily of the coarser alluvial deposits described above. The thickness of the deposits ranges from approximately 50 to 65 feet and covers much of the width of the flood plain between the river and Route 52 located to the east. Porosity of the aquifer material is likely to be on the order of 20 to 40 percent given the distribution of grain sizes. The groundwater potentiometric surface on site is encountered at depths of 25 to 50 feet below ground surface (bgs) (approximately 455 to 470 feet above mean sea level [msl]). The large variability is introduced by rising and falling river stage because of a relatively direct hydraulic connection between the riverbed and the aquifer.

The aquifer receives most of its recharge from infiltration of precipitation on the valley floor; however, secondary recharge sources include adjacent upgradient aquifers in the upland, and bank storage from the Ohio River during flood stages. Recharge to the aquifer from bank storage is periodic and short-lived, and the main movement of groundwater discharge is toward the river.

Zimmer Station withdraws water from the underlying sand and gravel aquifer through eight onsite production wells, all of which are located on the southern half of the facility. In general, each of the production wells is capable of yielding between 0.720 and 0.432 million gallons per day (mgd); however, the average daily yield is approximately 0.206 mgd.

When pumping, a localized cone of depression in the groundwater surface is created that encompasses the southern and, occasionally, the central portion of the site (AEP, November, 1986). This cone of depression induces flow from the Ohio River toward the pumping wells. The hydraulic gradient of the aquifer was calculated to be on the order of 0.0025 toward the Ohio River with a west-northwest to west southwest direction. The transmissivity of the aquifer is approximately 50,000 gallons per day per foot (gpd/ft), the hydraulic conductivity is approximately 1,000 gpd/ft^2 (134 ft/day), and the storage coefficient of the aquifer is 0.17 (Wm. H. Zimmer, 1983).

Material overlying the uppermost aquifer directly beneath Zimmer Station is comprised of glacial deposits consisting of fine-grained fluvial and lacustrine deposits (clay and silt) to a maximum depth of 45 feet bgs. Permeability tests conducted on in-situ cohesive material by American Electric Power Service Corporation, Civil Engineering Division in 1986 suggested values in the range of 9.7 x 10^{-9} to 1.4 x 10^{-8} cm/sec.

The lower confining unit underlying Zimmer Station is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. Depth to bedrock beneath the site varies between 60 and 90 feet bgs. These low-yielding shale and limestone formations are approximately 400- to 600-feet thick (Luft, et. al., 1973). Groundwater yields from the bedrock strata in this region are quite limited. Generally, the bedrock is not tapped for water due to its low permeability. Those wells which do tap the bedrock aquifers generally draw water from the bedding planes and fracture zones. Due to the relatively impermeable nature of the shales and limestone underlying this region, water yields are generally insufficient for domestic use. Fresh water does not typically occur at depths greater than 150 feet bgs (Wm. H. Zimmer, 1983).

REFERENCES

American Electric Power Service Corporation, Civil Engineering Division, November 1986, Geotechnical report for the WM. H. Zimmer Coal Conversion Project.

Luft, Stanley J.1 Osborne, Robert H., and Malcolm P. Weiss. Geologic Map of the Moscow Quadrangle, Ohio - Kentucky (GQ-I069). Prepared in cooperation with The Commonwealth of Kentucky, University of Kentucky, Kentucky Geological Survey, 1973.

Zimmer, William. H., 1983, Nuclear Power Station Unit 1 Environmental Report Operating License Stage, Volume 1, Section Number 245.

CCR MONITORING WELL LOCATION

TEST BORING LOCATION

CROSS SECTION LOCATION

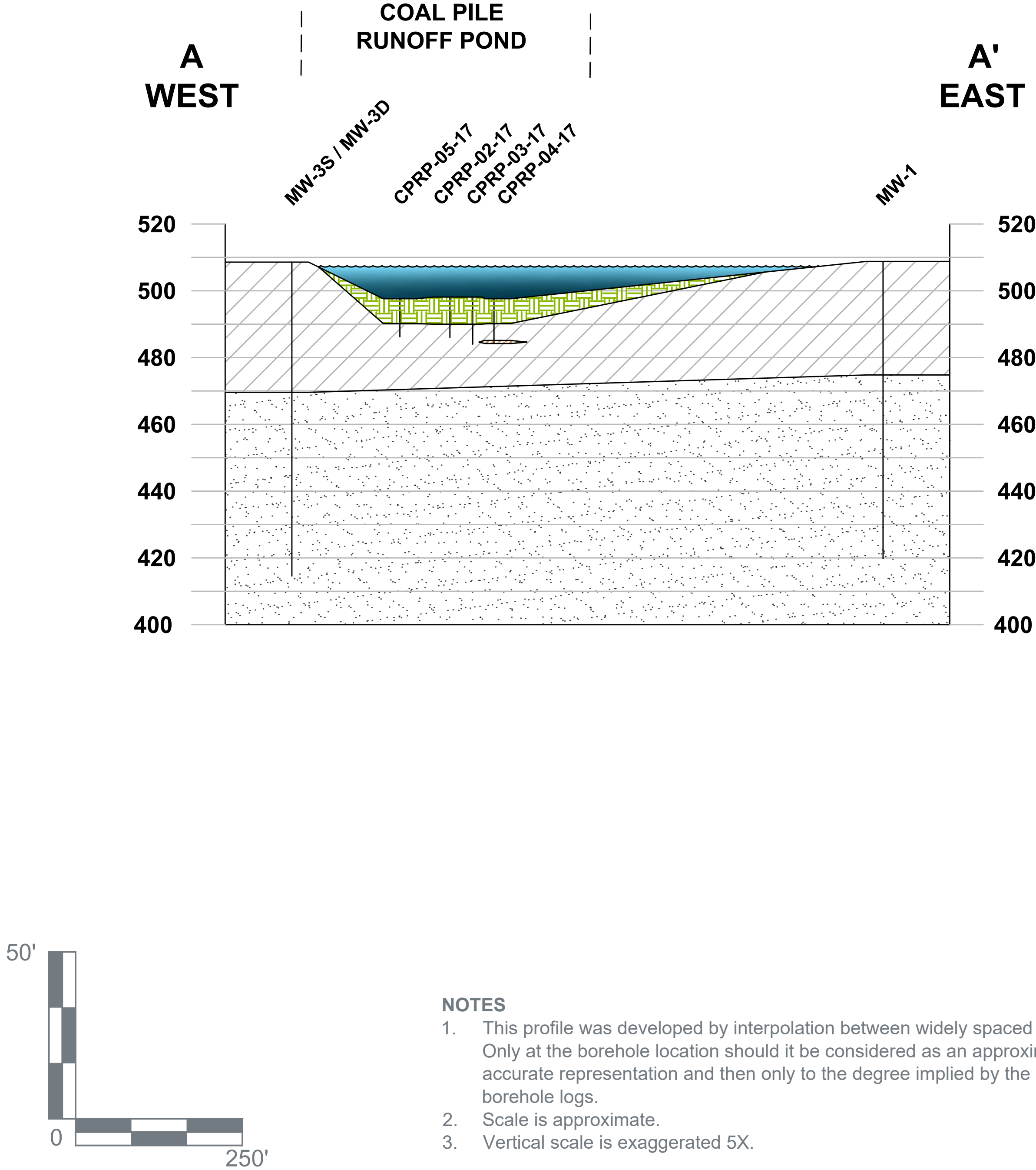
CCR MONITORED UNIT

0 200 400 Feet

CROSS SECTION LOCATION MAP

ZIMMER D BASIN (UNIT ID: 121),
ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



NOTES
1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

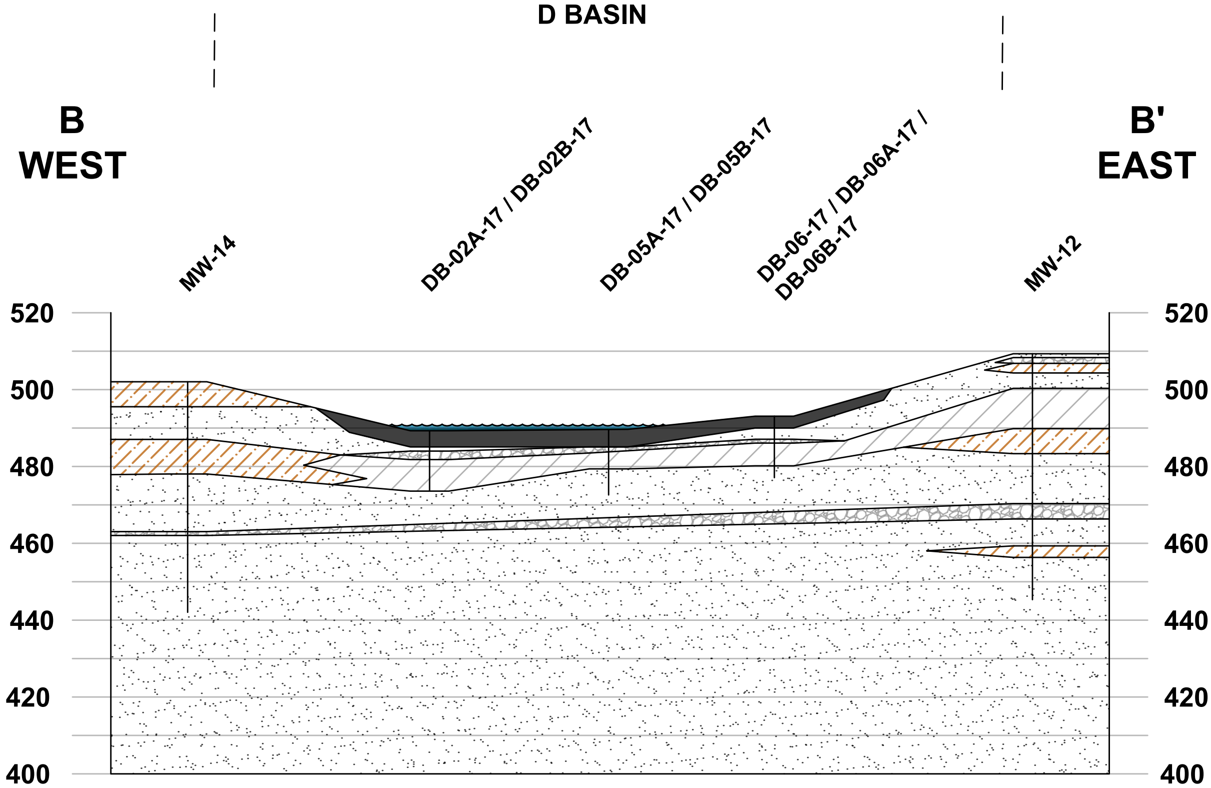
LEGEND
- WATER
- SEDIMENT
- CLAY
- SILT
- SAND

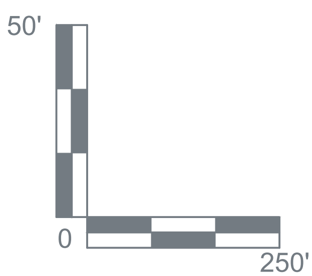
CROSS SECTION
A-A'

FIGURE 2

ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY





NOTES
1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

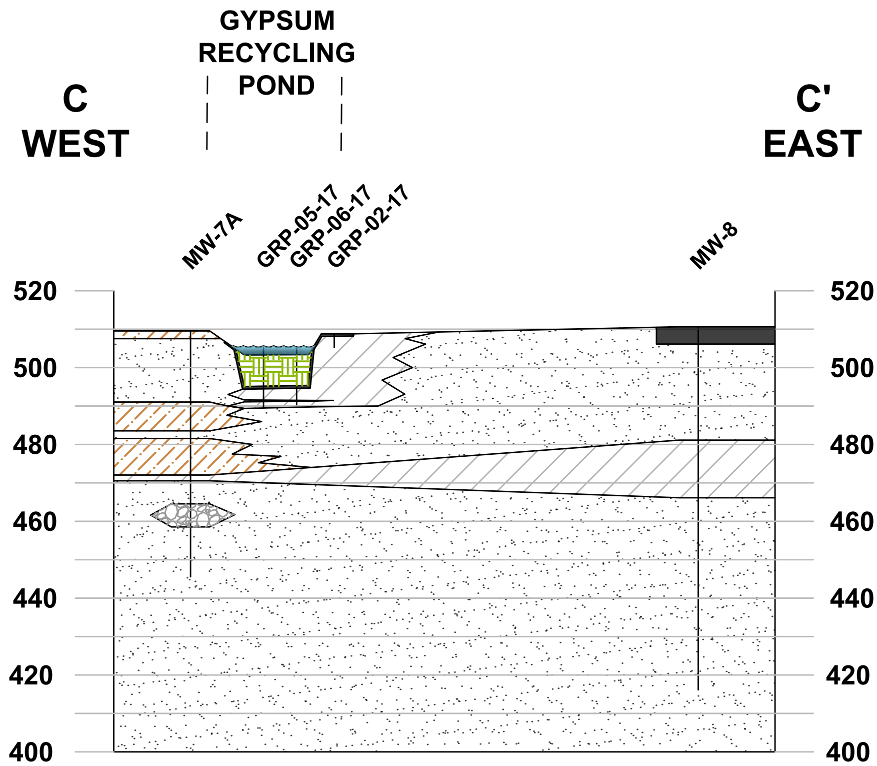
LEGEND
- WATER
- CCR
- CLAY
- SILT
- SAND
- GRAVEL

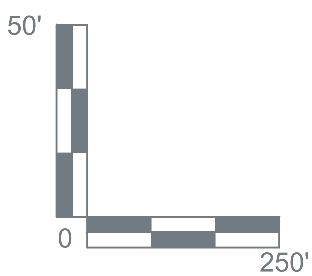
CROSS SECTION B-B'

FIGURE 2

ZIMMER D BASIN (UNIT ID:121)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY





NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

LEGEND

- WATER
- CONCRETE / ROAD BASE
- SEDIMENT
- CLAY
- SILT
- SAND
- GRAVEL

CROSS SECTION C-C'

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

HYDROGEOLOGICAL CHARACTERIZATION REPORT

CCR MANAGEMENT UNIT – 122 (Landfill)

ZIMMER POWER STATION CLERMONT COUNTY, OHIO

Prepared for:

Dynegy Zimmer, LLC
Job Number: 60442412
October 11, 2017

Prepared by:

AECOM

525 Vine Street, Suite 1800
Cincinnati, Ohio
513.651.3440 tel
877.660.7727 fax

Approved by:
Dennis P. Connair, CPG

Signature

10-11-17
Date:

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HYDROGEOLOGICAL CHARACTERIZATION REPORT

ZIMMER POWER STATION
CLERMONT COUNTY, OHIO

[Unit 122 - Landfill]

1.0 INTRODUCTION

This Hydrogeological Characterization Report (HCR) was prepared on behalf of Dynegy Zimmer, LLC to document the character of site conditions that control the occurrence and flow of groundwater relative to the monitoring requirements for coal combustion residual (CCR) management units at the Zimmer Power Station (Zimmer) in accordance with Part 257.91 of the United States Environmental Protection Agency (USEPA) Final Rule to regulate the disposal of CCR under Subtitle D of the Resource Conservation and Recovery Act (RCRA) [40 Code of Federal Regulations (CFR) 257 Subpart D; published in 80 FR 21302-21501, April 17, 2015].

This HCR will apply specifically to the following CCR Unit; *Unit 122 (Zimmer Landfill)*, as defined further below.

The HCR describes the hydrogeologic context of the entire landfill site so as to inform the Qualified Professional Engineer (QPE) who is charged with certifying that the groundwater monitoring system proposed for the CCR unit meets the requirements stated in 40 CFR 257.91.

2.0 SITE DESCRIPTION

The Unit 122 is located at the intersection of State Route 756 and Turkeyfoot Road in Washington Township approximately 3 miles east of the W. H. Zimmer Station (**Figure 1**).

The Unit 122 footprint covers approximately 288 acres and is bounded by S.R. 756 on the northeast, Turkeyfoot Road on the northwest, and Fruit Ridge Road on the southwest. The area bounded by the roadway boundaries is 680 acres. Turkeyfoot Road, which is now vacated, provides limited access for local landfill construction traffic. Primary access to Unit 122 is provided by a dedicated, paved haul road from the Station to the Unit 122. The dedicated haul road is gated and not open to public traffic.

Residual wastes generated at the station are trucked to the facility for disposal in accordance with permit-to-install [PTI] (Permit No. 05-9746) conditions. The PTI was effective November 2, 1988. Wastes approved for disposal include fly ash, dewatered bottom ash, pyrites, pond sediments, dewatered and stabilized flue gas desulfurization (FGD) wastes, and gypsum. Disposal activities commenced in January 1991 and have progressed through a series of fill areas or phases.

3.0 SITE CHARACTERIZATION MEANS AND METHODS

The site conditions that control the occurrence and flow of groundwater relative to the monitoring of CCR units was evaluated through a series of investigation and well installation efforts on site. The available data were primarily derived from the following resources:

- Hydrogeologic Report - December 1985, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light

Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Civil Engineering Division, Columbus, Ohio.

- Addendum to the Hydrogeologic Report – June 1987, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Columbus, Ohio.

- Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)), William H. Zimmer Residual Solid Waste Landfill, Clermont County, Ohio, prepared by Duke Energy Ohio, Inc., Cincinnati, Ohio and S&ME, Inc., Dublin, Ohio, BBCM August 1998 (revised November 2012).

- Well logs for supplemental CCR monitoring wells installed around the Unit 122 (**Attachment A**).

- Annual evaluations (and Addendum 1-24-17) of the permit-required groundwater monitoring system conducted as required by Ohio Administrative Code (OAC) 3745-30-08(B)(5) and Section B(5) of the Facility permit-to-install (PTI) (Permit No. 05-9746) Groundwater Monitoring Plan (GWMP) dated August 1998 (revised November 2012). An evaluation of groundwater flow data is performed in order to evaluate whether the Groundwater Monitoring System is adequate for the facility.

The data from these reports were reviewed and used to evaluate geologic cross sections and potentiometric surface maps, that constitute the unified conceptual model of Unit 122 conditions as described in Section 4.0 below. Specific data cited in the sections below can be found within the documents listed above.

4.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) as described in the following sections addresses the requirements of 40 CFR 257.91(b), which specifies that the monitoring system design shall be based upon site-specific technical information that characterizes the following:

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.

4.1 Regional Physiography

The Ohio River valley generally separates the Till Plains Section of the Central Lowlands Physiographic Province from the Lexington Plain Section of the Interior Low Plateaus Physiographic Province. The Central Lowlands Physiographic Province is characterized by plains of low relief with youthful to mature dissection developed on soil and rock deposits. The Till Plains Section is generally north of the Ohio River and is characterized by hills of low relief that are developed on nearly horizontal, Paleozoic sedimentary strata. Continental glaciation has affected most of the province so that bedrock is almost entirely concealed by glacial drift. Hills in the Till Plains are often composed of moraines or other glacial deposits (Hydrogeologic Report, December 1985). The bedrock consists of interbedded shales and limestones typical of the Cincinnatian Series.

Unit 122 is located in a transition zone between the Central Lowlands and Interior Low Plateaus Physiographic Provinces. Unit 122 lies east of the Ohio River on the uplands that rise to an elevation ranging between 700 and 850 feet National Geodetic Vertical Datum of 1929. These uplands are dissected by numerous small intermittent streams that result in an irregular set of ridges of similar elevation.

4.2 Site Geology and Hydrogeology

Unit 122 is underlain by a layer of unconsolidated sediments (glacial till) that ranges from 10 to 40 feet in thickness. The till is hard and consists of coarse, angular, gravel-sized material in a clay- and silt-rich matrix. Below the till is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations.

4.2.1 Uppermost Aquifer

The uppermost groundwater is typically encountered near the interface between the bedrock and overlying till deposits. This uppermost aquifer is continuous beneath Unit 122 and is comprised of the upper 20 feet or less of the fractured and weathered bedrock. Groundwater in this uppermost aquifer generally flows parallel to the direction of topographic slope in a manner similar to the flow of surface runoff. This is suggested by the relatively shallow depth-to-groundwater as compared to the topographic relief of the area. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns as groundwater movement may be controlled by the location of open fractures and their degree of interconnection.

A groundwater flow divide occupies the high ground between two major surface drainage channels at the site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The divide runs roughly northwest-southeast. Groundwater flows from the divide to the centerline of the drainage channels in the general downhill direction. These channels run roughly westward, exiting the site at the northern and western corners of the property.

As stated within the Addendum to the Hydrogeologic Report dated June 1987, field slug tests were performed on a total of nine observation wells in order to provide information on the site's hydrogeologic properties. These test data were used to evaluate the transmissivities of the Fairview and Kope formations, which underlie Unit 122. The aquifer test results had an average transmissivity value of 1.28 x 10^{-5} square meters per second (m^2/sec) and storage coefficient of 1.27 x 10^{-2}, which is indicative of the low permeability characterizing the site. The observation wells, with the exception of IJ_t and IK (noted in the Addendum to the Hydrogeologic Report dated June 1987), are designed to monitor the basal contact of the glacial till and the bedrock formations. Observation Wells IJ_t and IK are screened in the glacial till and exhibit lower transmissivity values (Addendum to the Hydrogeologic Report – June 1987).

The primary influences on groundwater flow beneath Unit 122 are infiltration of rainfall and other surface water and the lack of infiltration due to temporary or permanent capping of the landfill.

4.2.2 Material Overlying the Uppermost Aquifer

Material overlying the uppermost aquifer is comprised of unconsolidated sediments (glacial till) that range from 10 to 40 feet in thickness. The till is hard and consists of coarse, angular, gravel-sized material in a clay- and silt-rich matrix. Permeability tests conducted on test pit samples by American Electric Power Service Corporation, Civil Engineering Division in 1985 suggested a mean value of 6.18×10^{-6} centimeters per second (cm/sec) within the boundaries of Unit 122. Permeability tests conducted on the undisturbed Shelby tube samples gave a mean value of 5.78×10^{-8} cm/sec (Hydrogeologic Report - December 1985).

4.3.3 Materials Comprising the Lower Confining Unit

The lower confining unit underlying the site is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. These low-yielding shale and limestone formations are approximately 400- to 600-feet thick (Luft, et. al., 1973).

Groundwater yields from the bedrock strata in this region are quite limited. Generally, the bedrock is not tapped for water due to its low permeability. Those wells that do tap the bedrock aquifers generally draw water from the bedding planes and fracture zones. Due to the relatively impermeable nature of the shales and limestone underlying this region, water yields are generally insufficient for domestic use. Saline to brackish waters have been encountered at 50 feet below the surface of Unit 122. Fresh water does not typically occur at depths greater than 150 feet below the surface.

5.0 GROUNDWATER MONITORING SYSTEM

Pursuant to 40 CFR § 257.90(b)(1), by October 17, 2017, an owner and operator of a CCR unit must install a groundwater monitoring system that meets the requirements of 40 CFR § 257.91. The groundwater monitoring system must meet the CCR Rule's performance standard, which requires the system to consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of:

(1) background groundwater that has not been affected by leakage from a CCR unit; and

(2) 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 and must monitor all potential contaminant pathways.

The collection of monitoring wells that comprise the CCR groundwater monitoring system for Unit 122 consists of the following:

- Ten (10) PTI-required monitoring wells (MW-3, MW-9D, MW-11D, MW-13S, MW-16D, MW-18, MW-20D, MW-21, MW-22, and MW-24), installed July 1985 through August 1989, February 1997, February 2009, and April 2010,

- Five (5) supplemental monitoring wells (MW-D, MW-E, MW-F, MW-H, and MW-G), installed November/December 2015.

The monitoring well locations are illustrated on **Figure 2**. As-built specifics of each well installation are summarized on **Table 1**. The boring and well construction logs for the wells are located in **Attachment A**.

The section below provides details of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices constituting the groundwater monitoring system for the subject site so as to support QPE certification of the system as required under 40 CFR 257.91(e)(1).

5.1 Monitoring Well System Installation

Preparation tasks prior to the installation of any part of the groundwater monitoring system involved preparation of a health and safety plan for all site activities; coordination of site activities with Station security requirements; and clearance and placement of drilling locations with Duke Energy/Dynegy Zimmer engineering staff to ensure safe work conditions by avoiding underground and overhead utilities, traffic hazards, and other operational hazards.

Field activities for all monitoring well installations involved a survey and utility clearance of the proposed monitoring well locations, drilling and installation of the monitoring wells, development of monitoring wells, and a final elevation and location survey of the monitoring wells. For all monitoring wells installed at Unit 122, the drill rig and all downhole equipment were decontaminated by pressure cleaning after mobilization to the first well site and between drilling locations in order to prevent the introduction of contaminants to the wells.

Permit-Required Monitoring Wells

Drilling and well installation activities for monitoring wells MW-3, MW-9D, MW-11D, MW-13S, MW-16D, MW-18, MW-20D, MW-21, MW-22, and MW-24) were conducted between July 1985 and August 1989, February 1997, February 2009, and April 2010. The PTI groundwater monitoring system wells were installed by S&ME (formerly BBCM). The monitoring wells installed at the site were set into boreholes drilled with auger and rotary drilling methods. It is reported that proper decontamination procedures were used during the drilling of the borings and installation of the wells.

The wells have similar construction: 2-inch diameter polyvinyl chloride (PVC) casing with machine-slotted PVC well screens ranging from 5 to 20 feet in length located at the bottom. Annular space adjacent to the screens is filled with sand, and a bentonite seal is located atop the sand. The remaining annular space is filled with cement/bentonite grout. The wells are finished in concrete well pads with steel protective casings and locking caps.

Monitoring well installation was conducted in accordance with the specifications of the approved Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)) as described in Part G of the Site Investigation Report included as Section 4 of the PTI application. As-built specifics of each well installation are summarized on **Table 1**.

Supplemental Monitoring Well

Monitoring wells MW-D, MW-E, MW-F, MW-H, and MW-G were installed November/December 2015 by roto-sonic drilling methods. Drilling was conducted by Frontz Drilling Inc. located in Wooster, Ohio (Ohio Certified Driller ODH Registration Number 0120) under the observation of AECOM (formerly URS) personnel. Soil samples were collected continuously in 5- or 10-foot intervals in order to classify the physical characteristics of the unsaturated and saturated zones. The wells were constructed following the same protocols as the existing wells on site with 10 feet of 0.010 slot, 2-inch diameter PVC screen. The targeted depths placed the well screens at roughly the same elevation as the existing uppermost aquifer monitoring wells to facilitate integration of new and old data.

Surface Completion – All Monitoring Wells

With the exception of monitoring well MW-G, all of the monitoring wells were completed 1 to 3 feet above ground surface with a locking steel casing, 4 by 4 foot concrete pad (sufficiently deep to protect against frost heave), and in areas of high traffic three (3) or four (4) surrounding bollard posts were installed to protect against vehicle strikes. Monitoring well MW-G was completed at the surface as a flush-mount casing to accommodate for vehicle access to key landfill operations. Each casing was painted with a high visibility, rust-preventative paint and the well number was painted on the casing in a contrasting color.

All of the wells were developed after installation to promote hydraulic connection to the aquifer. Development involved hand-bailing equipment and /or the use of a small submersible pump to over-pump and surge the well until water from the entire screened interval ran clear.

The location, ground surface elevation, and top of internal casing elevation for each monitoring well were surveyed by a licensed surveyor utilizing the local reference datum elevations. These survey data, along with well construction details, are presented in **Table 1**.

All of the monitoring wells were equipped with dedicated Well Wizard® bladder pumps. The bladder pump specifications, installation guide, and warranty information supplied by the vendor are provided as **Attachment B**.

5.2 Groundwater Flow – Unit 122

Groundwater flow conditions for Unit 122 were evaluated through eight baseline CCR monitoring events, supplemented by permit-required annual evaluation of the groundwater monitoring system since 2003.

Water level data collected during the eight baseline CCR monitoring events from January 2016 through July 2017 are summarized on **Table 1**. These data were used to construct piezometric surface maps to illustrate seasonal groundwater flow conditions for the uppermost aquifer [**Figure 3** (March 2016) and **Figure 4** (December 2016)]. These data and figures are representative of general conditions at the site and support the following analysis.

The uppermost groundwater is typically encountered near the interface between the bedrock and overlying till deposits. This uppermost aquifer is continuous beneath the site and is comprised of the upper 20 feet or less of the fractured and weathered bedrock. Groundwater in this uppermost aquifer generally flows parallel to the direction of topographic slope in a manner similar to the flow of surface runoff. This is suggested by the relatively shallow depth-to-groundwater as compared to the topographic relief of the area. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns as groundwater movement may be controlled by the location of open fractures and their degree of interconnection.

A groundwater flow divide occupies the high ground between two major surface drainage channels at the site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The divide runs roughly northwest-southeast. Groundwater flows from the divide to the centerline of the drainage channels in the general downhill direction. These channels run roughly westward, exiting the site at the northern and western corners of the property.

6.0 REFERENCES

Addendum to the Hydrogeologic Report – June 1987, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Columbus, Ohio.

Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)), William H. Zimmer Residual Solid Waste Landfill, Clermont County, Ohio, prepared by Duke Energy Ohio, Inc., Cincinnati, Ohio and S&ME, Inc., Dublin, Ohio, BBCM August 1998 (revised May 2012).

Hydrogeologic Report - December 1985, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Civil Engineering Division, Columbus, Ohio.

Luft, Stanley J.1 Osborne, Robert H., and Malcolm P. Weiss. Geologic Map of the Moscow Quadrangle, Ohio - Kentucky (GQ-I069). Prepared in cooperation with The Commonwealth of Kentucky, University of Kentucky, Kentucky Geological Survey, 1973.

Tables

Table 1. Sample Location Summary
CCR Groundwater Monitoring System
CCR Rule Groundwater Monitoring
CCR Unit Name: Zimmer Landfill
Unit ID: 122

Well ID	MW-3	MW-9 D	MW-11 D	MW-13 S	MW-16 D	MW-18	MW-20 D	MW-21
Well Location Latitude	38° 51' 2.0988"	38° 51' 29.4582"	38° 51' 37.3566"	38° 51' 39.5382"	38° 51' 11.8512"	38° 51' 23.3208"	38° 51' 32.9502"	38° 51' 17.9166"
Well Location Longitude	-84° 10' 0.6672"	-84° 9' 47.7252"	-84° 9' 47.649"	-84° 9' 27.4176"	-84° 10' 18.948"	-84° 9' 12.369"	-84° 10' 6.204"	-84° 9' 26.3052"
Well Construction Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter (inches)	2	2	2	2	2	2	2	2
Top of Casing Well Elevation (ft)	872.85	857.91	851.85	862.1	825.22	888.57	824.68	862.15
Well Depth Below Ground Surface (ft)	35.34	69.53	35.79	19.01	30.07	17.47	38.61	37.16
Screen Length (ft)	10	10	10	10	10	10	10	10
Top of Screen Elevation (ft)	845.65	796.44	824.3	851.6	803.6	877.17	794.38	832.25
Bottom of Screen Elevation (ft)	835.65	786.44	814.3	841.6	793.6	867.17	784.38	822.25
Well Stick-up Above Ground Surface (ft)	1.86	1.94	1.76	1.49	1.55	3.93	1.69	2.74
Hydraulic Position of Well (1)	U	D	D	D	D	U	D	D

Notes:
ft = feet
PVC = polyvinyl chloride
1. upgradient (U) or downgradient (D)

Table 1. Sample Location Summary
CCR Groundwater Monitoring System
CCR Rule Groundwater Monitoring
CCR Unit Name: Zimmer Landfill
Unit ID: 122

Well ID	MW-22	MW-24	MW-D	MW-E	MW-F	MW-G	MW-H
Well Location Latitude	38° 51' 22.482"	38° 51' 42.624"	38° 51' 40.0962"	38° 51' 27.09"	38° 51' 13.5936"	38° 51' 22.7298"	38° 51' 17.463"
Well Location Longitude	-84° 9' 37.08"	-84° 10' 1.0446"	-84° 9' 55.7856"	-84° 9' 40.4064"	-84° 9' 40.4526"	-84° 10' 11.6826"	-84° 10' 17.1804"
Well Construction Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter (inches)	2	2	2	2	2	2	2
Top of Casing Well Elevation (ft)	866.94	852.36	852.34	863.42	884.02	821.4	811.13
Well Depth Below Ground Surface (ft)	37.29	34.41	35.02	32.73	29.78	67.7	27.02
Screen Length (ft)	10	10	10	10	10	10	10
Top of Screen Elevation (ft)	836.97	826.65	824.82	838.03	861.7	764.39	792.03
Bottom of Screen Elevation (ft)	826.97	816.65	814.82	828.03	851.7	754.39	782.03
Well Stick-up Above Ground Surface (ft)	2.68	1.3	2.75	2.91	2.79	(0.44)	2.33
Hydraulic Position of Well (1)	D	D	D	D	D	D	D

Notes:
ft = feet
PVC = polyvinyl chloride
1. upgradient (U) or downgradient (D)

TABLE 2

MONITORING WELL GROUNDWATER ELEVATIONS - JANUARY 2016-JULY 2017

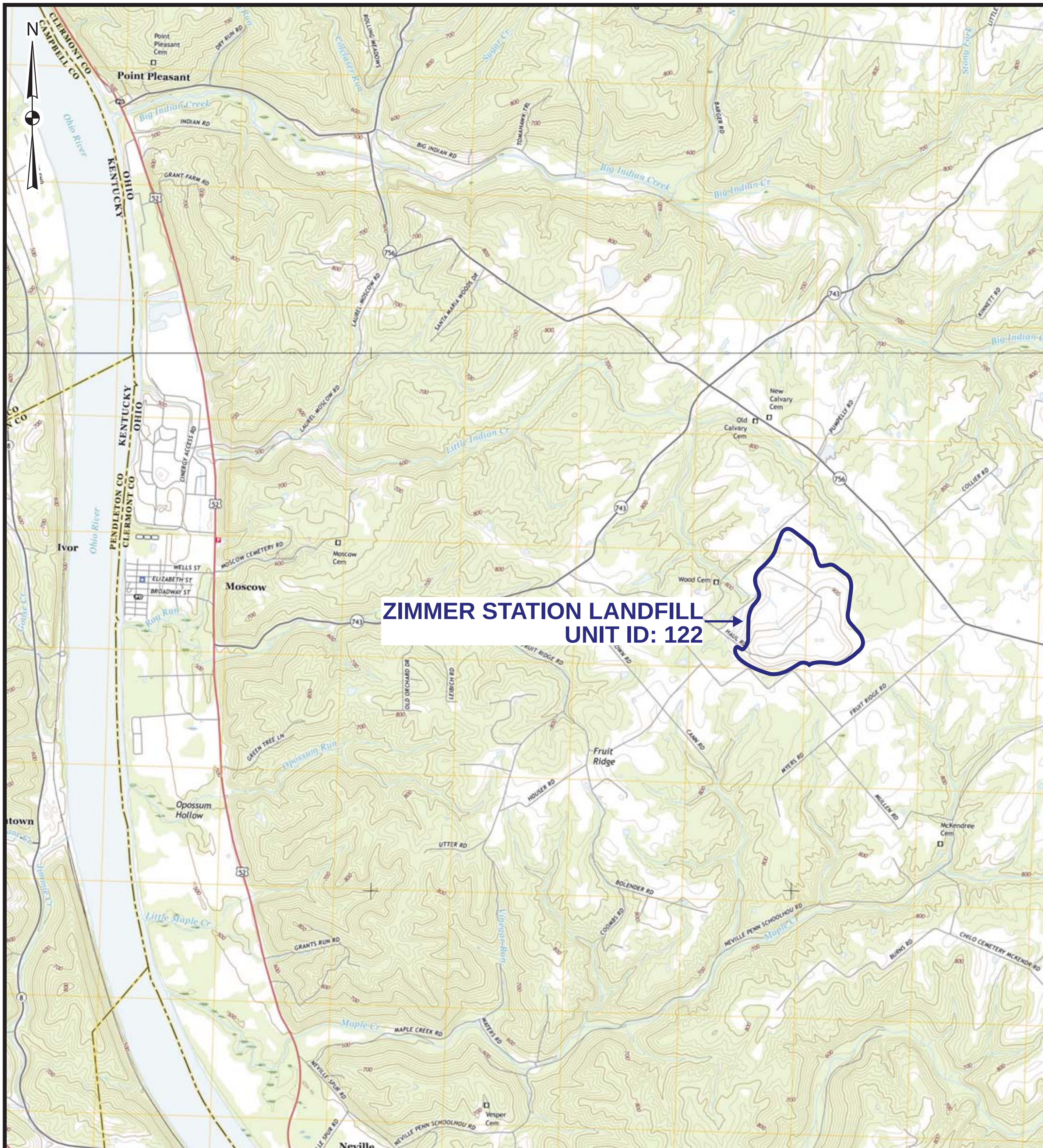
ZIMMER STATION - CLERMONT COUNTY, OHIO

ZIMMER LANDFILL (122)

Well ID	Reference Elevation Top of Casing* (feet, NAVD 88)	January 26, 2016		March 14, 2016		June 13, 2016		September 28, 2016		December 14, 2016		April 17, 2017		June 8, 2017		July 12, 2017	
		Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)
MW-3	872.85	10.68	862.17	7.91	864.94	11.20	861.65	13.13	859.72	12.87	859.98	9.81	863.04	10.78	862.07	11.11	861.74
MW-9D	857.91	30.80	827.11	29.63	828.28	30.83	827.08	31.11	826.80	30.96	826.95	30.89	827.02	30.91	827.00	30.93	826.98
MW-11D	851.85	16.85	835.00	15.78	836.07	17.20	834.65	17.54	834.31	17.54	834.31	17.31	834.54	17.27	834.58	17.16	834.69
MW-13S	862.1	8.54	853.56	7.15	854.95	NM**	NM	NM**	NM	NM**	NM	8.53	853.57	11.80	850.30	10.38	851.72
MW-16D	825.22	9.03	816.19	7.91	817.31	9.07	816.15	9.43	815.79	9.53	815.69	9.22	816.00	9.19	816.03	9.05	816.17
MW-18	888.57	13.28	875.29	10.16	878.41	NM	NM	NM	NM	NM	NM	12.54	876.03	15.77	872.80	14.67	873.90
MW-20D	824.68	23.83	800.85	21.35	803.33	22.70	801.98	21.75	802.93	23.12	801.56	23.79	800.89	24.01	800.67	23.82	800.86
MW-21	862.15	11.35	850.80	9.62	852.53	10.81	851.34	13.92	848.23	15.80	846.35	11.13	851.02	10.94	851.21	11.48	850.67
MW-22	866.94	17.38	849.56	16.11	850.83	17.18	849.76	17.36	849.58	17.59	849.35	17.94	849.00	17.77	849.17	17.75	849.19
MW-24	852.36	21.13	831.23	18.88	833.48	20.59	831.77	22.87	829.49	23.06	829.30	19.40	832.96	20.17	832.19	20.03	832.33
MW-D	852.34	17.28	835.06	16.19	836.15	17.45	834.89	18.83	833.51	19.44	832.90	18.49	833.85	17.66	834.68	17.51	834.83
MW-E	863.42	26.02	837.40	21.16	842.26	26.01	837.41	26.30	837.12	26.18	837.24	25.19	838.23	25.23	838.19	25.66	837.76
MW-F	884.02	9.74	874.28	9.21	874.81	9.82	874.20	12.97	871.05	14.54	869.48	9.56	874.46	10.11	873.91	11.07	872.95
MW-G	821.4	34.19	787.21	32.60	788.80	34.03	787.37	34.40	787.00	34.49	786.91	34.12	787.28	34.38	787.02	34.37	787.03
MW-H	811.13	8.60	802.53	7.04	804.09	8.70	802.43	10.25	800.88	10.68	800.45	8.24	802.89	9.24	801.89	9.37	801.76

* = Reference elevations of monitoring wells surveyed by American Land Surveys 1-27-16
** = Well was dry to the top of pump

Figures



J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)

0 4,000 8,000

APPROXIMATE SCALE IN FEET

BASE MAP SOURCE: USGS 7½ minute topographic quadrangle maps: Laurel, Ohio-Kentucky 2016; Moscow, Ohio-Kentucky 2016.

Quadrangle Location

DYNEGY

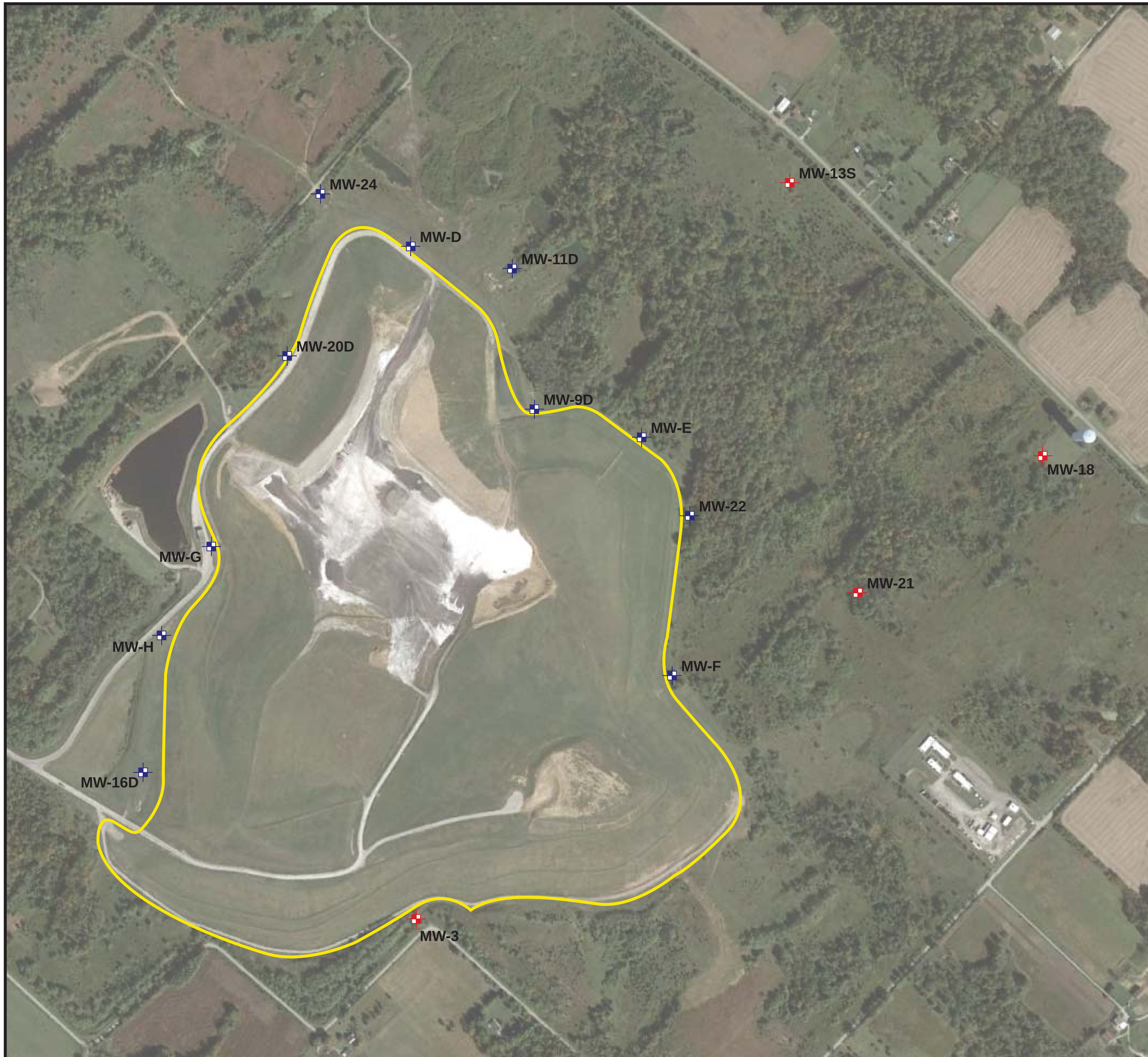
Zimmer Station
Clermont County, Ohio

FIGURE 1
SITE AND WELL LOCATION MAP
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM



UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

AERIAL SOURCE: CAGIS

N

0 300 600

SCALE IN FEET

DYNEGY

Zimmer Station
Clermont County, Ohio

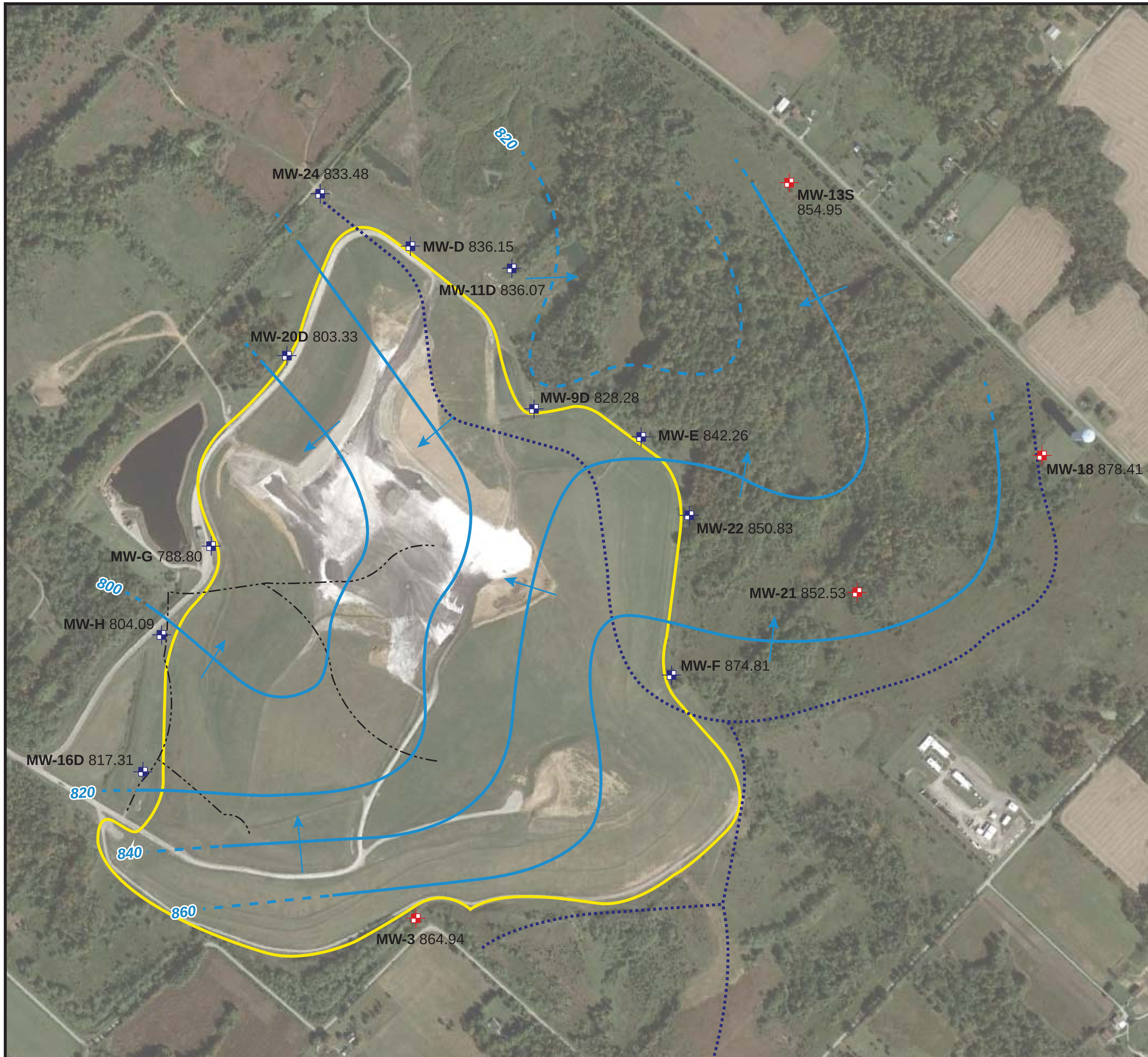
FIGURE 2
SITE AND WELL LOCATION MAP
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)



UNIT BOUNDARY
DOWNGRADIENT MONITORING WELL LOCATION
UPGRADIENT MONITORING WELL LOCATION
GROUNDWATER DIVIDE
FORMER DRAINAGE PATH LOCATION
WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
GROUNDWATER FLOW DIRECTION
836.15 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 14, 2016

AERIAL SOURCE: CAGIS

N

0 300 600
SCALE IN FEET

DYNEGY

Zimmer Station
Clermont County, Ohio

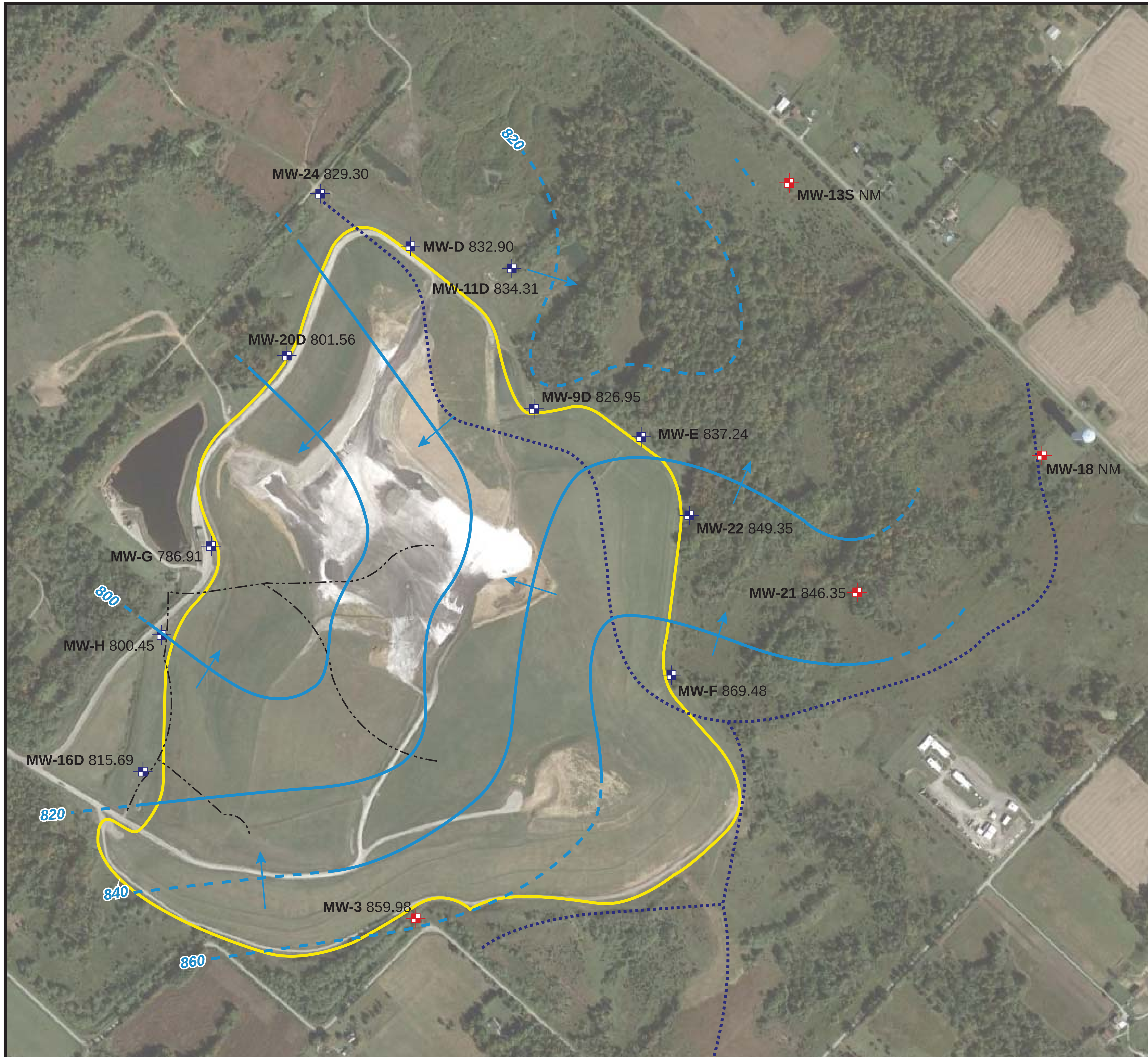
FIGURE 3
GROUNDWATER SURFACE MAP-
MARCH 14, 2016
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)



UNIT BOUNDARY
DOWNGRADIENT MONITORING WELL LOCATION
UPGRADIENT MONITORING WELL LOCATION
GROUNDWATER DIVIDE
FORMER DRAINAGE PATH LOCATION
WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
GROUNDWATER FLOW DIRECTION
834.31 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 14, 2016
NM NOT MEASURED

AERIAL SOURCE: CAGIS

N

0 300 600
SCALE IN FEET

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 4
GROUNDWATER SURFACE MAP-
DECEMBER 14, 2016
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412 AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)

Attachment A

Boring Logs and Well Construction Logs

JOB No.

COMPANY ZIMMER PLANT

PROJECT FGD LANDFILL

COORDINATES S:2325.72 E:17,443.40

DATE 08-23-89 TIME

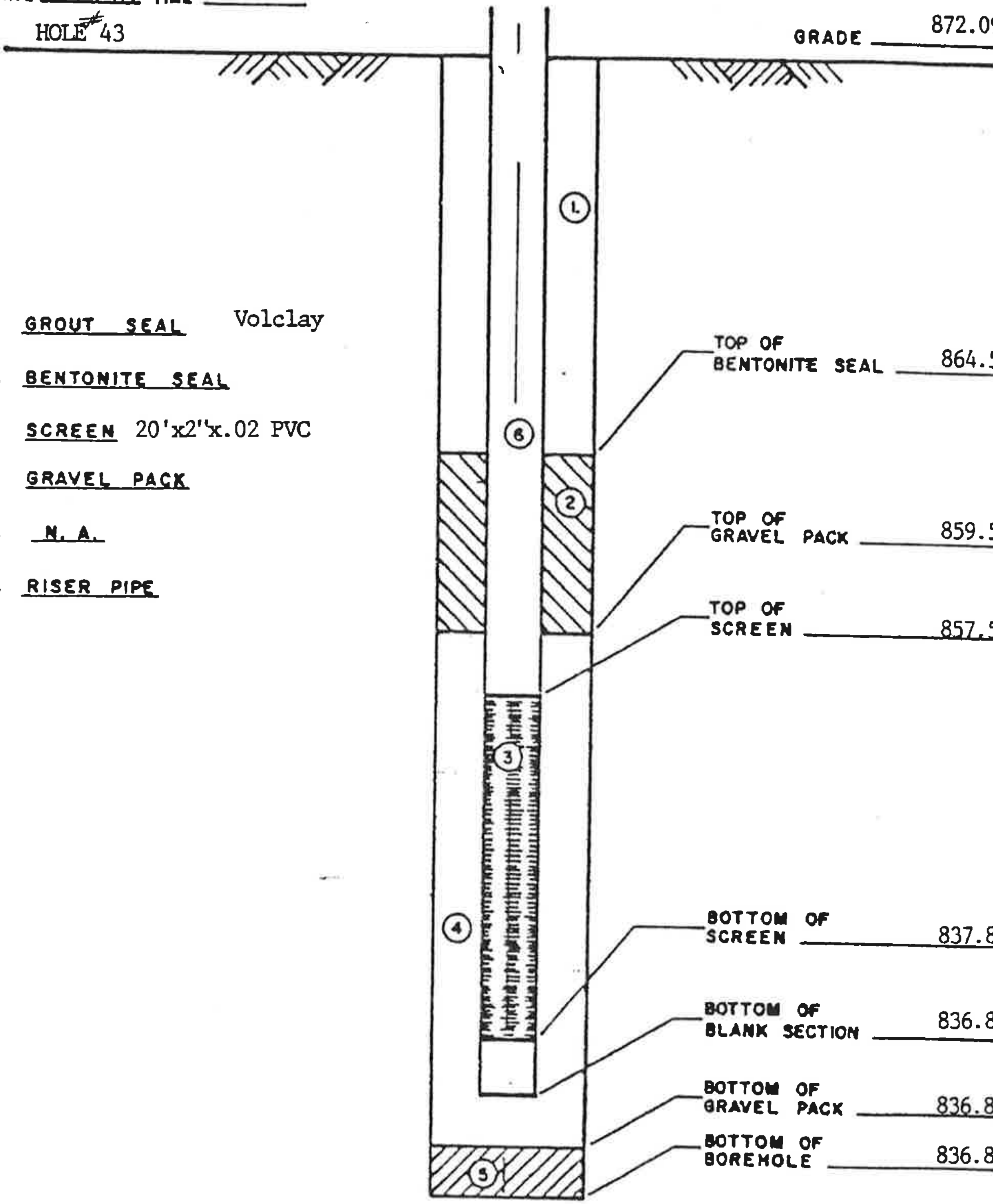
HOLE # 43

WELL CONSTRUCTION SUMMARY ELEVATIONS (ft NGVD)

WELL No. 3

REF. DATUM PT. 874.29

GRADE 872.09



1. GROUT SEAL Volclay
2. BENTONITE SEAL
3. SCREEN 20'x2"x.02 PVC
4. GRAVEL PACK
5. N. A.
6. RISER PIPE

TOP OF BENTONITE SEAL	864.59
TOP OF GRAVEL PACK	859.59
TOP OF SCREEN	857.59
BOTTOM OF SCREEN	837.89
BOTTOM OF BLANK SECTION	836.89
BOTTOM OF GRAVEL PACK	836.89
BOTTOM OF BOREHOLE	836.89

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION	OBSERVATION WELL
APPROVED	DR.	CH.	
AMERICAN ELECTRIC POWER SVC. CORP.			CDS-04 SH.

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING Well 3

JOB NO. ______
COMPANY Zimmer Plant
PROJECT FGD Land Fill
COORDINATES S 2325.72 E: 17,443.40

BORING NO. 43 . DATE 8-22-89 SHEET 1 OF 2
TYPE OF SAMPLES: SPT x 3" TUBE ____ CORE x
CASING USED ______ SIZE HW DRILLING MUD USED ______
BORING BEGUN 8-22-89 BORING COMPLETED 8-22-89
GROUND ELEVATION 872.09 REFERRED TO ______ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	
WATER LEVEL	Hole was Drilled w/
TIME	casing see well log
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	4.0	5.5	13	16	16	17"				CL	Sandy clay - multi-color Br moist	
2	9.0	10.5	5	12	12	9"		10		CL	Clay - multi-color Br moist med to low plasticity	
3	14.0	15.5	8	50/.4		6"					Soft Gray clay + Clay Shale w/ lime stone Frags.	water changed From Br to Gray at 14.5
4	19.0	19.1	50/.1			0						

6" x 3.25 HSA	
HW CASING ADVANCER 4"	✓
NQ CORE ROCK	✓
NW CASING 3"	
SW CASING 6"	

RECORDER ______

FORM CE-5
REV. 1/87

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

JOB NO.
COMPANY
PROJECT
COORDINATES

LOCATION OF BORING:

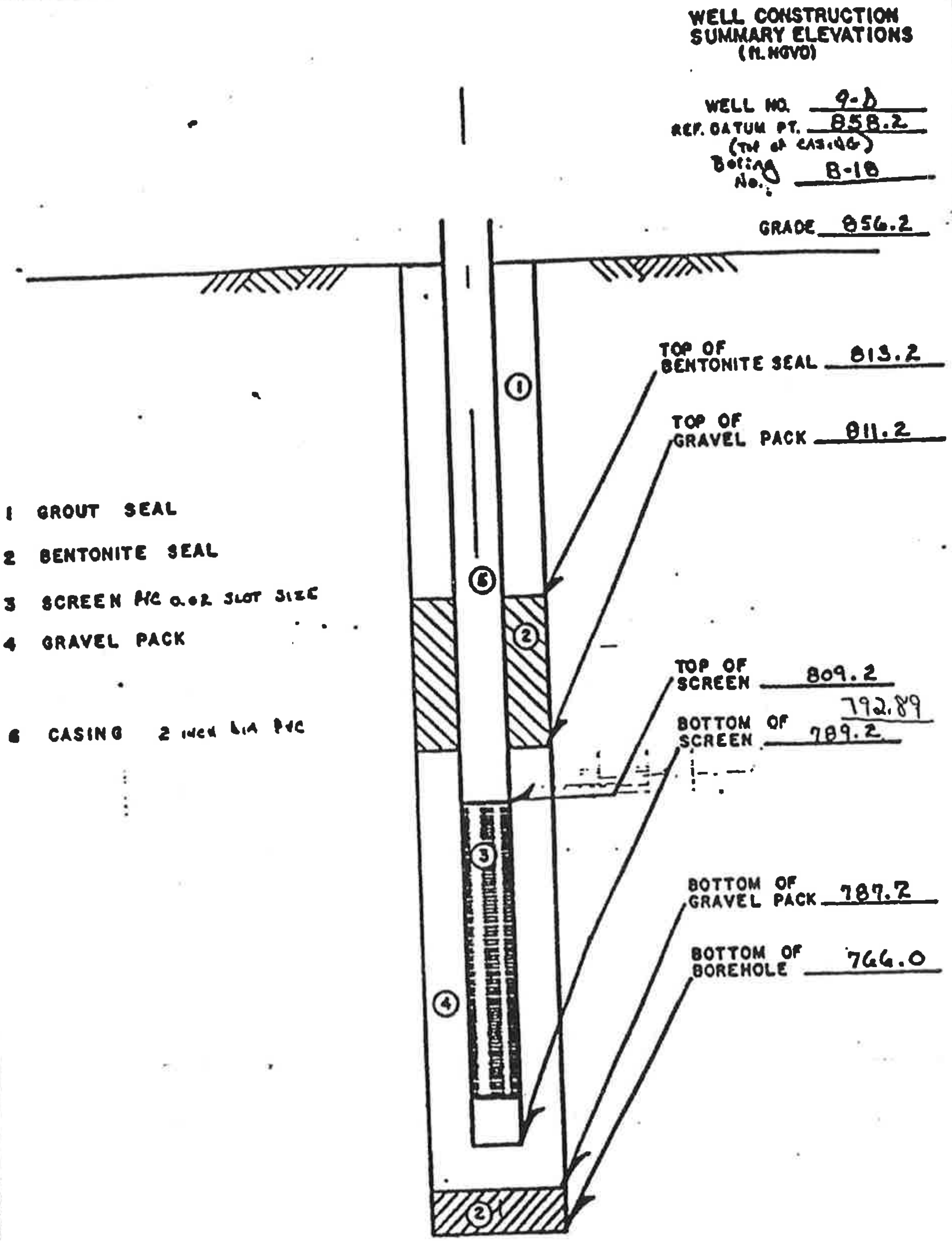
WATER LEVEL	
TIME	
DATE	

BORING NO. 43 DATE SHEET 2 OF 2
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO DATUM
FIELD PARTY RIG

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
											19.1 - 35.2	
											Gray Hard Limestone w/	
	19.1	22.7				3.5	0				Layers of Gray Clay Shale	
	22.7	30.0				6.9	0					
	30.0	35.2				5.1	37	30				
												Installed ws #3
											Stopped Hole 35.2	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER



GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD	REVISION 0	OBSERVATION WELL
APP'D. / DR. J. DEEMS	CH. JMN / DATE JUL 6, 1988	
AMERICAN ELECTRIC POWER SERVICE CORP.	CDS — 04	SH.

PLATE 20

Well 9D

FORM CE-5
REV. 1/07

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

Job No. ______

Company: AEP

Project: Zimmer FGD Land Fill

Location of Boring: N. 500 E 18170

Water Level	
Time	
Date	

Boring No. B-18 Date 2-3-87 Sheet 1 of ___

Type of Boring: SPT X 3" Tube ___ Core ✓

Casing used ✓ Size HW Drilling mud used ___

Boring begun 2-3-87 Boring Completed ___

Ground Elevation 856.20 referred to ___ Datum

Field Party Smith - Bumgarner Brill Rig 75

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
1	4.0	5.5	7	9	12	15"		4		CL	Clay- org. Br + Gray mottled moist - med to low plasticity	
2	9.0	10.5	5	8	9	18"		10			Same as Sample No. 1	
3	14.0	15.5	22	50	—	11"		14		CL	Sandy Clay- Dk. Br. + Gray mottled - moist - w/ some Limestone Frag - strong Reaction to HCl	
4	19.0	20.5	10	18	22	12"		20			Sandy Gravelly Clay- Blue moist - strong Reaction to HCL - limestone gravel	

6" x 3.25 HSA	
HW Casing Advancer 4"	X
NQ Core Rock	X
NW Casing 3"	
SW Casing 6"	

Engineer ______

FORM CE-9 REV. 1/87

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

JOB NO. ______
COMPANY ______
PROJECT ______
LOCATION OF BORING: ______

BORING NO. B-18 DATE ______ SHEET 2 OF ______
TYPE OF BORING: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
								22				
5	24.0	25.5	4	8	12	14"		24			Clay - Blue - moist - strong Reaction to HCl w/ some Gravel	
								26				
								28				
6	29.0	30.5	5	8	10	16"		30			Same as Sample No. 5	
								32				
7	34.0	35.5	4	6	10	4"		34			Same as Sample No 5 more Sand	
								36				
								38				
8	39.0	40.5	4	5	16	13"		40			Same as Sample No. 5	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER ______

FORM CE-5
REV. 1/87

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

JOB NO.
COMPANY
PROJECT
LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. B-18 DATE ______ SHEET 3 OF ____
TYPE OF BORING: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
								42				
9	44.0	45.5	4	4	6	16"		44			Clay - Blue Gray moist to wet - med. to low plasticity - moderate Reaction to HCl	
								46		CL		
								48				
10	49.0	50.5	32	15	50/.4	3"					Lime stone Rock Frag. + Clay mixture	
								50				
	52.0	50				–						
								52				
	52.2	55.1				2.3	0					
								53			Gray Hard Limestone	
											Broken shale	
								54			Broken limestone w/ shale lenses	
								55			Gray soft shale	
	55.1	65.1				9.0	0				→ Core lost ? 55.1 to 56.4 Gray soft shale - Broken Large % Fossil at 55.3 + 56.2	
								56				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER ______

FORM CE-9 REV. 1/87

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

JOB NO.
COMPANY
PROJECT
LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. B-18 DATE SHEET 4 OF
TYPE OF BORING: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO DATUM
FIELD PARTY RIG

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
						56				
									56.4 to 57.0 Gray Hard Lime stone w/ Shale Lows at 56.4 - 56.45	
						57			57.0 - 62.6 - Gray Soft Shale Except when noted	
						58			58.6 - 58.8 Gray Hard Lime stone	
						59			59.2 - 59.4 - Shale w/ Fossil Fragment Core Lost This Area - ?	
						60			60.0 - 60.3 Gray Hard Lime stone. 60.3 - 60.7 Shale w/ Fossil Fragment.	
						61			61.4 - 62.6 Gray Hard Lime stone	
						62				
						63			62.6 - 65.0 Gray Soft Clay shale	
						64				
	65.1	75.1		10.0	60.0 to 70.0	65			65.0 - 65.1 Gray Hard Lime stone	
						66				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER

FORM CE-8
REV. 1/97

AMERICAN ELECTRIC POWER SERVICE CORPORATION
CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY
PROJECT
LOCATION OF BORING:

BORING NO. B-18 DATE SHEET 5 OF
TYPE OF BORING: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO DATUM
FIELD PARTY RIG

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								66			65.1 - 75.1 - Gray soft clay Shale Except where noted	
								67				
								68			68.2 - 68.3 - Gray Hard Limestone Fossil Fragment in shale	
								69			68.9 - 69.8 Gray Hard Lime-stone w/ .1 Shale Seam	
								70				
								71				
								72				
								73				
								74			73.9 to 74.3 Gray Hard Limestone	
	75.1	85.1				9.9	61.0	75			75.4 - 76.3 Gray Limestone w/ Layers of Clay Shale	
								76			75.1 to 85.1 Gray soft Shale Except where noted	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER

FORM CE-8
REV. 1/87

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

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. 19 DATE ______ SHEET 6 OF ___
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								76				
											76.3 - 77.1 Gray Hard Lime-stone	
								77				
								78			78.1 - 78.3 Gray Hard Lime-stone	
											78.3 - 78.5 Fossil Fragment in shale	
								79			79.2 - 79.4 Gray Hard Lime-stone	
								80				
								81			Gray Hard Limestone 81.1-81.3	
								82				
								83			Fossil Fragment in shale 83.0-83.2	
								84				
								85				
	85.1	92.4				7.3	24.0					
											Gray Hard 85.5-85.8 Lime-stone	
								86			85.8 - 85.9 Fossil Fragment in shale	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-6
REV. 1/87

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

JOB No. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING No. B-18 DATE ______ SHEET 7 OF 7
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								86				
								87			87.1 Seam of Limestone 87.2 " " "	
											87.4 - 87.6 Fossil Fragment in shale	
								88			87.7 - 91.4 Gray Hard Limestone w/ layers of clay shale	
								89				
								90				
								91			91.4 - 92.4 Gray Soft Clay shale	
								92				
								93			Stopped Hole 92.4 + installed Piezometer	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

MW-11 D

Job No. ____

AEP

Zimmer FGD Landfill

Location of Boring:

Water Level	
Time	
Date	

Boring No. IJB Date 2-13-86 Sheet 1 of 1

Type of Boring ____ Rig CME-75

Casing used ____ Size ____ Drilling mud used ____

Boring Begun ____ Boring Completed ____

Ground Elevation 850.5 Referred to ____

____ Datum

Field Party: Smith - Bumgarner

2" PVC rizer pipe

2" PVC .02 well screen

3" steel protector set in grout

Grout from 0 to 31.0 ft.

Bentonite seal from 31.0 to 33.5 ft.

Sand from 33.5 to 47.5 ft.

Screen from 35.5 to 45.5 ft.

Bentonite seal from 47.5 to 48.3 ft.

Cuttings from 48.3 to 85.0 ft.

Bottom of boring 85.0 ft.

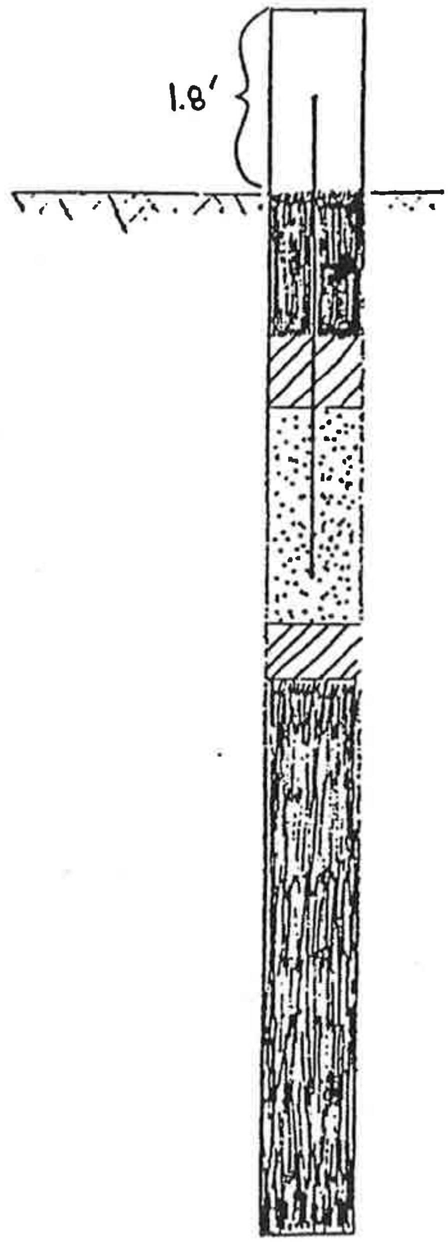


Figure 5

FORM CE-5
REV. 8/81

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING IJ

N 1325.9
E 18,159.2
//s //d

JOB NO. ______

COMPANY A.E.P.

PROJECT ZIMMER FGD

B-10
BORING NO. II DATE 7-23-85 SHEET 1 OF 2

TYPE OF BORING ______ RIG CME-75

CASING USED 20' SIZE NW DRILLING MUD USED ______

BORING BEGUN 7-23-85 BORING COMPLETED 7-23-85

GROUND ELEVATION 850.5 REFERRED TO ______ DAT

FIELD PARTY: Smith - Bumgarner

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION	DEPTH IN FEET	DESCRIPTION: SOIL TYPE, COLOR, TEXTURE, CONSISTENCY, SAMPLER DRIVING NOTES BLOWS PER FOOT ON CASING, DEPTHS WASH WATER LOST, OBSERVED FLUCTUATIONS IN WATER LEVEL, NOTES ON DRILLING EASE, ETC.
								0	ROTARY wash + NQ CORE
								3	6 Sec. 1200 PSI 2.0 PUSH
1	3.0	5.0				1.6		4	TOP 7" MED. BRWN SDY CLAY CS SD SIZE IRON NODULES & SS FRAG
								5	BOTTOM 13" TAN-ORG BRWN SDY CLAY CS SD SIZE IRON NOD. & SS FRAG.
								6	Couldn't push Tube
2	6.0	8.0						7	
								8	Sandy Clay - Br. moist - Quartz + Limestone sand size material - STRONG REACTION -
3	8.0	9.5	16	21	33	12"		9	(Till)
								13	Sandy clay silt - Gray - moist - Limestone + Quartz sand size material - STRONG Reaction to HCL
4	13.0	14.4	36	38	50/4	6"		14	(Till)
								19	Sandy silty clay - Gray + Gray BR mottled - moist - STRONG REACTION TO HCL - (Till)
5	19.5	21.0	10	15	18	8"		20	

Engineer

FORM CE-5
REV. 5/81

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

JOB NO. ______

COMPANY ______

PROJECT ______

LOCATION OF BORING: ______

WATER LEVEL	
TIME	
DATE	

BORING NO. I J DATE ______ SHEET 2 OF 4

TYPE OF BORING ______ RIG ______

CASING USED ______ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ______ BORING COMPLETED ______

GROUND ELEVATION ______ REFERRED TO ______ DATUM

FIELD PARTY: ______

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION	DEPTH IN FEET	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								20	
6	24.5	26.0	11	26	33	14"		25	Clay - Blue Gray - moist - Slight Reaction to HCL - Trace of Sand
7	29.5	31.0	14	16	16	16"		30	Clay - Blue Gray - moist - med to low plasticity - Trace of organic material - 8
8	34.5	36.0	12	16	20	16"		35	Clay - Blue Green - moist - med to low plasticity - moderate Reaction to HCL
9	39.5	39.6	50/.1					40	Drilled into Rock to 41.0

ENGINEER

FORM CE-5
REV 5/81

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

JOB No. ______
[COM]PANY ______
PROJECT ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING No. IJ DATE ______ SHEET 3 OF 4
TYPE OF BORING ______ RIG ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY: ______

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION RQD	DEPTH IN FEET	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								40	Gray clay shale
	41.0	43.7				1.9	0	1	
								2	water Return stop at 44.0
								3	? 43.7 - 55
	43.7	50.0				6.3	31%	4	Gray clay shale w/ Laminated Layers of Limestone
								5	
								6	
								8	
								9	
	50.0	55.0				4.8	28%	50	
								1	
								2	
								3	
								4	
								5	55.0 - 66.0
	55.0	63.7				8.7	21%	6	Gray clay shale
								7	
								8	
								9	
								60	

ENGINEER ______

FORM CE-5
REV. 9/81

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

JOB NO. ________
COMPANY ________
PROJECT ________

BORING NO. I J DATE ________ SHEET 4 OF 4
TYPE OF BORING ________ RIG ________
CASING USED ________ SIZE ____ DRILLING MUD USED ________
BORING BEGUN ________ BORING COMPLETED ________
GROUND ELEVATION ________ REFERRED TO ________ DATUM
FIELD PARTY: ________

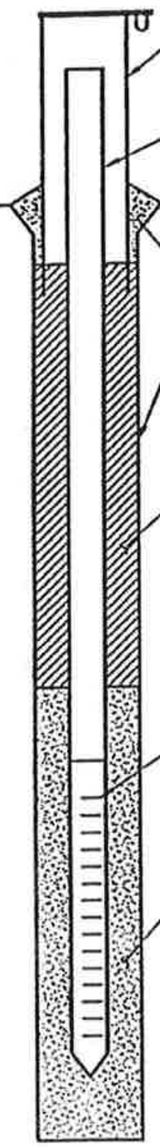
LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION RQD	DEPTH IN FEET	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								40	
	63.7	66.0				2.3	0		
	66.0	70.0				4.0	58%		66.0 - 70.0 Gray clay shale w/ laminated layers of limestone
	70.0	75.0				5.0	67%	70	? Gray clay shale
	75.0	85.0				10.0	38%		Gray clay shale w/ laminated layers of limestone
								80	Stopped boring 85.0

7-23-85 Bailed water to 10.0 - 7-25-85 water 10' 7-30-85 water 11.5 installed 2" PVC + Bailed water to 32.0 - 8-1-85 water Elev. 11.0

ENGINEER --

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
862.43	2.3	TOP OF COVER
862.22	2.1	TOP OF PVC
860.1	0.0	GROUND SURFACE
855.6	4.5	TOP OF BENTONITE
852.1	8.0	TOP OF FILTER PACK
853.8	6.3	TOP OF AQUIFER
851.9	9.1	TOP OF SCREEN OPENINGS
841.7	18.4	BOTTOM OF SCREEN OPENINGS
841.3	18.8	BOTTOM OF WELL
841.1	19.0	BOTTOM OF AQUIFER
840.8	19.3	BORING DEPTH



WELL COMPLETION DIAGRAM
(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-13S (B-117)

DATE WELL INSTALLED: 2/27/97

BBC & M PROJECT NO: 5718

STATIC WATER LEVEL #	857.85	841.38		
DATE:	3/5/97	4/9/97		

WELL DEVELOPMENT:

3/5 Hand bailed 20 gallons

3/7 Hand bailed 10 gallons, water slightly silty

FEET ABOVE MSL

FORM CE-5
REV. 1/87

Well 13

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

JOB NO. ______
COMPANY A & P
PROJECT Zimmer Sludge Land Fill
COORDINATES N. 1680 - E. 19730

BORING NO. B-22 DATE 2-26-87 SHEET 1 OF 3
TYPE OF SAMPLES: SPT X 3" TUBE ____ CORE X
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 2-26-87 BORING COMPLETED 2-26-87
GROUND ELEVATION 859.88 REFERRED TO ____ DATUM
FIELD PARTY T. Smith - Bumgarner RIG 75

LOCATION OF BORING:	
WATER LEVEL	Dry
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.0	3.5	4	7	10	7"		2			Clayey Silt - Br - Gr. moist	
2	7.0	7.5	50			2"		7			Weathered Lime stone	
								10			Auger Refusal 10.5	
	10.5	15.0				3.1	0	11			Gr. lime stone .1 - .2 long w/ clay shale layers	
	15.0	25.0				6.8	0	16			lime stone Gr. max length ~~.25~~ + .3 clay shale	
								20				

6" x 3.25 HSA	
HW ~~Casing Advanced~~ 4"	X
NQ Core Rock	X
NW Casing 3"	
SW Casing 6"	

RECORDER ______

FORM CE-5
REV. 1/87

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

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING NO. B-22 DATE ____ SHEET 2 OF 3
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
								22				
								24				
	25.0	35.0				9.5	0				Gray Lime stone w/ Layers of Clay shale - max length of Lime stone .25 + Clay shale .3	
								26				
								28				
								30				
								32				
								34				
	35.0	45.0				8.2	12	36			Clay shale. Gr w/ Layers of Lime stone - max length of Clay shale .75 + Lime-stone .2	
								38				
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

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

Job No. ______
Company ______
Project ______
Coordinates ______

Location of Boring:

Water Level	
Time	
Date	

Boring No. B-22 Date ______ Sheet 3 of 3
Type of Samples: SPT ______ 3" Tube ______ Core ______
Casing used ______ Size ______ Drilling mud used ______
Boring begun ______ Boring Completed ______
Ground Elevation ______ referred to ______ Datum
Field Party ______ Rig ______

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
								40				
								42				
								44				
	45.0	50.5				5.5	11					
								46			Gray lime stone w/ layers of clay shale - max length of lime stone .3 - clay shale .7	
								48				
								50				
											Stopped Hole 50.5 FT	
								52			+ installed piezometer	
											water level 45.5 FT	
											16 Hrs later 6.0	

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

Recorder ______

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-309
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: **S 1,461; E 15,918** ELEVATION: **823.5** DATE: **2/11/97 2/13/97**

DRILLING METHOD: **4-1/4" I.D. Hollow-stem Auger; Air Rotary** COMPLETION DEPTH: **68.5'**

SAMPLER(S): **2" O.D. Split-barrel Sampler; NQM Rock-core Barrel**

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT (10, 20, 30, 40)

DESCRIPTION

- FILL: Medium-stiff to very-stiff brown with gray lean clay with sand (CL).
- Very-stiff to hard brown sandy lean clay, few desiccation planes with oxidation, (CL).
- Very-stiff to hard gray lean clay with sand, few cobbles.
- Medium-dense brown poorly graded sand with gravel, (SP-SC).
- Medium-dense elastic silt, (MH).
- Very-stiff to hard gray silty clay, few seams (< 1/4") silt to fine sand, (CL-ML).
  - At 12.7', 1" seam of fine to coarse sand.
- Very-stiff to hard gray lean clay with sand, occasional desiccation plane, (CL).
- Very-soft gray with brown shale, nearly horizontally bedded, similar to soil.
- Very-soft gray shale, nearly horizontally bedded, many seams 1/4" to 5" of medium-hard fossiliferous limestone, numerous horizontal fractures, partly similar to soil, 26% limestone.
- Soft gray with streaks of brown shale, nearly horizontally bedded, horizontal fractures, few seams 1/4" to 3" medium-hard fossiliferous limestone, 15% limestone.

SAMPLES AND TEST RESULTS

Sample Number	Sample Effort	Test Results
1	1/3/3/2	H=0.6-3.4
2A	5/5/6/7	H=0.6-1.2
2B		H=3.7-4.5+
3	8/12/11/12	H=4.5+
4A	8/12/12/16	H=4.5+
4B		H=4.5+
5	7/8/13/32	H=2.4-4.5+
6A	11/12/13/14	
6B		
6C		H=3.2-4.5+
7	7/10/9/12	H=3.1-4.4
8	5/6/6/6	H=2.6-4.5+
9	7/9/11/11	H=4.5+
10A	10/33/38/48	H=2.1-4.5+
10B		H=4.5+
		RQD 0%
11	NQM REC 38%	RQD 10%, K=9.4E-3
12	NQM REC 22%	RQD 0%, K=3.2E-3
13	NQM REC 29%	RQD 21%
14	NQM REC 58%	RQD 44%, K=3.3E-3
15	NQM REC 84%	

Depth, feet: 0, 5, 10, 15, 20, 25, 30, 35

WATER LEVEL: ∇ 13.1
WATER NOTE:
DATE: 02/13/97

SYMBOLS USED TO INDICATE TEST RESULTS
G - GRADATION, Q - UNCONFINED COMPR, T - TRIAXIAL COMPR, C - CONSOLIDATION — SEE SEPARATE CURVES
H - PENETROMETER (tsf), W - UNIT DRY WEIGHT (pcf), D - RELATIVE DENSITY (%)

JOB: 5718

-CONTINUED-

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-309
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: **S 1,461; E 15,918** ELEVATION: **823.5** DATE: **2/11/97 2/13/97**

DRILLING METHOD: **4-1/4" I.D. Hollow-stem Auger; Air Rotary** COMPLETION DEPTH: **68.5'**

SAMPLER(S): **2" O.D. Split-barrel Sampler; NQM Rock-core Barrel**

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION - CONTINUED	TEST RESULTS
40	16	NQM REC 45%	Very-soft gray with yellow-brown shale, nearly horizontally bedded, few thin seams 1/4" to 2" medium-hard fossiliferous limestone, many horizontal fractures.	RQD 0% K=3.9E-3
	17	NQM REC 17%		RQD 0%
45	18	NQM REC 32%		RQD 0% K=3.3E-3
	19	NQM REC 80%	- From 46.6' to 47.1', vertical fracture.	RQD 0%
50	20	NQM REC 76%	Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/2" to 2", medium-hard gray fossiliferous limestone, 31% limestone. - From 50.3' to 50.8', vertical fracture. - From 50.3' to 51.3', limestone.	RQD 32% K=2.6E-3
55	21	NQM REC 100%	- From 55.9' to 57.2', limestone.	RQD 72% K=5.9E-4
60	22	NQM REC 99%		RQD 78% K=2.0E-5
65			Medium-hard gray limestone, nearly horizontally bedded, fossiliferous, many horizontal fractures, many seams 1/4" to 1.5' shale, 43% shale.	K=1.5E-3
70			- Slight seepage from 10.1' to 10.9'. - Seepage at 12.7'. - Encountered water from 20.7' to 34.5' (3-5 gpm). - Encountered water from 38.0' to 42.3'. - K values from packer tests, tests completed on 5' intervals. - Boring converted to groundwater monitoring well MW-16D.	
75				

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT (10, 20, 30, 40)

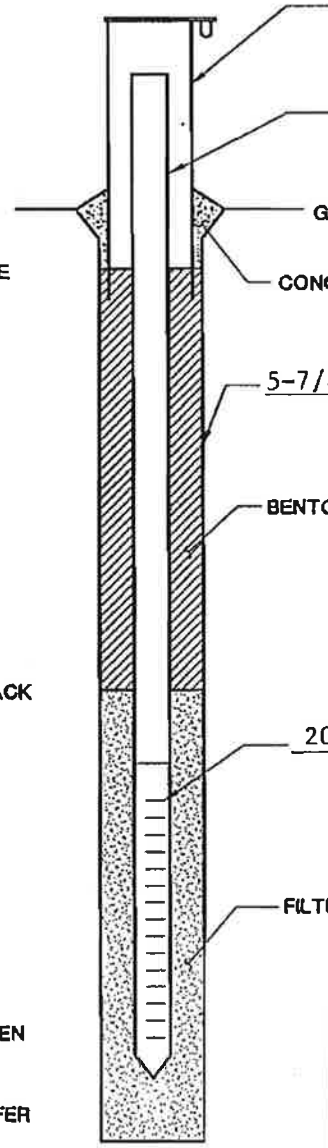
WATER LEVEL: 13.1
WATER NOTE:
DATE: 02/13/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION, Q - UNCONFINED COMPR, T - TRIAXIAL COMPR, C - CONSOLIDATION — SEE SEPARATE CURVES

H - PENETROMETER (tsf), W - UNIT DRY WEIGHT (pcf), D - RELATIVE DENSITY (%)

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
825.59	2.1	TOP OF COVER
825.35	1.9	TOP OF PVC
823.5	0.0	GROUND SURFACE
819.0	4.5	TOP OF BENTONITE
801.3	22.2	TOP OF FILTER PACK
804.9	18.6	TOP OF AQUIFER
801.3	22.2	TOP OF SCREEN OPENINGS
794.1	29.4	BOTTOM OF SCREEN OPENINGS
793.5	30.0	BOTTOM OF WELL
776.2	47.3	BOTTOM OF AQUIFER
755.0	68.5	BORING DEPTH



WELL COMPLETION DIAGRAM
(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-16D (B-109)

DATE WELL INSTALLED: 2/13/97

BBC & M PROJECT NO: 5718

Bottom Seal (Bentonite Chips) 31.7' - 35.0'

STATIC WATER LEVEL #	812.29	812.42	811.54	
DATE:	2/14/97	3/7/97	4/9/97	

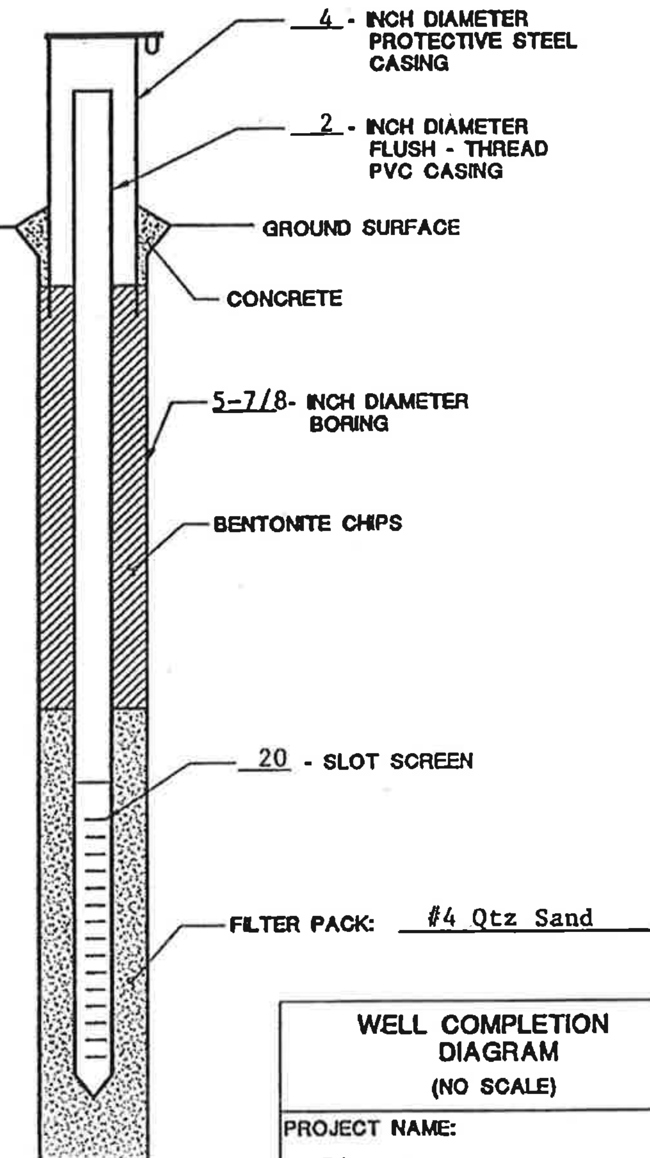
WELL DEVELOPMENT:

2/19 Hand bailed 20 gallons

3/7 Hand bailed 15 gallons, water slightly silty

FEET ABOVE MSL

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
887.61	2.1	TOP OF COVER
887.37	1.9	TOP OF PVC
885.5	0.0	GROUND SURFACE
881.0	4.5	TOP OF BENTONITE
875.1	10.4	TOP OF FILTER PACK
877.1	8.4	TOP OF AQUIFER
875.1	10.4	TOP OF SCREEN OPENINGS
866.0	19.5	BOTTOM OF SCREEN OPENINGS
865.4	20.1	BOTTOM OF WELL
865.5	20.0	BOTTOM OF AQUIFER
766.7	118.8	BORING DEPTH



WELL COMPLETION DIAGRAM
(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-18 (B112)

DATE WELL INSTALLED: 2/24/97

BBC & M PROJECT NO: 5718

Bottom Seal (Bentonite Chips) 20.7' - 24.0'

STATIC WATER LEVEL #	877.61	876.20		
DATE:	2/26/97	4/9/97		

WELL DEVELOPMENT:

2/26 Hand bailed 7 gallons, nearly dry

3/6 Hand bailed 5 gallons, nearly dry, water silty

FEET ABOVE MSL

BBC&M ENGINEERING, INC.

BBC&M

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION	TEST RESULTS
		TOPSOIL - 10 INCHES	
1	1/2/2/3	Medium-stiff to stiff brown lean clay, (CL).	H=0.8-1.6
2	3/3/6/8	Very-stiff to hard brown mottled gray fat clay, (CH).	H=2.3-4.5+
3	5/6/7/10		H=2.3-3.6
4	4/13/11/7		H=2.4-3.4
5A	15/29/33		H=3.2-3.6
5B	/50-4"R	Very-soft brown shale, nearly horizontally bedded, many seams 1/2" to 1" medium-hard gray limestone, partly similar to soil.	H=2.7-4.5+
6	50-5"R		H=4.5+
7	NQM REC 76%	Soft to medium-hard gray with streaks of brown interbedded shale and limestone, nearly horizontally bedded, many horizontal fractures, limestone beds 1/2" to 6", shale beds 1/4" to 8", 44% limestone.	RQD 24%
8	NQM REC 94%		RQD 44% K=1.3E-4
9	NQM REC 96%		K=6.8E-5 RQD 54%
10	NQM REC 99%	Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.	K=2.2E-7 RQD 81% K=5.2E-7

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT (10 20 30 40)

WATER LEVEL: "Dry"
WATER NOTE:
DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS
G - GRADATION, Q - UNCONFINED COMPR, T - TRIAXIAL COMPR, C - CONSOLIDATION: SEE SEPARATE CURVES
H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

BBC&M

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
			NQM REC 94%	Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.		K=2.2E-7 RQD 49%
35						
	11					K=1.0E-7
40						RQD 63%
	12		NQM REC 96%			K=2.2E-7 RQD 54%
			NQM REC 98%			
45						K=1.0E-7
	13					
50						
			NQM REC 100%			K=1.1E-7 RQD 64%
55						
	14					K=1.0E-7
60						
			NQM REC 100%			K=1.1E-7 RQD 77%
65						

WATER LEVEL: "Dry"
WATER NOTE:
DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS
G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES
H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

BBC&M Engineering, Inc.

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	15			Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.		K=1.0E-7
70				Medium-hard gray limestone, nearly horizontally bedded, fossiliferous, many horizontal fractures, numerous 1/8" to 1/2" shale partings, few seams 2" to 6" of soft shale.		
			NQM REC 99%			K=3.2E-7 RQD 49%
75						
	16					K=1.0E-7
80				Soft to medium-hard gray interbedded shale and fossiliferous, limestone, nearly horizontally bedded, many horizontal fractures, shale beds 1/4" to 8", limestone beds 1/2" to 3", 52% shale.		
			NQM REC 100%			K=1.1E-7 RQD 51%
85						
	17			Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/4" to 5" medium-hard fossiliferous, limestone, 19% limestone.		K=4.2E-7
90						
			NQM REC 88%			K=5.4E-7 RQD 46%
95				- From 95.3' to 95.6', vertical fracture.		
	18			- From 97.6' to 98.6', vertical fracture.		K=1.0E-7

WATER LEVEL: ∇ "Dry"

WATER NOTE:

DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
} SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718

-CONTINUED-

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: **N 156; E 21,063** ELEVATION: **885.5** DATE: **2/19/97 2/24/97**

DRILLING METHOD: **4-1/4" I.D. Hollow-stem Auger; Air Rotary** COMPLETION DEPTH: **118.1'**

SAMPLER(S): **2" O.D. Split-barrel Sampler; NQM Rock-core Barrel**

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
				- From 99.3' to 103.1', vertical fracture.		
100						
				Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/4" to 5" medium-hard fossiliferous, limestone, 19% limestone.		K=1.0E-7 RQD 65%
			NQM REC 99%			
105						
						K=1.0E-7
	19					
110						
			NQM REC 100%			K=1.1E-7 RQD 46%
115	20					
				- Slight seepage from 10.4' to 20.0' (<1 gpm).		
120				- K values are from packer tests, tests completed on 5' intervals.		
				- Boring converted to groundwater monitoring well MW-18.		
125						
130						

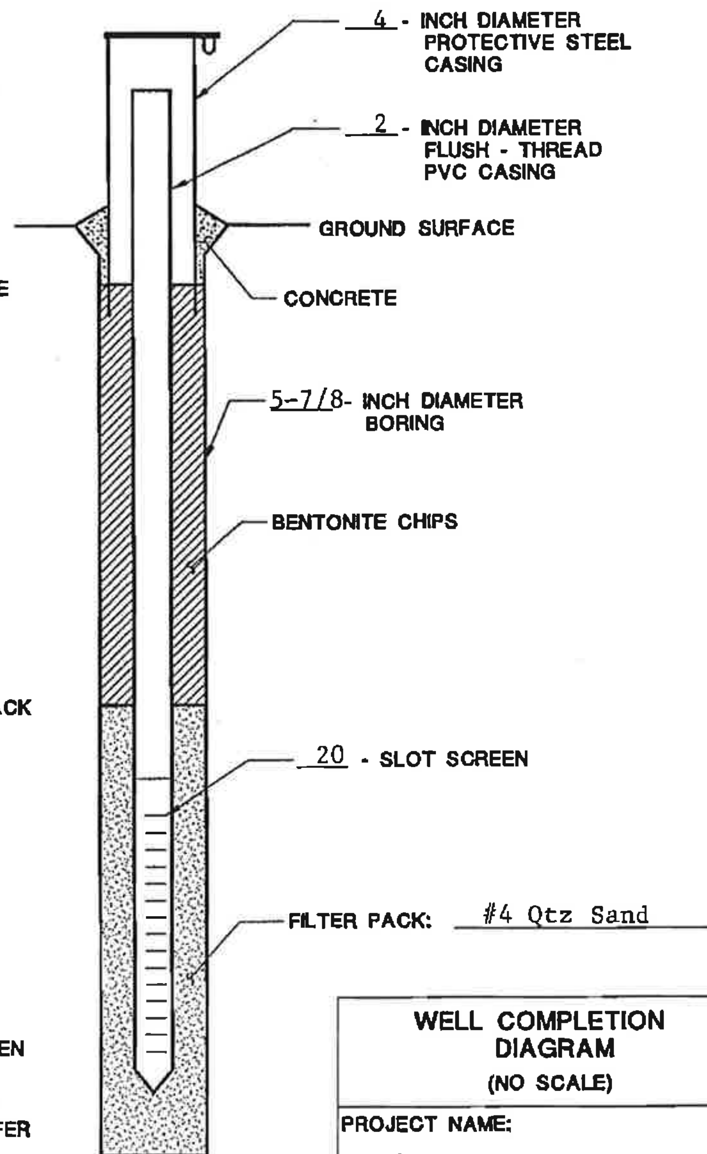
WATER LEVEL: ▽ "Dry"
WATER NOTE:
DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
887.61	2.1	TOP OF COVER
887.37	1.9	TOP OF PVC
885.5	0.0	GROUND SURFACE
881.0	4.5	TOP OF BENTONITE
875.1	10.4	TOP OF FILTER PACK
877.1	8.4	TOP OF AQUIFER
875.1	10.4	TOP OF SCREEN OPENINGS
866.0	19.5	BOTTOM OF SCREEN OPENINGS
865.4	20.1	BOTTOM OF WELL
865.5	20.0	BOTTOM OF AQUIFER
766.7	118.8	BORING DEPTH



WELL COMPLETION DIAGRAM
(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-18 (B112)

DATE WELL INSTALLED: 2/24/97

BBC & M PROJECT NO: 5718

Bottom Seal (Bentonite Chips) 20.7' - 24.0'

STATIC WATER LEVEL #	877.61	876.20		
DATE:	2/26/97	4/9/97		

WELL DEVELOPMENT:

2/26 Hand bailed 7 gallons, nearly dry

3/6 Hand bailed 5 gallons, nearly dry, water silty

FEET ABOVE MSL

BBC&M

LOG OF BORING NO. B-502
ZIMMER FGD LANDFILL MODIFICATION
CLERMONT COUNTY, OHIO

LOCATION: N 754, E 16,726 ELEVATION: 823.2 DATE: 1/18/99 1/19/99

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger COMPLETION DEPTH: 40.5'

SAMPLER(S): 2" O.D. Split-barrel Sampler

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION	TEST RESULTS
0			TOPSOIL - 14 INCHES	
			Medium-stiff to stiff gray mottled with brown silty clay, trace fine to coarse sand.	
	1	2/3/5		H=.9-1.5
5			Very-stiff to hard brown mottled with gray silty clay, trace fine to coarse sand, trace fine to coarse gravel.	
	2	2/5/6		H=2.7-3.5
	3	2/4/5		H=2.0-4.1
10				
			Brown fine to coarse sand, some fine to coarse gravel, little clayey silt, few cobbles.	
			Hard brown clayey silt, some fine to coarse sand, trace fine to coarse gravel, few cobbles.	
	4	9/22/45		H=4.5+
15				
			Hard gray clayey silt, some fine to coarse sand, little fine to coarse gravel.	
	5	12/25/30		H=4.5+
20				
			Very-stiff gray clayey silt with seams of silt, trace fine to coarse sand.	
	6A	5/8/12		H=2.6-2.8
25	▽6B		Hard gray clayey silt, little fine to coarse sand,	H=4.5+

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT; PLASTIC LIMIT; LIQUID LIMIT (scale 10, 20, 30, 40)

WATER LEVEL:	▽ 25.0	▼	▼
WATER NOTE:			
DATE:	01/19/99		

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718A

-CONTINUED-

PLATE

BBC&M

LOG OF BORING NO. B-502
ZIMMER FGD LANDFILL MODIFICATION
CLERMONT COUNTY, OHIO

LOCATION: N 754, E 16,726 ELEVATION: 823.2 DATE: 1/18/99 1/19/99
DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger COMPLETION DEPTH: 40.5'
SAMPLER(S): 2" O.D. Split-barrel Sampler

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
25				trace fine to coarse gravel.		
				Very-soft gray shale, nearly horizontally bedded, thinly bedded, many seams medium-hard limestone 1" - 6" thick.		
	7		37/50R-3"			
30						
			50R-1"			
35						
40						
				- Encountered water at 12.0' - 13.0'. - Encountered water below 27.0'. - Boring converted to groundwater monitoring well MW-20D. See well completion diagram.		
45						

WATER LEVEL: 25.0
WATER NOTE:
DATE: 01/19/99

SYMBOLS USED TO INDICATE TEST RESULTS
G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES
H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718A

PLATE

DATE: 4/19/10 - 4/20/10

LOG OF BORING NO. MW-21
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N -485.9; E 20013.1** ELEVATION: **859.4**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **41.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0						TOPSOIL - 11 INCHES	
858.4		1	1/1/1	3	87	CH	Stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, few roots, moist.	H=1.5-1.75
856.4		2	P		67	CH	Stiff to very-stiff brown mottled with gray and orange-brown silty clay, some fine to coarse sand, trace fine gravel, cobbles near bottom of stratum, damp.	H=2.75
	5	3	3/5/4	13	60			H=2.75-3.5
		4	5/8/25	47	73			H=2.0-3.5
		5	12/11/50-3"R		67			H=1.25
849.9	10	6	46/17/25	60	73	CH	Very-stiff to hard brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, numerous cobbles, damp.	H=3.1 G
		7	22/17/11	40	73			H=4.5+
		8	4/5/50-5"R		100			LL=68 H=3.5-4.0
	15	9	12/32/40	102	53			H=4.5+
843.9		10	50-3"R		33		Gray fine to coarse gravel (limestone fragments), estimated medium to hard gray limestone interbedded with soft to medium-hard gray shale.	
		11	50-3"R		100			
		12	50-2"R		50			
839.5	20	13	50-6"R		100		Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures.	
		14	RQD 17%		100			
		15	RQD 8%		47		52% LIMESTONE, 48% SHALE	
	25							

NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (scale 10, 20, 30, 40)

WATER LEVEL:	▽ 10.1'	▼ 7.5'
WATER NOTE:	Prior to Coring	After Coring
DATE:	4/19/10	4/20/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. (See Separate Curves)
H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

DATE: 4/19/10 - 4/20/10

LOG OF BORING NO. MW-21
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N -485.9; E 20013.1** ELEVATION: **859.4**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **41.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	25							Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures. 52% LIMESTONE, 48% SHALE		
		16		RQD 48%		100				
	30									
		17		RQD 48%		97				
	35									
		18		RQD 8%		99				
	40									
818.2										
								- Encountered seepage at 17.0'. - Encountered water at 26.0' during coring. - Encountered auger refusal at 19.9'. - Boring converted to groundwater monitoring well-see separate well log MW-21 for well completion diagram. - Boring location and elevation surveyed by ALS, Inc.		
	45									
	50									

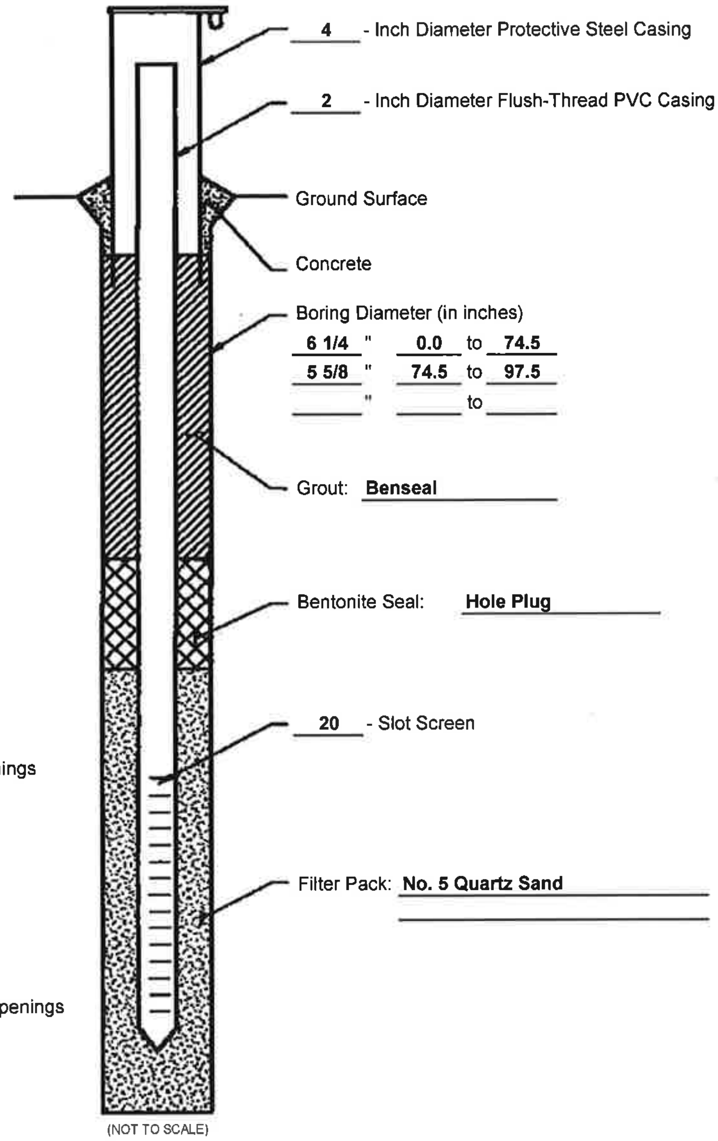
WATER LEVEL:	▽ 10.1'	▼ 7.5'
WATER NOTE:	Prior to Coring	After Coring
DATE:	4/19/10	4/20/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
862.66	3.30	Top of Cover
862.20	2.84	Top of PVC
859.4	0.0	Ground Surface
N/A	0.0	Top of Grout
836.4	23.0	Top of Bentonite
834.4	25.0	Top of Filter Pack
#VALUE!	?	Top of Aquifer
831.9	27.5	Top of Screen Openings
822.3	37.1	Bottom of Screen Openings
821.9	37.5	Bottom of Well
N/A	N/A	Bottom of Aquifer
818.2	41.2	Bottom of Boring



Static Water Elevation:	851.90	848.80	851.90		
Date:	5/5/10	5/5/10	7/1/10		

Well Development:

- Well surged prior to hand bailing
- 5/5 Hand bailed 5 gallons of water (approx. 10 well volumes)
  (0-3 gallons - clear; 3-5 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
1st reading after surging, 2nd reading after bailing

Well Location:
Plant Coordinates: N. -485.88; E. 20,013.12

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-21

Date Well Installed:
5/4/2010

DATE: 4/21/10 - 4/28/10

LOG OF BORING NO. MW-22
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: As Staked   COORDINATES : N -99.7; E 19123.4   ELEVATION: 864.4

DRILLING METHOD: 3-1/4" I.D. Hollow-stem Auger   COMPLETION DEPTH: 37.5'

SAMPLER(S): 2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	N60	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0						TOPSOIL - 13 INCHES	
863.3						CH	Stiff to very-stiff brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, few roots near bottom of stratum, damp.	
		1	3/4/2	9	47			H=1.0
		2	3/3/4	10	53			LL=65 H=2.25-2.5
860.4						CL	Very-stiff to hard brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, damp,	G
	5	3	1/2/3	7	67			H=2.0
		4	3/5/9	20	73			H=3.0
		5	4/6/14	28	100			H=3.0-3.25
	10	6	P					
853.4						CL	Hard brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, numerous cobbles, damp.	
		8	14/26/50-5"R		100			H=4.5+
		9	31/35/50-3"R		80			H=4.5+
		10	50-2"R		100			
	15	11	32/50-4"R		20			
847.4						CL	Hard gray silty clay, some fine to coarse sand, trace fine gravel, numerous cobbles, damp.	
		12	15/50-5"R		36			
		13	19/43/50-2"R		79			
	20	▽14	34/50-3"R		67			
843.1							Soft gray shale interbedded with hard gray limestone. 57% SHALE, 43% LIMESTONE	
		15	RQD 0%					
		16						
	25							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT (scale 10, 20, 30, 40)

WATER LEVEL:	▽ 20.5	▼ 0.5'
WATER NOTE:	Inside HSA	Prior to Coring
DATE:	4/21/10	4/26/10

SYMBOLS USED TO INDICATE TEST RESULTS: G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. (See Separate Curves); H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

DATE: 4/21/10 - 4/28/10

LOG OF BORING NO. MW-22
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N -99.7; E 19123.4** ELEVATION: **864.4**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **37.5'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	25	17						Soft gray shale interbedded with hard gray limestone. 57% SHALE, 43% LIMESTONE		
837.1		18		RQD 0%				Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures. 56% LIMESTONE, 44% SHALE		
	30	19		RQD 37%						
	35	20		RQD 32%						
826.9								- Encountered seepage at 4.0' and 19.0'. - Encountered cobbles at 11.0'. - Encountered water at 13.7'. - Boring converted to groundwater monitoring well-see separate well log MW-22 for well completion diagram. - Boring location and elevation surveyed by ALS, Inc.		
	40									
	45									
	50									

WATER LEVEL:	∇ 20.5	▼ 0.5'
WATER NOTE:	Inside HSA	Prior to Coring
DATE:	4/21/10	4/26/10

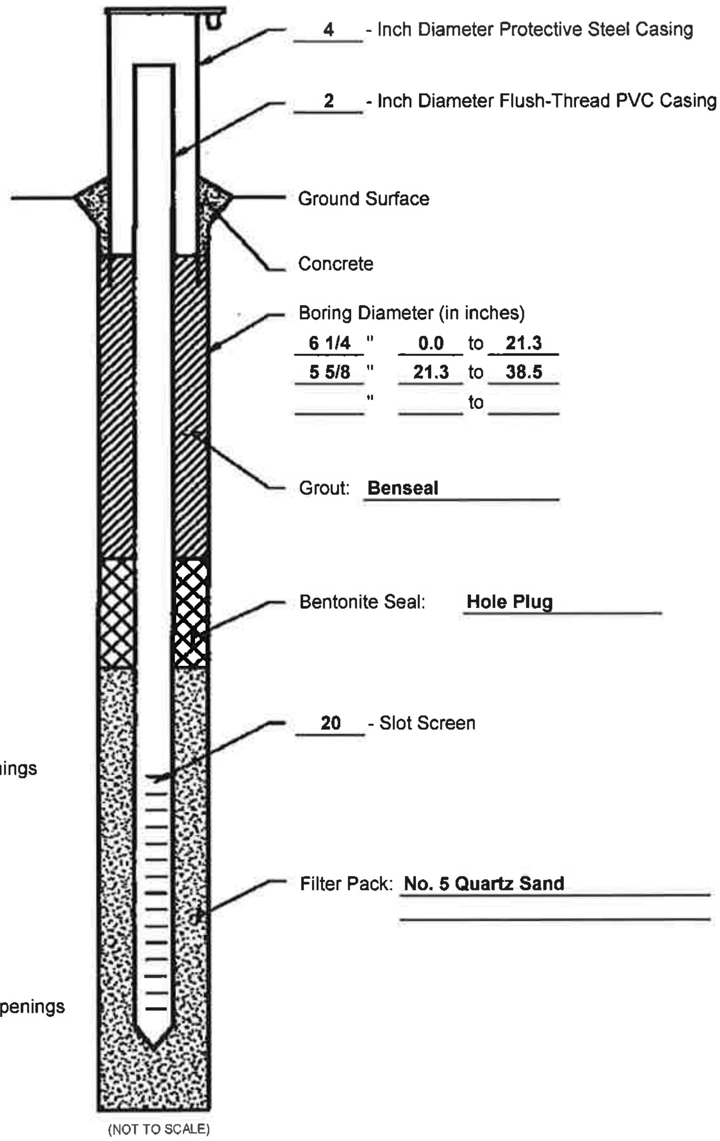
SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
867.33	2.89	Top of Cover
867.11	2.67	Top of PVC
864.4	0.0	Ground Surface
N/A	0.0	Top of Grout
838.4	26.0	Top of Bentonite
836.5	27.9	Top of Filter Pack
#VALUE!	?	Top of Aquifer
836.5	27.9	Top of Screen Openings
826.8	37.6	Bottom of Screen Openings
826.4	38.0	Bottom of Well
N/A	N/A	Bottom of Aquifer
825.9	38.5	Bottom of Boring



Static Water Elevation:	854.11	845.61	849.31	849.61	
Date:	4/28/10	4/29/10	4/30/10	7/1/10	

Well Development:

- Well surged prior to hand bailing
- 4/15 Hand bailed 7 gallons of water (approx. 10 well volumes
  (0-2 gallons - clear; 2-7 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
1st reading after surging, 2nd reading after bailing

Well Location:
Plant Coordinates: N. -99.68; E. 19,123.36

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-22

Date Well Installed:
4/28/2010

DATE: 2/8/10 - 2/9/10

LOG OF BORING NO. MW-24
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N 1764.1; E 17056.9** ELEVATION: **850.9**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **34.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0					CH	FILL: Hard brown mottled with dark-brown silty clay, little fine to coarse sand, trace fient o coarse gravel, damp.	
		1	2/10/10	28				H=3.75-4.5+
848.4						CH	Very-stiff to hard brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, contains silt seams near top of stratum, few lenses of silt near 6.0', damp.	
		2	5/6/8	20				H=3.5-3.75
	5	3	3/6/12	26				H=3.5-4.5+
		4	7/8/10	26				H=4.0-4.5
		5	3/5/7	17				H=4.5+
		6	3/4/14	26				LL=55 H=3.5-4.5+
840.9	10	7	3/50-0"R			CH	Hard brown silty clay, trace fine sand.	H=4.0-4.5+
840.4							Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many diagonal and horizontal fractures, few fossils (limestone 53%; Shale 47%).	
		8	RQD 0%		64			
	15	9	RQD 0%		55			
	20	10	RQD 15%		80			
	25							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT (●), PLASTIC LIMIT (×), LIQUID LIMIT (×); scale 10, 20, 30, 40.

WATER LEVEL: "Dry"
WATER NOTE: Prior to Coring
DATE: 2/9/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

DATE: 2/8/10 - 2/9/10

LOG OF BORING NO. MW-24
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES: **N 1764.1; E 17056.9** ELEVATION: **850.9**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **34.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	25	11		RQD 0%		100		Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many diagonal and horizontal fractures, few fossils (limestone 53%; Shale 47%).		
	30	12		RQD 29%		95				
816.8										
	35							- Encountered seepage at 3.0'. - Encountered water at 17.6'. - Packer testing performed in rock stratum. - Boring converted to groundwater monitoring well-see separate well log MW-24 for well completion diagram. - Boring location and elevation surveyed by ALS, Inc.		
	40									
	45									
	50									

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

WATER LEVEL: ∇ "Dry" ▼

WATER NOTE: Prior to Coring

DATE: 2/9/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

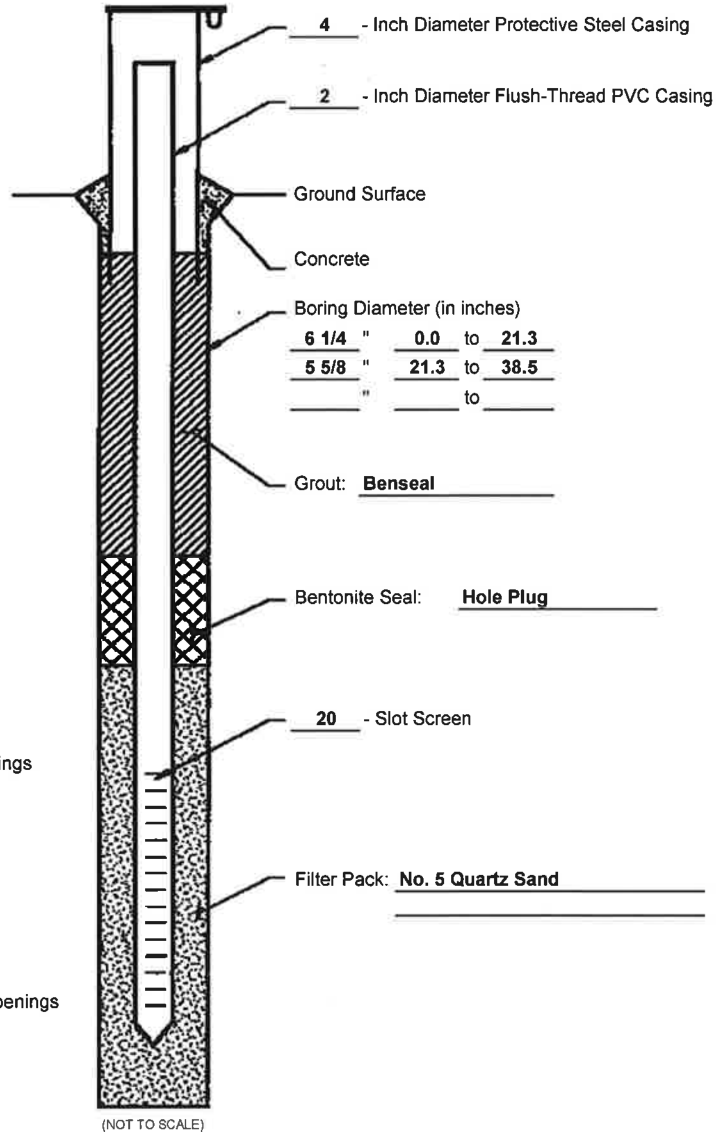
Drill Rod Energy Ratio: 0.85

Last Calibration Date: 02/17/09

Drill Rig Number: ATV 550X

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
852.71	1.79	Top of Cover
852.59	1.67	Top of PVC
850.9	0.0	Ground Surface
N/A	0.0	Top of Grout
829.9	21.0	Top of Bentonite
827.9	23.0	Top of Filter Pack
#VALUE!	?	Top of Aquifer
825.9	25.0	Top of Screen Openings
816.3	34.6	Bottom of Screen Openings
815.9	35.0	Bottom of Well
N/A	N/A	Bottom of Aquifer
815.9	35.0	Bottom of Boring



Static Water Elevation:	827.19	828.99	820.89	830.99	830.99	830.99
Date:	4/14/10	4/15/10	4/15/10	4/22/10	4/30/10	7/1/10

Well Development:

- Well surged prior to hand bailing
- 4/15 Hand bailed 7 gallons of water (approx. 10 well volumes
  (0-2 gallons - clear; 2-7 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
Packer testing performed prior to well installation.
1st reading prior to packer test, 2nd reading after surging,
3rd reading after bailing.

Well Location:
Plant Coordinates: N. 1,764.12; E. 17,056.91

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-24

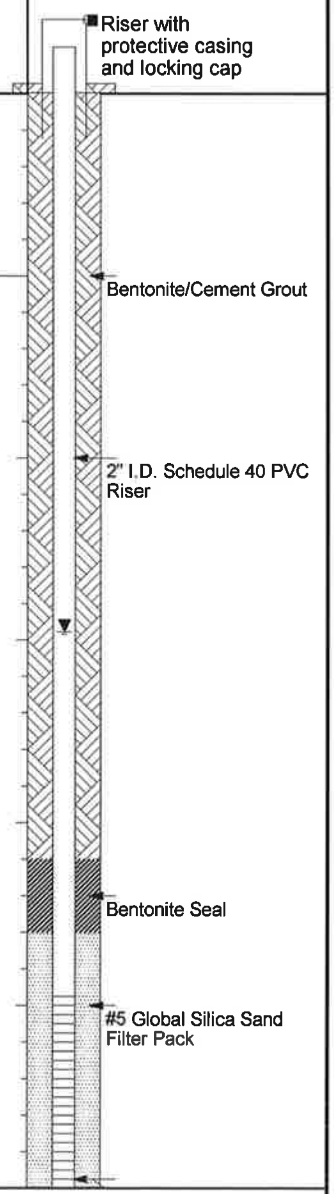
Date Well Installed:
4/14/2010

Project: Dynegy	**Monitoring Well**
Project Location: Zimmer Station	**MW-D**
Project Number: 60442412	Sheet 1 of 2

Date(s) Drilled	12/14/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	35.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	849.59 feet, msl
Depth to Groundwater	14.77 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	852.34 feet, msl
Diameter of Hole (inches)	6.0 / Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Orangish brown clayey laminated SILT with trace angular shale fragments and trace gray laminar and black mottling, medium stiff, slightly moist
845	5		100		Dark gray fossiliferous crystaline LIMESTONE with alternating layers of bluish gray SHALE
840	10		100		
					grades to light gray micritic limestone with alternating layers of gray shale
			86		
835	15				
					grades to gray fossiliferous crystaline limestone with alternating layers of bluish gray shale
830	20		100		
825	25		100		
820	30				

WELL CONSTRUCTION DETAILS



Project: Dynegy	Monitoring Well
Project Location: Zimmer Station	MW-D
Project Number: 60442412	Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		100			2" I.D. Schedule 40 0.010" Slotted Screen
815	35				End of boring at 35' bgs	End Cap
810	40					
805	45					
800	50					
795	55					
790	60					
785	65					
780	70					

DYNEGY ZIMMER ZIMMER STATION CCR WELLS.GPJ 3/3/16

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number: 2057043

Page 1 of 1 for this record.

WELL LOCATION

County: CLERMONT   Township: WASHINGTON

Owner/Builder: DYNEGY - ZIMMER

Address of Well Location: 1781 SR 52

City: MOSCOW   Zip Code +4: 45153

Permit No. ____ Section; ____ and/or Lot No. ____

Use of Well: MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N [x] X 318015 +/- 4593 ft.

S [ ] Y 1494268 +/- 5285 ft.

Latitude, Longitude Coordinates

Latitude: 0   Longitude: 0

Elevation of Well in feet: 852.3 +/- ____ ft.

Datum Plane: [ ] NAD27 [x] NAD83   Elevation Source: TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-D

Comments on water quality/quantity and well construction:

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1. Borehole Diameter 6 inches   Depth 35 ft.
   Casing Diameter 2 in.   Length 25 ft.   Thickness 0.154 in.
2. Borehole Diameter ____ inches   Depth ____ ft.
   Casing Diameter ____ in.   Length ____ ft.   Thickness ____ in.

Casing Height Above Ground 2.5 ft.

Type: 1: PVC 2:

Joints: 1: Threaded 2:

SCREEN

Diameter 2 in.   Slot Size 0.01 in.   Screen Length 10 ft.

Type PREPACKED SLOTTED   Material PVC

Set Between 35 ft. and 25 ft.

GRAVEL PACK (Filter Pack)

Material/Size: #5 Silica Sand   Vol/Wt. Used: 250 lbs.

Method of Installation: Poured (gravity)

Depth: Placed From: 35 ft. To: 23 ft.

GROUT

Material: Bentonite/cement slurry   Vol/Wt. Used: 4.5 cubic feet

Method of Installation: Pumped w/Tremie pipe

Depth: Placed From: 21 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	CLAYEY	SILT	0	5
DARK GRAY		LIMESTONE AND SHALE	5	35

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/14/2015   Total Depth of Well 35 ft.

WELL TEST *

Pre-Pumping Static Level 14 ft.   Date 12/14/2015

Measured from TOP OF CASING

Pumping test method ____

Test Rate ____ gpm   Duration of Test ____ hrs.

Feet of Drawdown ____ ft.   Sustainable Yield ____ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? [ ] Yes [x] No   Flowing Well? [ ] Yes [x] No

PUMP/PITLESS

Type of pump ____   Capacity ____ gpm

Pump set at ____ ft.   Pitless Type ____

Pump installed by ____

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm: FRONTZ DRILLING, INC.

Address: 2031 RD MILLERSBURG

City, State, Zip: WOOSTER OH 44691

Signed: STEVE FRONTZ (Filed Electronically)   Date: 5/13/2016

ODH Registration Number: 0120

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

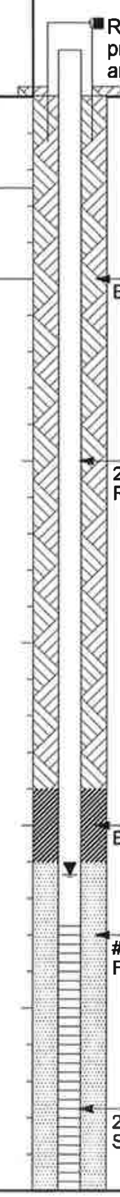
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-E

Date(s) Drilled	12/17/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	33.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	860.51 feet, msl
Depth to Groundwater	21.35 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	863.42 feet, msl
Diameter of Hole (inches)	6.0 / Diameter of Well (inches): 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
860	0		100		Golden brown silty CLAY with trace sand and black mottling, medium stiff to soft, moist
					Bluish gray laiminated weathered SHALE, oxidation staining, brittle, soft
855	5		100		Gray fossiliferous crystaline LIMESTONE, with alternating layers of bluish gray SHALE
850	10		100		
845	15				grades wet, shale becomes soft
			100		
840	20		100		
					grades more competent
835	25		100		
	30				

WELL CONSTRUCTION DETAILS



Project: Dynegy Project Location: Zimmer Station Project Number: 60442412	Monitoring Well MW-E Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
830	30		100			
					End of boring at 33' bgs	End Cap
825	35					
820	40					
815	45					
810	50					
805	55					
800	60					
795	65					
	70					

WELL LOG AND DRILLING REPORT

DNR 7802.05e

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number: 2057045

Page 1 of 1 for this record.

WELL LOCATION

County: CLERMONT   Township: WASHINGTON

Owner/Builder: DYNEGY - ZIMMER

Address of Well Location: 1781 SR 52

City: MOSCOW   Zip Code +4: 45153

Permit No. ____ Section; ____ and or Lot No. ____

Use of Well: MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N [x] X 316677 +/- 2666 ft.

S [ ] Y 1495460 +/- 6258 ft.

Latitude, Longitude Coordinates

Latitude: 0   Longitude: 0

Elevation of Well in feet: 863.4 +/- ____ ft.

Datum Plane: [ ] NAD27 [x] NAD83   Elevation Source: TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-E

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 21 ft.   Date 12/17/2015

Measured from TOP OF CASING

Pumping test method ____

Test Rate ____ gpm   Duration of Test ____ hrs.

Feet of Drawdown ____ ft.   Sustainable Yield ____ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? [ ] Yes [x] No   Flowing Well? [ ] Yes [x] No

PUMP/PITLESS

Type of pump ____ Capacity ____ gpm

Pump set at ____ ft.   Pitless Type ____

Pump installed by ____

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm: FRONTZ DRILLING, INC.

Address: 2031 RD MILLERSBURG

City, State, Zip: WOOSTER OH 44691

Signed: STEVE FRONTZ (Filed Electronically)   Date: 5/13/2016

ODH Registration Number: 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1. Borehole Diameter 6 inches   Depth 33 ft.
   Casing Diameter 2 in.   Length 23 ft.   Thickness 0.154 in.
2. Borehole Diameter ____ inches   Depth ____ ft.
   Casing Diameter ____ in.   Length ____ ft.   Thickness ____ in.

Casing Height Above Ground 2.5 ft.

Type: 1: PVC 2: ____

Joints: 1: Threaded 2: ____

SCREEN

Diameter 2 in.   Slot Size 0.01 in.   Screen Length 10 ft.

Type PREPACKED SLOTTED   Material PVC

Set Between 33 ft. and 23 ft.

GRAVEL PACK (Filter Pack)

Material/Size: #5 Silica Sand   Vol/Wt. Used: 215 lbs.

Method of Installation: Poured (gravity)

Depth: Placed From: 33 ft. To: 21 ft.

GROUT

Material: Bentonite/cement slurry   Vol/Wt. Used: 4.5 cubic feet

Method of Installation: Poured (gravity)

Depth: Placed From: 19 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	SILTY	CLAY	0	3
BLUE	BROKEN	SHALE	3	5
GRAY		LIMESTONE AND SHALE	5	33

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/17/2015   Total Depth of Well 33 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

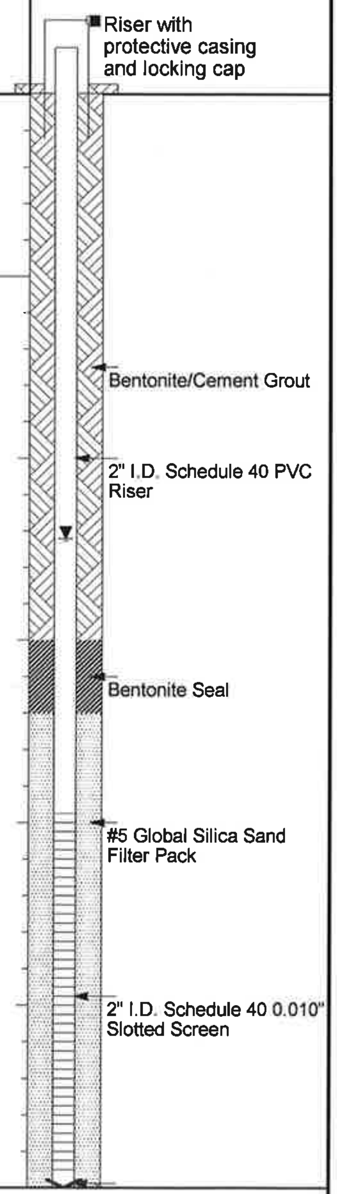
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-F

Date(s) Drilled	12/16/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	30.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	881.23 feet, msl
Depth to Groundwater	12.21 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	884.02 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		60		Brown SILT with clay and trace fine angular gravel, hard, dry
880					
	5		100		Gray micritic LIMESTONE with alternating layers of orangish brown heavily weathered SHALE, oxidation staining, soft to medium dense, trace gray lamina
875					
	10		100		grades brown to gray with alternating layers of fossiliferous crystaline limestone
870			100		
	15				
865					grades bluish gray shale with alternating layers of limestone
			73		
	20				
860					
			91		
	25				
855					
	30				

WELL CONSTRUCTION DETAILS



DYNEGY ZIMMER STATION CCR WELLS.GPJ 3/3/16

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-F

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				End of boring at 30' bgs	End Cap
850						
	35					
845						
	40					
840						
	45					
835						
	50					
830						
	55					
825						
	60					
820						
	65					
815						
	70					

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number 2057046

Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

DYNEGY - ZIMMER
Owner/Builder

1781 SR 52
Address of Well Location

City MOSCOW Zip Code +4 45153

Permit No. Section; and/or Lot No.

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N [x] X 315312 +/- 3562 ft.

S [ ] Y 1495431 +/- 7322 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 884 +/- ft.

Datum Plane: [ ] NAD27 [x] NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-F

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 12 ft. Date 12/16/2015

Measured from TOP OF CASING

Pumping test method

Test Rate gpm Duration of Test hrs.

Feet of Drawdown ft. Sustainable Yield gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? [ ] Yes [x] No Flowing Well? [ ] Yes [x] No

PUMP/PITLESS

Type of pump Capacity gpm

Pump set at ft. Pitless Type

Pump installed by

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016
(Filed Electronically)

ODH Registration Number 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 30 ft.
Casing Diameter 2 in. Length 15 ft. Thickness 0.154 in.

2 Borehole Diameter inches Depth ft.
Casing Diameter in. Length ft. Thickness in.

Casing Height Above Ground 2.5 ft.

Type 1: PVC
2:

Joints 1: Threaded
2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 30 ft. and 20 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 210 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 30 ft. To: 17 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 4.5 cubic feet

Method of Installation Pumped w/Tremie pipe

Depth: Placed From: 15 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	SILTY	CLAY	0	5
GRAY	BROKEN	LIMESTONE AND SHALE	5	30

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/16/2015 Total Depth of Well 30 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

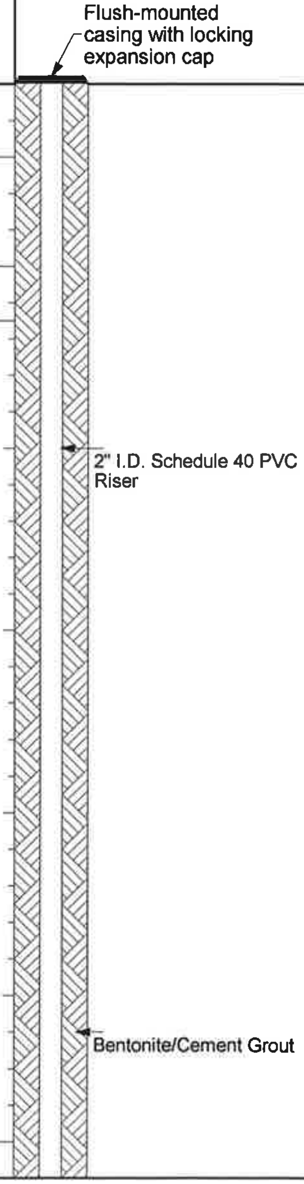
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-G

Date(s) Drilled	11/18/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	69.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	821.84 feet, msl
Depth to Groundwater	33.91 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	821.4 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION
	0		56	Dark brown silty fine to coarse SAND with trace fine gravel, roots, loose, dry to slightly moist
820				Light brown to gray sandy fine to coarse angular limestone GRAVEL, with fines, dense to medium dense, dry [FILL]
	5		80	Brownish yellow high plasticity CLAY with trace fine subrounded gravel and gray and black motting, medium stiff, slightly moist [FILL]
815				Bluish gray silty non-plastic CLAY with trace fine subrounded gravel and brownish yellow mottling, medium stiff to stiff, slightly moist [FILL]
				grades sandy, with fine sand
	10		100	
810				grades gravelly, with fine to coarse angular to subrounded gravel and trace cobbles
				grades with less gravel, with trace brownish yellow and black mottling, hard, dry
	15			clayey fine to coarse angular 4" gravel layer
805				black medium to coarse 2" sand layer grades yellowish brown [NATIVE]
	20		100	grades with gray and black mottling, laminated, with horizontally oriented gravel
800				
	25			grades with trace fine gravel
795				trace wood fragments
			100	Gray SILT, with trace angular to subrounded fine gravel, heavy oxidation
	30			

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-G

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				staining, hard, dry	
790					grades with oxidation banding	
					grades with trace oxidation banding grades without oxidation	
	35					
785					grades moist	
			100		grades blue, clayey, hard, dry	
	40					
780						
	45					Bentonite/Cement Grout
775						
			100			
	50					
770					grades with oxidation stainging	
						Bentonite Seal
	55				Gray alternating layers of SHALE and fossiliferous, crystaline LIMESTONE	
765						
			100			
	60					
760						#5 Global Silica Sand Filter Pack
						2" I.D. Schedule 40 0.010" Slotted Screen
	65					
755						
					End of boring at 69' bgs	End Cap
	70					

WELL LOG AND DRILLING REPORT

DNR 7802.05e

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number: 2057047

Page 1 of 1 for this record.

WELL LOCATION

County: CLERMONT Township: WASHINGTON

Owner/Builder: DYNEGY - ZIMMER

Address of Well Location: 1781 SR 52

City: MOSCOW Zip Code +4: 45153

Permit No. ____ Section; ____ and or Lot No. ____

Use of Well: MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N [x] X 316282 +/- 484 ft.

S [ ] Y 1492978 +/- 7138 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 821.4 +/- ____ ft.

Datum Plane: [ ] NAD27 [x] NAD83 Elevation Source: TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-G

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 33 ft. Date 11/18/2015

Measured from: TOP OF CASING

Pumping test method ____

Test Rate ____ gpm Duration of Test ____ hrs.

Feet of Drawdown ____ ft. Sustainable Yield ____ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? [ ] Yes [x] No Flowing Well? [ ] Yes [x] No

PUMP/PITLESS

Type of pump ____ Capacity ____ gpm

Pump set at ____ ft. Pitless Type ____

Pump installed by ____

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm: FRONTZ DRILLING, INC.

Address: 2031 RD MILLERSBURG

City, State, Zip: WOOSTER OH 44691

Signed: STEVE FRONTZ (Filed Electronically) Date: 5/13/2016

ODH Registration Number: 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 69 ft.
Casing Diameter 2 in. Length 53 ft. Thickness 0.154 in.

2 Borehole Diameter ____ inches Depth ____ ft.
Casing Diameter ____ in. Length ____ ft. Thickness ____ in.

Casing Height Above Ground: 1 ft.

Type 1: PVC
Type 2:

Joints 1: Threaded
Joints 2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type: PREPACKED SLOTTED Material: PVC

Set Between 69 ft. and 59 ft.

GRAVEL PACK (Filter Pack)

Material/Size: #5 Silica Sand Vol/Wt. Used: 350 lbs.

Method of Installation: Poured (gravity)

Depth: Placed From: 69 ft. To: 54 ft.

GROUT

Material: Bentonite/cement slurry Vol/Wt. Used: 9.5 cubic feet

Method of Installation: Pumped w/Tremie pipe

Depth: Placed From: 53 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
DARK BROWN	SILTY	SAND	0	2
BROWN-GRAY	SANDY	GRAVEL	2	5
GRAY-BROWN		SANDCLAYGRAVEL	5	29
GRAY		SILT	29	54
GRAY		SHALE AND LIMESTONE	54	69

Aquifer Type (Formation producing the most water.): SAND/CLAY/GRAVEL

Date of Well Completion: 11/18/2015 Total Depth of Well: 69 ft.

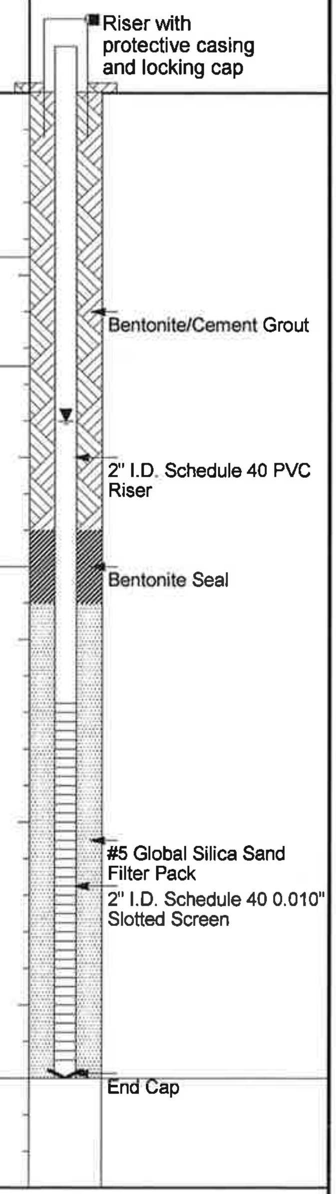
Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Project: Dynegy	Monitoring Well MW-H
Project Location: Zimmer Station	
Project Number: 60442412	Sheet 1 of 1

Date(s) Drilled	11/19/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	27.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	808.80 feet, msl
Depth to Groundwater	9.01 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	811.13 feet, msl
Diameter of Hole (inches) 6.0	Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown clayey SILT with fine to coarse sand and trace fine angular gravel, trace roots, soft to medium stiff, slightly moist grades without roots grades with less clay limestone cobble grades yellowish brown, clayey with black mottling, medium stiff to stiff
805					
	5		100		Yellowish brown silty CLAY with fine to coarse, angular gravel, black mottling, medium stiff to stiff, slightly moist grades sandy
800					Yellowish brown SILT with clay, trace fine gravel, with light gray lamina, soft to very soft, moist
	10		100		grades with coarse angular gravel and limestone cobbles
795					Dark gray crystaline LIMESTONE with alternating layers of soft, weathered, blue and brown laminated SHALE, heavey oxidation staining, wet
	15		100		
790			100		
	20				grades to gray fossiliferous crystaline limestone with shale
785			100		grades more competent, brittle
	25				
					End of boring at 27' bgs
780					
	30				

WELL CONSTRUCTION DETAILS



DYNEGY ZIMMER ZIMMER STATION CCR WELLS.GPJ 3/3/16

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number: 2057048

Page 1 of 1 for this record.

WELL LOCATION

County: CLERMONT   Township: WASHINGTON

Owner/Builder: DYNEGY - ZIMMER

Address of Well Location: 1781 SR 52

City: MOSCOW   Zip Code +4: 45153

Permit No. ______ Section; ______ and or Lot No. ______

Use of Well: MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N [x] X 315757 +/- 4048 ft.

S [ ] Y 1492534 +/- 264 ft.

Latitude, Longitude Coordinates

Latitude: 0   Longitude: 0

Elevation of Well in feet: 811.1 +/- ______ ft.

Datum Plane: [ ] NAD27 [x] NAD83   Elevation Source: TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-H

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 9 ft.   Date 11/19/2015

Measured from: TOP OF CASING

Pumping test method ______

Test Rate ______ gpm   Duration of Test ______ hrs.

Feet of Drawdown ______ ft.   Sustainable Yield ______ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? [ ] Yes [x] No   Flowing Well? [ ] Yes [x] No

PUMP/PITLESS

Type of pump ______ Capacity ______ gpm

Pump set at ______ ft.   Pitless Type ______

Pump installed by ______

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm: FRONTZ DRILLING, INC.

Address: 2031 RD MILLERSBURG

City, State, Zip: WOOSTER OH 44691

Signed: STEVE FRONTZ (Filed Electronically)   Date: 5/13/2016

ODH Registration Number: 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1. Borehole Diameter 6 inches   Depth 27 ft.
   Casing Diameter 2 in.   Length 12 ft.   Thickness 0.154 in.
2. Borehole Diameter ______ inches   Depth ______ ft.
   Casing Diameter ______ in.   Length ______ ft.   Thickness ______ in.

Casing Height Above Ground: 1 ft.

Type: 1: PVC 2: ______

Joints: 1: Threaded 2: ______

SCREEN

Diameter 2 in.   Slot Size 0.01 in.   Screen Length 10 ft.

Type: PREPACKED SLOTTED   Material: PVC

Set Between 27 ft. and 17 ft.

GRAVEL PACK (Filter Pack)

Material/Size: #5 Silica Sand   Vol/Wt. Used: 210 lbs.

Method of Installation: Poured (gravity)

Depth: Placed From: 27 ft. To: 14 ft.

GROUT

Material: Bentonite/cement slurry   Vol/Wt. Used: 4.5 cubic feet

Method of Installation: Pumped w/Tremie pipe

Depth: Placed From: 13 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	CLAYEY	SILT	0	4
BROWN	SILTY	CLAY	4	13
DARK GRAY		LIMESTONE AND SHALE	13	27

Aquifer Type (Formation producing the most water.): CLAY

Date of Well Completion: 11/19/2015   Total Depth of Well: 27 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Attachment B

Well Wizard Sampling Pumps, Equipment Specifications

PLEASE GIVE THIS INFORMATION PACKET TO THE PERSON(S) COMPLETING THE INSTALLATION

The Information provided within this packet is designed to assist in the installation of **WELL WIZARD®** Pump equipment.

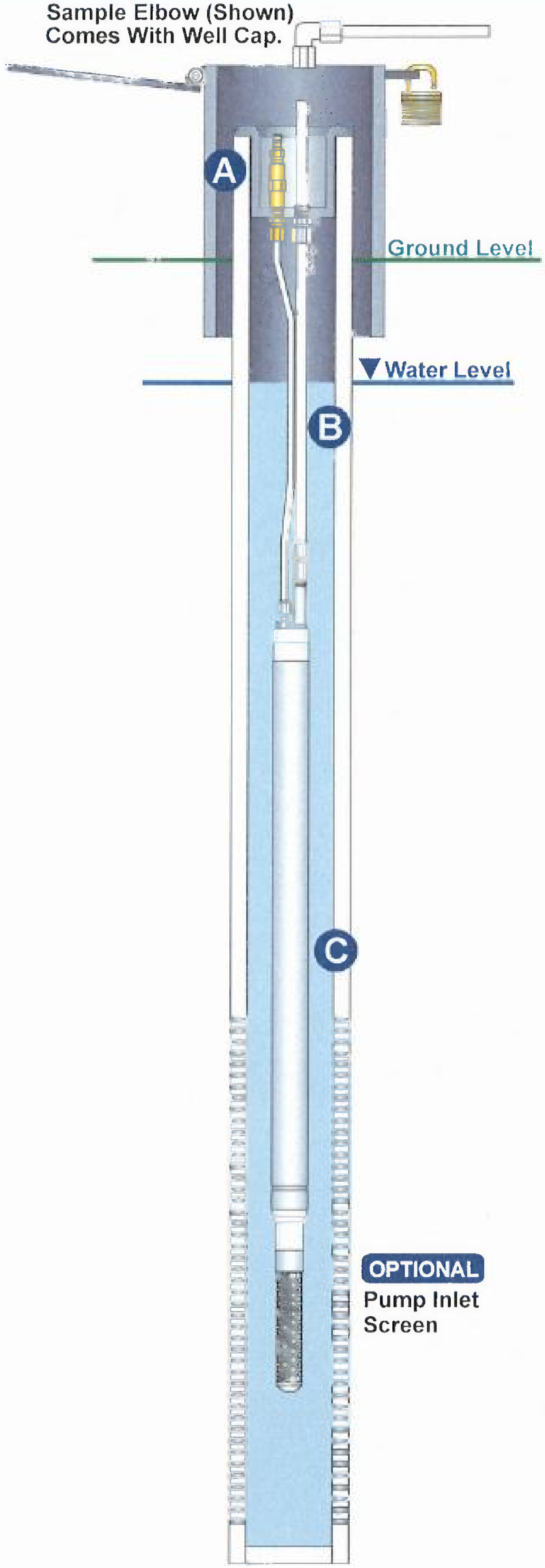
This information has been produced specifically for the site at which this equipment is to be installed.

Every effort is made at the factory to include all of the down-well components for a single pump assembly or system in one package. On the outside of these packages, the well ID's and components are clearly labeled. However, there are times when components are too large to be included with the complete system. When this occurs, they are inside another package and that package is clearly marked with the item number and well ID.

When heading out to the well, please make sure to take along all of the components for that specific well. Include any tools or other supplies that will make installation easier.

QED Environmental Systems
Phone: 1-800-624-2026
After Hours Phone: 1-800-272-9559

SYSTEM "A" Bladder Pump Only



System Components Checklist:

- **A** Well Cap
- **B** Pump Tubing
- **C** Pump

Options: Pump Inlet Screen

System Components Instructions:

1. Attach pump inlet screen to pump inlet (if applicable).
2. Attach bladder pump tubing to pump.
3. Lower pump to desired depth.
4. Pass discharge tube through cap and attach air line under cap.

Table of Contents

Introducing Well Wizard

WELL WIZARD®

Contacting QED

Please call our Customer Service Department at one of the following numbers for assistance

- **Monday through Friday, 8:30 a.m. to 5:00 p.m. EST:** (734) 995-2547
- **After Hours and weekends:** 1-800-272-9559 (or 1-734-746-8045 if you are outside the U.S.)

Introduction

To monitor the quality of ground water, you need an efficient way to collect unbiased samples. Well Wizard® is a total system for meeting all your ground water monitoring needs - with the flexibility to meet your special requirements. This section describes the components of the Well Wizard System.

The Well Wizard system includes both dedicated and portable components. The water contacting components are dedicated; you permanently install them in each well. The control elements are portable; you transport them from well to well.

BASIC DEDICATED COMPONENTS

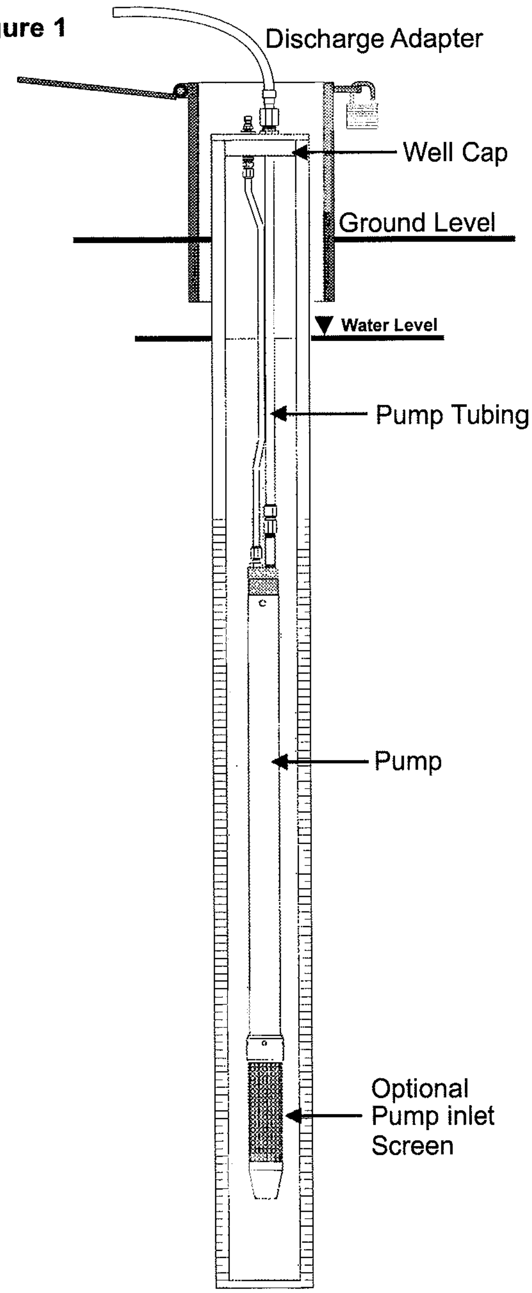
- A sampling pump
- Pump Tubing
- An optional inlet screen
- A well cap
- Discharge Adapter
- Freeze Protection

The following sections describe these components.

Sampling Pump

A Well Wizard® sampling pump is an air-actuated bladder pump that you permanently position in the well.

Figure 1



Sampling Pump

As figure 1 shows, you normally position the pump inlet midway in the screened section of the well, suspending it by two tubes that supply air to the pump and convey the water sample to the well cap. Whenever possible, pumps are shipped already preassembled to the tubing and the well cap assembly.

Several types of Well Wizard® bladder pumps are available.

1100 Series Pumps

The 1100 series pumps include 4 major components:

- Upper-end check valve assembly (polyvinyl chloride (PVC or Teflon®)
- Lower-end check valve assembly (PVC or Teflon)
- Bladder Cartridge (Teflon)
- Pump Body (PVC or Teflon)

You can totally disassemble the pump without tools by unscrewing each end cap and pushing the bladder cartridge out of the pump body (for more information refer to the instructions included with the field-replaceable bladder kit).

1200 Series Pumps

The 1200 series pumps include 2 major components

- Bladder Cartridge assembly (either Teflon and stainless steel or PVC and stainless steel)
- Pump Body (Stainless Steel)

You can partially disassemble the pump (for more information refer to the instructions included with the field-replaceable bladder kit).

How Bladder Pump Works

The bladder pump has two alternating cycles (refer to figures 2 & 3).

Discharge Cycle

During the discharge cycle, air forced into the space between the pump body and the pump bladder squeezes the water inside the bladder into the exit/entrance holes of the fill rod. As air pressure increases, liquid-having no place else to go - is forced up the discharge line and to the surface. At the same time, the top check ball rises with the discharging liquid while the bottom check ball is forced down by the air pressure; this seals the pump inlet so that no water can enter the bladder chamber.

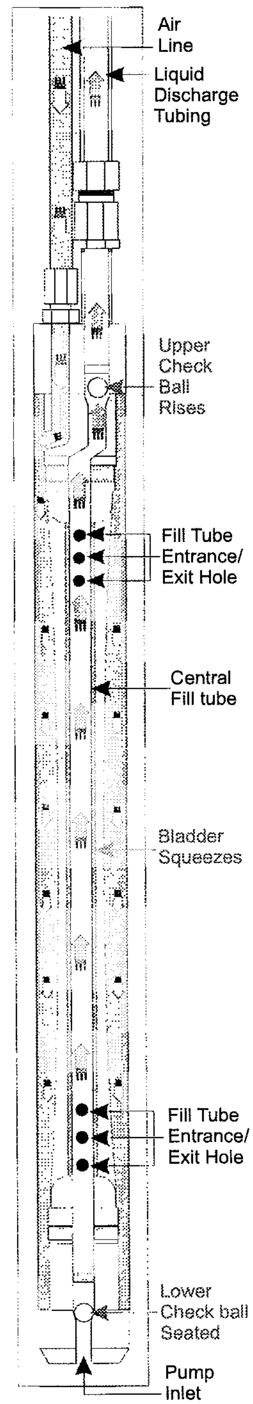


Figure 2

How Bladder Pump Works

Refill Cycle

During the refill cycle, with no air pressure holding it down, the water pressure pushes the bottom check ball up, allowing the water to reenter the bladder chamber. The bladder expands as it refills with water. Simultaneously, the top check ball is forced down and seals because of the force of the water pressure above it from the water in the discharge tubing, this prevents the water in the discharge tube from reentering the bladder chamber.

Caution: A Well Wizard® pump bladder can be punctured if you pump sand. So be sure to use an inlet screen in wells with high sand and sediment content, or when the inlet of the pump is placed within 2 feet of the bottom of the well. Remember, the Well Wizard 10-year warranty is void if you do not use an inlet screen.

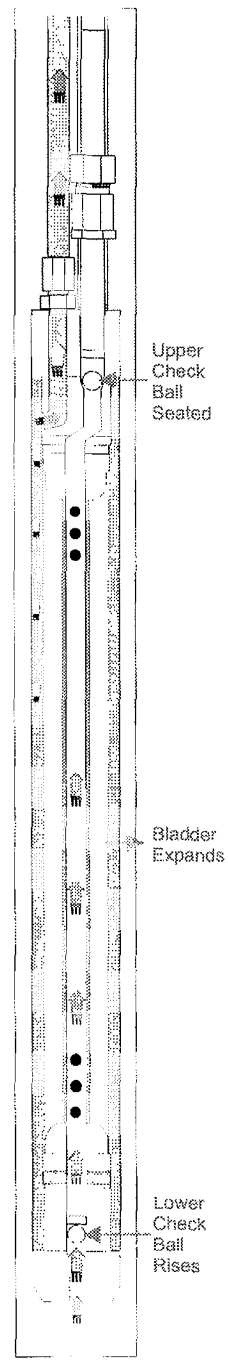


Figure 3

Pump Tubing/ Inlet Screen/ Well Cap

Pump Tubing

A ground water sample is only as good as the tubing it runs through. Your Well Wizard® was shipped with one of the following types of superior-quality tubing:

- Polyethylene
- Teflon® -lined polyethylene
- Teflon

Most tubing is supplied as a bonded pair (air supply and discharge), to save time and avoid tube entanglement.

Unless your order specified that you wanted *bulk* tubing, the tubing for your Well Wizard bladder pump is pre-cut to the correct length for your well.

Inlet Screen

An inlet screen can protect the bladder in your Well Wizard pump by preventing sand from contacting the bladder. If you install a screen on your dedicated Well Wizard bladder pump, QED warranties the pump for a full 10 years.

Well Cap

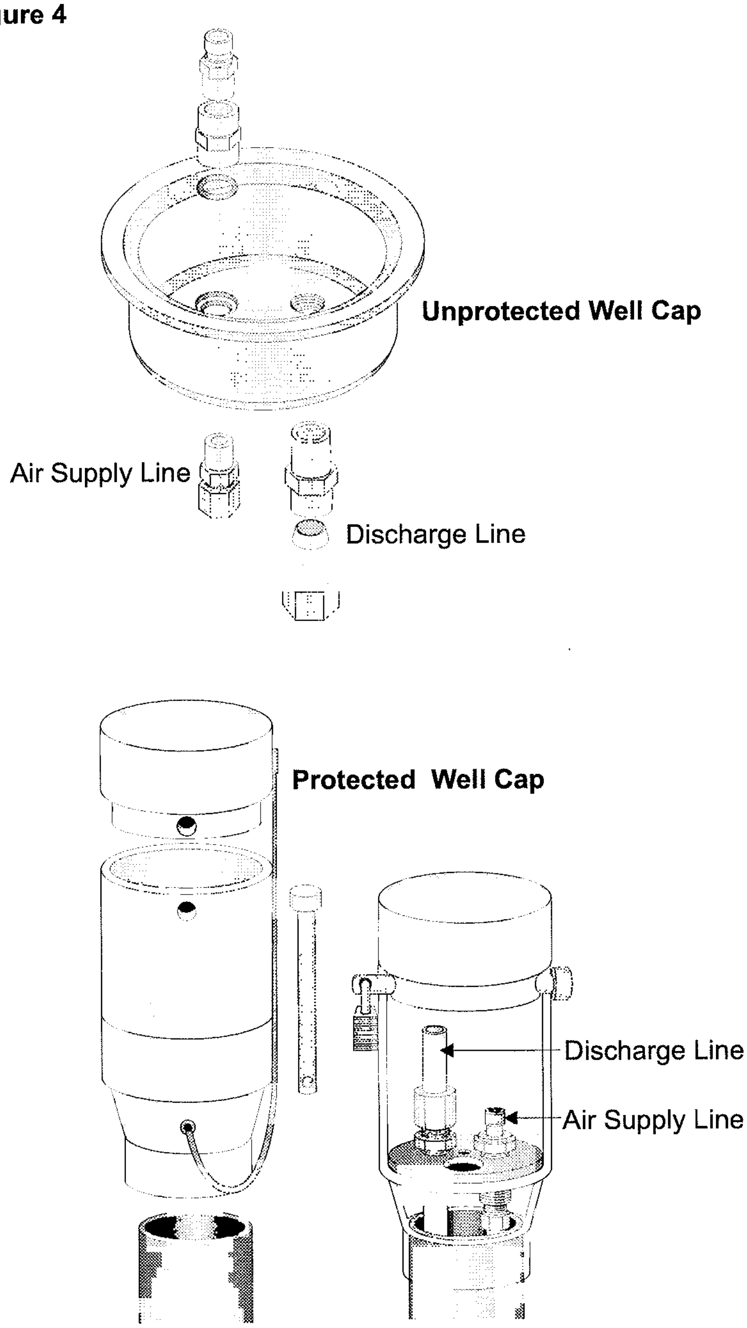
You fit a well cap to the top of the well casing to suspend the pump and tubing. There are two terminal fittings inside the basic well cap (see figure 4).

- A compression *through fitting* for the discharge line
- A short brass *quick-connect nipple* for the pump air-supply line

The *protected* well cap has a lid with a lock pin. You can record well identification and reference date information on the cap label. The *unprotected* well cap is meant for wells located within a user-supplied protected standpipe.

Well Cap (Figure 4)

Figure 4



Portable Components

Portable Well Wizard® components include a cycle controller, water-level meter, disposable sample filters, and a flow-through cell.

Controller

A controller controls operation of the Well Wizard pump by regulating the air flow from a compressed-gas source to the pump.When connected to an appropriate compressed-gas source, the controller alternately pressurizes then vents the air supply line to the pump, allowing the pump to discharge and then fill with water. For more information, please refer to the operation and installationmanuals for the individual controllers.

Water Level Meter

The model MP30 drawdown/water level meter can be connected to the QED cycle controllers to automatically control the drawdown during purging and sampling.

The series 6000 electronic water-level meters use a portable conductivity probe attached to a calibrated tape. There is a light and audio signal when the probe touches the water surface.

Flow Cell

The MP20 is QED's *optional* flow cell. The MP20 lets you know when it's okay to sample - generally saving you from spending a lot of time and from removing large volumes of purge water. The MP20 signals when stabilization has been achieved for selected water parameters.

QuickFilter®

To ensure accurate samples of dissolved metals, you can use an optional QED QuickFilter. It removes solids larger than 0.45 micron. Because QuickFilters are disposable - you use one for each sampling event - there's no need to try to clean or decontaminate the filter from well to well.

Installing the Components

If you've received a set of preassembled dedicated components, you'll find that unpacking them and installing them is easy when you follow the following instructions. Because not everyone needs to read this whole section, the first section helps you decide which of the other sections you need to read.

If, instead of preassembled components you've received unassembled components and bulk tubing, read the section titled "Installing a Pump Using Bulk Tubing."

Unpack the Components

Here's how to unpack the Well Wizard® dedicated components.

1. If you need to install a Well Wizard system in more than one well, decide which well you want to do first. Then find the box of components with the correct well-identification number written on the outside of the box.
2. Carry the box to the well site, then open the box, but don't touch anything yet.
3. Open the box, then, before unpacking the rest of the box, put on a pair of latex gloves.

Caution: Touching well components with your bare hands can contaminate the components and degrade the quality of the samples obtained using the Well Wizard system, and at any other time when your hands might touch a water-contacting component.

4. Taking care to *not kink the tubing*, gently remove the plastic-wrapped pump and tubing from the box. A label on the package provides the well cap ID, cap, and tubing length. You may need this information later, so save the label.

Note: The plastic bag also contains the lab-clean certificate on which is recorded the pump batch serial number. Keep this tag for each pump you install. It's your proof that the pump is contaminant free - if you need to, you can call QED with the serial number to find out which lab certified the pump.

5. Open the plastic wrapping, then gently slide the pump out of the bag.

Installing the Inlet Screen

Install the Inlet Screen

Well Wizard bladder pumps have a 10 year warranty that is valid *only* if you use the appropriate inlet screen.

There are two types of inlet screens: One that you thread onto the pump inlet for 1100 series pumps, and one that you secure with *set screws* for 1200 and 1300 series pumps. The correct screen for each pump is usually included with the other components for the well - the box label tells you where to find the screen. The following sections describe how to install the two types of inlet screens.

Screens For 1100 Series Pumps

To install a screen on an 1100 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove the screen.
2. Thread the screen onto the male-threaded pump inlet, making sure the screen is firmly tight.

Screens For 1200 and 1300 Series Pumps

To install a screen on an 1200 & 1300 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove from the bag both the screen and the small plastic bag that contains spare set screws and a small Allen wrench.
2. Find the groove around the inlet end of the stainless steel pump body (the end opposite the air and water connectors), then slide the screen onto the bottom of the pump assembly, aligning the top rim of the screen with the top groove.

> **Note:** If you have difficulty installing the screen, use the Allen wrench to loosen the set screws a little.

3. Using the Allen wrench, *lightly* tighten each of the set screws, then make sure the screws have engaged the groove.
4. Using the Allen wrench, *firmly* tighten each of the set screws.
5. Check to make sure the screen is secure.

Installing the Sampling Pump

Caution: Make sure that you don't bring the tubing or other pump components in contact with the ground or any other surface. It's often helpful to spread out a polypropylene tarp next to the well during installation.

1. Still wearing the latex gloves, if you have a protected well cap, mark any necessary information - such as well ID and depth - on the label inside the well cap.
2. Slowly lower the pump into the well while uncoiling the tubing bundle, until the entire length of tubing is in the well.

Attaching Tubing to the Well Cap

To attach tubing to the well cap, follow the instructions included with the shipment for the appropriate well cap.

Installing a Pump with Bulk Tubing

This section is for you if you ordered your Well Wizard® components and tubing unassembled, The following sections tell you how to assemble the components and tubing.

Getting Ready

It's important to not contaminate pump components. Doing so can degrade the quality of the samples obtained using your Well Wizard system. Always wear latex gloves when unpacking and installing Well Wizard components, and any other time when your hands might touch a water-contacting component.

Install the Inlet Screen

Well Wizard bladder pumps have a 10 year warranty that is valid *only* if you use the appropriate inlet screen.

There are two types of inlet screen: One that you thread onto the pump inlet for 1100 series pumps, and one that you secure with *set screws* for 1200 and 1300 series pumps. The correct screen for each pump is usually included with the other components for the well - the box label tells you where to find the screen. The following sections describe how to install the two types of inlet screens.

Screens For 1100 Series Pumps

To install a screen on an 1100 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove the screen.
2. Thread the screen onto the male-threaded pump inlet, making sure the screen is firmly tight.

Screens For 1200 and 1300 Series Pumps

To install a screen on an 1200 & 1300 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove from the bag both the screen and the small plastic bag that contains spare set screws and a small Allen wrench.
2. Find the groove around the inlet end of the stainless steel pump body (the end opposite the air and water connectors), then slide the screen onto the bottom of the pump assembly, aligning the top rim of the screen with the top groove.

Installing a Pump with Bulk Tubing

> **Note:** If you have difficulty installing the screen, use the Allen wrench to loosen the set screws a little.

3. Using the Allen wrench, *lightly* tighten each of the set screws, then make sure the screws have engaged the groove.
4. Using the Allen wrench, *firmly* tighten each of the set screws.
5. Check to make sure the screen is secure.

Connect the Pump to the Tubing

To connect the pump to the tubing, follow these steps:

1. Separate the discharge (larger) tubing from the air-supply (smaller) tube for 8-12 inches from one end.
2. Loosen the nut-and-ferrule assembly as much as possible without actually removing the nut.
3. Push the air-supply tube into the matching fitting on the top end of the pump.
4. Tighten the nut.
5. Cut off a short length from the end of the discharge tubing to compensate for the offset height of the discharge tube fitting.

> **Note:** This is usually 3 to 4 inches. You determine the exact length by checking both fitting nuts for full tube insertion after loose assembly.

6. Make sure that the tube-to-pump fit is correct before proceeding.
7. If the discharge tubing is 3/8" O.D. or larger, or if it has a Teflon lining, you must use a tubing insert, just push the insert into the tubing before inserting the tubing into the tubing fitting.
8. Tighten both fitting nuts finger tight.
9. For each fitting nut, hold the fitting base with *one* wrench and the fitting nut with *another* wrench, then tighten the fitting nut one additional turn.

Cut Tubing to Length

To cut the tubing to the correct lengths, follow these steps:

1. Lower the pump into the well until the pump touches the bottom of the well.
2. Raise the pump up, as follows:
   - 1 foot, for low recovery wells
   - To the middle of the screen, for high recovery wells

Attaching Tubing to the Well Cap

To attach tubing to the well cap, follow the instructions included with the shipment for the appropriate well cap.

Bladder Pump Operation in Low-Submergence

Bladder Pump Operation in Low-Submergence Applications

Pump submergence is defined as the height of the static water column above the top of the pump. In wells in which this water column height is 5 feet or less, the pump is considered to be in a low-submergence application.

QED sampling bladder pumps fill by hydrostatic pressure. As the inside of the pump's bladder fills with water, the bladder expands. This filling and expanding of the bladder is referred to as the "refill" half of the pump cycle. When air pressure is applied to the outside of the bladder, the bladder is squeezed, forcing the water up the discharge tubing. This is referred to as the "discharge" half of the pump cycle. In low-submergence applications, there is less water pressure available to expand the bladder during the refill.

This can result in a smaller volume of water being pumped with each pump cycle because the bladder may not fully expand.

As a result of the lower volume per cycle, more time will be required to bring the water to the surface. An easy way to verify that the pump is working, prior to the water reaching the surface, is to submerge the pump's discharge tubing in a beaker of water. Each time the pump goes into discharge, air in the discharge tubing, which is displaced as the water level in the tubing rises, can be seen as air bubbles coming from the end of the tubing. To optimize the pumping rate, the refill time should be set long enough to achieve the maximum volume of air bubbles on each pump cycle, and the discharge time should be set long enough to ensure that the air has stopped bubbling out of the tube before the pump controller switches back into refill.

In low submergence wells, **it is critical that the air pressure driving the pump not be more than 10-15psi higher than the minimum requirement of 0.42psi per foot of pump depth.** Higher pressures than this can cause the bladder to be squeezed too tightly during discharge, a condition which can prevent the bladder from expanding during refill. To avoid this condition in deeper wells, it is suggested that the air pressure applied to the pump be gradually increased as the water level in the pump's discharge tubing rises. It is recommended that the air pressure be set at 15psi initially, and slowly increased in increments of 10psi as needed until the water reaches the surface. Submerging the end of the discharge tubing under water as described above will verify whether the air pressure is set high enough.

Install or Replace Pump Connectors

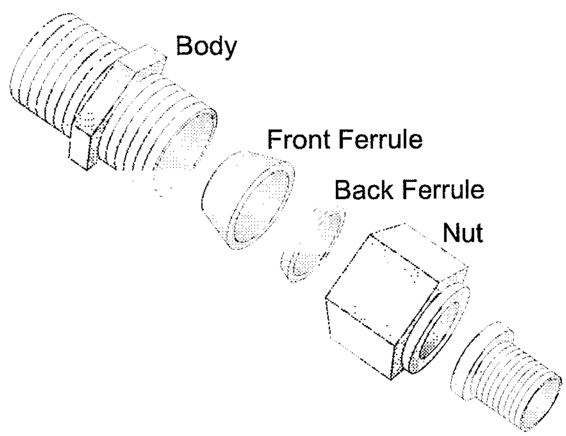
The following sections describe how to install or replace the three types of connectors that may be included in your Well Wizard system.

Stainless Steel Connectors

Swagelok™ tube fittings, which include four pieces (see figure 5), come to you completely assembled, finger tight.

Figure 5

Parts of the Swagelok Tube Fitting



Caution: If you disassemble a connector before you use it, dirt or foreign material can get into the fitting and later cause a leak.

To install a stainless steel connector, follow these steps:

1. If you are working with a 1/2- or 3/4-inch connector, wrap the male threads under the nut with Teflon tape.
2. Insert the tubing into the Swagelok tube fitting as follows:
   - **For 1/4 -inch tubing**, insert it approximately 5/8 inch
   - **For 3/4 -inch tubing**, insert it up to 7/8 inch

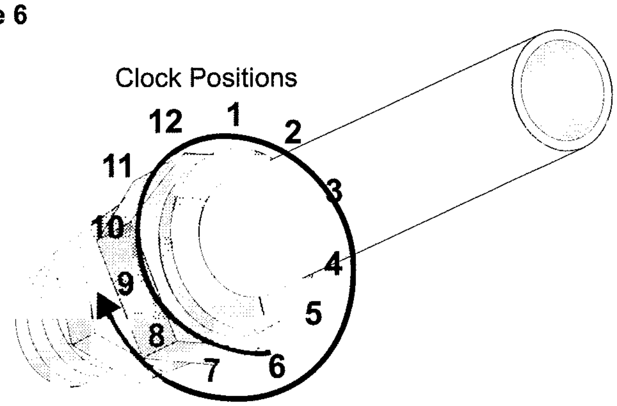
   Make sure that the tubing firmly contacts the shoulder of the fitting and that the nut is finger tight.

Note: If the discharge tubing is 3/8 inch or larger, you must use a tubing insert, just push the stainless steel insert into the tubing before inserting the tubing into the tube fitting.

Install or Replace Pump Connectors

3. Referring to figure 6, scribe or mark the nut at the 6 o'clock position.

Figure 6



4. While holding the fitting body steady with a backup wrench or vise, tighten the nut as follows, depending on the size of the tube fitting:
   - **For fittings larger than 3/16 inch**, turn the fitting one and one quarter turns (watch the scribe mark make one complete turn, then continue to the 3 o'clock position).
   - **For fittings sizes 1/6, 1/8, and 3/16 inch**, turn the fitting three quarters of a turn (watch the scribe mark turn to the 9 o'clock position).

Note: These are guidelines, you may need to further tighten the nut.

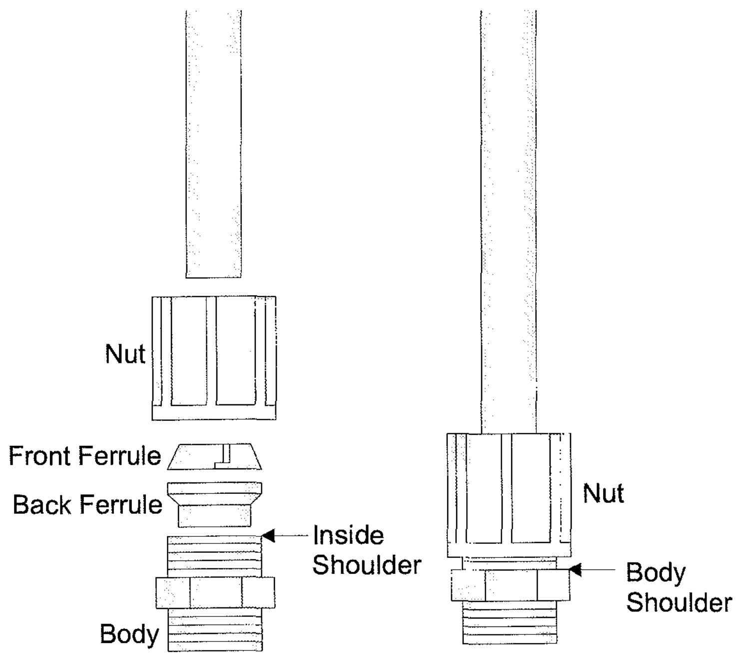
Install or Replace Pump Connectors

Polypropylene Connector

To install a polypropylene connector, follow these steps.

1. Cut the tubing cleanly and squarely to length.
2. If the tubing is larger than 1/2 inch, push an insert into the tube.
3. Push the tubing into the completely assembled connector until it contacts the shoulder inside the fitting (see figure 7).
4. Tighten the nut with a wrench, but be careful to not over tighten it; the nut should not come in contact with the shoulder of the body (see figure 7).

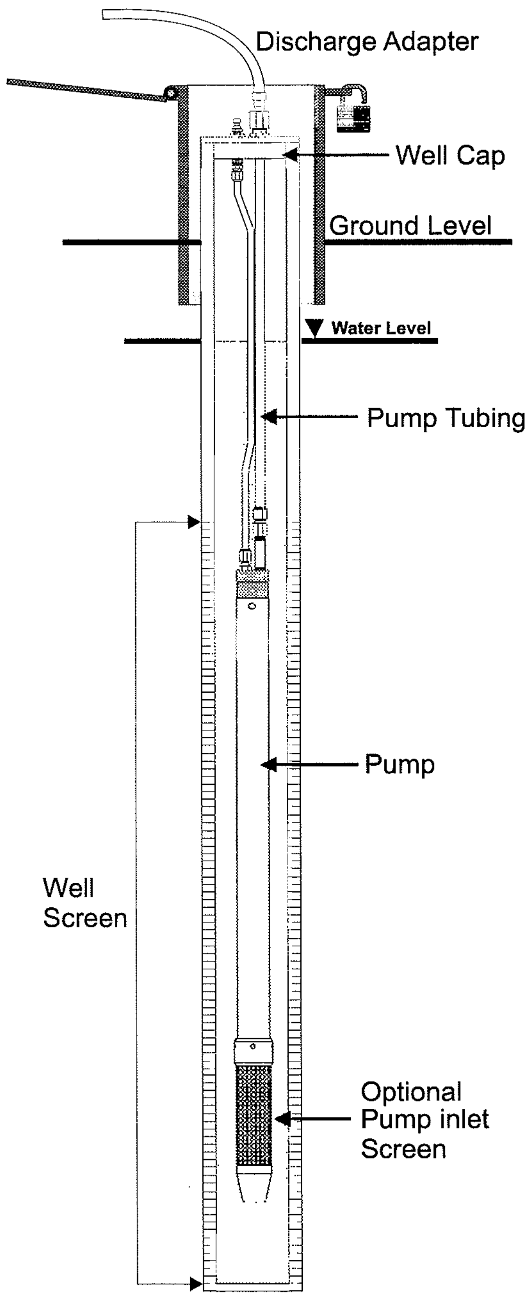
Figure 7



Sampling System Type A

Figure A-1 shows the Type A sampling system, the basic bladder pump

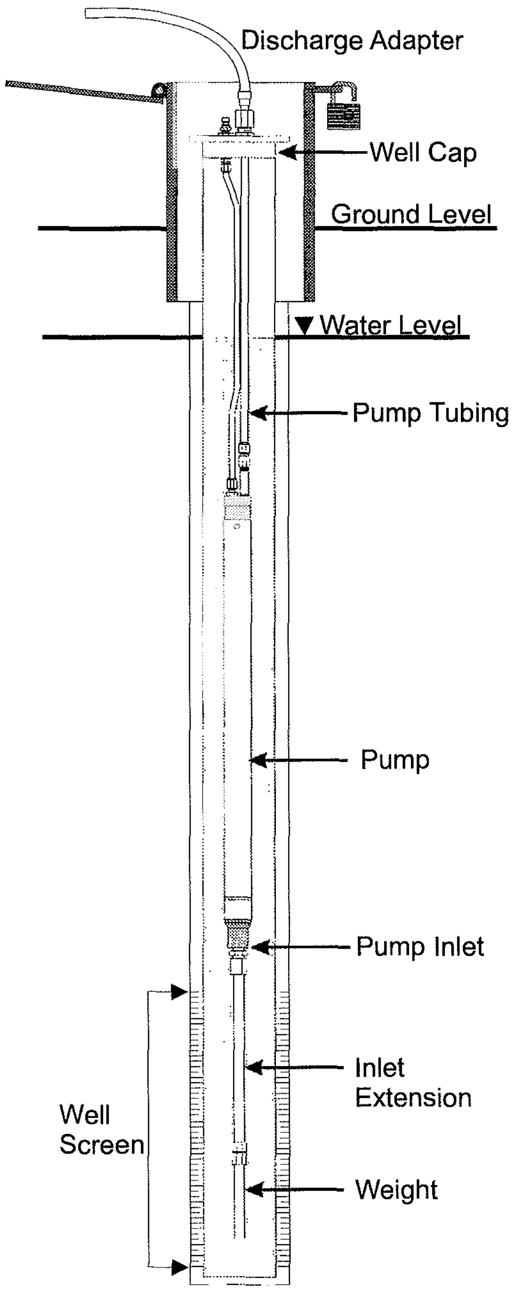
Figure A-1



Sampling System Type L

Figure A-2 shows the Type L sampling system, a bladder pump with an inlet extension.

Figure A-2



Sampling Pump Troubleshooting Guide

START

Is water being pumped to the surface?

Yes → Adjust cycle times as necessary to optimize the flow. When in doubt, contact QED for assistance.

No → Is there at least 5 feet of water over the top of the pump?

No → Lower the pump -or- Refer to low-submergence operating instructions.

Yes → Verify that the controller is cycling and check cycle times. When in doubt, contact QED for assistance.

Place the end of the discharge tube in a cup of clean water and verify that air bubbles are flowing from the tube during each discharge cycle. This verifies that the pump is actually filling and discharging, and is especially important for deep well applications, since it could take several minutes of pumping before any water would be seen at the surface. If there are no air bubbles, the problem is most likely either insufficient drive air pressure, or inability of the pump to fill with water during the refill cycle. These issues are addressed by the checks listed above. While performing the "bubble test", if water is being drawn up into the tubing during the pump refill, there is a problem either with drain-back through the discharge check ball or weep-hole. If drain-back is occurring, call QED for assistance.

Make sure the drive air pressure is not lower than the required lift pressure (0.42 PSI/foot). If the air pressure cannot be increased by adjusting the pressure regulator on the controller panel, check the air source (with compressors, make sure intake filters are in place and are not clogged; with cylinders, make sure the valve is open and the tank is sufficiently filled).

Make sure the drive air pressure is not set too high. Air pressure should be no more than 10-15 PSI above required lift pressure (0.42 PSI/ foot).

Verify that the pump inlet (or drop tube inlet) isn't setting on the bottom of the well, preventing refill. This can happen if well data or tubing length is incorrect, or if silt has accumulated in the bottom of the well. Also, if a drop tube is being used, verify that it is not kinked.

Check all connections, from air source to controller and controller to cap, for air leaks.

Well Wizard® System Warranty

QED ENVIRONMENTAL SYSTEMS, INC. ("Q.E.D.") warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workman-ship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by Q.E.D. in the manner provided herein.

This warranty shall be limited to the duration and the conditions set forth below. All warranty durations are calculated from the original date of purchase.

1. *Dedicated-Use Systems Products*- 10 year warranty on dedicated bladder pumps equipped with Q.E.D. inlet screens, and purge pumps used in periodic, non continuous groundwater sampling (up to 52 sampling events per year.) All other components, equipment and accessories are warranted for one year.

2. *Portable-Use Systems*- Controllers and water level meters are warranted for one year. Hose reels, Pumps and Caps are warranted for ninety (90) days. Tubing and Purge Mizers are covered by a ninety (90) day material and workmanship warranty. There will be no warranty for application on tubing and Purge Mizers when used as part of a Portable System.

3. *Separately sold parts and Spare Parts Kits*- Separately sold parts and spare parts kits are warranted for ninety (90) days. Repairs performed by Q.E.D. are warranted for ninety (90) days from date of repair or for the full term of the original warranty, whichever is longer.

Buyers' exclusive remedy for breach of said warranty shall be as follows: if, and only if, Q.E.D. is notified in writing within applicable warranty period of the existence of any such defect in the said products, and Q.E.D. upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from Q.E.D. to Buyer, Q.E.D. will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Buyer. If Q.E.D. for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's/Buyer's notification of a warranty claim, then Q.E.D.'s sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Buyer, or to refund the full purchase price. In no event shall such allegedly defective products be returned to Q.E.D. without its consent, and Q.E.D.'s obligations of repair, replacement or refund are conditioned upon the Buyer's return of the defective product to Q.E.D. **IN NO EVENT SHALL QED ENVIRONMENTAL SYTEMS BE LIABLE FOR CONSEQUENTIAL DAMAGES OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.**

The foregoing warranty does not apply to major sub-assemblies and other equipment, accessories and parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties,if any, supplied by the respective manufacturers. Q.E.D. makes no warranty concerning products or accessories not manufactured by Q.E.D. In the event of failure of any such product accessory, Q.E.D. will give reasonable assistance to the Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Well Wizard® System Warranty

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of Q.E.D., neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that Q.E.D. shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty. Q.E.D. shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than Q.E.D.'s service personnel unless such repair by others is made with the written consent of Q.E.D.

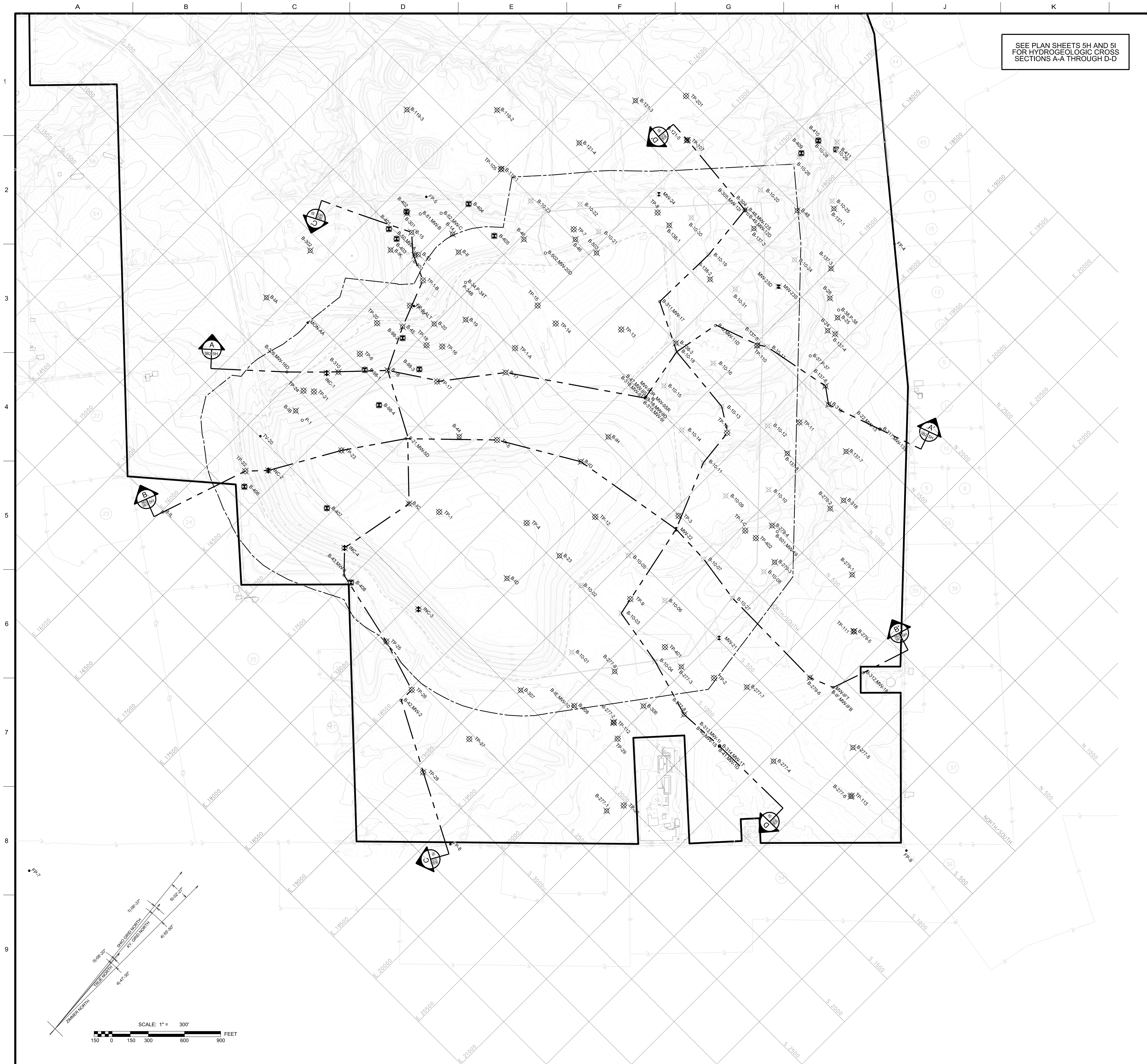
If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact Q.E.D. for determination of warranty coverage. If the return of a component is determined to be necessary, Q.E.D. will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the purchaser.

RESPONSIBILITY OF THE PURCHASER

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify Q.E.D. of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of Q.E.D. and:

1. Identifying the product involved (by model or serial number or other sufficient description that will allow Q.E.D. to determine which product is defective).
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. Sending the malfunctioning component, after authorization by Q.E.D. to:

QED ENVIRONMENTAL SYSTEMS
P.O. Box 3726
Ann Arbor, MI 48106-3726 USA



EXPLORATION	NORTHING	EASTING	ELEVATION
B-IA	-1,144.0	15,361.0	831.9
B-IB	-1,637.0	16,197.0	840.0
B-IC	-1,517.0	17,407.0	850.0
B-ID	-1,380.0	18,419.0	863.8
B-IE	-1,744.0	19,555.0	867.7
B-IF	-107.0	20,973.0	881.0
B-IG	-262.0	18,169.0	864.7
B-IH	44.0	18,184.0	862.9
B-II	250.0	16,223.0	826.1
B-IJ	1,326.0	18,159.0	850.3
B-IK	-438.0	15,509.0	823.2
B-IL	-3,011.0	16,012.0	847.9
B-13	0.0	16,000.0	821.2
B-14	320.0	16,080.0	819.6
B-15	90.0	15,830.0	816.9
B-16	-860.0	16,500.0	829.8
B-17	-180.0	17,205.0	831.0
B-18	502.0	18,169.0	856.2
B-19	-105.0	16,660.0	817.0
B-20	-315.0	16,500.0	795.0
B-21	-1,154.0	17,007.0	817.4
B-22	1,681.0	19,730.0	859.3
B-23	-940.0	18,595.0	889.6
B-24	1,955.0	18,848.0	818.6
B-25	2,089.0	18,830.0	821.7
B-26	2,158.0	18,670.0	814.3
B-34	113.0	16,440.0	826.3
B-37	1,704.0	18,893.0	810.1
B-38	2,140.0	18,790.0	817.4
B-40	-1,117.0	20,648.0	863.2
B-41	-1,123.0	20,653.0	863.0
B-42	-2,718.0	18,514.0	857.8
B-43	-2,318.0	17,445.0	871.4
B-44	-1,131.0	17,006.0	818.7
B-45	-517.0	16,331.0	819.3
B-46	708.0	16,530.0	821.0
B-47	492.0	18,170.0	856.4
B-48	2,178.0	17,663.0	834.4
B-49	2,170.0	17,696.0	834.0
B-50	-19.0	15,966.0	810.6
B-51	249.0	15,773.0	813.4
B-52	375.0	15,891.0	810.7
B-98-1	-992.0	16,362.0	830.2
B-98-2	-583.0	16,397.0	814.3
B-98-3	-668.0	16,678.0	821.9
B-98-4	-1,115.0	16,652.0	829.3
B-119-1	986.0	15,986.0	820.2
B-119-2	1,309.0	15,614.0	814.6
B-119-3	782.0	15,084.0	814.4
B-121-3	2,176.0	16,371.0	831.6
B-121-4	1,598.0	16,289.0	825.9
B-121-5	2,244.0	16,904.0	831.8
B-137-1	2,706.0	18,169.0	828.8
B-137-2	2,121.0	17,816.0	832.0
B-137-3	2,338.0	18,503.0	822.1
B-137-4	1,978.0	18,911.0	826.2
B-137-5	1,453.0	18,519.0	844.0
B-137-6	1,616.0	19,160.0	840.3
B-137-7	1,354.0	19,664.0	843.8
B-137-8	997.0	19,331.0	845.3
B-138-1	1,643.0	17,300.0	855.1
B-138-2	1,566.0	17,856.0	850.3
B-138-3	991.0	18,030.0	860.4
B-277-1	-2,159.0	20,368.0	866.0
B-277-2	-1,599.0	19,887.0	866.6
B-277-3	-877.0	19,961.0	880.0
B-277-4	-889.0	21,056.0	870.6
B-277-5	-343.0	21,442.0	878.6
B-277-6	-643.0	21,716.0	880.1
B-277-7	-611.0	20,465.0	870.5
B-277-8	-1,140.0	20,257.0	883.4
B-277-9	-1,294.0	19,597.0	886.3
B-279-1	666.0	20,423.0	861.7
B-279-2	925.0	19,906.0	838.6
B-279-3	285.0	19,895.0	853.9
B-279-4	484.0	19,666.0	856.9
B-279-5	347.0	20,766.0	879.5
B-279-6	-186.0	20,779.0	870.5
B-301	-127.0	15,391.0	811.4
B-302	-612.0	15,343.0	827.2
B-303	-328.0	15,682.0	817.0
B-304	2,177.0	17,655.0	834.4
B-305	2,177.0	17,655.0	834.4
B-306	-1,329.0	19,969.0	879.9
B-307	-1,956.0	19,156.0	880.6
B-308	-1,733.0	19,562.0	868.6
B-309	-1,461.0	15,918.0	823.5
B-310	-1,462.0	15,918.0	823.5
B-311	1,139.0	17,692.0	864.8
B-312	156.0	21,063.0	885.5
B-313	-1,114.0	20,648.0	863.2
B-314	-1,114.0	20,650.0	863.2
B-315	488.0	18,172.0	856.6
B-316	489.0	18,171.0	856.6
B-317	1,686.0	19,734.0	860.1
B-318	1,052.0	19,937.0	841.3
B-319	1,526.0	19,286.0	839.6
B-401	-24.0	15,677.0	782.4
B-402	181.0	15,678.0	808.3
B-403	-36.0	15,780.0	807.4
B-404	591.0	15,997.0	796.6
B-405	554.0	16,336.0	833.3
B-406	-2,383.0	16,341.0	860.3
B-407	-2,025.0	16,951.0	931.1
B-408	-2,320.0	17,528.0	872.2
B-409	2,841.0	17,652.0	809.8
B-410	3,014.0	17,678.0	778.6
B-411	3,067.0	17,834.0	801.5
B-501	480.0	19,730.0	857.2
B-502	754.0	16,736.0	823.2
B-503	753.0	16,734.0	823.3
B-INC-1	-1,233.0	16,157.0	853.8
B-INC-2	-2,147.0	16,386.0	900.6
B-INC-3	-2,081.0	18,081.0	894.2
B-INC-4	-2,154.0	17,288.0	904.0
TP-1	-1,389.0	17,632.0	832.0
TP-2	-750.0	20,219.0	872.0
TP-3	-7.0	19,059.0	866.7
TP-4	-940.0	18,210.0	867.5
TP-5	-627.0	17,549.0	848.2
TP-6	-926.0	16,239.0	825.6
TP-7	1,059.0	16,763.0	820.4
TP-8	1,650.0	17,157.0	852.5
TP-9	-778.0	19,264.0	871.7
TP-10	765.0	18,856.0	850.9
TP-11	1,250.0	19,220.0	829.6
TP-12	-502.0	18,576.0	882.7
TP-13	750.0	17,630.0	867.0
TP-14	400.0	17,210.0	849.9
TP-15	400.0	17,000.0	843.6
TP-16	-400.0	16,680.0	800.1
TP-17	-635.0	16,855.0	803.8
TP-18	-485.0	16,580.0	818.0
TP-19	-350.0	16,250.0	793.1
TP-20	-645.0	16,160.0	818.1
TP-21	-1,417.0	16,191.0	833.6
TP-22	-2,286.0	16,255.0	861.0
TP-23	-1,601.0	16,698.0	843.3
TP-24	-1,473.0	16,125.0	818.4
TP-25	-2,458.0	18,083.0	884.7
TP-26	-2,594.0	18,515.0	861.0
TP-27	-2,544.0	19,140.0	889.6
TP-28	-3,010.0	19,065.0	883.5
TP-29	-1,672.0	20,010.0	862.5
TP-30	-2,028.0	20,436.0	875.2
TP-1-A	18.0	17,116.0	831.0
TP-1-B	-125.0	16,178.0	818.3
TP-1-C	298.0	19,537.0	854.1
TP-105	987.0	15,983.0	820.1
TP-107	2,250.0	16,909.0	831.8
TP-110	1,454.0	18,523.0	843.6
TP-111	341.0	20,764.0	879.6
TP-112	-1,601.0	19,883.0	866.7
TP-113	-634.0	21,716.0	880.5
TP-201	2,500.0	16,640.0	837.0
TP-401	-856.0	19,749.0	882.0
TP-402	316.0	19,643.0	858.5

LEGEND

- GROUND SURFACE CONTOURS
- EXISTING ROADS
- SURFACE WATER
- VEGETATION
- EXISTING LIMITS OF RESIDUAL WASTE
- PROPOSED LIMITS OF RESIDUAL WASTE
- PROPOSED RESIDUAL WASTE - 300' BUFFER ZONE
- FACILITY BOUNDARY
- PROPERTY LINE
- 23 — PROPERTY OWNER NUMBER (REFER TO PROPERTY OWNERS TABLE)
- TV-20 — BENCHMARK (SEE BENCHMARK TABLE BELOW FOR LOCATIONS OF BENCHMARKS)
- WET-14 — WETLAND
- SEEPS/SPRINGS
- EXISTING STRUCTURE
- B-121-4 — BORING LOCATION
- B-311, MW-17 — BORING CONVERTED TO GROUNDWATER MONITORING WELL
- B-37, P-37 — BORING CONVERTED TO PIEZOMETER
- INC-1 — INCLINOMETER LOCATION
- TP-2 — TEST PIT LOCATION
- B-10 — BORINGS PERFORMED FOR GEOTECHNICAL INVESTIGATION
- C 3B2 3B3 5H / C' 3B2 3B3 5H — SECTION LINE (HYDROGEOLOGIC CROSS-SECTIONS)

BORING	NORTHING	EASTING	ELEVATION
B-10-01	-1,430.0	19,230.0	884.0
B-10-02	-990.0	18,900.0	881.0
B-10-03	-920.0	19,290.0	876.0
B-10-04	-1,000.0	19,770.0	887.0
B-10-05	-530.0	19,000.0	870.0
B-10-06	-580.0	19,480.0	866.0
B-10-07	-110.0	19,460.0	857.0
B-10-08	170.0	19,890.0	853.0
B-10-09	390.0	19,220.0	863.0
B-10-10	670.0	19,440.0	853.0
B-10-11	450.0	18,890.0	860.0
B-10-12	1,040.0	19,050.0	838.0
B-10-13	890.0	18,670.0	853.0
B-10-14	520.0	18,580.0	861.0
B-10-15	670.0	18,210.0	856.0
B-10-16	1,090.0	18,370.0	846.0
B-10-17	1,500.0	18,590.0	841.0
B-10-18	940.0	18,090.0	850.0
B-10-19	1,700.0	17,700.0	846.0
B-10-20	2,390.0	17,630.0	832.0
B-10-21	1,190.0	16,920.0	823.0
B-10-22	1,240.0	16,650.0	822.0
B-10-23	970.0	16,350.0	818.0
B-10-24	2,180.0	18,240.0	815.0
B-10-25	2,740.0	18,110.0	826.0
B-10-26	2,810.0	17,660.0	816.0
B-10-27	-170.0	19,860.0	856.0
B-10-28	3,020.0	17,670.0	780.0
B-10-29	3,110.0	17,800.0	800.0
B-10-30	1,820.0	17,390.0	842.0
B-10-31	1,650.0	18,060.0	840.0
MW-8	710.0	16,525.0	821.0
MW-21	-485.9	20,013.1	859.4
MW-22	-99.7	19,123.4	864.4
MW-23	1,921.9	18,297.7	832.0
MW-24	1,764.1	17,056.9	850.9

NOTE: DRAWING IS INCLUDED FOR REFERENCE ONLY AND IS NOT PART OF THE PERMIT DOCUMENTS

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD
4	6/8/12	1176-11-019F	LANDFILL	CKH	EDV	CKH	SJL	SJL
DESC: N.O.D. RESONSE								
3	5/27/11	011.5718.005	LANDFILL	CKH	EDV	CKH	SJL	SJL
DESC: 2011 PTI MODIFICATION								
2	1/28/00							SJL
DESC: PTI CONDITION 19b								
1	3/18/99							SJL
DESC: N.O.D. RESPONSE								
0	7/20/98							SJL
DESC: ISSUED FOR PTI								

OEPA DRAWING NO.: 3B1

TITLE

ZIMMER LANDFILL
PLAN OF EXPLORATIONS

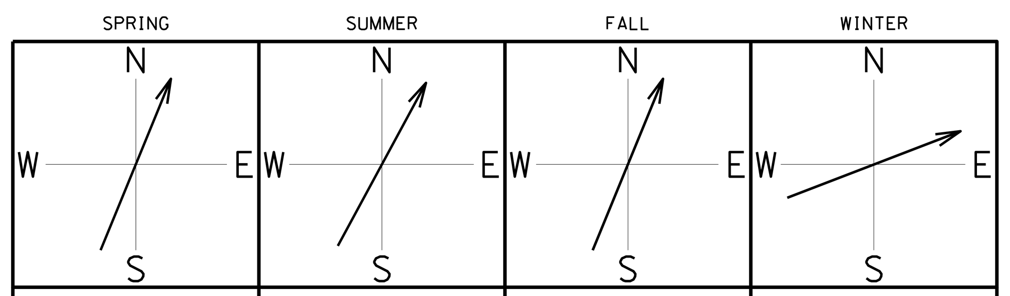
FOR
WM. H. ZIMMER GENERATING STATION - LANDFILL

Duke Energy®

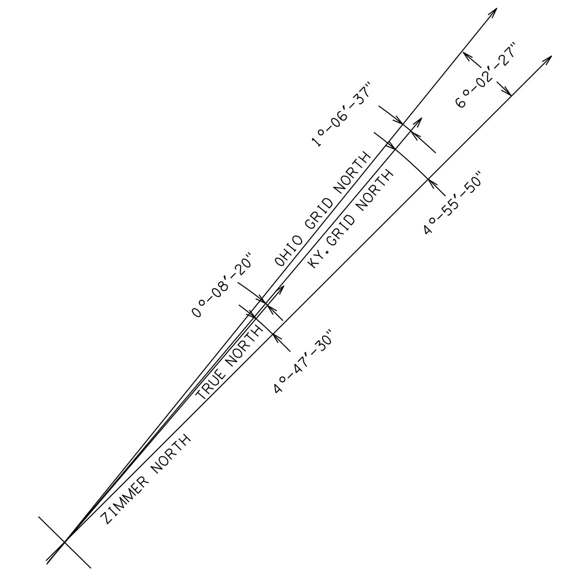
SCALE:	1"=200'	DES:	JPL
DWG TYPE:		DFTR:	
JOB NO:		CHKD:	CKH
DATE:	07/20/98	ENGR:	SJL
FILENAME:	WHZ_01_AEP_1-30904.dgn	APPD:	

DWG SIZE	DRAWING NO.	REVISION
ARCH E3 30.0"x44.0"	1-30904	4

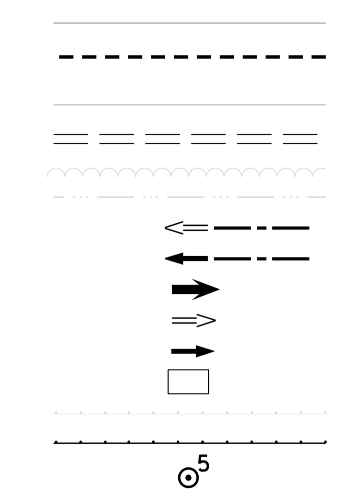
PREVAILING WINDS BY SEASON
PERIOD OF RECORD - 1991 THROUGH 1995



SPRING	SUMMER	FALL	WINTER
10,920 OBSERVATIONS 659 WERE CALM	11,040 OBSERVATIONS 1,038 WERE CALM	10,993 OBSERVATIONS 596 WERE CALM	10,823 OBSERVATIONS 326 WERE CALM



LEGEND



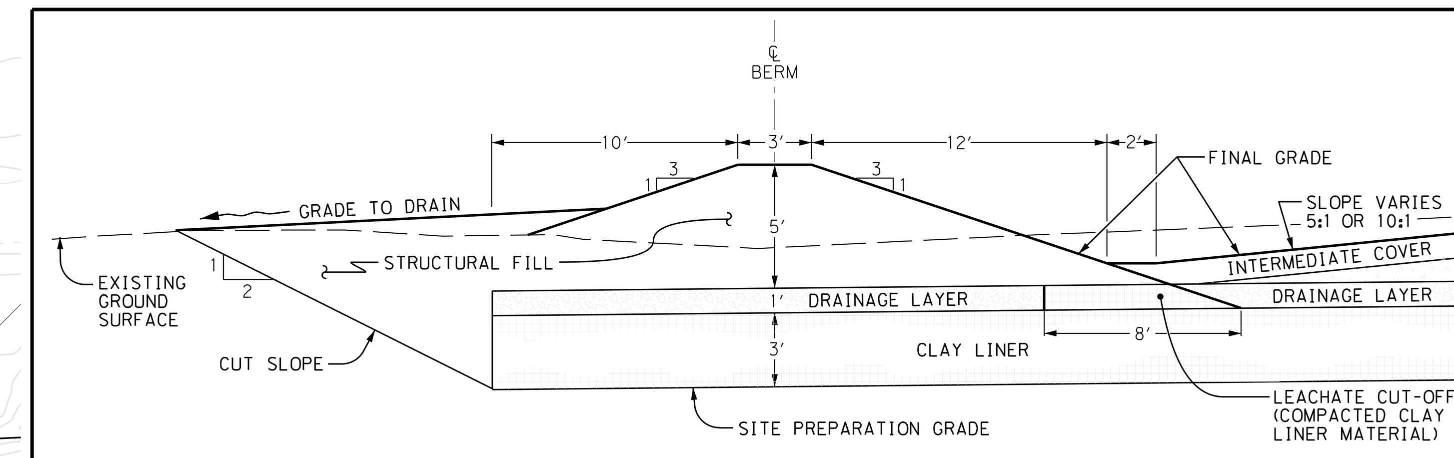
- 1998 FINAL GRADES - TOP OF CAP
- SEQUENCE 1 SITE PREPARATION GRADES - BOTTOM OF CLAY LINER
- EXISTING TOPOGRAPHY
- EXISTING ROADS
- VEGETATION
- SURFACE WATER
- CLEAN WATER DRAINAGE BERM
- CONTACT WATER DRAINAGE BERM
- TRAFFIC FLOW PATTERN
- CLEAN WATER FLOW
- CONTACT WATER FLOW
- EXISTING STRUCTURE
- EXISTING GUARDRAIL
- PROPOSED GUARDRAIL
- CONSTRUCTION CONTROL POINT

SEQUENCE 1

DESCRIPTION	QUANTITY
VIRGIN FOOTPRINT (ACRES)	10
TOTAL FOOTPRINT (ACRES)	102
MAXIMUM WORKING AREA (ACRES)	46
PERMANENT COVER (ACRES)	16
INTERMEDIATE COVER (ACRES)	86
RESIDUAL WASTE VOLUME (CY) (1)	2,898,759
RESIDUAL WASTE VOLUME - CUMULATIVE (CY) (2)	2,898,759
RESIDUAL WASTE VOLUME (TONS)	3,333,573
RESIDUAL WASTE VOLUME - CUMULATIVE (TONS)	3,333,573
LIFE (YEARS)	1.9
LIFE - CUMULATIVE (YEARS) (2)	1.9
MAXIMUM ELEVATION (FT)	974

(1) VOLUME BASED UPON 85 PCF DENSITY
(2) SEQUENCE 1 THROUGH 1

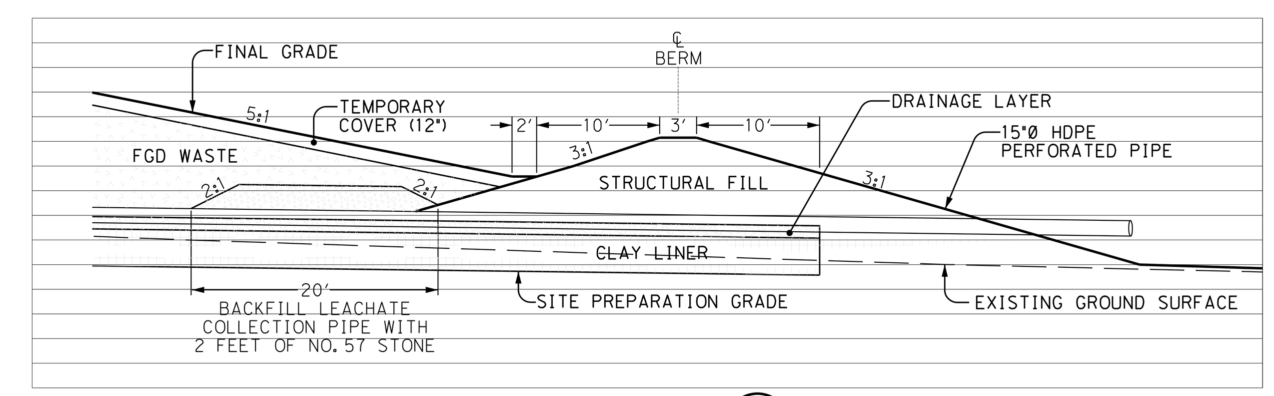
CONTROL POINT	NORTHING	EASTING	PROPOSED ELEVATION
1	-618.7	16662.2	812.0
2	-782.7	16776.6	814.0
3	-868.5	16882.8	814.0
4	-284.2	17645.6	846.0
5	47.3	17580.2	846.0
6	-151.6	17223.5	830.0
7	-459.2	16819.4	812.0
8	-499.3	16691.7	810.0



SEQUENCE 1 BERM DETAIL IN CUT* AREAS

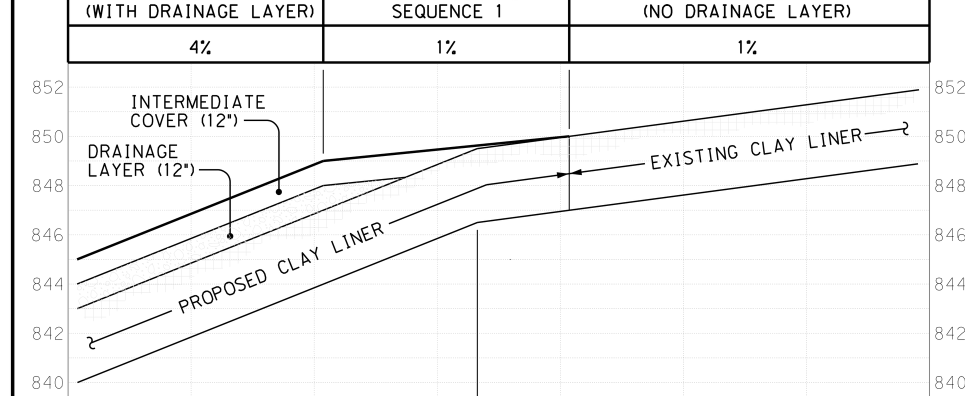
SCALE: 1" = 5'

* SITE PREPARATION GRADE BELOW ADJACENT GROUND SURFACE



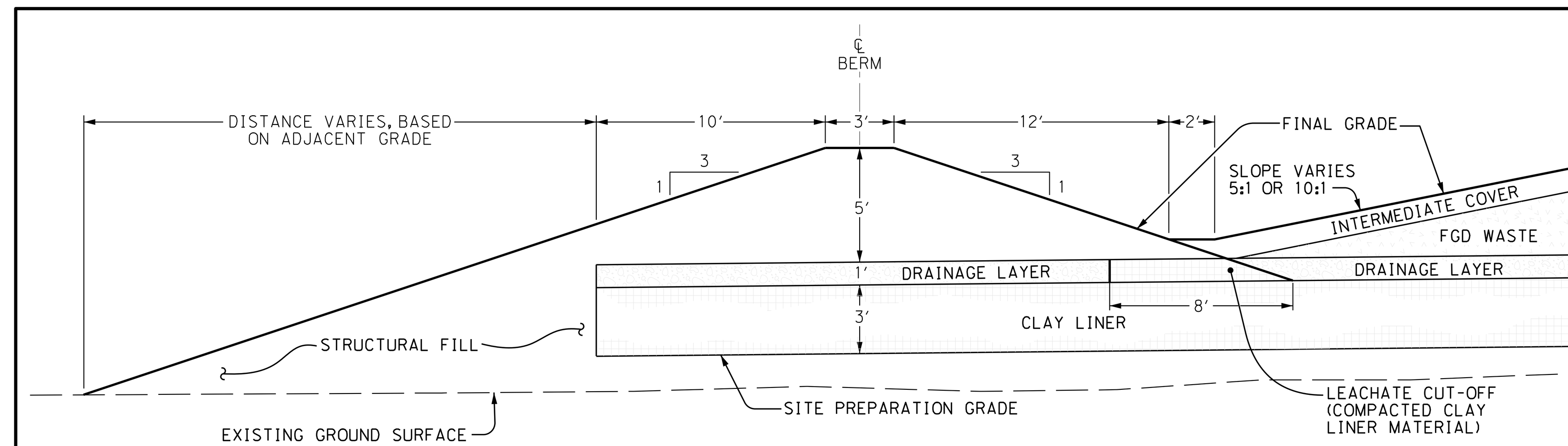
SECTION B-B (B/6A 6A)

SCALE: 1" = 10'



PROFILE A-A (A/6A 6A)

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'



SEQUENCE 1 BERM DETAIL IN FILL* AREAS

SCALE: 1" = 5'

* SITE PREPARATION GRADE ABOVE ADJACENT GROUND SURFACE

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD
2	7/30/99							SJL
DESC: TIE-IN REVISION								
1	3/18/99							SJL
DESC: N.O.D. RESPONSE								
0	7/20/98							SJL
DESC: ISSUED FOR PTI								

OEPA DRAWING NO.: 6A

TITLE
ZIMMER LANDFILL
SEQUENCE 1 SITE PREPARATION GRADES

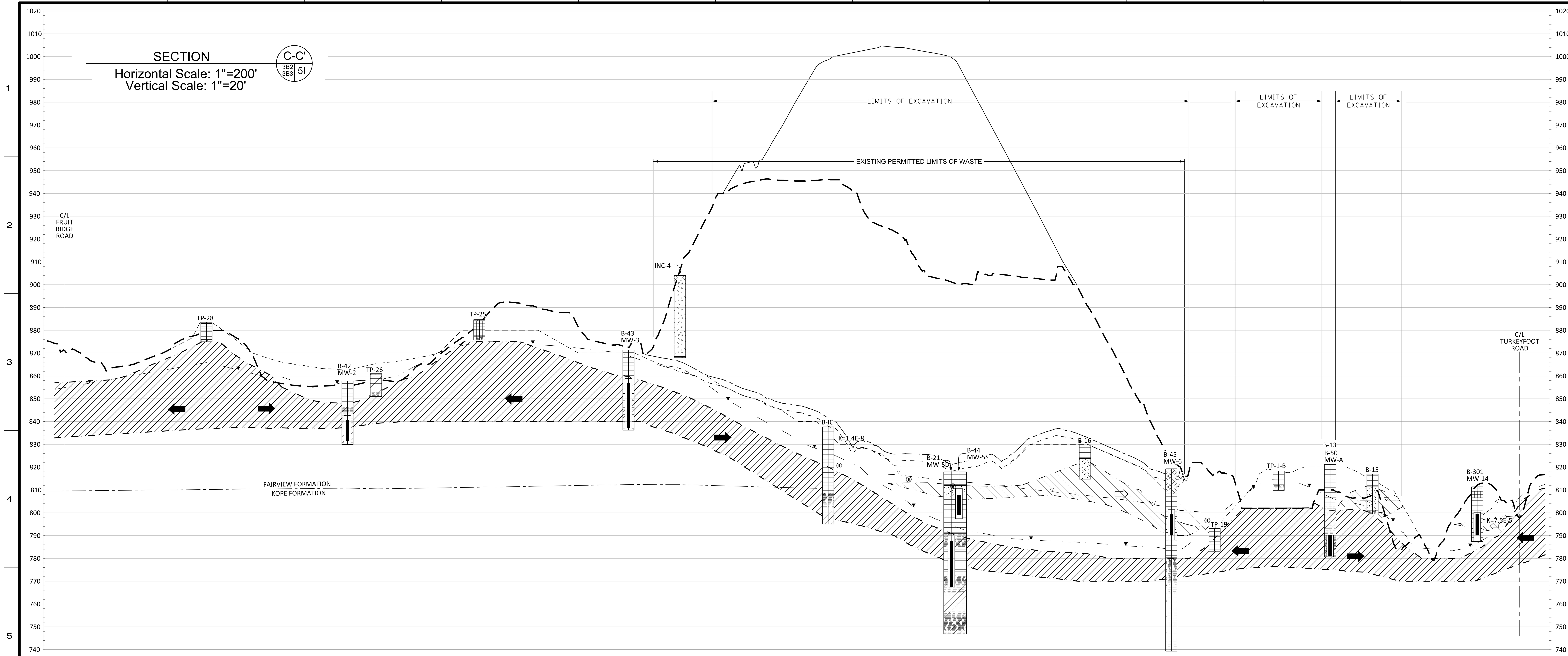
FOR WM. H. ZIMMER GENERATING STATION - LANDFILL

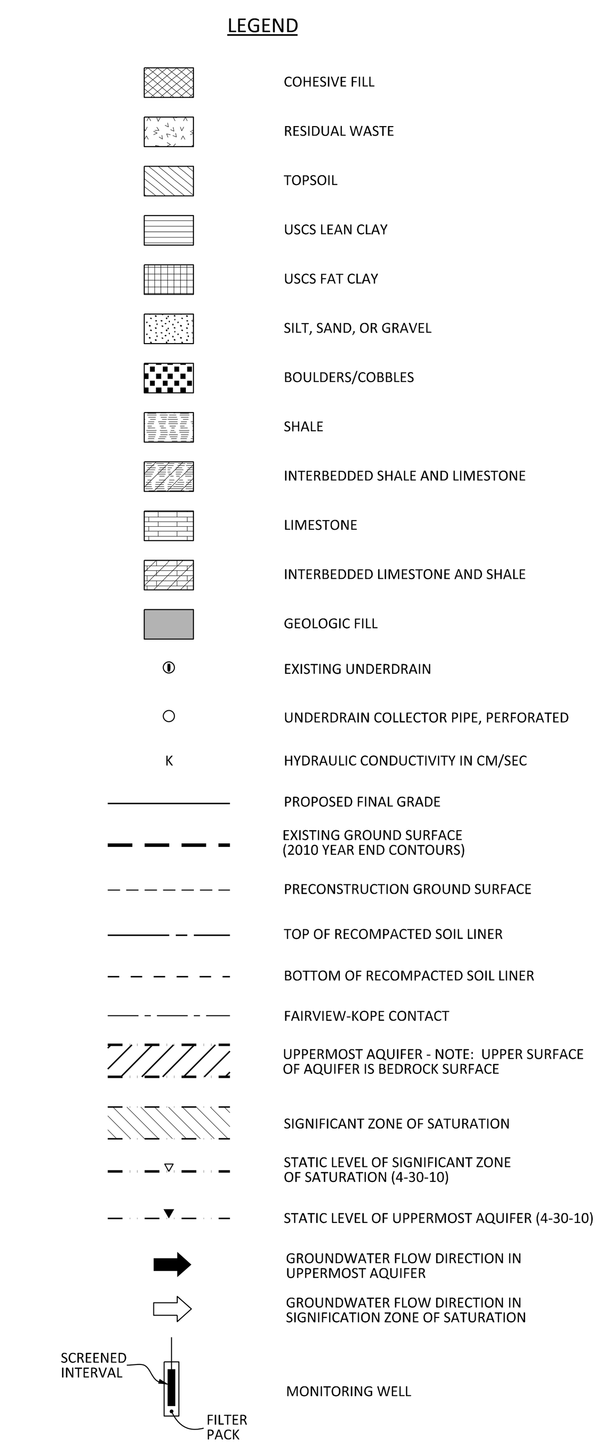
Duke Energy

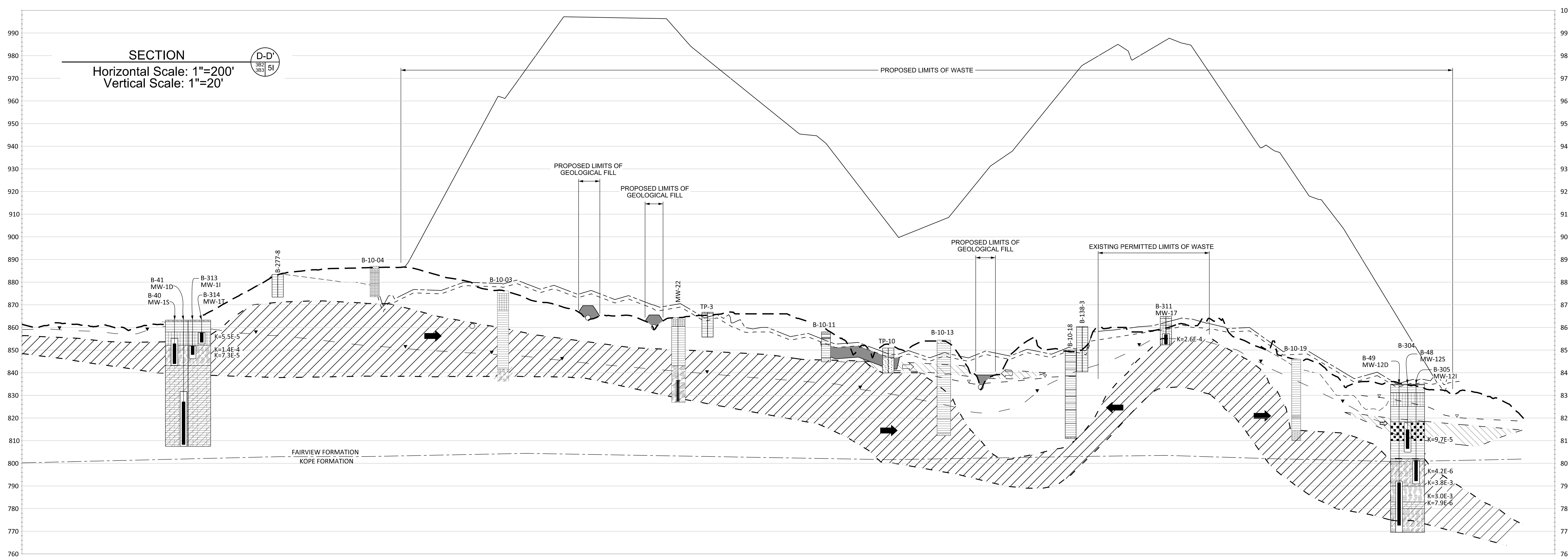
SCALE:	1"=100'	DES:	JLP
DWG TYPE:		DFTR:	
JOB NO:		CHKD:	SJL
DATE:	07/20/98	ENGR:	SJL

FILENAME: WHZ_01_AEP_1-30925.dgn | APPD:

DWG SIZE	DRAWING NO.	REVISION
ARCH E3 30.0"x44.0"	1-30925	2







REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD
6	6/8/12	1176-11-019F	LANDFILL	CKH	NWB	CKH	SJL	SJL
DESC: N.O.D. RESPONSE								
5	5/27/11	011.5718.005	LANDFILL	CKH	EDV	CKH	SJL	SJL
DESC: 2011 PTI MODIFICATION								
4	4/9/03							SJL
DESC: PERMIT MODIFICATIONS								
~~3~~	~~3/14/03~~							SJL
~~DESC: PERMIT MODIFICATIONS~~								
2	1/28/00							SJL
DESC: PTI CONDITION 19b								
1	3/18/99							SJL
DESC: N.O.D. RESPONSE								
0	7/20/98							SJL
DESC: ISSUED FOR PTI								

OEPA DRAWING NO.: 5I

TITLE

ZIMMER FGD LANDFILL

HYDROGEOLOGIC CROSS SECTIONS SECTIONS C-C' AND D-D'

FOR WM. H. ZIMMER GENERATING STATION - LANDFILL

Duke Energy

SCALE:	As Shown	DES:	RJK
DWG TYPE:		DFTR:	
JOB NO:		CHKD:	PHA
DATE:	07/20/98	ENGR:	SJL
FILENAME:	WHZ_01_AEP_1-30924.dgn	APPD:	

DWG SIZE	DRAWING NO.	REVISION
ARCH E3 30.0"x44.0"	1-30924	6

APPENDIX C6 – STRUCTURAL STABILITY ASSESSMENT

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Coal Pile Runoff Pond

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Coal Pile Runoff Pond at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Coal Pile Runoff Pond is located near Moscow, Ohio in Clermont County, approximately 0.6 miles north of the Zimmer Power Station. The Coal Pile Runoff Pond receives leachate from the Zimmer Power Station's on-site landfill, discharge from the Chemical Metal Cleaning waste treatment tank, and pumped flows from the D Basin CCR surface impoundment and other non-CCR ponds at Zimmer Power Station.

The Coal Pile Runoff Pond is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of the Coal Pile Runoff Pond is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of the Coal Pile Runoff Pond were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. The Coal Pile Runoff Pond is a ring dike structure and does not have abutments.

The foundation consists of medium stiff to hard clay soil, underlain by loose to very dense sand, which indicates stable foundations. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). A review of information about operations and maintenance as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, the Coal Pile Runoff Pond was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the Coal Pile Runoff Pond. No evidence of significant areas of erosion or wave action were observed and slopes were covered in vegetation. The Zimmer Power Station regularly maintains the slopes, including repairing observed surface erosion and addressing areas of poor vegetation growth, as required. Due to the characteristics of the outfall structure for the

Coal Pile Runoff Pond, sudden drawdown conditions are not expected to occur on the interior slopes. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of very stiff to hard clay material, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016); therefore, the original design and construction of the Coal Pile Runoff Pond included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the interior and exterior slopes is adequate as no substantial bare or overgrown areas were observed. Therefore, the original design and construction of the Coal Pile Runoff Pond included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance practices are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The spillway was evaluated using design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Coal Pile Runoff Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway consists of two, high-density polyethylene (HDPE) pipes, which is a non-erodible material that is designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). Any issues with the spillway are repaired and debris or other obstructions are removed from the spillway during operations and maintenance, as appropriate and as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

The stability and structural integrity of the hydraulic structure penetrating the dike of the Coal Pile Runoff Pond, which includes two HDPE pipe conduits, was evaluated using design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of the Coal Pile Runoff Pond.

AECOM's field observations found the HDPE pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structure. Operations and maintenance practices are in place to remove debris or other obstructions from the hydraulic structures, and address any deficiencies, as evidenced by conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the hydraulic structures. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of the Coal Pile Runoff Pond was evaluated by comparing the location of the Coal Pile Runoff Pond relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the Coal Pile Runoff Pond. No other downstream water bodies such as rivers, streams, or lakes are adjacent to the Coal Pile Runoff Pond. Several adjacent non-CCR surface impoundments are present, but they are not a river, stream, or lake.

A sudden drawdown slope stability analysis was performed for a cross section adjacent to the Ohio River considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from normal to empty pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the Coal Pile Runoff Pond meets the requirements listed in §257.73(d)(1)(vii).

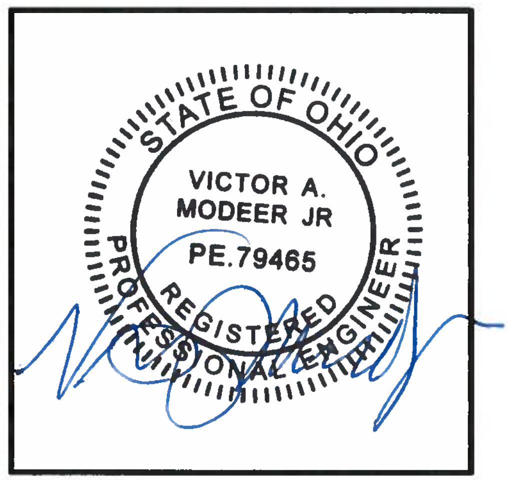
3 Certification Statement

CCR Unit: Zimmer Power Station; Coal Pile Runoff Pond

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date



AECOM

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Gypsum Recycle Pond

At Zimmer Power Station

This Coal Combustion Residual (CCR) Rule Report documents that the Gypsum Recycle Pond at the Zimmer Power Station is exempt from the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Gypsum Recycle Pond is located near Moscow, Ohio in Clermont County, approximately 0.1 miles northeast of the Zimmer Power Station. The Gypsum Recycle Pond serves as a storage pond for miscellaneous CCRs from wash-down collection systems and stormwater runoff at the Zimmer Power Station.

The Gypsum Recycle Pond is an incised CCR surface impoundment, as defined in 40 CFR 257.53. Under 40 CFR §257.73(b) structural stability assessments (§257.73(d)) must be performed for an existing CCR surface impoundment that:

1. *Has a height of five feet or more and a storage volume of 20 acre-feet or more; or*

2. *Has a height of 20 feet or more.*

The Gypsum Recycle Pond does not satisfy the criteria of §257.73(b) because the incised impoundment does not have dikes. Therefore, the Gypsum Recycle Pond is not subject to the structural stability assessment requirements under §257.73(d).

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

D Basin

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the D Basin at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The D Basin is located near Moscow, Ohio in Clermont County, approximately 0.5 miles north of the Zimmer Power Station. The D Basin serves as a dewatering basin for CCR produced by the Zimmer Power Station.

The D Basin is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of the D Basin is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of the D Basin were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. The D Basin is a ring dike structure and does not have abutments.

The foundation consists of soft to stiff alluvial soil overlying medium dense to very dense alluvial soil. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for D Basin at Zimmer Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of information about operations and maintenance as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, the D Basin was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the D Basin meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the D Basin. No evidence of significant areas of erosion or wave action were observed. Under normal operating conditions there is no free water present within the D Basin. The interior slopes are protected vegetation and a bottom ash protection layer. The exterior slopes are protected with vegetation. The bottom ash protection layer on the interior slopes isolates the embankment soils from surface erosion, wave action, and acts as a free-draining material that is not susceptible to the adverse effects of sudden drawdown. Therefore, the D Basin meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of medium dense to very dense material, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for D Basin at Zimmer Power Station* (October 2016); therefore, the original design and construction of the D Basin included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the D Basin meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior slopes, and vegetation where present on the interior slopes, is adequate as no substantial bare or overgrown areas were observed. Where vegetation is not present on the interior slopes, the bottom ash protection layer is used as an alternate form of slope protection, which is adequate as significant areas of erosion or wave action were not observed. Therefore, the original design and construction of the D Basin included adequate vegetation of the dikes and surrounding areas. Adequate information about operations and maintenance are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the D Basin meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The §257.73(d)(1)(v)(A) requirements are not applicable to the D Basin at the Zimmer Power Station because a spillway is not present. However, the §257.73(d)(1)(v)(B) requirement was evaluated to determine if the D Basin meets the requirements without a spillway system present, as discussed below.

The ability of the D Basin to adequately manage flow without a spillway system was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the D Basin can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for D Basin at Zimmer Power Station* (October 2016). Therefore, the D Basin meets the requirements in §257.73(d)(1)(v)(B), even though a spillway system is not present.

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Based on an evaluation of design drawings, information about operations and maintenance, and conditions observed in the field by AECOM, no hydraulic structures are present that underlie the base or pass through the dike of the D Basin. Therefore, the §257.73(d)(1)(vi) requirements are not applicable to the D Basin.

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of the D Basin was evaluated by comparing the location of the D Basin relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the D Basin. No other downstream water bodies are adjacent to the D Basin. The adjacent C and B Basins do not retain a pool that inundates the downstream slope of the D Basin during normal conditions.

A sudden drawdown slope stability analysis was performed at a cross-section considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from normal to low pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the D Basin meets the requirements listed in §257.73(d)(1)(vii).

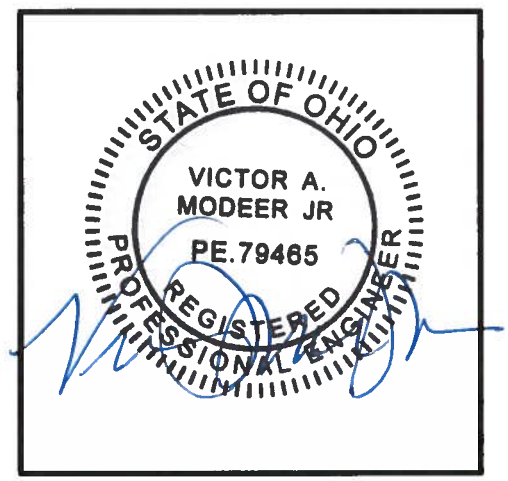
3 Certification Statement

CCR Unit: Zimmer Power Station; D Basin

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date



APPENDIX C7 – SAFETY FACTOR ASSESSMENT

AECOM

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Coal Pile Runoff Pond

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Coal Pile Runoff Pond at the Zimmer Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The Coal Pile Runoff Pond is located near Moscow, Ohio in Clermont County, approximately 0.6 miles north of the Zimmer Power Station. The Coal Pile Runoff Pond receives leachate from the Zimmer Power Station's on-site landfill, discharge from the Chemical Metal Cleaning waste treatment tank, and pumped flows from the D Basin CCR surface impoundment and other non-CCR ponds at Zimmer Power Station.

The Coal Pile Runoff Pond is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)
The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
(iii) The calculated seismic factor of safety must equal or exceed 1.00.
(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of the Coal Pile Runoff Pond. The exploration consisted of hollow-stem auger borings and laboratory program including strength and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at the Coal Pile Runoff Pond consist of very stiff to hard clay embankment fill underlain by medium stiff to hard alluvial clay. The alluvial clay layer is underlain by a layer of medium dense to very dense sand and gravel extending to bedrock. Phreatic water is within the foundation soils of the Coal Pile Runoff Pond.

Three (3) representative cross sections were analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross sections were located to represent critical surface geometry, subsurface stratigraphy, and phreatic conditions across the site. Each cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the Coal Pile Runoff Pond dikes. As a result, this loading condition is not applicable to the Coal Pile Runoff Pond.

Results of the Initial Safety Factor Assessments, for the critical cross-section for each loading condition (i.e. the lowest calculated factor of safety out of the cross sections analyzed for each condition), are listed in **Table 1**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	2.28
Maximum Surcharge Pool Loading	(ii)	1.40	2.28
Seismic	(iii)	1.00	1.60
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, the Coal Pile Runoff Pond meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Zimmer Power Station; Coal Pile Runoff Pond

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

AECOM

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Gypsum Recycle Pond

At Zimmer Power Station

This Coal Combustion Residual (CCR) Rule Report documents that the Gypsum Recycle Pond at the Zimmer Power Station is exempt from the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The Gypsum Recycle Pond is located near Moscow, Ohio in Clermont County, approximately 0.1 miles northeast of the Zimmer Power Station. The Gypsum Recycle Pond serves as a storage pond for miscellaneous CCRs from wash-down collection systems and stormwater runoff at the Zimmer Power Station.

The Gypsum Recycle Pond is an incised CCR surface impoundment as defined by 40 CFR 257.53. Under 40 CFR §257.73(b), a safety factor assessment (§257.73(e)) must be performed for an existing CCR surface impoundment that:

1. *Has a height of five feet or more and a storage volume of 20 acre-feet or more; or*

2. *Has a height of 20 feet or more.*

The Gypsum Recycle Pond does not satisfy the criteria of §257.73(b) because the incised impoundment does not have dikes. Therefore, the Gypsum Recycle Pond is not subject to safety factor assessment requirements under §257.73(e).

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

D Basin

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the D Basin at the Zimmer Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The D Basin is located near Moscow, Ohio in Clermont County, approximately 0.5 miles north of the Zimmer Power Station. The D Basin serves as a dewatering basin for CCR produced by the Zimmer Power Station.

The D Basin is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)
The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
(iii) The calculated seismic factor of safety must equal or exceed 1.00.
(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of the D Basin. The exploration consisted of hollow-stem auger borings and laboratory program including strength, hydraulic conductivity, and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at the D Basin consist of medium dense to dense sand overlying soft to stiff alluvial clay, which in turn overlies medium dense to very dense sand and gravel. Phreatic water is within the foundation of the D Basin.

A critical cross section was analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross section was located at the maximum embankment height for the D Basin. Due to the relatively short height of the D Basin embankments and uniform slope orientations, subsurface stratigraphy, and phreatic conditions, a cross section at the maximum embankment height is sufficient to represent the critical cross section. The cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the D Basin dikes. As a result, this loading condition is not applicable to the D Basin.

Results of the Initial Safety Factor Assessments are listed in **Table 1**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	3.88
Maximum Surcharge Pool Loading	(ii)	1.40	2.63
Seismic	(iii)	1.00	1.79
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, the D Basin meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Zimmer Power Station; D Basin

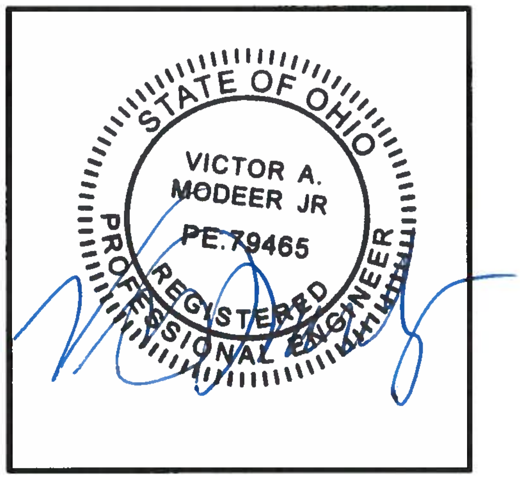
I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR.

Printed Name

10/13/16

Date



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Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com