Form CCR 1

Illinois Environmental Protection Agency

CCR Surface Impoundment Permit Application

Form CCR 1 – General Provisions

Bureau of Water ID Number: **CCR Permit Number:** **Facility Name:**	For IEPA Use Only

SECTION 1: FACILITY, OPERATOR, AND OWNER INFORMATION (35 Ill. Adm. Code 845.210(b))

Facility, Operator, and Owner Information

1.1	Facility Name		
	Powerton Generating Station		
1.2	Illinois EPA CCR Permit Number (if applicable)		
1.3	Facility Contact Information		
	Name (first and last) Joseph Kotas	Title Environmental Specialist	Phone Number 309-477-5216
	Email address Joseph.Kotas@nrg.com		
1.4	Facility Mailing Address		
	Street or P.O. box 13082 East Manito Road		
	City or town Pekin	State IL	Zip Code 61554
1.5	Facility Location		
	Street, route number, or other specific identifier 13082 East Manito Road		
	County name Tazewell	County code (if known)	
	City or town Pekin	State IL	Zip Code 61554
1.6	Name of Owner/Operator		
	Midwest Generation, LLC		

Facility, Operator, and Owner Info				
1.7	Owner/Operator Contact Information			
	Name (first and last) Todd Mundorf	Title Plant Manager	Phone Number 309-477-5212	
	Email address Todd.Mundorf@nrg.com			
1.8	Owner/Operator Mailing Address			
	Street or P.O. box 804 Carnegie Center			
	City or town Princeton	State NJ	Zip Code 08540	

SECTION 2: LEGAL DESCRIPTION (35 Ill. Adm. Code 845.210(c))

Legal Description

2.1	Legal Description of the facility boundary
	SEC 9 T24N R5W LYING W OF RR IN W 1/2 & W 50 X 2220.46 OF ADJ RR (EXC 2.05 AC TRACT) N W 1/4 300.7 AC

SECTION 3: PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS (35 Ill. Adm. Code 845.810)

Internet Site

3.1	Web Address(es) to publicly accessible internet site(s) (CCR website)
	https://midwestgenerationllc.com/illinois-ccr-rule-compliance-data-and-information/
3.2	Is/are the website(s) titled "Illinois CCR Rule Compliance Data and Information"
	☑ Yes ☐ No

SECTION 4: IMPOUNDMENT IDENTIFICATION

Impoundment Identification

4.1 List all the impoundment identification numbers for your facility and check the corresponding box to indicate that you have attached a written description for each impoundment.

Impoundment ID		
W1798010008-04	☑	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description

			☐	Attached written description
			☐	Attached written description
			☐	Attached written description
			☐	Attached written description

SECTION 5: CHECKLIST AND CERTIFICATION STATEMENT

Checklist and Certification Statement

5.1 In Column 1 below, mark the sections of Form 1 that you have completed and are submitting with your application. For each section, specify in Column 2 any attachments that you are enclosing.

Column 1		Column 2	
Section 1: Facility, Operator, and Owner Information	☑	w/attachments	☑
Section 2: Legal Description	☑	w/attachments	☐
Section 3: Publicly Accessible Internet Site Requirement	☑	w/attachments	☐
Section 4: Impoundment Identification	☑	w/attachments	☑

5.2 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name (print or type first and last name) of Owner/Operator	Official Title
Todd Mundorf	Plant Manager
Signature	Date Signed
Todd Mundorf	7/15/2022

Form CCR 2CN

Illinois Environmental Protection Agency

CCR Surface Impoundment Permit Application

Form CCR 2CN – New Construction

Bureau of Water ID Number:

CCR Permit Number:

Facility Name:

For IEPA Use Only

SECTION 1: DESIGN AND CONSTRUCTION PLANS (35 Ill. Adm. Code 845.220)

Design and Construction Plans (Construction History)

1.1	CCR surface impoundment name.	Bypass Basin
1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).	W1798010008-04
1.3	Describe the boundaries of the CCR surface impoundment. (35 Ill. Adm. Code 845.210 (c)).	SEC 8 T24N R5W E 1/2 OF NE 1/4 (EXC RIVER) & E 1/2 OF SE 1/4 (EXC RIVER & EXC TRACT) 111.65 AC
1.4	State the purpose for which the CCR surface impoundment is being used.	The Bypass Basin is not currently in service and was historically used as a settling pond for bottom ash remaining in decant water from the facility's dewatering bins and for other process water related to power generation at the site when the facility's Ash Surge Basin was out of service for regular maintenance. After it has been retrofitted, the Bypass Basin will be used for the same purpose.
1.5	How long has the CCR surface impoundment been in operation?	42 Years (since 1980)
1.6	List the types of CCR that have been placed in the CCR surface impoundment.	Bottom Ash
1.7	List the name of the watershed within which the CCR surface impoundment is located.	Pekin Lake-Illinois River Watershed

Section	Item	Content	
Design and Construction Plans (Continued)	1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
		28,834 acres	
	1.9	Check the corresponding boxes to indicate that you have attached the following:	
		☑	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.
		☑	A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment.
		☑	A statement of the method of site preparation and construction of each zone of the CCR surface impoundment.
		☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
		☑	Drawings satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(1)(F).
		☑	A description of the type, purpose, and location of existing instrumentation.
		☑	Area Capacity Curves for the CCR Impoundment.
		☑	A description of each spillway and diversion design features and capacities and provide the calculations used in their determination.
		☑	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.
	1.10.1	Is there any record or knowledge of structural instability of the CCR surface impoundment?	
		☐ Yes ☑ No	
	1.10.2	If you answered yes to Item 1.10.1, provide detailed explanation of the structural instability.	

SECTION 2: NARRATIVE DESCRIPTION OF THE FACILITY (35 Ill. Adm. Code 845.220)

Section	Item	Content
Narrative Description	2.1	List the types of CCR expected in the CCR surface impoundments.
		Bottom Ash
	2.2	Have you attached a chemical analysis of each type of expected CCR?
		☑ Yes

Narrative Description (Cont.)	2.3	Estimate of the maximum capacity of the surface impoundment in gallons or cubic yards.
		The Bypass Basin's maximum capacity is approximately 6,700 cubic yards.
	2.4	The rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.
		18.8 million GPD; dTn
	2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.
		Approximately 5 Years (Until December 31, 2028)
	2.6	Have you attached an on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment?
		☑ Yes ☐ No

SECTION 3: MAPS (35 Ill. Adm. Code 845.220)

Maps	3.1		Check the corresponding boxes to indicate that you have attached the following maps:
		☑	A site location map on the most recent United Sates Geological Survey (USGS) quadrangle of the area from the 7 ½ minute series (topographic) or on another map whose scale clearly shows the information required in 35 Ill. Adm. Code 845.220(a)(3).
		☑	Site plans maps satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(4).

SECTION 4: ATTACHMENTS

Attachments	4.1		Check the corresponding boxes to indicate that you have attached the following:
		☑	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.
		☑	Plans and specifications fully describing the design, nature, function, and interrelationship of each individual component of the facility.
		☑	The signature and seal of a qualified professional engineer.
		☑	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under 35 Ill. Adm. Code 845.240.
		☑	A summary of the issues raised by the public during the public notification and public meetings.
		☑	A summary of any revisions, determinations, or other considerations made in response to those issues raised by the public during the public notification and public meetings.
		☑	A list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.
		☑	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.

			Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in the operation of heavy equipment and excavation.
SECTION 5: GROUNDWATER MONITORING PROGRAM			
Groundwater	5.1	Indicate that you have attached the following components of a new groundwater monitoring program or any modifications to an existing groundwater monitoring program by checking the corresponding boxes:	
		☑	A hydrogeologic site investigation meeting the requirements of 35 Ill. Adm. Code 845.620, if applicable.
		☑	Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.
		☑	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 35 Ill. Adm. Code 845.640 and 35 Ill. Adm. Code 845.650.
SECTION 6: PLANS AND SPECIFICATIONS			
Plans and Specifications	6.1	Indicate that you have attached plans and specifications that demonstrate the proposed CCR surface impoundment will meet the location standards in the following sections by checking the corresponding boxes:	
		☑	35 Ill. Adm. Code 845.300 (Placement Above the Uppermost Aquifer)
		☑	35 Ill. Adm. Code 845.310 (Wetlands)
		☑	35 Ill. Adm. Code 845.320 (Fault areas)
		☑	35 Ill. Adm. Code 845.330 (Seismic impact zones)
		☑	35 Ill. Adm. Code 845.340 (Unstable areas and floodplains)
	6.2	Indicate that you have attached plans and specifications that demonstrate the proposed CCR surface impoundment will meet the following design criteria by checking the corresponding boxes:	
		☑	The CCR surface impoundment will have a liner meeting the liner requirements of 35 Ill. Adm. Code 845.400(b) or (c).
		☑	The CCR surface impoundment will have a leachate collection system meeting the requirements of 35 Ill. Adm. Code 845.420.
		☑	The CCR surface impoundment, if not incised, will be constructed with slope protection, as required by 35 Ill. Adm. Code 845.430.
	6.3	Indicate that you have attached the following plans by checking the corresponding boxes:	
		☑	CCR fugitive dust control plan, as specified in 35 Ill. Adm. Code 845.500(b).
		☑	Preliminary written closure plan, as specified in 35 Ill. Adm. Code 845.720(a).
		☑	Initial written post-closure care plan, as specified in 35 Ill. Adm. Code 845.780(d), if applicable.

MWG
Midwest Generation, LLC

Powerton Generating Station
Bypass Basin
(IEPA ID No. W1798010008-04)

Application for Retrofit Construction Permit

Revision 0

July 15, 2022

Issue Purpose: Permit

Project No.: 12661-130

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
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Sargent & Lundy

TABLE OF CONTENTS

TABLES

ATTACHMENTS

INTRODUCTION

Midwest Generation, LLC (MWG) currently operates the Powerton Generating Station (“Powerton” or the “Station”), a coal-fired steam electric generating station located in Pekin, Illinois. The Station’s address is 13082 East Manito Rd, Pekin, IL 61554. The Station consists of four coal-fired boilers and two electric generating units, Units 5 and 6, with an approximate nameplate capacity of 1,785 megawatts (MW). As part of electric power generating operations, bottom ash, a coal combustion residual (CCR) from the Station’s boilers, is sluiced to a set of two dewatering bins (one dedicated pair per unit) which mechanically promote sedimentation of the suspended bottom ash particles in the sluice water. Decant water from each pair of dewatering bins, which still contains some bottom ash particles, then overflows into a concrete trench that directs the effluent into a CCR surface impoundment for additional sedimentation.

Currently, decant water from the Station’s dewatering bins is sent to the Station’s Ash Surge Basin. Historically, whenever the Station had to clean the Ash Surge Basin as part of regular maintenance, decant water from the concrete trench would be diverted to the Bypass Basin instead. However, the Bypass Basin was taken out of service in October 2020 and has not been used for managing CCR or non-CCR waste streams since. It will not be placed back into service until it has been retrofitted with a new composite liner system and a new leachate collection and removal system in accordance with federal and state environmental regulations for CCR surface impoundments.

Pursuant to § 845.220 of Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code), MWG is submitting this application to the Illinois Environmental Protection Agency (Illinois EPA) for a construction permit to retrofit Powerton’s Bypass Basin with a new composite liner system and a new leachate collection and removal system so that it may be placed back into service to manage CCR effluent from the Station’s dewatering bins and other non-CCR waste streams from electric power generating operations. The purpose of this report and all attachments hereto is to demonstrate that the design, construction, and operation of the retrofitted Bypass Basin will comply with the Illinois Pollution Control Board’s “Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments,” which are codified in Part 845 to the aforementioned 35 Ill. Adm. Code. Accordingly, this report and all attachments hereto provide the documents and information required for a construction permit application to retrofit an existing CCR surface impoundment as specified by 35 Ill. Adm. Code 845.220(a)–(b).

1.0 HISTORY OF CONSTRUCTION (845.220(A)(1))

The history of construction for the Bypass Basin as specified by 35 Ill. Adm. Code 845.220(a)(1) is presented in Sections 1.1 through 1.13.

1.1 CCR SURFACE IMPOUNDMENT IDENTIFYING INFORMATION

The Bypass Basin is operated by Midwest Generation, LLC, whose address is 804 Carnegie Center, Princeton, NJ, 08540. The Bypass Basin's Illinois EPA identification number is W1798010008-04.

1.2 PURPOSE OF THE CCR SURFACE IMPOUNDMENT

The Bypass Basin was historically used as a settling pond for bottom ash remaining in decant water from Powerton's dewatering bins and for other process water related to power generation at the site when the Station's Ash Surge Basin was out of service for regular maintenance. After it has been retrofitted with a new composite liner system and a new leachate collection and removal system, the Bypass Basin will be used for this same purpose.

1.3 CCR SURFACE IMPOUNDMENT SERVICE HISTORY

The Bypass Basin was originally constructed circa 1980 and operated until it was taken out of service for routine cleaning in early October 2020, after which MWG elected to take it out of service until it is retrofitted with a new composite liner system and a new leachate collection and removal system.

1.4 TYPES OF CCR IN THE SURFACE IMPOUNDMENT

Bottom ash was historically placed in the Bypass Basin until it was taken out of service in early October 2020. The chemical constituents that make up the Station's bottom ash are discussed in detail in Section 2.1.

1.5 NAME & SIZE OF SURROUNDING WATERSHED

The Bypass Basin is located within the Pekin Lake-Illinois River watershed (U.S. Geological Survey 12-Digit Hydrologic Unit Code 071300030304), which is approximately 28,834 acres (USGS, 2021). This watershed is located within the larger Lower Illinois watershed.

It should be noted that the surface water runoff for the Bypass Basin is limited to the area within the embankment crests because they are constructed with elevated embankments in relation to the surrounding ground surface.

1.6 DESCRIPTION OF CCR SURFACE IMPOUNDMENT FOUNDATION MATERIALS

1.6.1 PHYSICAL PROPERTIES OF FOUNDATION MATERIALS

The following descriptions of the physical properties of the Bypass Basin's foundation materials are taken from the history of construction prepared by Geosyntec Consultants (Geosyntec) for the basin in 2016 (Geosyntec, 2016a).

The physical properties of the foundation materials in the vicinity of the Bypass Basin generally consist of interlaying sandy and clayey units. Soil borings performed in 2005 as part of a site investigation by KPRG and Associates, Inc. (KPRG) identified layers of sand with silt and gravel, silty sand with traces of clay from the ground surface to a depth of about 20 feet. Approximately 100 to 125 feet of alluvial sands and gravels with some minor clay underlies the Station based on publicly available geologic information. Silt and clay layers were observed beneath the fill material used to construct the basin's embankments based on logs from monitoring wells installed in the basin's embankments as well as borings and cone penetration test (CPT) soundings performed in the vicinity of the basin. This information was obtained from site investigation work performed by Patrick Engineering in 2011 and Geosyntec in 2016. The logs and CPT soundings show that the silt and clay layers range from 16 to 20 feet thick, and these layers are underlain by approximately 34 to 43 feet of medium dense sand and gravel that is poorly graded. Geosyntec performed a soil boring and a CPT sounding north of the Bypass Basin that identified a layer of very hard lean clay below the above-mentioned poorly graded sand and gravel. Finally, no abutments are present.

1.6.2 ENGINEERING PROPERTIES OF FOUNDATION MATERIALS

The following descriptions of the engineering properties of the Bypass Basin's foundation materials are taken from the initial structural stability and safety factor assessments prepared by Geosyntec for the basin in 2016 (Geosyntec, 2016b).

The foundation materials for the Bypass Basin were determined to be clay or sand as indicated in Section 1.6.1; the engineering properties for these materials are presented in Table 1.6-1. The properties were determined from site investigations, published correlations, and laboratory testing of samples collected during the site investigations referenced in Section 1.6.1.

Table 1.6-1 – Engineering Properties of Foundation Materials

Material	Unit Weight (pcf)	Drained Friction Angle (degrees)	Effective Cohesion (psf)	Undrained Shear Strength (psf)
Clay	115	32	25	600
Sand	125	32	0	--

The very hard lean clay mentioned in Section 1.6.1 that underlies the poorly graded sand and gravel did not have engineering properties determined for it. This was because of its depth below ground surface in relation to the basins and its negligible contribution to the slope stability analysis (Geosyntec, 2016b).

1.7 DESCRIPTION OF CONSTRUCTION MATERIALS, METHODS, AND DATES

The following descriptions of the historical construction materials, methods, and dates for the Bypass Basin are based on the construction plans prepared by (1) NUS Corporation in 1980 for the basin's original construction and by (2) Natural Resource Technology (NRT) in 2010 for re-lining the basin. Both sets of construction plans are provided in Attachments 1-1 and Attachment 1-2, respectively. It should be noted that as-built drawings for the original construction of the Bypass Basin were not available detailing the actual methods and materials used to construct the basin circa 1980.

1.7.1 PHYSICAL & ENGINEERING PROPERTIES OF CONSTRUCTION MATERIALS

Based on the original construction plans for the Bypass Basin prepared by NUS Corporation in 1980, the basin's embankments were constructed using compacted fill. Engineering properties for the compacted fill were estimated by Geosyntec as shown in Table 1.7-1 for use in the Bypass Basin's initial safety factor assessment (Geosyntec, 2016b). These estimated engineering properties were based on site investigations, published data, and laboratory testing of the Bypass Basin's embankment materials.

Table 1.7-1 – Engineering Properties of Embankment Materials

Material	Unit Weight (pcf)	Drained Friction Angle (degrees)	Effective Cohesion (psf)
Embankment Fill	125	35	25

1.7.2 CONSTRUCTION METHODS

Based on the 1980 original construction plans, the fill material for the Bypass Basin's southern and eastern embankments were placed in loose lifts not to exceed 9 inches and compacted to 95 percent relative compaction when compacted to a maximum dry density obtained from a Modified Proctor test. The basin's northern and western embankments were already present when it was constructed because these embankments are shared with the Ash Surge Basin (north) and the East Yard Runoff Basin[1] (west), which were both constructed before the Bypass Basin. The design width for the top of the embankment ranged from 12 to 18 feet and a maximum slope height is approximately 24 feet on the west side of the basin where the embankment is shared by the East Yard Runoff Basin. The interior faces of the Bypass Basin's embankments were designed at slopes of 3-horizontal to 1-vertical (3H:1V), while the exterior faces were designed at slopes of 2.5H:1V or shallower.

[1] The East Yard Runoff Basin is a non-CCR surface impoundment.

Originally, the Bypass Basin was lined with a Hypalon® liner along the basin floor and interior slopes; a 12-in.-thick Poz-O-Pac liner was also installed along the basin floor when it was constructed. In 2010, the original Hypalon® and Poz-O-Pac liners were removed and replaced with a 60-mil HDPE geomembrane liner.

1.7.3 CONSTRUCTION DATES

Exact dates for construction of the Bypass Basin's embankments, original liner system, and appurtenant structures are unknown; however, construction drawings were approved for construction in June 1980. As previously stated, the Bypass Basin's original Hypalon® and Poz-O-Pac liners were removed and replaced with a 60-mil HDPE geomembrane liner in 2010.

1.8 DETAILED DIMENSIONAL DRAWINGS

The original construction plans for the Bypass Basin prepared by NUS Corporation in 1980 are provided in Attachment 1-1. Meanwhile, the as-built drawings for replacing the Bypass Basin's liner prepared by NRT in 2011 are provided in Attachment 1-2.

1.9 INSTRUMENTATION

When the Bypass Basin was in service, a water level monitoring system with an ultrasonic level detector in the pump house sump north of the Ash Surge Basin was used to control the pumps that maintained the operational water level in the Bypass Basin. However, this instrumentation did not determine the water level in the Bypass Basin. A staff gauge has been installed in the basin to determine the water level visually.

1.10 AREA-CAPACITY CURVE

An area-capacity curve for the retrofitted Bypass Basin is provided in Attachment 1-4.

1.11 SPILLWAY AND DIVERSION DESIGN FEATURE CAPACITIES AND CALCULATIONS

There is a vertical 5-foot-diameter, corrugated metal pipe (CMP) riser located in the northeast corner of the Bypass Basin that was originally designed to act as an emergency spillway for the basin. The vertical riser connects to a 30-inch diameter concrete pipe that extends northwards within the embankment between the Bypass Basin and the Ash Surge Basin that discharges onto a concrete apron on the southern slope of the Ash Surge Basin. Although no calculations for the original design of this emergency spillway structure are available, the Bypass Basin has historically operated properly without any issues.

1.12 SURVEILLANCE, MAINTENANCE, & REPAIR CONSTRUCTION SPECIFICATIONS

Technical specifications for the Bypass Basin liner replacement project performed in 2010 are provided in Attachment 1-3.

1.13 RECORD OF STRUCTURAL INSTABILITY

There is no record or knowledge of structural instability associated with the Bypass Basin.

2.0 NARRATIVE DESCRIPTION OF THE FACILITY (845.220(A)(2))

2.1 CCR TYPES & CHEMICAL ANALYSES

Bottom ash has historically been managed in the Bypass Basin and will continue to be managed in the basin after it has been retrofitted with a new composite liner system and a new leachate collection and removal system. A sample of the CCR present in the Ash Surge Basin, which is representative of the CCR that has been and will be managed in the Bypass Basin, was sampled and analyzed for the parameters listed in 35 Ill. Adm. Code 845.600(a) except for total dissolved solids. The results of those analyses are presented in Table 2.1-1, and the total laboratory data package is provided in Attachment 2-1.

Table 2.1-1 – Chemical Constituents of CCR to be Managed in Powerton Bypass Basin

Parameter	CCR Sample (06-23-2021)	Parameter	CCR Sample (06-23-2021)
Antimony	< 8.6	Cobalt	< 11
Arsenic	2.2	Fluoride	4.7
Barium	1,800	Lead	5.5
Beryllium	0.90	Lithium	12
Boron	46	Mercury	0.094
Cadmium	< 0.17	Molybdenum	1.0
Calcium	39,000	Selenium	< 0.86
Chloride	88	Sulfate	230
Chromium	16	Thallium	1.2

Notes:
1. Reproduced from Table 2-1 in KPRG, 2021a.
2. All results are in milligrams per kilogram (mg/kg), except for percent solids, which is percent (%).
3. Symbols:
    a. F1 – MS and/or MSD recovery exceed control limits.
    b. V – Serial Dilution exceeds the control limits.

2.2 MAXIMUM CAPACITY

The Bypass Basin's maximum capacity is approximately 6,700 cubic yards.

2.3 WASTE STREAMS

Powerton has not sent CCR or non-CCR waste streams to the Bypass Basin since early October 2020. However, the CCR and non-CCR waste streams currently being managed in the Ash Surge Basin will be managed in the Bypass Basin after the latter has been retrofitted. These waste streams and their corresponding average flow rates are listed in Table 2.3-1 and are shown on the Station's process flow diagram provided in Attachment 2-2. These waste streams are all treated for suspended solids removal prior to being discharged to the Illinois River in accordance with the Station's NPDES Permit No. IL0002232.

Table 2.3-1 – Future Inflows into Powerton Bypass Basin

Waste Stream	Description	Average Flow, MGD (Type)
Unit 5 & 6 Dewatering Bin Effluent	Effluent from the Unit 5 and 6 dewatering bins containing suspended bottom ash particles.	10.9 (Typical)
Unit 5 and 6 Slag Tank Overflow	Overflow water from the boiler slag tanks. Include wastewater from: • Dust extractors in the coal tripper room, and • Washdown of the tail end and tripper rooms.	6.2 (Typical)
East Yard Runoff Basin Overflow	Overflow water from the Station's East Yard Runoff Basin. In addition to runoff from the eastern portion of the Station's property, includes water from: • Roof and yard drains in the areas of former Units 1, 2, 3, and 4; • Boiler room sumps, roof drains, and building drains; • Scrubber and limestone building area drains; • Condensate storage tank overflow; • Washdown of the trona mill; and • Trona mill roof drains.	1.3 (Intermittent)
Makeup Treatment Plant Effluent	Wastewater generated by the Station for treating makeup water prior to use in plant processes. Includes: • Demineralizer sand filter backwash, • Demineralizer regenerant, • Reverse osmosis (RO) reject wastewater, and • RO cleaning wastewater.	0.4 (Typical)
Metal Cleaning Waste Treatment System Effluent	Effluent from the Station's Metal Cleaning Waste Treatment System, which treats gas-side boiler cleaning waste overflow from the Metal Cleaning Basin.	0.04 (Intermittent)

Source: Sargent & Lundy (2021).

2.4 OPERATING LIFE

The Bypass Basin is currently anticipated to receive the CCR and non-CCR waste streams listed in Table 2.3-1 until December 31, 2028.

2.5 ON-SITE TRANSPORTATION PLAN

The Powerton Generating Station is a secure facility. The property boundary is fenced in with two gates. The main gate has a guard house with full time security. This will be the typical vehicle access to the Bypass Basin using the main plant road. Visitors will be required to sign in and out with the guard personnel. The second gate will be used for large vehicles to access the Bypass Basin. This gate is a slide gate with a key card just east of the main gate.

Upon approval of this construction permit application, the Bypass Basin will be retrofitted with a new composite liner system and a new leachate collection system. During the retrofit construction activities, access to the facility will still be controlled via the two aforementioned gates. As needed, road intersections are traffic-controlled with stop signs. The speed limit on the property is 5 miles per hour.

The Bypass Basin will be accessed using the existing roads on the property. These roads are shown in Figure 2 in Attachment 2-3. The main road that leads from the main gate ultimately leads to the northwest corner of the Bypass Basin at the eastern end of the facility's property. Meanwhile, the plant road utilized by large vehicles ultimately leads to the southeast corner of the Bypass Basin. Gravel roads along the basin's northern and eastern embankments will allow vehicles to reach the basin's access ramp in the northeast corner of the basin. These roads will be used by construction personnel to bring materials and equipment required to retrofit the Bypass Basin. Larger construction equipment may utilize an existing road loop northeast of the basin to turn around. Such equipment will also have either backup alarms or spotters as they are backing up near the Bypass Basin.

Transportation access to the Bypass Basin will not be required during normal day-to-day operations after the Bypass Basin has been retrofitted and placed back into service. Station personnel will use the access roads shown in Figure 2 (Attachment 2-3) during weekly inspections of the basin to ensure no issue arise. On a quarterly basis, groundwater sampling will be performed at the monitoring wells surrounding the Bypass Basin, during which time these roads will be used to access the wells.

3.0 SITE LOCATION MAP (845.220(A)(3))

A site location map on the most recent U.S. Geological Survey (USGS) quadrangle of the area from the 7 ½ minute topographic series is provided in Attachment 3. This map includes details regarding the facility and adjacent properties boundaries extending 1000 meters, surface waters, the prevailing wind direction, and the limits of all 100-year floodplains. Alongside this, all natural areas designated as a Dedicated Illinois Nature Preserve under the Natural Areas Preservation Act, all historic and archaeological sites designated by the National Historic Preservation Act and the Illinois Historic Sites Advisory Council Act, and all areas identified as critical habitat under the Endangered Species Protection Act of 1973 and the Illinois Endangered Species Protection Act are also shown on this map.

4.0 SITE PLAN MAP (845.220(A)(4))

Site plan maps providing the information required by 845.220(a)(4) are included in various attachments. Figures 4-1 and 4-2 in Attachment 4 show the entire Powerton Generating Station property (Figure 4-1) and a plan view showing Units 5 and 6, the locations of all existing CCR surface impoundments, and facility roads (Figure 4-2). Transportation routes from the Station's main gates to the CCR surface impoundments are shown on the aforementioned transportation plan in Figure 2. The boundaries of the Station's CCR surface impoundments and the locations of their existing groundwater monitoring well locations are shown on Figure 9-1 in Attachment 9. Finally, cross sections near / through the Station's CCR surface impoundments are shown on Figures 9-2 through 9-7 in Attachment 9.

5.0 DESCRIPTION OF PROPOSED RETROFIT (845.220(A)(5))

The proposed construction plans and specifications for retrofitting the Bypass Basin are provided in Attachment 5-1. MWG intends for the retrofit work to be performed by a General Work (GW) Contractor and its subcontractors, while an independent, third-party Construction Quality Assurance (CQA) Contractor will be responsible for assuring the Bypass Basin is retrofitted in accordance with the proposed construction plans and specifications. The technical specifications for the CQA work are provided in Attachment 5-2.

In accordance with the proposed construction plans and specifications, MWG plans to retrofit the Bypass Basin with a new composite liner system and a new leachate collection and removal system by executing the following sequential steps:

1. Obtaining a construction permit from the Illinois EPA for retrofitting the Bypass Basin;
2. Removing the gravel warning and sand cushion layers over the existing geomembrane liner from the basin and transporting the soil materials to a permitted disposal facility;
3. Decontaminating the basin’s existing geomembrane liner for re-use as a supplemental liner in the retrofitted basin, including submittal of visual inspection documentation and analytical testing results to demonstrate the existing liner is no longer contaminated with CCR constituents in accordance with 35 Ill. Adm. Code 845.770(a)(4);
4. Decontaminating the basin’s appurtenant structures (*e.g.*, inlet and outlet structures, piping);
5. Placing structural fill within the basin floor to establish the slopes for the new leachate collection and removal system and to support the new composite liner system;
6. Installing a composite liner system consisting of a 60-mil HDPE geomembrane over a geosynthetic clay liner (GCL); and
7. Installing a leachate collection and removal system consisting of a drainage geocomposite, leachate collection pipe, and submersible sump pump;
8. Installing a sand filter layer over the leachate collection and removal system; and
9. Installing a protective warning layer over the sand filter layer.

5.1 CCR REMOVAL & DECONTAMINATION

In early October 2020, Powerton Station took the Bypass Basin out of service for routine cleaning and began drawing down the surface water in the basin to dewater the basin and the CCR material stored therein. The Station then began removing the ash stored above the existing granular protective layers covering the basin’s existing geomembrane liner in accordance with the Station’s historical cleaning and maintenance practices for the Bypass Basin whereby ash is periodically removed from the basin to recover storage capacity. As of late October 2021, no CCR remains in the Bypass Basin.

Upon approval of the retrofit construction permit application, the retrofit activities will begin with removal of the granular protective layers covering the Bypass Basin's existing geomembrane liner: a 6-in.-thick gravel warning layer and a 12-in.-thick sand cushion layer. These soil materials will be carefully excavated, loaded onto trucks, and transported off-site for disposal at a permitted disposal facility. Because these soil materials are likely to contain CCR, they will be handled and hauled off-site in accordance with 35 Ill. Adm. Code 845.740(c), which includes specifications for proper manifests for each transported truckload, a transportation plan, on-site fugitive dust controls, signage and public notices, and managing stormwater to prevent contamination of surface water and groundwater.

After the existing granular protective layers in the Bypass Basin have been removed, the basin's existing HDPE geomembrane liner will be decontaminated so that it can be re-used as a supplemental liner under the new composite liner system being installed. The basin's inlet and outlet structures, associated piping, etc. will also be decontaminated. At a minimum, decontamination procedures will include pressure washing of the geomembrane liner and pond appurtenances in a systematic manner to remove all CCR and residuals of CCR. Following decontamination, the existing geomembrane liner will be visually inspected, and an electrical leak location survey will be conducted to ensure the liner is competent. Analytical tests will also be conducted in accordance Note 4.C.III on Drawing POW-BBR-CSK-004 (see Attachment 5-1) to demonstrate that the liner is no longer contaminated with CCR constituents.

5.2 STRUCTURAL FILL

After the existing granular protective layers have been removed and the Bypass Basin's existing HDPE geomembrane liner and appurtenances have been decontaminated, structural fill will be placed, compacted, and graded along the relatively flat basin floor to establish a minimum slope of three percent towards the location of the new leachate collection pipe being installed near the center of the basin. All earthwork activities associated with placing, compacting, and grading structural fill along the basin floor will be done in a manner to prevent tearing, ripping, or otherwise damaging the Bypass Basin's existing HDPE geomembrane liner.

5.3 COMPOSITE LINER SYSTEM

After the structural fill has been placed over the basin's existing HDPE geomembrane liner, the Bypass Basin's new composite liner system will be installed. The proposed new composite liner system for the Bypass Basin consists of a 60-mil HDPE geomembrane over a geosynthetic clay liner (GCL). The liquid flow rate through the GCL component will be less than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec in accordance with 35 Ill. Adm. Code 845.400(c)(2).

The GCL panels will be delivered to the project site by the GCL manufacturer in rolls. The GCL panels will be deployed directly over the recently installed structural fill material parallel to the slope towards the leachate collection trench (*i.e.*, perpendicular to the slope elevation contours shown on the construction plans). Adjacent panels will be overlapped by a minimum of six inches along longitudinal seams and by a minimum of 24 inches along end seams. Seaming will be performed by pouring dry granular bentonite along the overlap zone in accordance with the GCL manufacturer's recommendations. Temporary anchoring, such as sand bags, will be placed along the edges of the exposed GCL panels to prevent uplift of the panels by wind during installation of the GCL.

As panels of GCL are deployed, placed, and seamed, panels of the upper HDPE geomembrane liner will be placed over the installed GCL panels. Similar to the GCL panels, the HDPE geomembrane liner panels will be delivered to the project site by the geomembrane manufacturer in rolls. The panels will be deployed directly over and in the same orientation as the installed GCL panels (i.e., parallel to the slope towards the leachate collection trench). Adjacent panels will be overlapped by a minimum of three to four inches prior to being seamed via double wedge fusion welding or extrusion fillet welding, depending on the geomembrane manufacturer's recommendations.

Both composite liner system components will be secured in an anchor trench along the crests of the Bypass Basin's embankments. The anchor trench will approximately two feet deep and will be backfilled to anchor the geosynthetic components of the Bypass Basin's new composite liner system and leachate collection and removal system in place (i.e., GCL, HDPE geomembrane liner, and drainage geocomposite). The backfill soil will be properly compacted to prevent the geosynthetic components from pulling out of the anchor trench.

As the composite liner system is being installed, field CQA inspections and tests will be performed in accordance with the retrofit construction plans and specifications provided in Attachments 5-1 and 5-2.

5.4 LEACHATE COLLECTION & REMOVAL SYSTEM

As areas of the Bypass Basin are lined with the new composite liner system, the new leachate collection and removal system (LCRS) components will be installed. The two primary components of the proposed LCRS are (1) a drainage geocomposite and (2) a perforated leachate collection pipe. The drainage geocomposite will consist of an HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet core. The transmissivity of the drainage geocomposite will be at least 6×10^{-4} m^2/sec pursuant to 35 Ill. Adm. Code 845.420(a)(B). Meanwhile, the perforated leachate collection pipe will be installed in the leachate collection trench along the middle of the basin and will convey collected leachate to a sump pump at the southern end of the Bypass Basin to ultimately be pumped out of the basin into the basin's outlet structure.

Similar to the GCL and HDPE geomembrane liner, the drainage geocomposite panels will be delivered to the project site by the corresponding manufacturer in rolls. The panels will be deployed directly over the new composite liner system. Adjacent panels will be overlapped by a minimum of four inches and will be joined using self-locking straps on 1-foot centers along end seams, 5-foot centers along longitudinal seams on the basin slopes, and 10-foot centers along longitudinal seams on the basin floor. The drainage geocomposite will also be secured with the GCL and HDPE geomembrane liner in the anchor trench along the crests of the Bypass Basin's embankments.

As previously stated, the 6-inch diameter perforated leachate collection pipe will be installed in a leachate collection trench along the center of the basin floor above the new composite liner system. To preclude the pipe's perforations from clogging, the pipe will be installed in and supported by a bedding layer of free-draining, coarse aggregate material. At the southern end of the basin, a non-perforated riser pipe will be installed to house a wheeled, submersible pump that will ultimately be used to dewater the Bypass Basin during periodic cleanings, at the time of closure, and as needed during the post-closure care period.

As the leachate collection and removal system is being installed, field CQA inspections and tests will be performed in accordance with the retrofit construction plans and specifications provided in Attachment 5-1 and 5-2.

5.5 SAND FILTER & PROTECTIVE WARNING LAYERS

After the new LCRS components are installed in the Bypass Basin, a sand filter layer will be installed above the new LCRS to prevent CCR and non-CCR sediments from clogging the LCRS. This filter layer will consist of sand imported from an offsite borrow source conforming to Gradations FA 1 or FA 2 pursuant to the Illinois Department of Transportation's (IDOT) Standard Specifications for Road and Bridge Construction. The material will be carefully placed and graded within the basin area to preclude damage to the new LCRS and composite liner system components. Finally, the sand filter layer will have a hydraulic conductivity of at least 1×10^{-5} cm/sec pursuant to 35 Ill. Adm. Code 845.420(a)(2).

In addition, pursuant 35 Ill. Adm. Code 845.420(a)(8), a protective warning layer will be installed over the sand filter layer to provide a means of deflecting the force of CCR pumped into the retrofitted Bypass Basin. Along the floor of the retrofitted Bypass Basin, this uppermost layer will be comprised of coarse aggregate materials conforming to IDOT Gradation CA 6 to provide a working surface for operators removing CCR from the basin; it will also serve as a means of warning these operators that they have reached the basin floor and to stop excavating. Along the basin's side slopes, the protective warning layer will consist of riprap on a gravel bedding layer to protect the sand filter layer from erosion. Like the sand filter layer, all protective warning layer materials will be carefully placed and graded within the Bypass Basin to preclude damage to the basin's new LCRS and composite liner system.

6.0 FACILITY COMPONENT PLANS & SPECIFICATIONS (845.220(A)(6))

The Powerton Generating Station is a coal-fired steam electric generating station that burns coal to generate electricity. The facility's boundaries are shown on Figure 4-1 in Attachment 4. The Station consists of four coal-fired boilers and two electric generating units (Units 5 and 6) as shown on Figure 4-2 in Attachment 4. Fly ash and bottom ash are both generated in the boilers as byproducts of burning coal. The fly ash is captured by electrostatic precipitators, is then pneumatically conveyed to on-site storage silos, and is finally deposited into trucks and hauled off-site. Meanwhile, bottom ash from the bottom of the boilers falls directly into slag tanks where it is quenched with water and subsequently sluiced to a set of two dewatering bins (one dedicated pair per electric generating unit). The dewatering bins mechanically promote sedimentation of the suspended bottom ash particles in the sluice water.

The Station's bottom ash-handling components are shown on Figure 4-2. Per the figure, bottom ash sluice piping from Unit 5 emanates from the north end of the boiler building and heads east above ground for approximately 900 feet where the piping terminates at the two dewatering bins for Unit 5. Meanwhile, bottom ash sluice piping from Unit 6 emanates from the south end of the boiler building and heads east above ground for approximately 1,100 feet, where the piping terminates at the two dewatering bins for Unit 6. Each dewatering bin has a decant pipe where treated overflow water drains into a concrete trench that heads northward towards the Bypass Basin and Ash Surge Basin. The dewatering bin overflow, which still contains some suspended CCR particles, then flows into the basin that is in service at the time for additional sedimentation. Flow into each basin is controlled by a dedicated controlled gate per basin.

Only one basin operates at any given time, with the larger Ash Surge Basin functioning as the Station's primary basin for precipitating CCR particles still suspended in the overflow water from the dewatering bins. Effluent from the dewatering bins enters the Ash Surge Basin through a distribution trough at the southern-most end of the basin. Upon entering the pond, the ash particles still suspended in the ash transport water settle to the pond floor as the wastewater migrates towards the basin outlet structure at the opposite end (i.e., northern-most end of the basin). Treated water is then discharged through a reinforced concrete pipe into a sump underneath the pump station located north of the Ash Surge Basin. Water is then pumped to the Service Water Basin[2] located northwest of the Ash Surge Basin and is then either recycled to the Station's cooling pond or discharged to the Illinois River through NPDES-permitted Outfall 001. This process is illustrated on drawing POW-CSK-PFD-001 in Attachment 2-2 which is a process flow diagram (PFD) that shows how Powerton currently manages the wastestreams produced by its coal-fired steam electric generating process.

[2] The Service Water Basin is a non-CCR surface impoundment.

Historically, when the Ash Surge Basin was being cleaned to recover the ash particles stored therein, overflow from the dewatering bins would be diverted to the smaller Bypass Basin. Like the Ash Surge Basin, the Bypass Basin is used to promote settling of the ash particles that remain in suspension in the dewatering bin effluent. When operating, treated water from the Bypass Basin flows over a weir wall at the basin's southeastern corner into a reinforced concrete pipe that then conveys the water to the aforementioned pump station sump.

Currently, decant water from the Station's dewatering bins is sent to the Ash Surge Basin. The Bypass Basin was taken out of service in early October 2020 and has not been used for managing CCR or non-CCR waste streams since. It will not be placed back into service until it has been retrofitted with a new composite liner system and a new leachate collection and removal system as detailed in this construction permit application.

7.0 RETROFIT CONSTRUCTION STANDARDS (845.220(B)(1)–(3))

This section demonstrates the retrofitted Bypass Basin will meet the location, liner, leachate collection and removal system, slope protection, and CCR fugitive dust control standards promulgated by 35 Ill. Adm. Code Part 845.

7.1 LOCATION STANDARDS

7.1.1 PLACEMENT ABOVE THE UPPERMOST AQUIFER

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the bottom of the Bypass Basin's existing liner is separated from the upper limit of the uppermost aquifer by at least five feet. This conclusion is based on the corresponding demonstration Geosyntec performed for the Bypass Basin in October 2018 (Geosyntec, 2018), which is included in Attachment 7-1.

Per Drawing POW-BBR-CSK-006 in Attachment 5-1, the base of the Bypass Basin's new composite liner system will be at El. 457.50 feet above mean sea level (amsl), approximately 6 inches above the base of the basin's existing liner (i.e., El. 457 feet amsl). Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.300(a).

7.1.2 WETLANDS

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the Bypass Basin is not located in mapped wetlands. This conclusion is based on the corresponding demonstration Geosyntec performed for the Bypass Basin in October 2018 (Geosyntec, 2018b), which is included in Attachment 7-1.

Per the proposed construction plans provided in Attachment 5-1, the new composite liner system and new LCRS are being installed within the existing limits of the Bypass Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.310(a).

7.1.3 FAULT AREAS

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the Bypass Basin is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time. This conclusion is based on the corresponding demonstration Geosyntec performed for the Bypass Basin in October 2018 (Geosyntec, 2018c), which is included in Attachment 7-1.

Per the proposed construction plans provided in Attachment 5-1, the new composite liner system and new LCRS are being installed within the existing limits of the Bypass Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.320(a).

7.1.4 SEISMIC IMPACT ZONES

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the Bypass Basin is not located within a seismic impact zone as defined by 35 Ill. Adm. Code 845.120. This conclusion is based on the corresponding demonstration Geosyntec performed for the Bypass Basin in October 2018 (Geosyntec, 2018d), which is included in Attachment 7-1.

Per the proposed construction plans provided in Attachment 5-1, the new composite liner system and new LCRS are being installed within the existing limits of the Bypass Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.330(a).

7.1.5 UNSTABLE AREAS

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the Bypass Basin is not located in an unstable area. This conclusion is based on the corresponding demonstration Geosyntec performed for the Bypass Basin in October 2018 (Geosyntec, 2018e), which is included in Attachment 7-1.

Per the proposed construction plans provided in Attachment 5-1, the new composite liner system and new LCRS are being installed within the existing limits of the Bypass Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.340(a).

7.1.6 FLOODPLAINS

As demonstrated in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), the Bypass Basin is not located in a floodplain according to the National Flood Hazard Layer FIRMette Map No. 17179C0175E prepared by the Federal Emergency Management Agency (FEMA, 2017). This map is included in Attachment 7-2.

Per the proposed construction plans provided in Attachment 5-1, the new composite liner system and new LCRS are being installed within the existing limits of the Bypass Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Bypass Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Bypass Basin complies with 35 Ill. Adm. Code 845.340(c).

7.2 LINER DESIGN CRITERIA

As discussed in Section 5.3, the Bypass Basin will be retrofitted with a composite liner system consisting of a 60-mil HDPE geomembrane liner over a geosynthetic clay liner. As demonstrated in the Alternative Composite Liner Design Certification provided in Attachment 7-3, the design of this new composite liner system meets the requirements for an alternative composite liner system pursuant to 35 Ill. Adm. Code 845.400(c).

7.3 LEACHATE COLLECTION SYSTEM DESIGN CRITERIA

As discussed in Section 5.4, the Bypass Basin will be retrofitted with a new leachate collection and removal system (LCRS) consisting of a drainage geocomposite and a leachate collection pipe that will be used to ultimately pump collected leachate out of the basin. As demonstrated in the Leachate Collection System Design Certification provided in Attachment 7-4, the design of this new LCRS complies with 35 Ill. Adm. Code 845.420.

7.4 SLOPE PROTECTION DESIGN CRITERIA

7.4.1 INTERIOR SLOPES

Per Detail 008-02, "Typical Slope Transition Detail," on Drawing POW-BBR-CSK-008 in Attachment 5-1, a 6-inch-thick layer of riprap (IDOT Gradation No. RR 2) will be placed along the interior slopes of the Bypass Basin's embankments. This riprap layer will be supported by an underlying, 6-inch-thick bedding layer of coarse aggregate material (IDOT Gradation No. CA 16). This form of slope protection represents an engineered cover; will extend along the entire slope; and will provide protection against surface erosion, wave action, and adverse effects of rapid drawdown. Therefore, the retrofit construction of the Bypass Basin's interior slopes complies with 35 Ill. Adm. Code 845.430.

7.4.2 EXTERIOR SLOPES

As documented in MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a), slope protection for the basin's exterior slopes consists of either the HDPE geomembrane liner of an adjacent surface impoundment or vegetative cover. The northern exterior slope is an interior slope for the Ash Surge Basin, which is lined with an HDPE geomembrane liner. Meanwhile, the eastern, southern, and western exterior slopes have grassy vegetation. The form of protection provided for each slope extends along the entire face of the given slope and provides protection against surface erosion, wave action, and adverse effects of rapid drawdown. Therefore, the existing construction of the Bypass Basin's exterior slopes comply with 35 Ill. Adm. Code 845.430.

Per the design drawings provided in Attachment 5-1, no lateral expansions are planned for the basin's existing embankments. Therefore, the downstream slopes of the Bypass Basin will remain unchanged, including the existing slope protection measures. Thus, the protection measures for the retrofitted Bypass Basin's exterior slopes will comply with 35 Ill. Adm. Code 845.430.

7.5 CCR FUGITIVE DUST CONTROL

The Station will continue to control CCR fugitive dust at the retrofitted Bypass Basin in accordance with its "CCR Compliance Fugitive Dust Control Plan" (KPRG, 2021b), which also covers the Station's Ash Surge Basin, Former Ash Basin, and Metal Cleaning Basin. This plan is included in Attachment 7-5.

8.0 RETROFIT, CLOSURE, & POST-CLOSURE CARE PLANS (845.770(C)(2) & 845.220(B)(4)–(5))

8.1 WRITTEN RETROFIT PLAN

MWG's written retrofit plan describing the steps necessary to retrofit the Bypass Basin has been prepared in accordance with 35 Ill. Adm. Code 845.770(c) and is included in Attachment 8-1.

8.2 PRELIMINARY WRITTEN CLOSURE PLAN

MWG currently intends to close the retrofitted Bypass Basin by removing CCR and CCR-mixed materials remaining in the basin at the time of closure and decontaminating affected areas in accordance with 35 Ill. Adm. Code 845.740(a). The preliminary written closure plan describing the steps necessary to close the retrofitted Bypass Basin in this manner has been prepared in accordance with 35 Ill. Adm. Code 845.720(a) and is included in Attachment 8-2.

8.3 POST-CLOSURE CARE PLAN

Because MWG intends to close the retrofitted Bypass Basin by removal of CCR in accordance with 35 Ill. Adm. Code 845.740(a), the post-closure care requirements promulgated by 35 Ill. Adm. Code 845.780 are not applicable to the retrofitted Bypass Basin. However, pursuant to 35 Ill. Adm. Code 845.740(b), MWG will continue groundwater monitoring under 35 Ill. Adm. Code Part 845 Subpart F for a minimum of three years after the basin has been closed.

9.0 GROUNDWATER MONITORING PROGRAM (845.220(A)(7))

To monitor the groundwater at the retrofitted Bypass Basin site, MWG plans to continue using the existing combined groundwater monitoring well network that was established for the Bypass Basin and the Ash Surge Basin. The details of this groundwater monitoring program are provided in Section 9.0 of MWG's initial operating permit application for the Bypass Basin that was submitted to the Illinois EPA in October 2021 (KPRG, 2021a). In accordance with 35 Ill. Adm. Code 845.220(a)(7), the details of this groundwater monitoring program are reproduced in this section. Where used in this section, "subject CCR surface impoundments" refers to the Station's Bypass Basin, Ash Surge Basin, and Former Ash Basin.

9.1 HYDROGEOLOGIC SITE CHARACTERIZATION

The following subsections provide information on the geology and hydrogeology of the site as required under 35 Ill. Adm, Code 845.620(b). Referenced tables and figures are provided in Attachment 9-0.

9.1.1 GEOLOGY

The physiography of Tazewell County is made up of end moraines, plains (including flood plains), river terraces and valleys, alluvial fans and loess. The Illinois and Mackinaw River Valleys are the prominent landforms. Several small lakes are located near the western border of the county, which is bound by the Illinois River. Tazewell County is in the Till Plaines Section of the Central Lowland Province. Near surface soils in the vicinity of the subject impoundment have been grouped as Orthents, loamy and Urban Land. Urban Land units are primarily covered by pavement, railroad tracks, and buildings, which typically impede infiltration and are subject to surface runoff. The Orthents, loamy soils are fine to moderately coarse textured soils found in areas that have been modified by filling and leveling. Available water capacity is generally high, while permeability is typically high at the surface level and decreases with depth. Organic matter and plant nutrient content is low in the Orthents, loamy soils (USDA, 1996).

Regionally, the stratigraphy in the area consists of approximately 100 to 125 feet of unconsolidated deposits consisting mainly of alluvial sands and gravels with some interspersed clays/silty clays. The unconsolidated deposits are underlain by alternating layers of limestone, shale, and coal of the Carbondale Formation. To evaluate local stratigraphy, water and test well logs were obtained for wells in the general vicinity of the Powerton Generation Station. The stratigraphy data from these boring logs and the well locations are provided in Attachment 9-1. In addition, well logs from 21 monitoring wells that were installed in the vicinity of the subject CCR surface impoundments were evaluated (MW-1 through MW-21; see Figure 9-1) with those borings ranging in depth from 30 feet to 41 feet. This information is also included in Attachment 9-1. Boring logs for these monitoring wells are included in Attachment 9-2. Based on an evaluation of this data, the following general site-specific stratigraphy is defined and geologic cross-sections are provided as Figures 9-2 through 9-7 based on the 21 on-site monitoring well boring logs:

- Fill (16' to 24.5' thick) – Consisting of tan, brown and black fine to medium sand/silty sand with some gravel and clay seams. Several locations also included black cinders and brick fragments.
- Clay/silty clay/silts (0' to approximately 18' thick) – Consisting of olive, brown and gray clays, silts and silty clays with some more organic rich layers. May locally contain fine silty sand and/or fine sand. This unit is not mappable across the site (i.e., discontinuous).
- Sand and gravel (thickness undetermined; borings terminate within unit) – Consisting of light brown, brown and/or gray medium to coarse sands and gravels.

Although no specific borings were extended into the sedimentary bedrock beneath this facility, water well logs obtained for water wells in the vicinity of the Powerton Generating Station indicate shale bedrock is encountered from approximately 35 to 140 feet below ground surface (bgs), depending on the location of the specific well. The boring logs indicate limestone was encountered from approximately 99 to 103 bgs just northeast of the Powerton Generating Station and in close proximity to the Illinois River. There are no underground mines beneath the subject CCR surface impoundment.

9.1.2 HYDROGEOLOGY

Based on information from the Soil Survey of Tazewell County, the average annual precipitation is approximately 36 inches with about 62% of that total falling between April and September of any given year. The average seasonal snowfall is approximately just over 26 inches. More site-specific precipitation data from a water station located in Peoria, Illinois, is provided in Table 9-1 (from KPRG, 2021a). The nearest natural surface water body is the Lost Creek which bends around the eastern edge of the Former Ash Basin and property boundary. Lost Creek is an ephemeral stream that only flows during and after precipitation events. The Illinois River is located to the north of the subject CCR surface impoundments. Powerton Lake is located to the west-northwest.

Groundwater beneath the Powerton Generating Station occurs under water table conditions. Saturated conditions are generally encountered between 18 to 32 feet bgs, depending on the well location. The combined CCR monitoring well network for the Bypass Basin and Ash Surge Basin consists of monitoring wells MW-01 (upgradient), MW-08, MW-09 (upgradient), MW-11, MW-12, MW-15, MW-17, MW-18 and MW-19 (upgradient). CCR monitoring wells MW-08, MW-12, MW-15 and MW-17 are screened within the shallow, localized, saturated clay/silt unit. The remaining monitoring wells have deeper screens, within the more extensive sand and gravel unit. Table 9-2 (from KPRG, 2021a) provides groundwater elevation measurements obtained for the on-site monitoring wells in the vicinity of the subject CCR surface impoundment which includes data for the monitoring wells associated specifically with the Bypass Basin and Ash Surge Basin (upgradient wells MW-01, MW-09 and MW-19 and downgradient wells MW-08, MW-11, MW-12, MW-15, MW-17 and MW-18). Hydrographs of water levels recorded at these monitoring wells are provided in Figure 9-8. A review of the hydrographs shows some temporal fluctuations with the highest water levels generally occurring within the first or second quarters of the year.

Groundwater flow maps for the four quarters from 3rd quarter 2020 through the 2nd quarter 2021 are provided as Figures 9-10 through 9-17. The maps include groundwater elevation data from all wells in the area, including the specific CCR monitoring wells associated with the Bypass Basin and Ash Surge Basin. The water levels from wells screened in the clay/silt unit and the water levels from monitoring wells screened within the sand unit were evaluated separately and used to generate groundwater flow maps for each unit. The water elevation data within the clay/silt unit indicates localized groundwater flow in a westerly direction. Groundwater flow within the more extensive sand unit shows some divergence with general flow in a northerly direction with flow components to the northwest and northeast towards the Illinois River. It is noted that MW-20 and MW-21 were installed in March 2021 and are therefore not shown on groundwater flow maps from prior to that time.

The horizontal hydraulic gradient is steeper within the silt/clay unit than within the deeper sandy gravel unit. Table 9-4 (from KPRG, 2021a) provides a summary of the flow direction, gradients and an estimated rate of groundwater flow for each sampling event. The flow rate was calculated using the following equation:

$$V_s = \frac{K\,dh}{n_e\,dl}$$

Where: V_s is seepage velocity (distance/time)
K is hydraulic conductivity (distance/time)
dh/dl is hydraulic gradient (unitless)
n_e is effective porosity (unitless)

Hydraulic conductivity (K) values were initially estimated for monitoring wells MW-2, -5, -8, -9, and -10 from slug tests. The geometric mean of the test data for these wells was approximately 350 feet per day (ft/d; 4.05×10^{-3} ft/sec) for each well (Patrick Engineering 2011). The slug test data were reviewed as part of a groundwater modeling study, and the data were re-analyzed using corrected input values for the well casing and borehole dimensions and effective porosity of the sand filter pack material. The revised geometric mean of the test data for these wells decreased to approximately 120 ft/d (1.39×10^{-3} ft/sec) for each well. The hydraulic conductivity estimate for MW-8 should be used with caution as this monitoring well was screened through site fill and native silty clay. The aquifer properties derived from this well have likely been impacted by the more porous non-native fill material in the upper portion of the well screen and are likely not indicative of the silty clay aquifer. As such, this data was grouped with the more porous sand/gravel materials.

The hydraulic conductivity of 1.39×10^{-3} ft/sec was used for the sandy unit in Table 9-4 (from KPRG, 2021a) as discussed above. The average hydraulic conductivities of 6.38×10^{-7} ft/sec (silt/clay unit) in Table 9-4 (from KPRG, 2021a) is consistent with estimates from literature (Freeze and Cherry, 1979) and is the center of the range of conductivity values used in the modeling work (1.16×10^{-7} to 1.16×10^{-6} ft/sec). The estimated effective porosities of the silt/clay materials (0.40) and of the sandy materials (0.35) were obtained from literature (Applied Hydrogeology, Fetter, 1980).

At this time, based on the geology discussion in Section 9.1.1 and the site-specific hydrogeology discussion above, the groundwater beneath the subject CCR surface impoundments is considered as Class I Potable Resource Groundwater in accordance with 35 Ill. Adm. Code 620.210. It is noted, however, that a Groundwater Management Zone (GMZ) and an Environmental Land Use Control ("ELUC") have been established where the subject CCR surface impoundments are located as part of a Compliance Commitment Agreement (CCA) between MWG and the Illinois EPA. The ELUC states that the groundwater shall not be used as potable water. The extent of the established and approved GMZ and ELUC are provided on Figure 9-19. The GMZ and ELUC occupy the same extent of the Powerton property.

A survey of all potable water sources within a 2,500-foot radius of the Powerton Generating Station was completed by Natural Resources Technology (NRT) in 2009. The following databases and sources of information were utilized by NRT in order to determine community water source and water well locations and construction in the vicinity of the ash pond wastewater treatment systems:

- Illinois State Geological Survey (ISGS) Water Well Database Query;
- Illinois State Water Survey (ISWS) Private Well Database and water well construction report request; and
- Illinois Division of Public Water Supply web-based Geographic System (GIS) files.

As part preparing the initial operating permit application for the Bypass Bain pursuant to 35 Ill. Adm. Code 845.230(d), KPRG evaluated the NRT information and reviewed the new Illinois State Geological Survey database and interactive map references as "ILWATER". The survey results are provided on Figure 9-19. Twelve wells were identified within a 2,500-foot radius of the Station's subject CCR surface impoundments. The two wells off-site to the east are upgradient of the subject CCR surface impoundments. There were eight wells identified on the Station's property on the ILWATER interactive map all of which were older construction wells installed by previous ownership. Discussions with facility personnel indicate that all eight of these wells were taken out of service/abandoned. The two wells at the far western boundary of the 2,500-foot radius (identified as wells 9 and 10 from the NRT evaluation) are part of the six water wells currently on Station property that are in use (the remaining four wells are located further west, outside the 2,500-foot search radius). These two wells are screened within the sand/gravel aquifer but are not directly downgradient of the subject CCR surface impoundments and are separated from those units by the Station's Intake

Channel and Discharge Channel. They are regularly sampled and analyzed for potable water constituents. The sampling results consistently have been in compliance with potable water regulations.

A search of the Illinois Department of Natural Resources dedicated nature preserve database (https://www2.illinois.gov/dnr/INPC/Pages/NaturePreserveDirectory.aspx) was performed to determine whether there may be a nearby dedicated nature preserve. There were no identified dedicated nature preserves in the immediate vicinity of the subject CCR surface impoundments.

Based on the geology of the site presented in Section 9.1.1 and the above hydrogeology discussions, the primary contaminant migration pathway for a potential release from the subject CCR surface impoundments would be downward migration to groundwater within the unconsolidated silty clay or sand/gravel aquifer. Due to the proximity to the Illinois River and/or Old Intake Canal, which are hydrogeologic flow boundaries, minimal to no downward vertical flow mixing would be anticipated. There are no other utility or man-made preferential pathway corridors that would act to potentially intercept the flow to move any contamination in a direction other than under natural groundwater flow conditions. There are no potable water wells between the subject CCR surface impoundments and anticipated flow discharge boundaries. Also, as previously discussed, there are no potable surface water intakes on the Illinois River either along or within at least several miles downstream of the subject site.

There is quarterly groundwater quality data associated with the Bypass Basin dating back to December 2010. However, the parameter list was slightly different from that specified in 35 Ill. Adm. Code 845.600 and included analysis of dissolved inorganic parameters rather than total inorganic parameters. That historical water quality data is provided in Attachment 9-3.

In addition to 35 Ill. Adm. Code Part 845, the Bypass Basin is also subject to the federal regulations for CCR groundwater monitoring networks under 40 CFR Part 257 Subpart D, “Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments”, also referred to herein as the (Federal CCR Rule). As required under the Federal CCR Rule, eight rounds of background sampling were completed for the monitoring wells within the monitoring network for the subject CCR surface impoundments. This included the full list of Appendix III (detection monitoring) and IV (assessment monitoring) parameters. Since the effective date of 35 Ill. Adm. Code Part 845, quarterly groundwater monitoring for the full list of parameters specified in 35 Ill. Adm. Code 845.600, which includes all parameters in the Federal CCR Rule Appendix III/IV, has continued. This data is provided in Table 9-5 (from KPRG, 2021a) for the combined Bypass Basin and Ash Surge Basin groundwater monitoring well network. In addition, it is noted that Illinois EPA added turbidity measurements to the list with a required eight rounds of background of that parameter for each well in the monitoring network for the subject CCR surface impoundment. This data is provided in Tables 9-7 (from KPRG, 2021a) for the Bypass Basin and Ash Surge Basin.

9.2 GROUNDWATER MONITORING SYSTEM DESIGN & CONSTRUCTION PLANS

A comprehensive monitoring well network that includes other basins in the vicinity of the Bypass Basin and Ash Surge Basin was established in 2010 and expanded pursuant to the CCA. The well spacing was developed as part of a previous hydrogeologic assessment. The well depths were determined based on depth to groundwater and the base elevations of the basins being monitored and were approved by Illinois EPA. Two separate groundwater monitoring networks have been established, including the combined network for the Bypass Basin and the Ash Surge Basin:

- Upgradient Wells: MW-01, MW-09, MW-19
- Downgradient Wells: MW-08, MW-11, MW-12, MW-15, MW-17, and MW-18

Groundwater data from the upgradient wells will be evaluated to provide a statistically representative upgradient water quality for the Bypass Basin and Ash Surge Basin prior to that water passing beneath the regulated units. The proposed monitoring well networks will be utilized for determining whether potential leakage from the regulated units may be causing or contributing to groundwater impacts in the vicinity of the units.

The monitoring wells MW-01 through MW-15 were installed in 2010 by Patrick Engineering, Inc. The remaining wells were installed by KPRG and Associates, Inc. at varying times since the initial 2010 well installations. Wells were drilled using 4.25-inch hollow stem augers. The wells were completed with standard 2-inch inner-diameter PVC casing with 10-feet of 0.010 slot PVC screen. Filter sand pack around each screen was extended to approximately 2-feet above the top of the well screen. The remainder of the annulus was backfilled with bentonite. Surface completions include stick-up (above grade two to three feet) locking protector casings set in concrete aprons. The wells are further protected by traffic bollards, as necessary. Boring logs and well construction summaries for these wells are provided in Attachment 9-2. Ground surface and top-of-casing elevations were surveyed by an Illinois licensed surveyor and are included in the previously referenced groundwater elevation table.

Each of the monitoring wells within the sampling network is outfitted with a dedicated sampling system. Specifically, each well has a QED Environmental Systems (QED) Well Wizard Model P1101M dedicated sampling pump with Model No. 37789 intake screens (0.010-inch slot). The screens are set within approximately one-foot of the base of the monitoring well.

In accordance with requirements under 35 Ill. Adm. Code 845.630(g), Attachment 9-4 includes an Illinois licensed Professional Engineer certification of the above-defined monitoring system.

9.3 GROUNDWATER SAMPLING & ANALYSIS PROGRAM

9.3.1 SAMPLE FREQUENCY

The Bypass Basin and Ash Surge Basin are regulated under the Federal CCR Rule. As such all of the above defined monitoring wells (upgradient and down-gradient) have been sampled on a quarterly basis starting the 4th quarter of 2015 for eight consecutive quarters for both Appendix III and Appendix IV parameters specified in the Federal CCR Rule which is the same parameter listing as provided under the 35 Ill. Adm. Code 845.600(a) plus calcium. This dataset will facilitate the development of proper statistical evaluation procedures for the site and use in development of applicable GWPSs for each constituent pursuant to 35 Ill. Adm. Code 845.600(b). Additional monitoring data collected since the initial eight rounds of background sampling will also be evaluated to determine whether an expanded dataset can be used in developing an appropriate and representative background for compliance with 35 Ill. Adm. Code Part 845. The Illinois EPA added turbidity as an additional parameter that will require development of a statistical background. Since this parameter was not included within the Federal CCR Rule, eight rounds of turbidity measurements were obtained within the 180-day period since the effective date of 35 Ill. Adm. Code Part 845. However, this restricted period of background data collection does not facilitate evaluation of potential seasonal variations during the development of statistical background for this parameter.

Currently, all wells within this CCR monitoring network are being sampled on a quarterly basis for all parameters specified in 35 Ill. Adm. Code 845.600(a) plus calcium and turbidity. Between quarterly monitoring events, groundwater level measurements from all designated CCR monitoring wells will be also obtained and recorded on a monthly basis. During the initial rounds of monthly groundwater level measurements after the enactment of 35 Ill. Adm. Code Part 845, surface impoundment measurements were not collected because the instrumentation for these measurements was not yet in-place and available for recording the data.

Quarterly groundwater monitoring will continue during the remaining active life of the Bypass Basin and the post-closure care period or, if closure is by removal, then in accordance with monitoring frequency requirements under 35 Ill. Adm Code 845.740(b). It is noted that if after 5 years of quarterly monitoring it can be demonstrated that the facility meets the requirements specified in 35 Ill. Adm. Code 845.650(b)(4), the owner can petition Illinois EPA to shift the monitoring frequency to semi-annual.

9.3.2 SAMPLING PREPARATION & CALIBRATIONS

Prior to any sampling event, the Station’s designated Environmental Specialist shall be notified in advance of sampling crew arrival so that any arrangements can be made, including security clearance and training.

Prior to sampling activities, and at intervals recommended by the manufacturer, all non-dedicated equipment shall be cleaned and calibrated. Specifically, the field parameter water quality meter to be used for pH, specific conductance, turbidity and temperature will be calibrated using standard reference solutions. In addition, an operational check of the electronic water level probe will also be performed by placing the probe into a bucket of water and ensuring that the audio signal is triggered when the sensor meets the water interface. The associated tape measure of the probe will also be checked for wear.

The monitoring network consists of all dedicated sampling equipment (QED Well Wizard P1101M). The controller used to operate individual bladder pumps will be checked and maintained prior to arrival at the site based on manufacturer specifications.

All lab ware shall be obtained directly from an Illinois certified laboratory. Upon arrival to the site, the monitoring wells will be assessed for structural integrity. Each well cover (either stick-up or flush mount) will be inspected for proper labels, locks, and any damage and be cleared of any flora or fauna that may be on the well or in the vicinity that would affect the sample or the sampling operation. In addition to any other notable observations, all of the above shall be entered on the sampling sheets. Once the well is uncovered and unlocked, and the well casing inspected, the well head shall be inspected for damage and cleanliness.

9.3.3 GROUNDWATER SAMPLE COLLECTION

Prior to initiating sampling, a round of groundwater levels will be collected from each monitoring well using an electronic water level probe. The timeframe over which these water levels are collected should be minimized and should not exceed 8 hours. The depth to water will be measured to the nearest one-hundredth of a foot from the top of casing using an electronic water level meter. The water level probe should be properly decontaminated between each reading using procedures specified in Section 9.3.4.

All of the monitoring wells at this Station are equipped with dedicated, down-hole, bladder pumps. At the top of casing for each well is a manifold with air and water quick connects and a port for a water level meter probe to fit so that an undisturbed water level can be obtained. Immediately prior to sampling, the depth to water will be measured again to the nearest one-hundredth of a foot from the top of casing using an electronic water level indicator and recorded onto the sampling sheets. Once recorded, an air compressor and flow controller will be attached to the air side quick connect and disposable tubing attached to the discharge connection. The discharge tubing will be run to a flow-through cell of the water quality meter. A discharge line from the flow-through cell will be placed into a vessel to allow for the measurement of the volume of groundwater removed. The water quality meter will be attached within the flow-through cell that allows for real time readings of pH, specific conductivity and temperature. It is noted that a calibration check of the water quality meter should be performed at the start and end of each day of sampling and recorded in the field notes. If the meter calibration-check shows drift outside of manufacturer specifications, the meter should be recalibrated in the field using standard solutions per manufacturer requirements.

The air controller will be set to the necessary pressure and to the slowest pumping interval, approximately 50 second refill and 10 second pump (flow rates at this setting tend to be less than 100 milliliters/minute), and the compressor will be started. The intent of the low flow pumping will be to minimize drawdown in the well with an ideal goal of keeping the drawdown to 0.30 feet or less. Once the water has filled the flow-through cell, a reading of the parameters will be recorded. Readings will continue to be recorded until such time as all parameters are deemed stable for three consecutive measurements at which point a sample will be collected from the tubing prior to the flow-through cell. An unfiltered groundwater sample shall be collected directly from the water tubing after it is disconnected from the flow-through cell. The laboratory provided bottles shall be properly filled. Once the sample is collected, the bottles shall be properly labeled and placed on ice as necessary.

If the well would pump dry prior to stabilized field parameter readings, the well will be allowed to recover for up to 24-hours at which point water sample collection will be initiated.

In the event that a dedicated bladder pump fails to work, the following procedures should be implemented:

- Pull the dedicated tubing and pump from the well and ensure that the tubing does not come in contact with the ground.
- Visually inspect the intake of the pump for clogging from sedimentation. If clogging is noted, clean the intake with distilled water. If there is no clogging, dismantle the pump casing and inspect the bladder for any holes, cracks or tears.
- If the bladder is determined to be compromised (i.e., wear has resulted in cracking or tearing), remove the bladder and replace it with a new bladder. Properly clean all parts of the pump using procedures described in Section 9.3.4, reassemble the pump and slowly lower it back down hole. Continue sampling as described above.
- If the entire pump is determined to have failed, a new pump will need to be ordered for replacement and a modified sampling procedure will be implemented as described below.

In the case of bladder pump failure, at a specific well during a sampling event, the alternate sampling method will be the use of a portable peristaltic pump (the pump itself does not go downhole) assuming depth to water is less than 23 feet bgs. Clean disposable polyethylene tubing will be attached to the pump and the tubing will be slowly lowered down hole along with the water level probe. The pump will be operated at the lowest rate possible to achieve the same goals as for sampling described above (generally below 300 milliliters/minute which is within the range of standard low flow protocols). Water will be collected in a clean glass jar for field parameter readings. Once stable field parameters are recorded, the sample will be collected directly onto laboratory prepared containers for analysis. Upon completion of sample collection, the water level meter and tubing should be removed from the well. The polyethylene tubing should be disconnected from the pump and discarded. The water level meter should be properly decontaminated as specified in Section 9.3.4. If depth to water is such that a peristaltic pump cannot be used, a submersible pump will need to be used. The submersible pump must be properly cleaned as specified in Section 9.3.4 prior to placement down the well. All subsequent procedures will be the same as above. The alternate sampling pump use will be recorded on the field data sheet for that well and noted in any subsequent reporting summary.

9.3.4 EQUIPMENT DECONTAMINATION

Any equipment that is used down-hole at more than one sampling location must be thoroughly decontaminated between uses. Based on procedures described above, only the water level meter is anticipated to be in this category; however, if a submersible pump needs to be used during a particular sampling event due to dedicated pump failure (see Section 9.3.3), these procedures will also apply. The water level meter probe and any measuring tape, or any other non-dedicated equipment that may need to be placed down the well that extended below the water surface will need to be cleaned with an Alconox solution, or equivalent, wash followed by a double rinse with distilled water. Any pump tubing that is not dedicated should be discarded and only clean tubing should be used down-hole.

9.3.5 SAMPLE PRESERVATION, CHAIN-OF-CUSTODY, & SHIPMENT

Since measurement of total recoverable metals is required by 35 Ill. Adm. Code Part 845, the samples will not be filtered prior to collection. This will facilitate the analysis to capture both the particulate fraction and dissolved fraction of metals in natural groundwater. Groundwater samples will be collected directly into Illinois certified laboratory provided containers. Those containers will be prepared by the laboratory to contain any necessary chemical preservation. The samples shall be stored at temperatures required by the lab following sample collection. Table 9-9 (from KPRG, 2021a) includes a summary of sample bottle requirements, preservatives and holding times.

All groundwater samples collected shall be transferred to the laboratory under proper COC procedures. The laboratory provided COC, completed with all pertinent information, shall be maintained from sample collection through receipt by the laboratory. The information shall include, but is not limited to, the following:

- Project name and number,
- State samples collected in,
- Sample name and type,
- Time and date collected,
- Analysis requested, and
- Printed name and signatures of person(s) sampling.

The COC shall be completed and properly relinquished by the field sampler(s) with all samples clearly printed or typed.

All samples will be either delivered directly to the laboratory or be shipped using Federal Express or a similar overnight service. It should be noted that Total Dissolved Solids (TDS) analysis has a 7-day holding time. TDS samples should be shipped to the laboratory within 72 hours after collection. All other holding times for the specified parameters are long enough to facilitate one shipment after the full round of sampling is complete.

9.3.6 ANALYTICAL METHODS

A list of the analytical methods to be used by the laboratory for each specified parameter is included in Table 9-9 (from KPRG, 2021a). Individual detection limits for the parameters may change slightly from sample to sample depending on potential matrix interferences with a sample (e.g., amount of suspended solids/sediment) and/or the concentration of the constituent in the sample. However, the base detection limits will be set below the applicable Illinois Class I Drinking Water Standards as defined in 35 Ill. Adm. Code 845.600(a)(1) for that compound which are also provided in Table 9-9 (from KPRG, 2021a).

9.3.7 QUALITY ASSURANCE & QUALITY CONTROL

9.3.7.1 LABORATORY

Only an Illinois certified analytical laboratory will be used for sample analysis. The laboratory will be conducting their work under their specific approved Quality Assurance and Quality Control (QA/QC) program. A copy of their program can be available upon request. A standard Level II data documentation package will be included in all subsequent reporting, however, the lab will be requested to also provide a Level IV data documentation package (i.e., U.S. EPA Contract Laboratory Protocol equivalent) in the event more detailed data validation/evaluation is deemed necessary.

9.3.7.2 FIELD

The QA/QC program for fieldwork will include the collection of blind duplicates and the use of a laboratory supplied trip blank. The blind duplicate will be collected from a random well during every sampling event in which more than three (3) samples are collected. The duplicate will be blind in the manner that there will be no way for the laboratory to determine from which well or point the sample was collected.

Upon receipt of the analytical data, a determination will be made if the duplicate is consistent with the sample collected from the well/point. A generally acceptable range for groundwater samples is +/- 30 percent. If outside the acceptable range, a resample may be determined to be necessary and reanalyzed. The trip blank analytical data will be reviewed for any values other than non-detect. If there are any questions regarding the duplicate, trip blank, or other reported analytical QA/QC runs, the laboratory will be contacted to determine the effect on data quality, if any, and usability. If necessary, a specific well may need to be re-sampled.

9.3.8 STATISTICAL METHODS

A proposed statistical evaluation plan meeting the requirements specified in 35 Ill. Adm. Code 845.640(f) is provided in Attachment 9-5 along with a certification of the plan by an Illinois licensed Professional Engineer.

10.0 PROFESSIONAL ENGINEER CERTIFICATION (845.220(A)(8))

I hereby certify that:

- This retrofit construction permit application meets the requirements of 35 Ill. Adm. Code 845.220(a) and 845.220(b),
- This retrofit construction permit application was prepared by me or under my direct supervision, and
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 15, 2022

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

Th. Dehlin
07/15/2022
Exp. 11/30/2023

11.0 OWNER CERTIFICATION (845.220(A)(9))

A certification stating that the owner or operator of the CCR surface impoundment has completed the public notification and public meetings that are required under 35 Ill. Adm. Code 845.240 is included in Attachment 11-1. Meanwhile, the following information is included in Attachment 11-2:

- A summary of the issues and questions raised by the public during the meetings;
- A summary of revisions, determinations, and other considerations made in response to those issues and questions; and
- A list of interested persons who attended the public meetings and would like to be added to the Illinois EPA's listserv for the facility.

12.0 REFERENCES

FEMA. (2017.) “Flood Insurance Rate Map, Tazewell County, Illinois and Incorporated Areas.” Map No. 17179C0175E. Panel No. 175. Effective February 17.

Geosyntec. (2016a.) “History of Construction, Ash Surge Basin and Bypass Basin, Powerton Station.” October.

Geosyntec. (2016b). “Structural Stability and Factor of Safety Assessment, Ash Surge Basin and Bypass Basin, Powerton Station.” October.

Geosyntec. (2018a). “Placement Above the Upper Aquifer Location Restrictions, Ash Surge Basin and Bypass Basin, Powerton Station.” October.

Geosyntec. (2018b). “Wetlands Location Restrictions, Ash Surge and Bypass Basins, Powerton Station.” October.

Geosyntec. (2018c). “Fault Areas Location Restrictions, Ash Surge and Bypass Basins, Powerton Station.” October.

Geosyntec. (2018d). “Seismic Impact Zones Location Restrictions, Ash Surge and Bypass Basins, Powerton Station.” October.

Geosyntec. (2018e). “Unstable Areas Location Restrictions, Ash Surge and Bypass Basins, Powerton Station.” October.

KPRG. (2021.) “Application for Initial Operating Permit, Powerton Generating Station, Midwest Generation, LLC, Pekin, Illinois.” October 29.

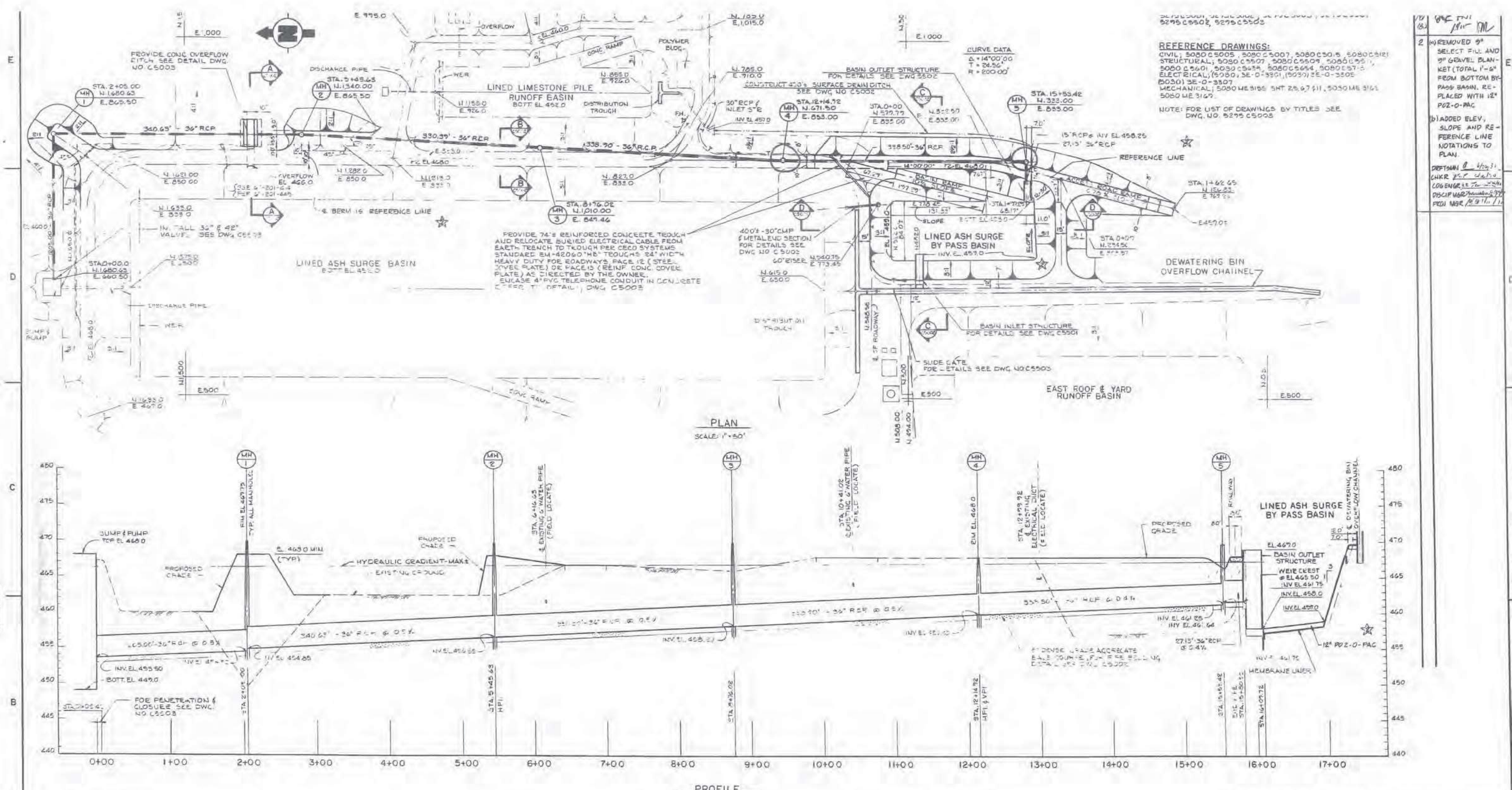
Patrick Engineering. (2011.) “Hydrogeologic Assessment Report, Powerton Generating Station, Pekin, Illinois.” Patrick Project No. 21053.070. February.

Sargent & Lundy. (2020.) “Powerton Generating Station, Demonstration for a Site-Specific Alternative Deadline to Initiate Closure.” Report SL-015574. November 30.

USDA. (1996.) “Soil Survey of Tazewell County, Illinois.” August.

USGS. (2021.) “Science in Your Watershed: Locate your Stream Site by 12-digit HUC.” https://water.usgs.gov/wsc/a_api/wbd/subwatershed07/071300030304.html. Accessed June 23, 2022.

ATTACHMENT 1-1
1980 ORIGINAL CONSTRUCTION DRAWINGS



SPECIFICATION:

3. MANHOLES

4. MEMBRANE LINER: REFER TO SPECIFICATION, SEE DWG NO. C5002

MANHOLE SCHEDULE

MH NO.	BY PASS STATION	EL TOP CONE	EL 36 IN PIPE INV. IN	EL 36 IN PIPE INV. OUT	MH DEPTH (MIN.)	NOTES
—	0+00	—	455.40	—	—	EXIST PUMP SUMP
1	2+05	469.0	454.85	454.55	14.45'	HPI ∠ = 90°
2	5+45.63	469.0	456.57	456.53	12.47'	HPI ∠ = 02°27'
3	8+76.02	469.0	458.22	458.18	10.82'	STRAIGHT RUN
4	12+14.92	467.25	457.92	457.88	7.37'	HPI ∠ = 2°27' USE GRADE RINGS REQ'D
5	15+53.42	469.0	461.64	461.25	7.75'	HPI ∠ = 90°
—	15+80.55	—	—	461.75	—	OUTLET STRUCTURE

NOTE: MAX HYDRAULIC GRADIENT EL 467.85±

Peter D. Amoamuth 4/18/80

DRAWING STATUS

APPROVED FOR CONSTRUCTION

Date 6/26/80

DRAWN J. Trox

CHECKED

APPROVAL

APPROVAL

APPROVAL

APPROVAL PROJ.

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

ASH SURGE BASIN BY PASS
PLAN AND PROFILE

CECO CONTRACT: 802668

CECO DWG. NO.

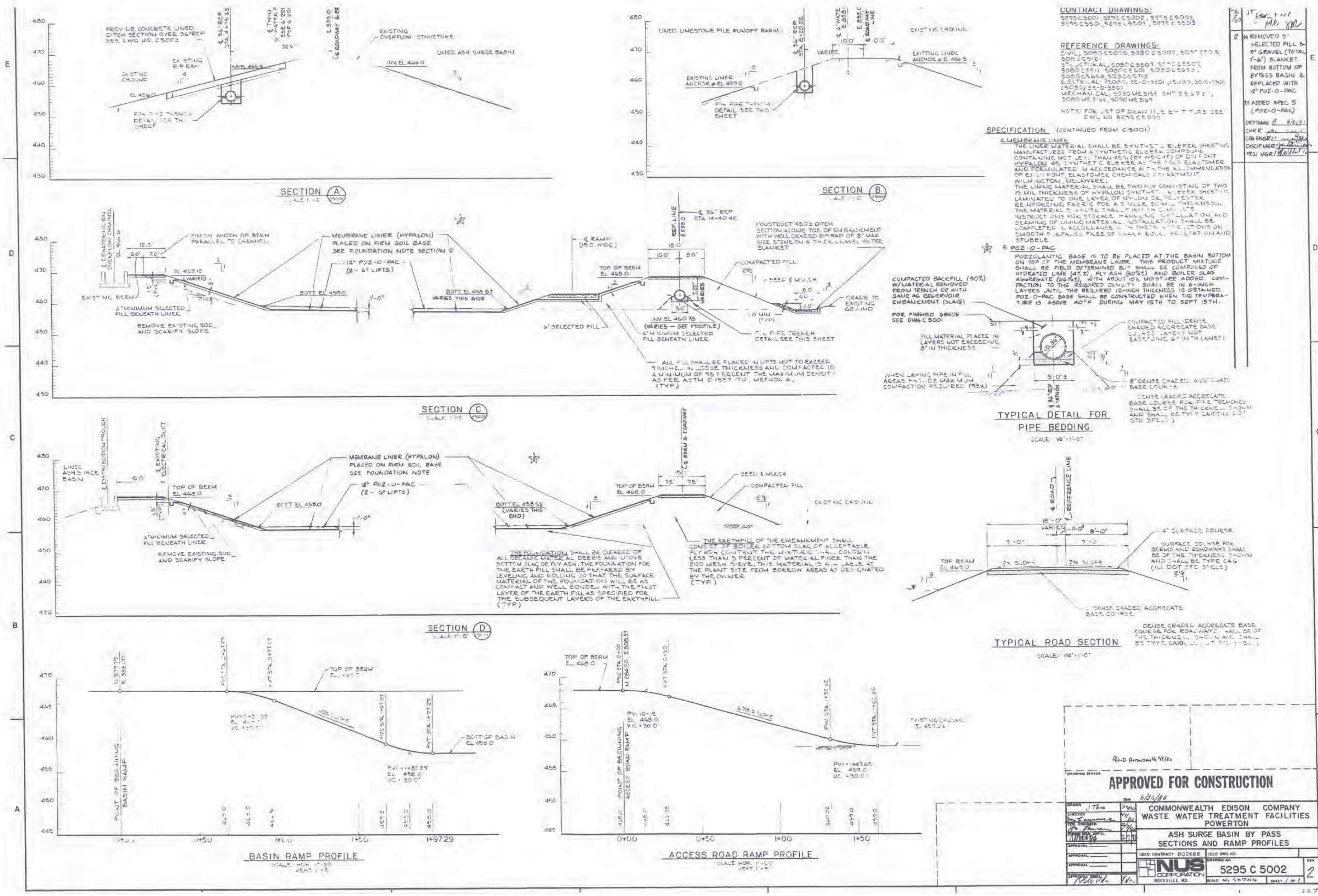
NUS CORPORATION
ROCKVILLE, MD.

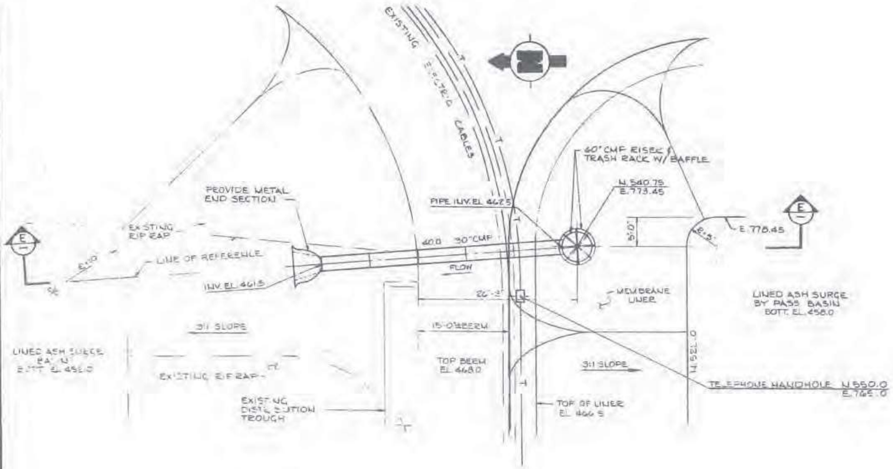
DRAWING NO. 5295 C 5001

REV. 2

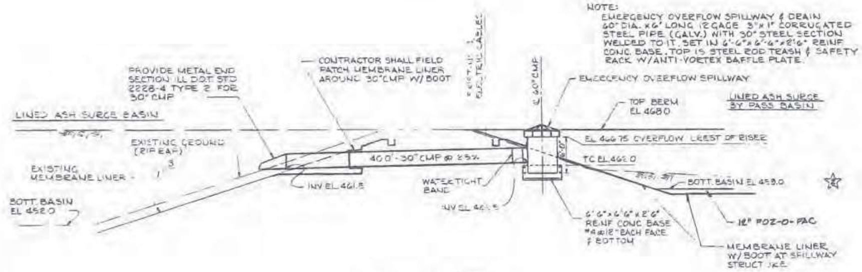
SCALE: AS SHOWN

SHEET 1 OF 1


SECTION A
SECTION B
SECTION C
SECTION D
TYPICAL DETAIL FOR PIPE BEDDING
TYPICAL ROAD SECTION
BASIN RAMP PROFILE
ACCESS ROAD RAMP PROFILE
CONTRACT DRAWINGS:
REFERENCE DRAWINGS:
SPECIFICATION (CONTINUED FROM C5001)
4. MEMBRANE LINER
5 POZ-O-PAC
POZZOLANTIC BASE IS TO BE PLACED AT THE BASIN BOTTOM ON TOP OF THE MEMBRANE LINER. THIS PRODUCT MIXTURE SHALL BE FIELD DETERMINED BUT SHALL BE COMPOSED OF HYDRATED LIME (4%±), FLY ASH (30%±) AND BOILER SLAG AGGREGATE (66%±), WITH ABOUT 10% MOISTURE ADDED. COMPACTION TO THE REQUIRED DENSITY SHALL BE IN 6-INCH LAYERS UNTIL THE REQUIRED 12-INCH THICKNESS IS OBTAINED. POZ-O-PAC BASE SHALL BE CONSTRUCTED WHEN THE TEMPERATURE IS ABOVE 40°F DURING MAY 15TH TO SEPT 15TH.
MEMBRANE LINER (HYPALON) PLACED ON FIRM SOIL BASE SEE FOUNDATION NOTE
12" POZ-O-PAC (2 - 6" LIPTS)
COMPACTED FILL
SEED & MULCH
EXISTING GROUND
TOP OF BERM EL 468.0
6" MINIMUM SELECTED FILL BENEATH LINER
REMOVE EXISTING SOD AND SCARIFY SLOPE
2 (a) REMOVED 9" SELECTED FILL & 9" GRAVEL (TOTAL 1'-6") BLANKET FROM BOTTOM OF BYPASS BASIN & REPLACED WITH 12" POZ-O-PAC (b) ADDED SPEC 5 (POZ-O-PAC)
APPROVED FOR CONSTRUCTION
6/25/80
COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
ASH SURGE BASIN BY PASS
SECTIONS AND RAMP PROFILES
CECO CONTRACT 802668
NUS CORPORATION
ROCKVILLE, MD.
DRAWING NO. 5295 C 5002
REV. 2
SCALE AS SHOWN
SHEET 1 OF 1



PLAN



SECTION (E)

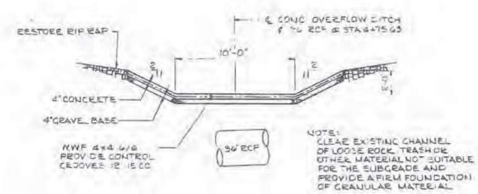
EMERGENCY OVERFLOW SPILLWAY

SCALE: 1/8"=1'-0"

CONTRACT DRAWINGS

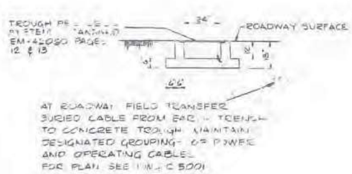
DRAWING NO.	REV.	DRAWING TITLES
5295C5001	1	PLAN & PROFILE
5295C5002	1	DETAILS & SECTIONS
5295C5003	1	MISCELLANEOUS DETAILS
5295C5501	1	INLET STRUCTURE
5295C5502	1	OUTLET STRUCTURE
5295C5503	1	MISCELLANEOUS GATES
REFERENCE DRAWINGS		
5080C5005	2	DETAIL PLAN - EAST ROOF & YARD RUNOFF BASIN
5080C5007	2	DETAIL PLAN ASH SURGE BASIN
5080C5015	2	MISCELLANEOUS SECTIONS AND DETAILS, SHTS 1&2
5080C5121	1	BASIN END SECTION
5080C5507	1	RAMPS & ASH SURGE BASIN OVERFLOW STRUCTURE
5080C5509	1	ASH SURGE BASIN & LIMESTONE BASIN DISTRIBUTION TROUGH SECTION & DETAILS
5080C5511	2	DEWATERING BIN OVERFLOW CHANNEL SECTIONS & DETAILS
5080C5601	2	STANDARD DETAILS
5080C5638	2	ASH SURGE BASIN SUMP - CLARIFIER OVERFLOW SUMP
5080C5654	1	PIPE SUPPORTS FRAMING PLAN & SECTIONS COL NO 7475 (5)
5080C5718	1	ASH SURGE BASIN SUMP PLAT FORM SECTIONS & DETAILS
(5080) 3E-0-3301	2	ELECTRICAL AREA LAYOUT EAST RUNOFF BASIN - NORTH
(5080) 3E-0-3305	3	ELECTRICAL AREA LAYOUT LIMESTONE PILE RUNOFF BASIN
(5080) 3E-0-3307	2	ELECTRICAL AREA LAYOUT ASH SURGE BASIN AREA
5080 ME 3155 SHT 2	4	PIPING ARRANGEMENT YARD AREA
SHT 5	3	
SHT 6	3	
SHT 7	3	
SHT 11	3	
5080 ME 3162 SHT 1	3	PIPING ARRANGEMENT YARD DETAIL EAST ROOF & YARD RUNOFF BASIN
5080 ME 3163 SHT 1	1	PIPING ARRANGEMENT YARD DETAIL LIMESTONE PILE RUNOFF BASIN AND ASH SURGE BASIN SUMPS

NOTE:
FOR ELECTRICAL CABLE TROUGH SEE CECO SYSTEMS STANDARD EM-42060 "HB" TROUGHS 24" WIDTH HEAVY DUTY FOR ROADWAYS PAGE 12 (STEEL COVER PLATE) OR PAGE 13 (REINFORCED CONCRETE COVER PLATE).



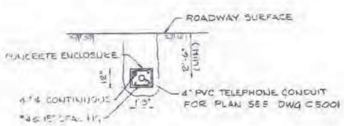
TYPICAL DETAIL
CONCRETE OVERFLOW DITCH

SCALE: 1/4"=1'-0"



DETAIL
ELECTRICAL CABLE TROUGH

SCALE: 3/4"=1'-0"



DETAIL
CONCRETE ENCLOSURE FOR TELEPHONE CONDUIT

SCALE: 3/8"=1'-0"

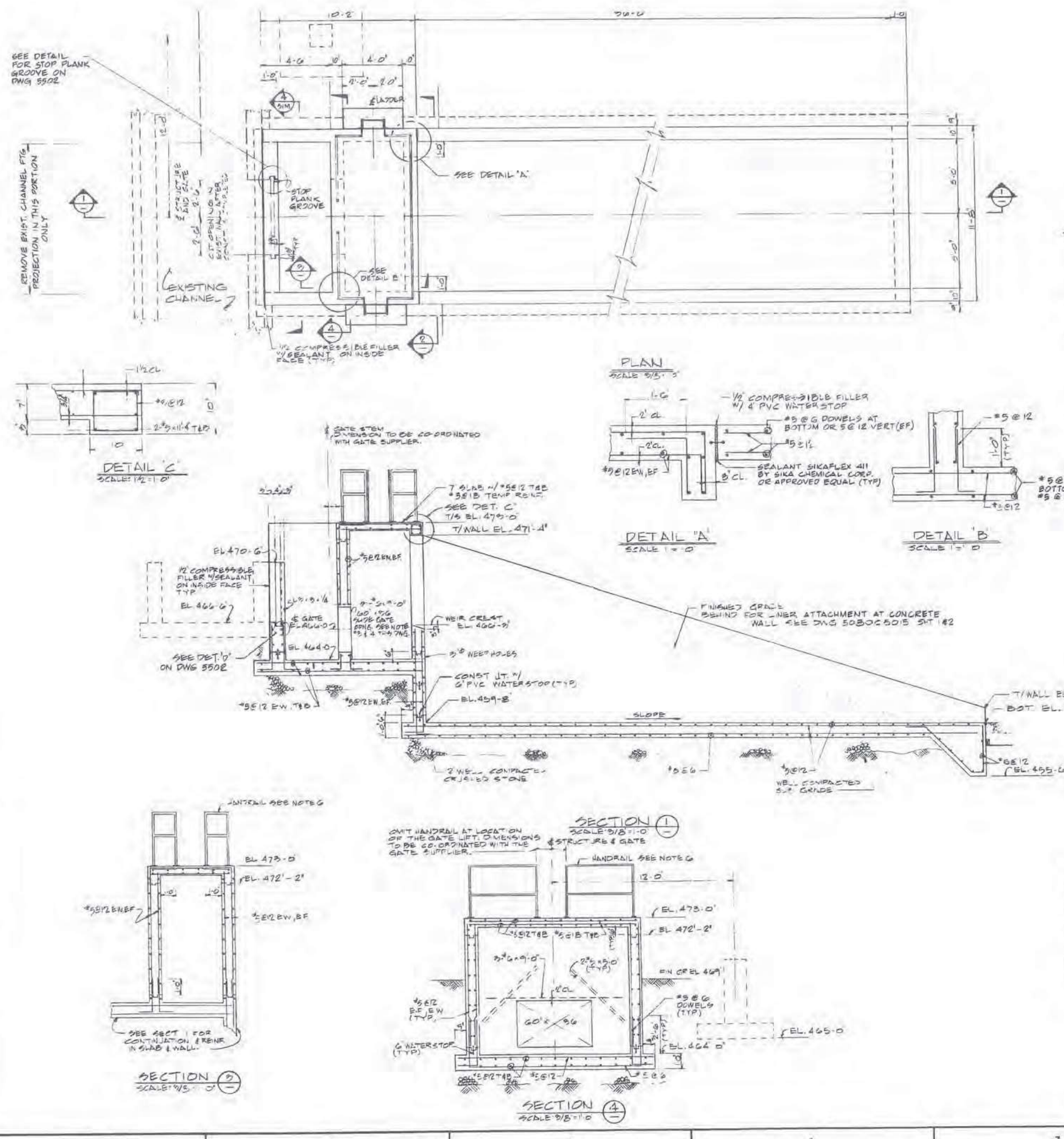
2		(a) REMOVED COMBINED SELECT AND GRAVEL BLANKET FROM BOTTOM OF BASIN AND ADDED 12" POZ-O-PAC, SEC. E (b) CHANGED BOTTOM EL. 458.0 TO 459.0. DRFTSMN CHKR COG ENGR DISCIP MGR PROJ MGR

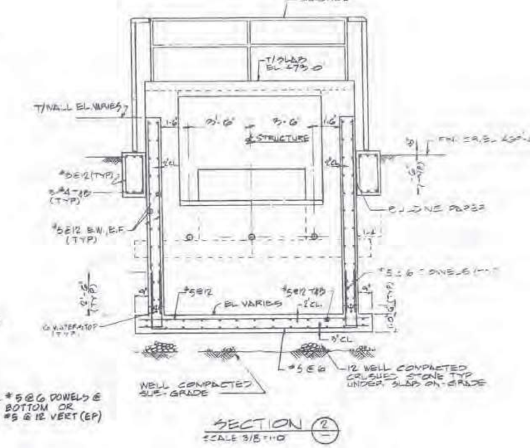
DRAWING STATUS
APPROVED FOR CONSTRUCTION
Date 6/26/80

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

ASH SURGE BASIN BY PASS
MISCELLANEOUS DETAILS

CECO CONTRACT: 802668
CECO DWG. NO.
NUS CORPORATION ROCKVILLE, MD.
DRAWING NO. 5295 C 5003
REV. 2
SCALE: AS SHOWN
SHEET 1 OF 1





NOTES:

1. CONCRETE: F'c = 3000 PSI AT 28 DAYS
2. REINFORCING = ASTM A 615, GRADE 60
3. CONTRACTOR SHALL FURNISH AND INSTALL FAB STEEL GATE AND ACCESSORIES AS MANUFACTURED BY ARMCO STEEL CORP. CONFORMING TO THE FOLLOWING SPEC'S OR APPROVED EQUAL.
   a. GATE MODEL 10-00
      QUANTITY REQUIRED = 1
      OPENING SIZE = 60"x36"
      FRAME TYPE = FLAT BACK, STD BOTTOM
      MATERIAL COMBINATION = #2
      STEM DIA. = 1½"Φ
   b. ACCESSORIES
      TYPE OF LIFT = CPE 2
      LIFT SUPPORT = WALL BRACKET TO MATCH CPE 2
      STEM SUPPORT = ADJUSTABLE STEM GUIDES AT SPACING RECOMMENDED BY MANUFACTURER
4. CONTRACTOR SHALL COORDINATE WITH THE GATE SUPPLIER FOR THE NUMBER, SIZE AND LOCATION OF ANCHOR BOLTS REQUIRED TO ATTACH THE GATE, WALL BRACKET AND STEM GUIDES TO THE SUPPORTING WALL.
5. WORK THIS DWG. WITH CIVIL DWGS. 5295 C 5001 AND 5002.
6. FOR HANDRAIL & LADDER DETAILS SEE REF DWG. 5080 C 5601
7. FOR STOP PLANKS SEE DWG 5295 C 5502 NOTE 4

CONTRACT DRAWINGS:

5295 C 5001, 5002, 5003, 5501, 5502, 5503.

REFERENCE DRAWINGS:

CIVIL: 5080 C 5005, 5007, 5015, 5121

STRUCTURAL: 5080 C 5507, 5509, 5511, 5601, 5638, 5654, 5713

ELECTRICAL: (5080) 3E-0-3301, 3305, 3307

MECHANICAL: 5080 ME 3155 SHT 2,5,6,7 & 11, 3162, 3169

NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG NO. 5295 C 5003

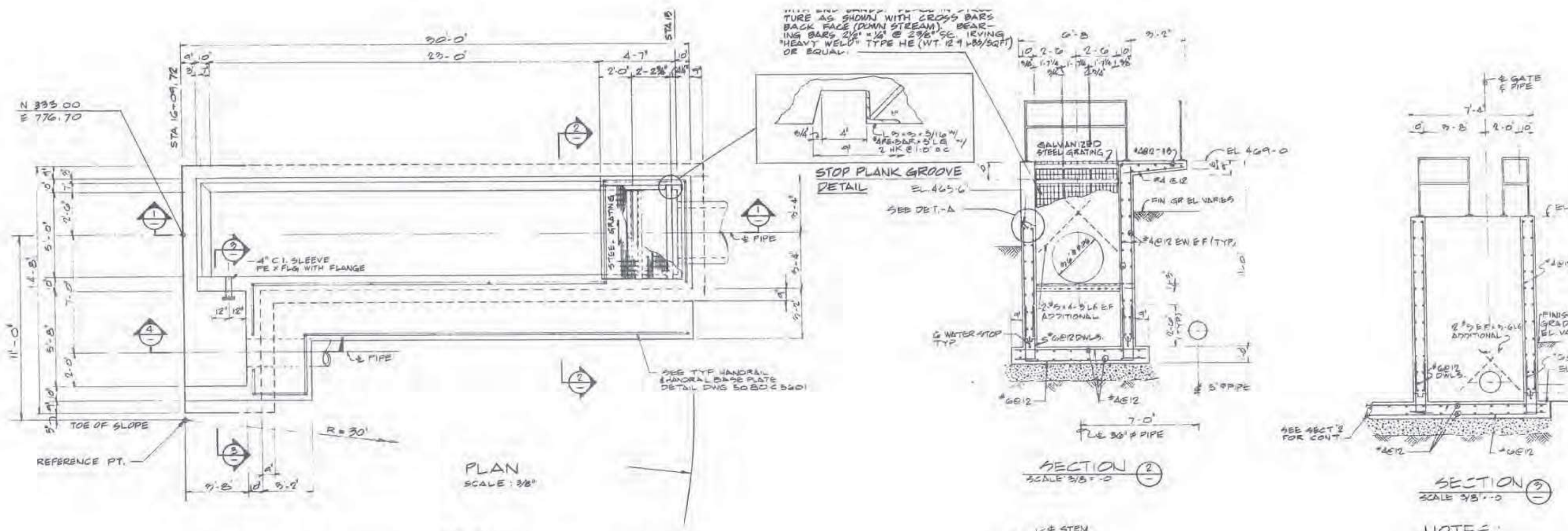
DRAWING STATUS

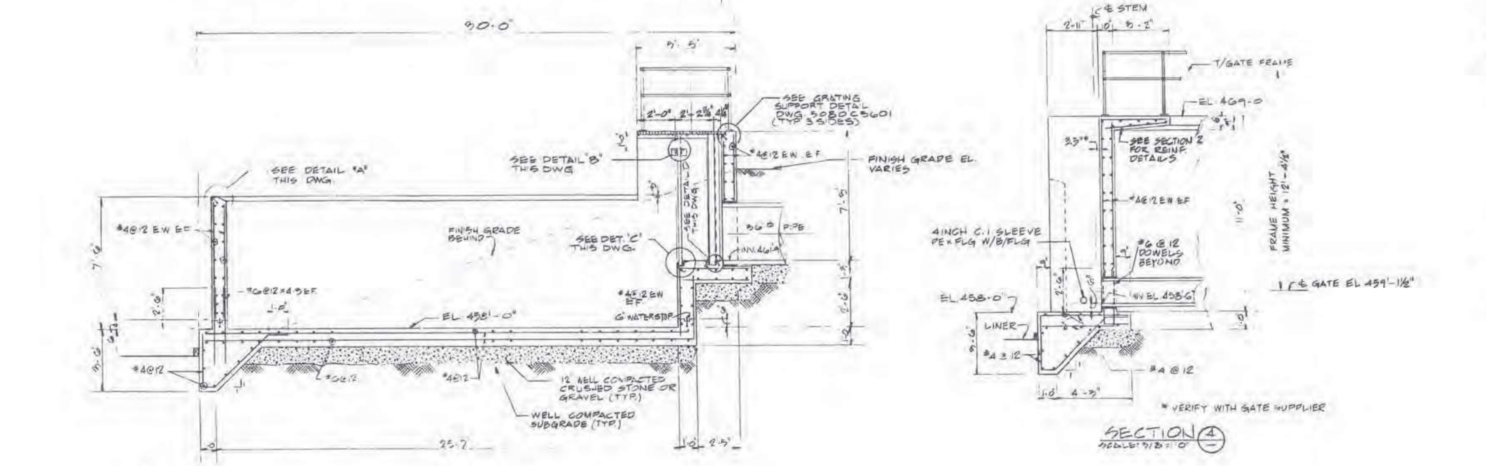
APPROVED FOR CONSTRUCTION

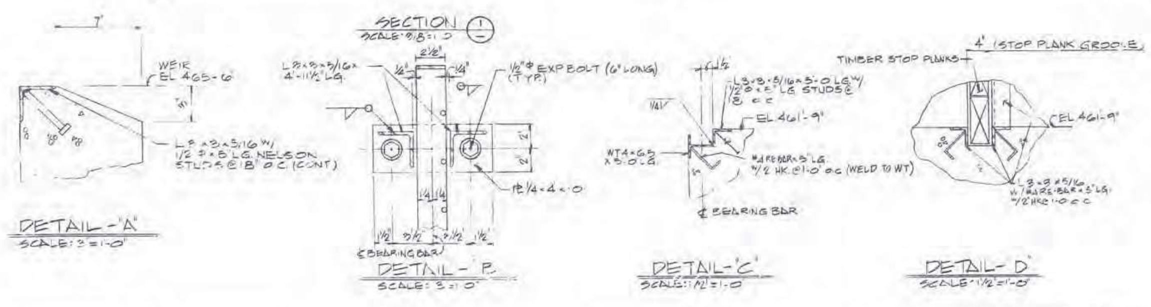
DATE 2/8/80

DRAWN: KENNETH LONG	COMMONWEALTH EDISON COMPANY WASTE WATER TREATMENT FACILITIES POWERTON
CHECKED	ASH SURGE BASIN BY PASS BASIN INLET STRUCTURE
COG. ENGINEER	802668
APPROVAL	NUS CORPORATION ROCKVILLE, MD.
APPROVAL	DRAWING NO. 5295 C 5501 — REV. 1
APPROVAL PROJ.	SCALE: AS SHOWN — SHEET 1 OF 1
APPROVAL CLIENT	

33-11







NOTES:

1. SEE NOTE NOS 1, 2, 4, 5 AND 6 ON DWG 5501.
2. CONTRACTOR SHALL FURNISH & INSTALL MEDIUM DUTY SLUICE GATE & ACCESSORIES AS MANUFACTURED BY ARMCO STEEL CORP. OR APPROVED EQUAL, CONFORMING TO FOLLOWING SPECS:
   a. GATE
      MODEL 20-10C
      QUANTITY REQD = 1
      OPENING SIZE = 15" DIA.
      FRAME TYPE = FLAT BACK
      MATERIAL COMBINATION = #2
      STEM DIA = 7/8"
   b. ACCESSORIES
      TYPE OF LIFT = H1-10
      FRAME HT = 12'-4 1/2" MINIMUM.
3. STEEL GRATING TO BE IRVING WELDED RECTANGULAR DESIGN TYPE IHB-2 WITH 1 1/4" x 1/4" MAIN BARS, AS MANUFACTURED BY IKG INDUSTRIES OR APPROVED EQUAL (GALVANIZED)
4. STOP PLANKS TO BE DOUGLAS FIR COMMERCIAL GRADE NO. 2 (WEST COAST)
   PROVIDE ONE SET OF 7 PLANKS 4" x 8" x 5'-5" LONG (DRESSED SIZE 3 1/2 x 7 1/4 x 5'-5")
   STOP PLANKS ARE INTERCHANGEABLE AT THREE LOCATIONS — SEE ALSO DWGS C5501 & C5503 (ONLY ONE SET REQUIRED UNLESS DIRECTED OTHERWISE BY OWNER)

CONTRACT DRAWINGS:
5295 C 5001, 5002, 5003, 5501, 5502, 5503.

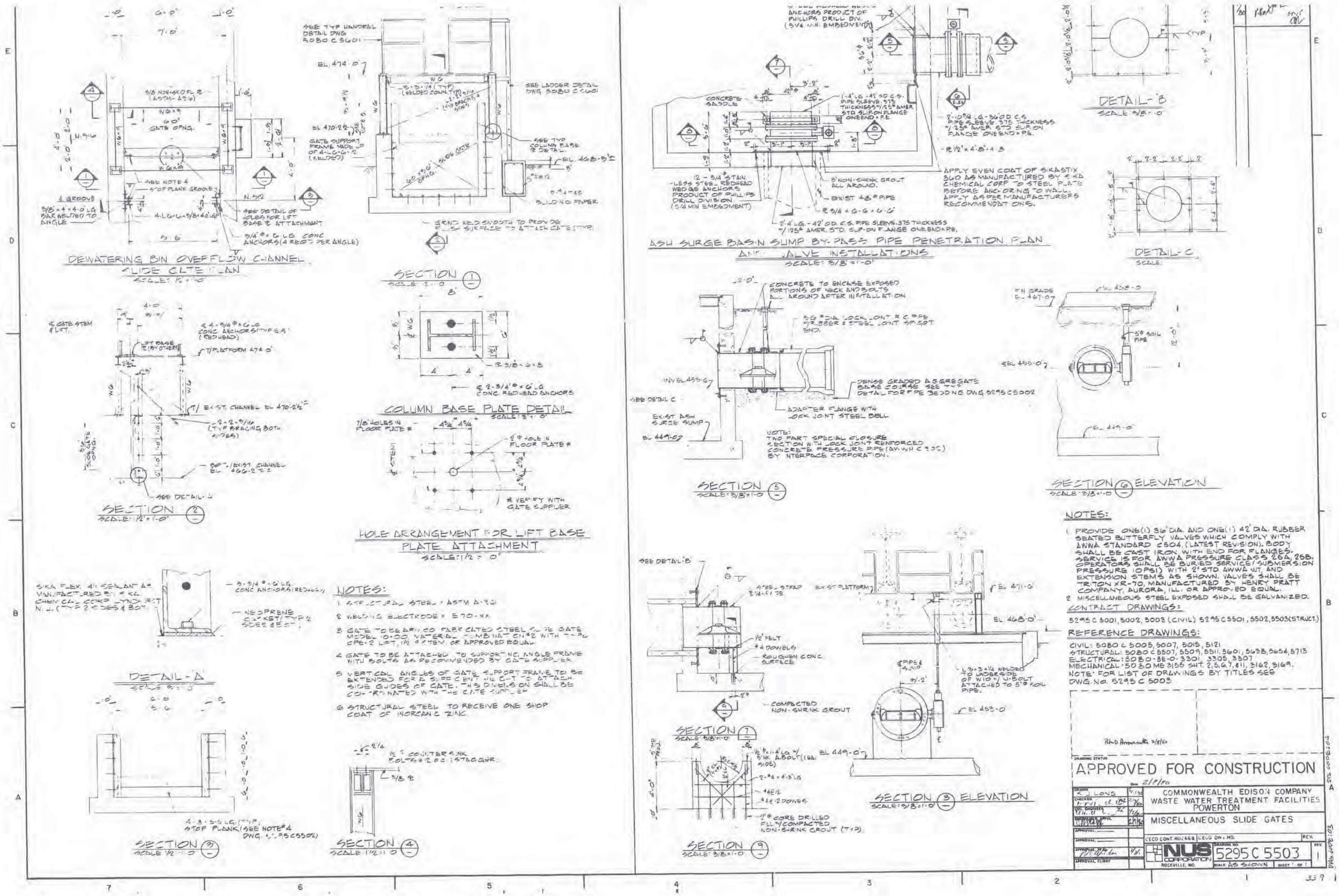
REFERENCE DRAWINGS:
CIVIL: 5080 C 5005, 5007, 5015, 5121
STRUCTURAL: 5080C 5507, 5509, 5511, 5601, 5638, 5654, 5713.
ELECTRICAL: (5080) 3E-0-3301, 3305, 3307
MECHANICAL: 5080 ME 3155 SHT 2, 5, 6, 7, & 11, & 62, 3169

NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG NO. 5295 C 5003.

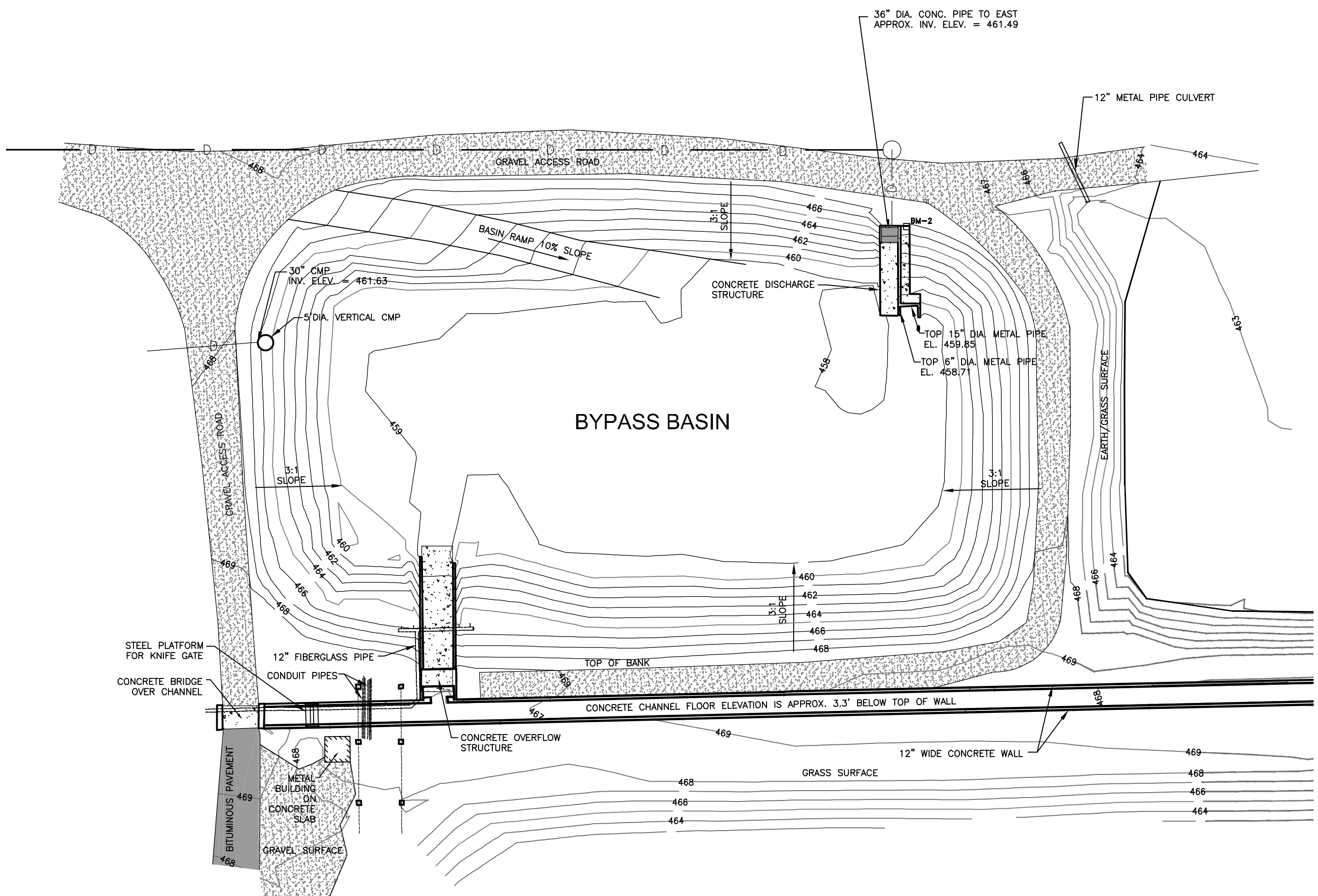
DRAWING STATUS
APPROVED FOR CONSTRUCTION
Date 2/9/80

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
ASH SURGE BASIN BY PASS
BASIN OUTLET STRUCTURE

CECO CONTRACT 802668 | CECO DWG NO. | REV.
NUS CORPORATION, ROCKVILLE MD
DRAWING NO. 5295 C 5502 | REV 1
SCALE AS SHOWN | SHEET 1 OF 1


DEWATERING BIN OVERFLOW CHANNEL SLIDE GATE PLAN
SECTION 1
SCALE: 1" = 1'-0"
COLUMN BASE PLATE DETAIL
SECTION 2
SCALE: 1/2" = 1'-0"
HOLE ARRANGEMENT FOR LIFT BASE PLATE ATTACHMENT
SCALE: 1/2 = 1'-0"
DETAIL-'A'
SECTION 3
SCALE 1/2" = 1'-0"
SECTION 4
SCALE 1 1/2" = 1'-0"
NOTES:
1. STRUCTURAL STEEL = ASTM A-36
2. WELDING ELECTRODE = E70-XX
3. GATE TO BE ARMCO FABRICATED STEEL SLIDE GATE MODEL 10-00 MATERIAL COMBINATION #2 WITH TYPE CPE-2 LIFT, 1 1/2 Ø STEM, OR APPROVED EQUAL
4. GATE TO BE ATTACHED TO SUPPORTING ANGLE FRAME WITH BOLTS AS RECOMMENDED BY GATE SUPPLIER
5. VERTICAL ANGLES OF GATE SUPPORT FRAME TO BE EXTENDED FOR A SUFFICIENT HEIGHT TO ATTACH SIDE GUIDES OF GATE. THIS DIMENSION SHALL BE CO-ORDINATED WITH THE GATE SUPPLIER
6. STRUCTURAL STEEL TO RECEIVE ONE SHOP COAT OF INORGANIC ZINC
ASH SURGE BASIN SUMP BY-PASS PIPE PENETRATION PLAN AND VALVE INSTALLATIONS
SCALE: 3/8" = 1'-0"
DETAIL-B
SCALE 3/8" = 1'-0"
DETAIL-C
SECTION 5
SCALE 3/8" = 1'-0"
SECTION 6 ELEVATION
SCALE 3/8" = 1'-0"
SECTION 7
SCALE 3/8" = 1'-0"
SECTION 8 ELEVATION
SCALE 3/8" = 1'-0"
SECTION 9
SCALE 3/8" = 1'-0"
NOTES:
1. PROVIDE ONE(1) 36" DIA. AND ONE(1) 42" DIA. RUBBER SEATED BUTTERFLY VALVES WHICH COMPLY WITH AWWA STANDARD C504 (LATEST REVISION). BODY SHALL BE CAST IRON WITH END FOR FLANGES. SERVICE IS FOR AWWA PRESSURE CLASS 25A, 25B. OPERATORS SHALL BE BURIED SERVICE/SUBMERSION PRESSURE (10PSI) WITH 2" STD AWWA NUT AND EXTENSION STEMS AS SHOWN. VALVES SHALL BE TRITON XR-70, MANUFACTURED BY HENRY PRATT COMPANY, AURORA, ILL. OR APPROVED EQUAL.
2. MISCELLANEOUS STEEL EXPOSED SHALL BE GALVANIZED.
CONTRACT DRAWINGS:
5295 C 5001, 5002, 5003 (CIVIL) 5295 C 5501, 5502, 5503 (STRUCT.)
REFERENCE DRAWINGS:
CIVIL: 5080 C 5005, 5007, 5015, 5121
STRUCTURAL: 5080 C 5507, 5509, 5511, 5601, 5638, 5654, 5713
ELECTRICAL: 5080-3E-0-3301, 3305, 3307
MECHANICAL: 5080 ME 3155 SHT. 2, 5, 6, 7, #11, 3162, 3169.
NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG. NO. 5295 C 5003
DRAWING STATUS
APPROVED FOR CONSTRUCTION
Date 2/8/80
DRAWN K J LONG
CHECKED
COG. ENGINEER
APPROVAL
APPROVAL, CLIENT
COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
MISCELLANEOUS SLIDE GATES
CECO CONT. NO. 2668
CECO DWG. NO.
REV.
NUS CORPORATION
ROCKVILLE, MD.
DRAWING NO. 5295 C 5503
REV. 1
SCALE AS SHOWN
SHEET 1 OF 1
339

ATTACHMENT 1-2
2010 LINER REPLACEMENT DRAWINGS



LEGEND

D	UNDERGROUND DISCHARGE PIPE
	ABOVEGROUND INTAKE PIPE
460	GROUND SURFACE CONTOUR
BM-2	BENCHMARK 2

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.

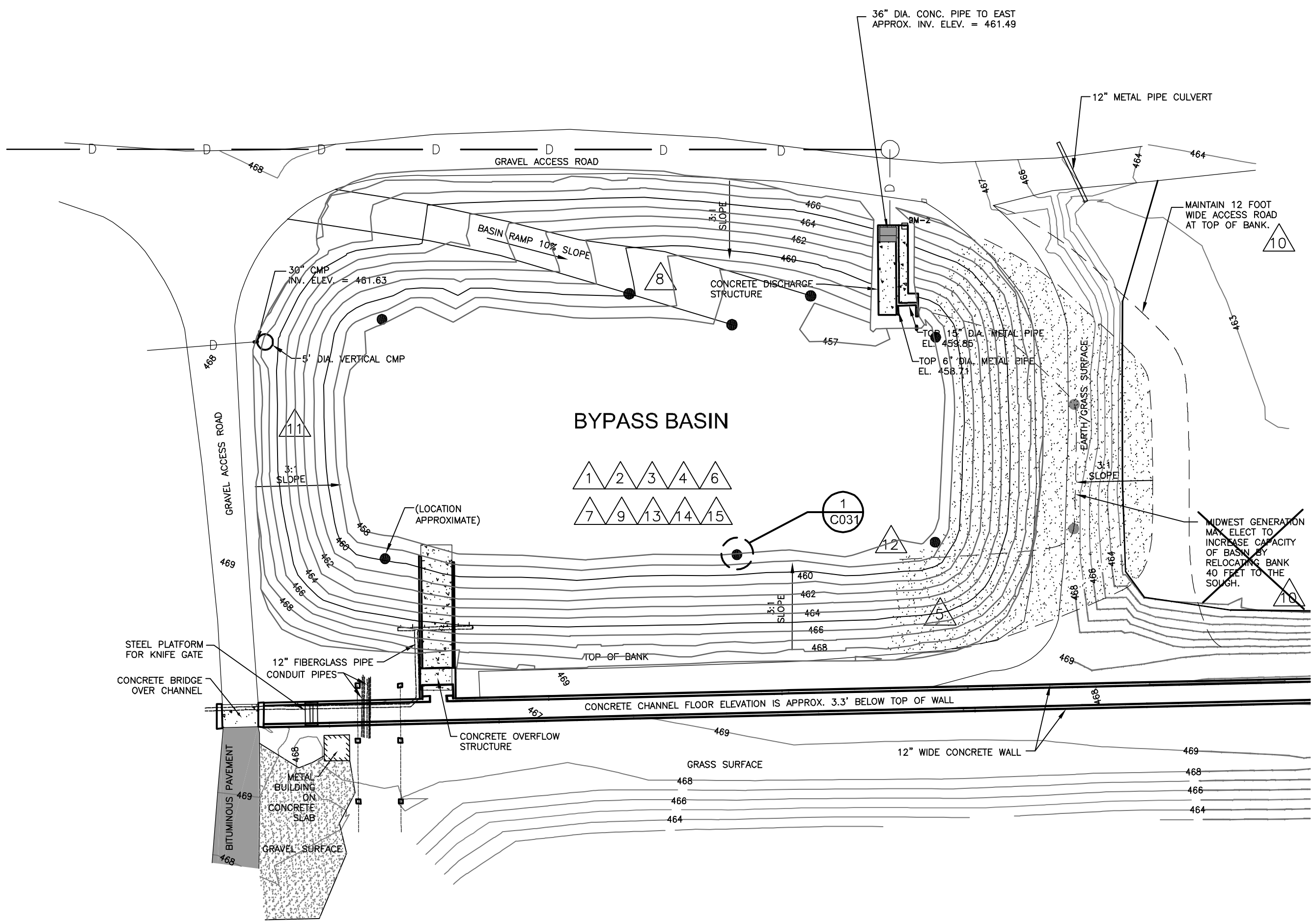
N

0 10 20 40
SCALE IN FEET

6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965.5/5.4	PRE-CONSTRUCTION CONDITIONS
DRAWN BY: KNW 06/30/10	BYPASS BASIN LINER REPLACEMENT MIDWEST GENERATION POWERTON POWER STATION PEKIN, ILLINOIS
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/130/10	DRAWING NO: D1965C010-02 REFERENCE: -
SHEET NO.	C010



LEGEND

D	UNDERGROUND DISCHARGE PIPE
	ABOVEGROUND INTAKE PIPE
460	PREPARED SUBGRADE SURFACE CONTOUR
	12 OZ. NON-WOVEN GEOTEXTILE
●	MARKER POST LOCATION
●	ADDITIONAL MARKER POST LOCATION IF BANK IS RELOCATED.
	~~BANK/AREA FOR POSSIBLE RELOCATION~~
BM-2	BENCHMARK 2

CONTRACTOR NOTES: △

1. CONTRACTOR SHALL FIELD VERIFY LOCATION OF UNDERGROUND PIPES WITH ASSISTANCE OF OWNER'S UTILITY LOCATOR.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION OF CONCRETE STRUCTURES AND ABOVE GROUND PIPING.
3. CONTRACTOR SHALL STORE ALL GEOSYNTHETICS AND SUBGRADE MATERIALS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
4. CONTRACTOR SHALL STORE AND STAGE EQUIPMENT AT LOCATION APPROVED BY OWNER.
5. CLEAR AND GRUB ALL BRUSH ALONG TOP OF SLOPE OF BASIN.
6. PROTECT ALL CONCRETE AND UTILITY STRUCTURES THROUGHOUT PROJECT DURATION.
7. CONTRACTOR SHALL REMOVE ALL VEGETATION, ROCKS, AND OTHER DEBRIS FROM EXISTING LINER AND DISPOSE OF IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
8. CONTRACTOR SHALL CLEAN OFF THE RAMP SURFACE TO THE EXTENT PRACTICAL TO REMOVE ROCKS THAT MAY POSE A HAZARD TO GEOMEMBRANE, AS APPROVED BY GEOMEMBRANE INSTALLER, ENGINEER AND/OR OWNER.
9. CONTRACTOR SHALL REMOVE 12-INCH LAYER OF POZ-O-PAC AND 6-INCHES OF POZ-O-PAC SUBGRADE FROM THE BASE OF BASIN.
10. ~~CONTRACTOR SHALL RELOCATE SOUTHERN BANK 40 FEET TO THE SOUTH, AS DIRECTED BY OWNER. SEGREGATE GRAVEL ACCESS ROAD MATERIAL TO BE REUSED AS BASE COURSE MATERIAL. MATERIAL REMOVED FROM THE EXISTING BANK MAY BE USED TO RECONSTRUCT NEW SOUTHERN BANK IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.~~
11. CONTRACTOR SHALL REMOVE "SOFT" SUBGRADE MATERIAL BENEATH EXISTING HYPALON LINER, AS DIRECTED BY OWNER AND/OR ENGINEER. BACK FILL AREAS WITH FILL IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. CUT HYPALON AS NEEDED TO REPAIR THE "SOFT" SUBGRADE AREAS.
12. CONTRACTOR SHALL INSTALL MARKER POSTS ALONG THE TOE OF SLOPE AS SHOWN AND IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND DETAIL 1 ON SHEET C031.
13. CONTRACTOR SHALL PLACE 16 OZ. NONWOVEN GEOTEXTILE AT BASE OF BASIN AND WHERE HYPALON LINER DOES NOT EXIST OR WAS REMOVED OF THE PREPARED SUBGRADE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
14. SUBGRADE SHALL BE APPROVED BY OWNER AND/OR ENGINEER PRIOR TO INSTALLATION OF GEOMEMBRANE.
15. CONTRACTOR SHALL PROVIDE MEANS TO PROTECT SUBGRADE FROM EROSION, STORM WATER, AND HEAVY EQUIPMENT TRAFFIC. DAMAGE TO SUBGRADE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.
BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

N

0 10 20 40

SCALE IN FEET

REV.	REVISION	DATE	APP'D BY
6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS

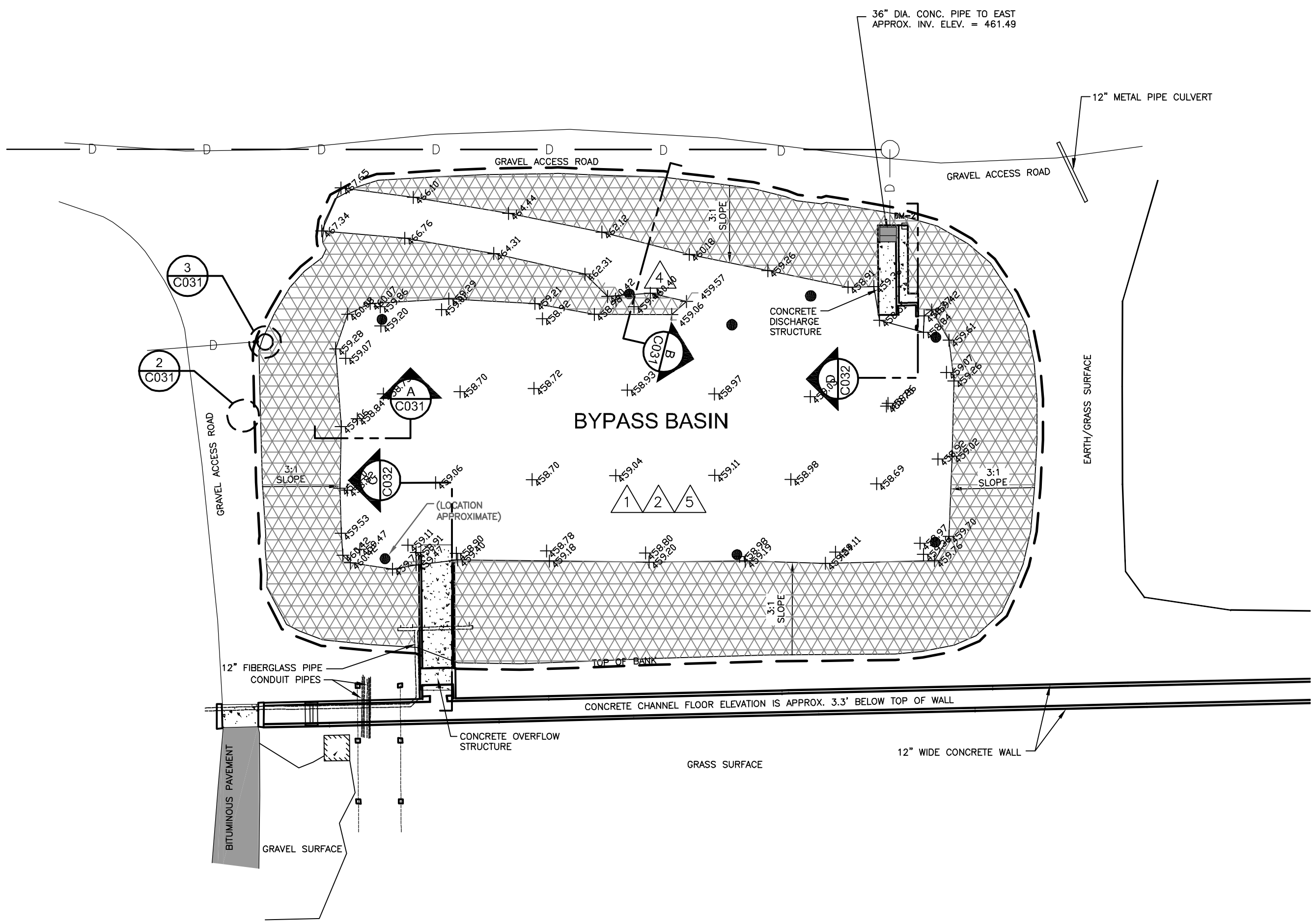
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/5.4
DRAWN BY: KNW 06/30/10
CHECKED BY: RJG 06/30/10
APPROVED BY: HMS 06/30/10

LINER SUBGRADE PREPARATION

BYPASS BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C020-02
REFERENCE: -
SHEET NO. C020



LEGEND

- UNDERGROUND DISCHARGE PIPE
- ABOVEGROUND INTAKE PIPE
- ANCHOR TRENCH
- × 459.11 — TOP OF WARNING LAYER (ELEVATION, FT.)
- MARKER POST LOCATION
- BM-2 — BENCHMARK 2
- HDPE GEOMEMBRANE

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

CONTRACTOR NOTES: △

1. CONTRACTOR SHALL INSTALL 60 MIL HDPE, WHITE, TEXTURED GEOMEMBRANE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION PRIOR TO PLACEMENT OF THE WARNING LAYER. CONTRACTOR SHALL PROVIDE AND FOLLOW AN APPROVED GEOMEMBRANE LAYOUT PLAN.
2. GEOMEMBRANE SHALL BE ANCHORED INTO 2.5 FEET DEEP TRENCHES ALONG TOP OF BASIN BANK, AS SHOWN ON SHEET C031. CONTRACTOR SHALL ADVISE OWNER AND/OR ENGINEER IF PROPOSED LOCATION FOR ANCHOR TRENCH IS NOT POSSIBLE.
3. CONTRACTOR SHALL PLACE 12-OZ. NON-WOVEN GEOTEXTILE, CUSHION MATERIAL AND WARNING LAYER MATERIAL OVER THE GEOMEMBRANE AT BASE AND 4 FEET ON SIDE SLOPES FOLLOWING ENGINEER APPROVAL AND PASSING QUALITY CONTROL RESULTS IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS (SEE SHEET C031).
4. CONTRACTOR SHALL PLACE 2 LAYERS OF 12-OZ. NONWOVEN GEOTEXTILE, CUSHION AND WARNING LAYER MATERIALS OVER THE GEOMEMBRANE ON THE RAMP, AS SHOWN ON SHEET C031.
5. RESTORE AREAS DISTURBED BY EQUIPMENT AND MATERIAL LAYDOWN.
6. CONTRACTOR SHALL PROVIDE SURVEY DOCUMENTATION OF THE ITEMS LISTED IN THE TECHNICAL SPECIFICATIONS.
7. CONTRACTOR SHALL PERFORM A LEAK LOCATION SURVEY IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.
BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICE, MARCH 2011.

N

0 10 20 40
SCALE IN FEET

	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS

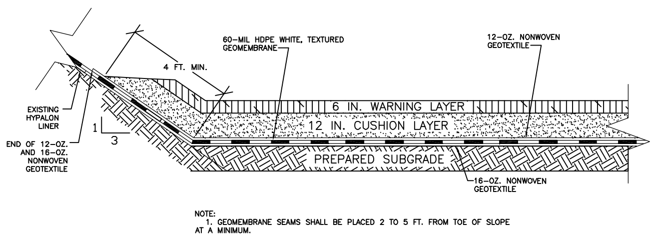
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965.5/5.4	
DRAWN BY: KNW 06/30/10	
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/30/10	

WARNING LAYER PLAN

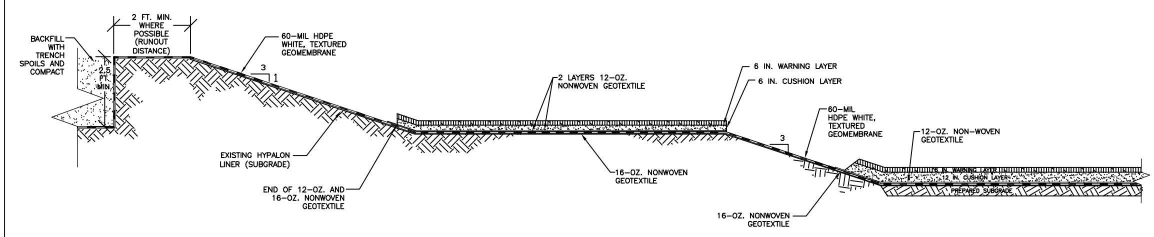
BYPASS BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C030-02
REFERENCE: -
SHEET NO. C030



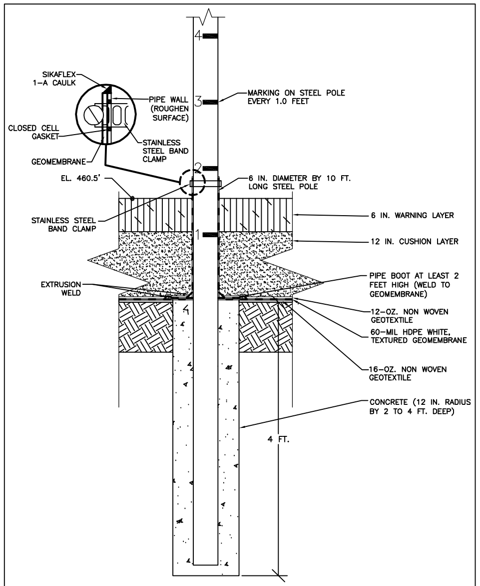
NOTE:
1. GEOMEMBRANE SEAMS SHALL BE PLACED 2 TO 5 FT. FROM TOE OF SLOPE AT A MINIMUM.

A
C030
SLOPE TRANSITION SECTION
NOT TO SCALE

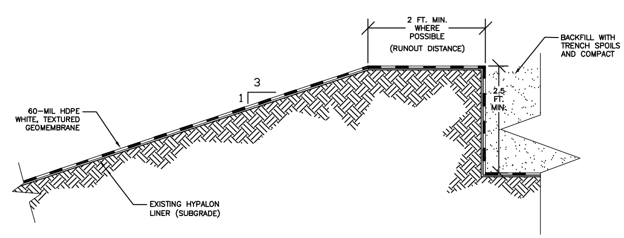


NOTE:
16-OZ. NONWOVEN GEOTEXTILE TO BE PLACED AT BASE OF BASIN AND WHERE HYPALON LINER DOES NOT EXIST OR WAS REMOVED OF PREPARED SUBGRADE

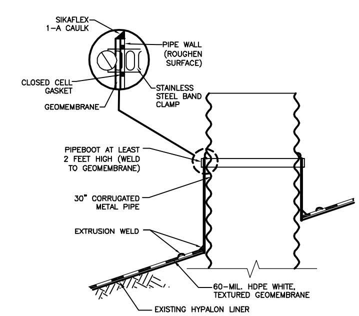
B
C030
RAMP SECTION
NOT TO SCALE



1
C020
MARKER POST DETAIL
NOT TO SCALE



2
C030
ANCHOR TRENCH DETAIL
NOT TO SCALE



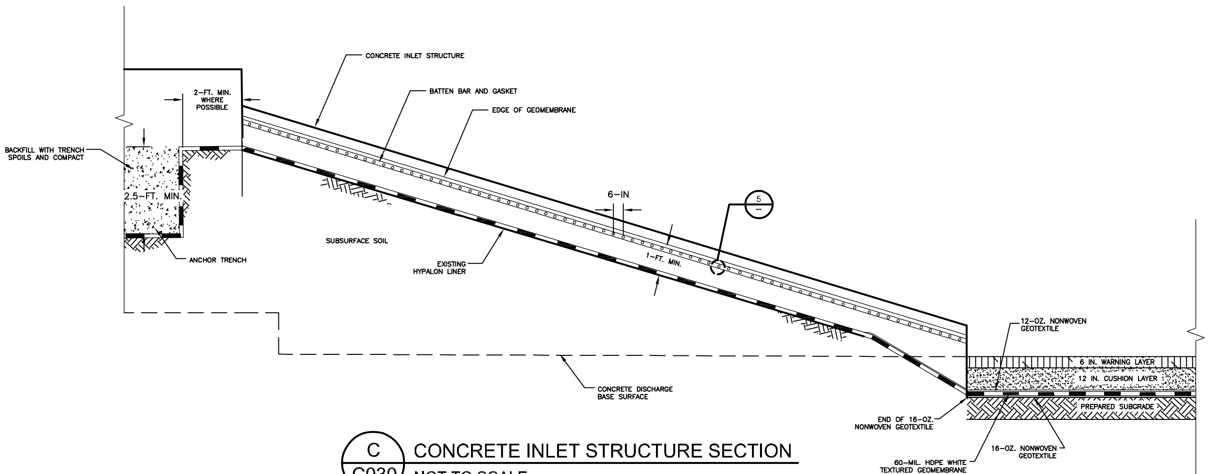
3
C030
OVERFLOW PIPE DETAIL
NOT TO SCALE

NOT FOR CONSTRUCTION

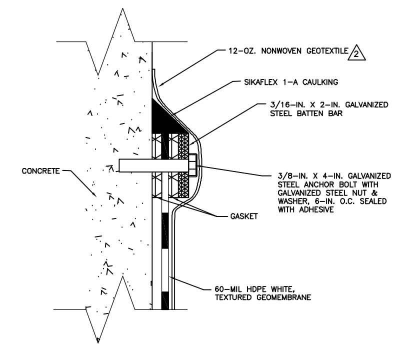
	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/16/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/5.4	DETAILS AND SECTIONS
DRAWN BY: KNW 06/30/10	BYPASS BASIN LINER REPLACEMENT MIDWEST GENERATION POWERTON POWER STATION PEKIN, ILLINOIS
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/30/10	DRAWING NO: D1965C031-02 REFERENCE: — SHEET NO. C031

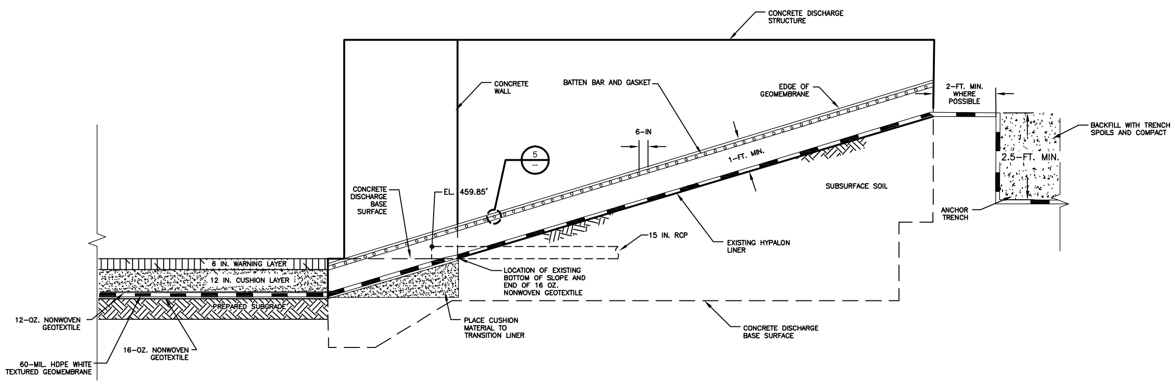


C
C030
CONCRETE INLET STRUCTURE SECTION
NOT TO SCALE



NOTE:
1. ANCHOR BOLTS 6 IN. ON CENTER.
2. 12-OZ. NONWOVEN GEOTEXTILE TO BE USED TO PROTECT GEOMEMBRANE BELOW CUSHION/WARNING LAYERS.

5
--
BATTEN BAR ATTACHMENT
NOT TO SCALE



D
-
CONCRETE DISCHARGE STRUCTURE SECTION
NOT TO SCALE

NOT FOR CONSTRUCTION

6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/16/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/5.4	**DETAILS AND SECTIONS**
DRAWN BY: KNW 06/30/10	BYPASS BASIN LINER REPLACEMENT MIDWEST GENERATION POWERTON POWER STATION PEKIN, ILLINOIS
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/30/10	DRAWING NO: D1965C032-02 REFERENCE:
SHEET NO.	C032

ATTACHMENT 1-3
2010 LINER REPLACEMENT SPECIFICATIONS

SECTION 02600
HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for installation of 60-mil High Density Polyethylene (HDPE) geomembrane, as specified herein, and as shown on Contract Drawings.

1.02 REFERENCE STANDARDS

A. ASTM D6392 –Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

B. ASTM D7007 Standard Practice for Locating Leaks in Geomembranes Covered with Water or Earthen Materials.

C. GRI Test Method, GM 13 - Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

D. GRI Test Method, GM 14 – Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes.

E. GRI Test Method, GM 19 – Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.

1.03 DEFINITIONS

A. Geomembrane Installer: hired by Contractor or Owner responsible for field handling, transporting, storing, deploying, seaming and testing of the geomembrane seams.

B. Geomembrane Manufacturer: hired by Geomembrane Installer, Contractor, or Owner to provide HDPE geomembrane.

C. Leak Location Contractor: hired by Contractor or Owner and responsible for locating potential holes in the installed geomembrane using electrical methods.

D. Geosynthetic Quality Assurance Consultant: Consultant, independent from the Manufacturer, and Installer, responsible for field oversight of geosynthetics installation, and related testing, usually under the direction of the Owner.

D. Geosynthetic Quality Assurance Laboratory (Testing Laboratory): Laboratory, independent from the Manufacturer and Installer, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the Owner.

D. Lot: A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.

E. Resin Supplier: selected by Geomembrane Manufacturer to provide resin used in manufacturing geomembrane.

F. Panel: Unit area of a geomembrane that will be seamed in the field that is larger than $100ft^2$.

G. Patch: Unit area of a geomembrane that will be seamed in the field that is less than $100ft^2$.

H. Subgrade Surface: Soil Layer surface which immediately underlies the geosynthetic material(s).

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Geomembrane Manufacturer shall have a minimum of 5 years of continuous experience manufacturing HDPE geomembrane totaling 1,000,000 square feet.

2. Geomembrane Installer:

a. 5 years of continuous experience in installation of HDPE geomembrane.

b. Experience totaling a minimum of 5,000,000 square feet of installed HDPE geomembrane on some combination of at least 10 completed facilities.

c. Personnel performing seaming operations qualified by experience or by successfully passing seaming tests. Master seamer shall have experience seaming a minimum of 3,000,000 square feet of geomembrane using same type of seaming apparatus to be used on this project.

3. Leak Location Contractor:

d. 3 years of continuous experience in performing leak location surveys using electrical methods.

e. Experience totaling a minimum of 2,000,000 square feet of geomembrane leak location surveys on some combination of at least 5 completed facilities.

f. Personnel performing survey qualified by experience with at least 2 years of geomembrane testing experience using the leak location survey electrical method.

B. Quality Assurance Program:

1. Geomembrane Manufacturer/Installer shall conform with requirements of these Technical Specifications.

2. The Owner or Contractor will engage and pay for the services of a Geosynthetic Quality Assurance Consultant and Laboratory to monitor geomembrane installation.

1.05 SUBMITTALS

A. Prior to project start, submit the following to Geosynthetic Quality Assurance Consultant in accordance with Section 01300, Submittals:

1. Raw Materials:

a. Name of Resin Supplier, location of supplier's production plant(s), resin brand name and product number.

b. Source and nature of plasticizers, fillers, carbon black and any other additives along with their percent addition to geomembrane material.

c. Test results documenting conformance with the "index properties" of GRI Test Method, GM 13.

2. Geomembrane Manufacturer's Certification:

a. Written certification that Geomembrane Manufacturer's Quality Control Plan was fully implemented during production of geomembrane material supplied for this project. (Submittal shall be made within 5 working days of delivery to site).

3. Geomembrane Installer's Seaming Personnel

a. Training completed by personnel.

b. Seaming experience for each personnel.

4. Geomembrane Manufacturer Production Information:

a. Corporate background information indicating compliance with qualification requirements.

b. Quality control plan for manufacturing.

c. Copy of quality control certificates demonstrating compliance with the quality control plan for manufacturing and the test property requirements of GRI Test method, GM 13 (i.e. mill certificates).

5. Geomembrane Installer's Information:

a. Corporate background information indicating compliance with qualification requirements.

b. List of completed facilities, totaling 5,000,000 square feet minimum for which Geomembrane Installer has completed installation of a HDPE geomembrane. Include name and purpose of facility, location, date of installation, and quantity installed.

c. Resumes of personnel performing field seaming operation, along with pertinent experience information. Include documentation regarding which seamers are qualified to use thermal fusion welding apparatus.

d. Installation quality control plan.

6. Installation panel layout diagram identifying placement of geomembrane panels, seams, and any variance or additional details which deviate from Contract Drawings or Technical Specifications. Layout shall be drawn to scale and shall be adequate for use as a construction plan. Layout shall include dimensions and pertinent seam and anchorage details.

7. Installation Sequence and Schedule shall be included as part of Construction Progress Schedule.

8. Description of seaming apparatus to be used.

B. With bid, submit the following to Owner and/or Engineer in accordance with Section 01300, Submittals

1. Leak Location Contractor's Work Plan:

a. Corporate background information indicating compliance with qualification requirements.

b. List of completed facilities, totaling 2,000,000 square feet minimum of geomembrane leak location surveys on some combination of at least 5 completed facilities. Include name and purpose of facility, location, date of survey, survey method, and quantity surveyed.

c. Resumes of personnel performing leak location survey, along with pertinent experience information.

d. Leak Location Contractor quality control plan including description of the proposed survey methods and procedures, and field calibration procedures.

e. Leak Location Contractor's required site preparations to be completed to perform the proposed leak location survey, and estimated duration to complete the survey.

f. An example of a final report (per ASTM D 7007) provided by the Leak Location Contractor following the completion of the survey.

C. During installation, submit the following to the Geosynthetic Quality Assurance Consultant:

1. Daily records/logs prepared by Geomembrane Installer documenting work performed, personnel involved, general working conditions, and any problems encountered or anticipated on project. Submit on a weekly basis.

2. Copy of subgrade acceptance signed by Geomembrane Installer for areas to be covered with geomembrane each day.

D. Within 10 days of geomembrane installation completion, submit the following to Geosynthetic Quality Assurance Consultant:

1. Geomembrane installation certification that Work was performed under Geomembrane Installer's approved quality control plan and in substantial compliance with Technical Specifications and Contract Drawings.

2. As-built panel diagram identifying placement of geomembrane panels, seams, repairs, and destructive seam sample locations.

3. Copy of warranty for material (including factory seams) and installation covering both for a period of 2 years from the date of substantial completion.

E. The Geosynthetic Quality Assurance Consultant will review and inspect HDPE geomembrane installation upon completion of all Work specified in this Section. Deficiencies noted shall be corrected at no additional cost to the Owner.

F. The Geosynthetic Quality Assurance Consultant will provide written final acceptance of the geomembrane installation after completion of material placement above geomembrane. Written conditional geomembrane installation acceptance can be provided to the Contractor prior to completion of material placement above geomembrane when the following conditions are satisfied, if necessary, and requested by the Contractor:

1. The entire geomembrane installation is completed or any pre-determined subsection if the project is phased.

2. All installation quality assurance/control documentation has been completed and submitted to the Geosynthetic Quality Assurance Consultant or Owner.

3. Verification of the adequacy of all field seams, repairs and associated testing is complete.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transportation:

1. Geomembrane rolls shall be transported, unloaded and handled at the job site in accordance with manufacturer recommendations. Damaged material may be rejected by the Geosynthetic Quality Assurance Consultant.

B. On-site Storage:

1. Geomembrane rolls which have been delivered to job site shall be unloaded and stored in original, unopened packaging in a secure location, determined by Owner and/or Geosynthetic Quality Assurance Consultant.

2. Store geomembrane rolls to ensure adequate protection against exposure to the following:

    a. Equipment;

    b. Strong oxidizing chemicals, acids, or bases;

    c. Flames, including welding sparks;

    d. Temperatures in excess of 160 deg. F;

    e. Dust;

    f. Ultraviolet radiation (i.e. sunlight); and

    g. Inclement weather.

3. Whenever possible, provide a 6-inch minimum air space between rolls.

4. Containers/rolls shall not be stacked.

C. On-Site Handling:

1. Handle rolls per Geomembrane Manufacturer's recommendations and as necessary to prevent damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. High Density Polyethylene (HDPE) White Textured Geomembrane.

1. HDPE geomembrane shall be white, textured, 60-mil product approved by the Engineer and/or Geosynthetic Quality Assurance Consultant.

2. The Contractor shall submit, with the bid, written certification from the proposed Geomembrane Manufacturer that geomembrane products proposed in the bid satisfy the following requirements:

    a. The proposed HDPE compound shall be comprised entirely of virgin materials. Compliance with this specification shall be documented in accordance with Geomembrane Manufacturer's quality control program and submitted to the Geosynthetic Quality Assurance Consultant with the written conformance certification.

b. The proposed Geomembrane Manufacturer shall certify that any plasticizers, fillers and additives incorporated into the manufacturing process for the proposed HDPE geomembrane have demonstrated acceptable performance on past projects.

c. The proposed geomembrane shall meet the requirements of Geosynthetic Research Institute's test method GM 13.

d. The nominal thickness of proposed geomembrane shall be 60 mil., or as approved by the Engineer and/or Geosynthetic Quality Assurance Consultant.

3. Geomembrane sheets shall be visually consistent in appearance and shall contain no holes, blisters, undisbursed raw materials or other signs of contamination by foreign material. Geomembrane must have no striations, roughness or bubbles on the surface.

B. Seaming Apparatus

1. Thermal fusion welding machines used for joining geomembrane surfaces may be either extrusion or hot wedge. These machines shall include sufficient temperature and rate-of-travel monitoring devices to allow continuous monitoring of operating conditions.

2. One spare, operable thermal fusion seaming device shall be maintained on site at all times.

C. Field Test Equipment

1. Field Tensiometer: the field tensiometer shall be calibrated within three months prior to project start date over the range of field test values.

2. Air Channel Test Equipment: air channel test equipment shall consist of hoses, fittings, valves and pressure gauge(s) needed to deliver and monitor the pressure of compressed air through an approved pressure feed device.

3. Air Compressor: the air compressor utilized for field testing shall be capable of producing and maintaining an operating pressure of at least 50 psi.

4. Vacuum Box: the vacuum box shall consist of a vacuum gage, valve, and a gasket around the edge of the open bottom needed to apply vacuum to a surface.

2.02. CONFORMANCE TESTING REQUIREMENTS

A. Geomembrane shipped to site shall undergo conformance testing. Manufacturer's roll certificates may be used for conformance evaluation at the option of the Geosynthetic Assurance Consultant. Nonconforming material shall either be retested at the direction of the Geosynthetic Quality Assurance Consultant or removed from site and replaced at Contractor's expense.

B. Conformance Test Methods

1. Samples will be located and collected by the Geosynthetic Quality Assurance Consultant at a rate of one sample per 100,000 square feet of geomembrane delivered to site.

2. One sample will be obtained from each geomembrane production batch delivered to the site.

3 Samples shall be cut by Geomembrane Installer and be at least 45 square feet in size.

4. Samples shall be tested in accordance with Table 1 (Smooth) or Table 2 (Textured) specified in GRI Test Method GM13.

5. Geomembrane thickness shall be measured a minimum of three times per panel during deployment to verify conformance with GRI Test Method GM13.

C. Role of Testing Laboratories

1. The Geosynthetic Quality Assurance Consultant will be responsible for acquiring samples of the geomembrane for conformance testing. The Owner or Geosynthetic Quality Assurance Consultant will retain an independent, third party laboratory to perform conformance testing on samples of geomembrane.

2. Retesting of geomembrane panels by the Geomembrane Installer because of failure to meet any of the conformance specifications can only be authorized by the Geosynthetic Quality Assurance Consultant. Non-conforming panels may be retested in accordance with Subsection 2.02(B) and 2.02(D) under authorization of the Geosynthetic Quality Assurance Consultant only.

3. The Geomembrane Manufacturer and/or Geomembrane Installer may perform independent tests in accordance with methods and procedures specified in Subsection 2.02(B). Results shall not be substituted for quality assurance testing described herein.

D. Procedures for Determining Conformance Test Failures

1. If conformance test results fail to meet specifications, the roll and/or batch may be retested using specimens from either the original roll sample or from another sample collected by the Geosynthetic Quality Assurance Consultant. Two additional tests (retests) shall be performed for each failed test procedure. Each retest shall consist of multiple specimen tests if multiple specimens are specified in the test procedure. If the results of both retests meet specifications, the roll and batch will be considered to have passed conformance testing.

2. Failure of any retest shall be cause for rejection of the entire roll or batch depending on the type of failing test. The Geosynthetic Quality Assurance Consultant reserves the right to collect samples from other rolls of a particular batch for further conformance testing. The Geosynthetic Quality Assurance Consultant may choose to accept only a portion of the batch on the basis of the results of conformance testing of samples collected from other rolls.

3. If retesting does not result in conformance with the specifications as defined in preceding paragraph, or if there are any other nonconformities with the material specifications, the Contractor shall remove the rolls from use in the project. The Contractor shall also be responsible for removal of rejected geomembrane from the site and replacement with acceptable geomembrane at no additional cost to the Owner.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

A. A Pre-Construction Meeting shall be held at the site to discuss and plan the details of geomembrane installation. This meeting shall be attended by the Geomembrane Installer, Owner, Engineer and the Contractor.

B. The following topics relating to geomembrane installation shall be addressed:

1. Responsibilities of each party.
2. Lines of authority and communication.
3. Methods for documenting, reporting and distributing documents and reports.
4. Procedures for packaging and storing archive samples.
5. Review of the schedule for all installation and quality assurance testing, including third-party testing turnaround times.
6. Review of panel layout, access and numbering systems for panels and seams including details for marking on the HDPE geomembrane.
7. Procedures and responsibilities for preparation and submittal of as-built drawings.
8. Temperature and weather limitations, installation procedures for adverse weather conditions and defining acceptable subgrade or ambient moisture and temperature conditions for working during liner installation.
9. Subgrade conditions, dewatering responsibilities and subgrade maintenance plan.
10. Deployment techniques including allowable subgrade for geomembrane.
11. Procedures for covering of the geomembrane to prevent damage.

12. Plan for minimizing wrinkles in the geomembrane.

13. Measurement and payment schedules.

14. Site health and safety procedures/protocols.

3.02 SUBGRADE PREPARATION

A. Contractor shall prepare a subgrade surface in accordance with Section 02300, Earthwork.

B. The Contractor shall not excavate more than the amount of anchor trench required for one day of geosynthetics deployment, unless otherwise specified by the Geosynthetic Quality Assurance Consultant. Rounded corners shall be provided in the trenches where the geosynthetics enter the trench to allow them to be uniformly supported by the subgrade and to avoid sharp bends. The geosynthetics shall not be supported by loose soils in anchor trenches.

C. The Geomembrane Installer shall visually inspect the subgrade immediately prior to geomembrane deployment. Inspection shall verify that there are no potentially harmful foreign objects present, such as sharp rocks and other deleterious debris. Any foreign objects encountered shall be removed by Geomembrane Installer or Contractor. All subgrade damaged by construction equipment and deemed unsuitable for geomembrane deployment shall be repaired prior to geomembrane deployment. All repairs shall be approved by the Geosynthetic Quality Assurance Consultant and Geomembrane Installer. The responsibility for preparation, repairs, and maintenance of the subgrade shall be defined in the preconstruction meeting. The Geomembrane Installer shall provide the Geosynthetic Quality Assurance Consultant with written acceptance of subgrade surface over which geomembrane is deployed (Part 1 .05C) for each day of deployment.

3.03 GEOMEMBRANE DEPLOYMENT

A. Geomembrane shall not be deployed until all applicable certifications/quality control certificates listed in Subsection 1.05 of this section and conformance testing listed in Subsection 2.02 of this section are submitted and approved by the Geosynthetic Quality Assurance Consultant. Any geomembrane deployed prior to approval by the Geosynthetic Quality Assurance Consultant shall be at the sole risk of the Geomembrane Installer and/or Contractor. If material installed prior to approval by the Geosynthetic Quality Assurance Consultant does not meet the requirements of this specification, it shall be removed from the site at no additional cost to the Owner.

B. Geomembrane will be deployed according to submitted panel layout drawing as approved by the Geosynthetic Quality Assurance Consultant. The Geosynthetic Quality Assurance Consultant is to be notified of and approve any revisions or modifications to the approved panel layout drawing prior to deploying geomembrane in the area of review.

C. Adequate temporary anchoring (sand bags, tires, etc.) that will not damage the geomembrane shall be placed on a deployed panel to prevent uplift by wind.

D. Geomembrane shall not be deployed if:

1. Ambient temperatures are below 41 degrees F (5 degrees C) or above 104 degrees F (40 degrees C) measured six inches above geomembrane surface unless approved by the Geosynthetic Quality Assurance Consultant.

2. Precipitation is expected or in the presence of excessive moisture or ponded water on the subgrade surface.

3. Winds are excessive as determined by Geomembrane Installer in agreement with the Geosynthetic Quality Assurance Consultant.

4. The Geosynthetic Quality Assurance Consultant will have the authority to suspend work during such conditions.

E. The Geomembrane Installer shall be responsible for conformance with the following requirements:

1. Equipment utilized for installation/quality assurance testing does not damage geomembrane. Such equipment shall have rubber tires and a ground pressure not exceeding 5 psi or total weight exceeding 750 lbs. Only equipment necessary for installation and quality assurance testing is allowed on the deployed geomembrane.

2. Personnel working on geomembrane do not damage geomembrane (activities such as smoking or wearing damaging clothing shall not be allowed).

3. Method of deployment does not damage geomembrane.

4. Method of deployment minimizes wrinkles.

5. Temporary loading or anchoring does not damage geomembrane.

6. Direct contact with geomembrane is minimized.

F. No vehicles shall be allowed on deployed geomembrane under any circumstances.

3.04 FIELD SEAMS

A. Seam Layout

1. In general, seams shall be oriented parallel to the line of the maximum slope. In corners and at other odd-shaped geometric intersections, number of seams should be minimized. If at all possible, seams shall not be located at low points in the subgrade unless geometry requires seaming to be done at these locations.

2. A seam numbering system compatible with the panel numbering system shall be agreed upon at the Pre-Construction Meeting.

C. Field Test Methods

1. Ten 1-inch-wide samples described above under Part 3.06(B)(3) shall be field tested for peel (5 samples) and shear (5 samples) in accordance with GRI GM 19.

2. One seam sample shall be field tested for peel and shear at the end of each continuous field seam 100 feet or greater in length.

3. Testing shall be performed in accordance with ASTM D6392 using a field tensiometer or equivalent device to qualitatively and quantitatively determine mode of failure.

4. Seam shall be considered passing if failure in both peel and shear meet criteria listed in GRI GM 19.

5. The procedures specified in Subsection 3.06(D) shall be implemented when sample passes field tensiometer test.

D. Laboratory Test Methods

1. Laboratory testing of seam samples shall be conducted by the Geosynthetic Quality Assurance Laboratory under contract with the Geosynthetic Quality Assurance Consultant or Owner. Five specimens shall be tested in shear and five in peel.

2. Laboratory testing shall be conducted in accordance with GRI GM 19.

3. For both seam shear and peel tension tests, an indication will be given for each specimen tested which defines locus of failure.

4. For shear tests, the following values, along with the mean and standard deviation where appropriate, will be reported for each specimen tested:

    a. Maximum tension in pounds per square inch.

    b. Elongation at break (up to a tested maximum of 100 percent).

    c. Locus of failure using ASTM D6392 designations.

5. For peel tests, the following values, along with the mean and standard deviation where appropriate, will be reported for each specimen tested:

    a. Maximum tension in pounds per square inch.

    b. Seam separation (expressed as percent of original seam area).

c. Locus of failure.

6. Retesting of seams due to nonconformance with specifications may be performed at the discretion of the Geosynthetic Quality Assurance Consultant.

E. Destructive Seam Test Failure

1. Shear and peel test results derived from testing described in Parts 3.06(C) and 3.06(D) shall comply with GRI GM 19 for seam to be considered acceptable.

2. The Geomembrane Installer has two options in determining the repair boundary whenever a seam has failed destructive testing:

   a. The seam can be reconstructed between the two previously tested and passed destructive sample locations; or,

   b. The Geomembrane Installer can trace the welding path to an intermediate location at least ten feet from point of failed test in each direction and obtain destructive test samples collected from these locations. If destructive tests on these samples are acceptable, then the seam shall be reconstructed between the intermediate locations. If either sample fails, the process may be repeated until an acceptable seam test has been performed on both sides of the original failed sample. If a passing sample is not realized on one (or both) side of the original failed sample, then seam repair must extend to the end(s) of the seam. Retesting of seams according to this procedure shall utilize the sampling methodology described in Part 3.06(B). The Owner reserves the right to terminate this process, at the discretion of the Geosynthetic Quality Assurance Consultant, after the second retesting. An additional sample taken from the reconstructed zone must pass destructive seam testing if destructive sample failure(s) causes reconstruction.

3. The Geosynthetic Quality Assurance Consultant shall be responsible for documenting all actions taken in repairing seams. The Geomembrane Installer will be responsible for keeping the Geosynthetic Quality Assurance Consultant informed of seaming progress.

4. Additional fees for destructive seam test failures shall be assessed to the Contractor and deducted from payment. This fee shall be assessed only if the failing sample is a laboratory sample.

3.07 ELECTRONIC LEAK LOCATION SURVEY

A. The Owner shall have the option to conduct an electronic leak location survey. Leak location survey shall be performed by the Leak Location Contractor under the observation of the Geosynthetic Quality Assurance Consultant.

B. Leak Location Contractor shall identify actions required by Contractor to prepare the site for the leak location survey.

C. Contractor shall ensure that the layers above and below the geomembrane contains sufficient moisture to conduct a leak location survey. Typically, a moisture content of earth materials of 1% to 2% by weight is sufficient to conduct the survey. If the moisture content of layers above and/or below the geomembrane is not sufficient per the requirements of the Leak Location Contractor, Contractor shall add moisture to the layers, as required.

D. Contractor shall provide electrical isolation of the metal marker posts, batten bars, and concrete structures, as requested by Leak Location Contractor.

E. Leak Location Contractor shall inspect the site prior to commencing the survey to ensure all site preparations are completed and the site conditions are appropriate for conducting the leak location survey.

F. Any discrepancy in the required site preparation detailed in the Leak Location Contractor's Work Plan or site conditions shall be reported to the Contractor for corrective or appropriate action.

G. After the final layer is placed above the geomembrane, conduct a leak location survey on the final layer material using the procedures for surveys with earth materials covering the Geomembrane as described in ASTM D 7007.

H. A leak detection sensitivity test using an artificial leak shall be conducted on the geomembrane for each set of equipment used before the equipment is used on for the leak location survey, as described in ASTM D 7007 to determine the detection distance for the survey.

I. The leak location survey shall be taken on survey lines or on a grid spaced no farther apart than twice the leak detection distance as determined in the leak detection sensitivity test.

J. The Leak Location Contractor shall inform the Owner and/or Engineer and mark the locations of all identified or indicated leaks with a flag or spray paint. The Geomembrane Installer shall repair the defect/hole as detailed in Part 3.08 of this Section.

3.08 DEFECTS AND REPAIRS

A. The geomembrane shall be examined by the Geomembrane Installer and the Engineer for defects, holes, blisters, undispersed raw materials, and any signs of contamination by foreign matter. The geomembrane surface shall be swept and/or washed by the Geomembrane Installer if the amount of dust or mud inhibits examination. The

Contractor shall provide a water truck, an operator, clean water and hoses as reasonably necessary to assist the Geomembrane Installer in this activity.

B. Portions of geomembrane exhibiting flaws, or failing a non-destructive or destructive (if conducted) test, shall be repaired or replaced by the Geomembrane Installer. Repair procedures available include:

1. Patching - used to repair large holes, tears, undispersed raw materials, contamination by foreign matter, holes resulting from destructive sampling (if conducted), and locations where seam overlap is insufficient;

2. Capping - used to repair large lengths of failed seams; and

3. Additional Procedures - used upon recommendation of the Geomembrane Installer if agreed to by the Engineer.

C. Patches or caps.

1. Extend patch or cap 6 inches (minimum) beyond the edge of the defect.

2. Round corners of patch and/or cap (suggest 3-inch radius).

3. Repair procedures, equipment, materials, and techniques will be approved by the Geosynthetic Quality Assurance Consultant prior to repair.

4. Geomembrane below large caps shall be appropriately cut to avoid water or gas collection between two sheets.

D. The Geomembrane Installer shall mark on the geomembrane (using a non-puncturing writing utensil), repair date, time, and personnel involved.

E. Each repair shall be non-destructively tested in accordance with Part 3.05. Large caps may require destructive test sampling in accordance with Part 3.06 at the discretion of the Geosynthetic Quality Assurance Consultant.

F. Repairs which fail testing shall be redone and retested until a passing result is obtained. The Geomembrane Installer will perform non-destructive testing on repairs and will document retesting of repairs.

G. The Geosynthetic Quality Assurance Consultant will document repairs, repair testing, and retesting results.

H. The Geomembrane Installer shall cut and seam wrinkles which may adversely affect long-term integrity of the geomembrane, hinder subsequent construction of overlying layers, or impede drainage off of the geomembrane after it is covered by soil. Seaming shall be done in accordance with procedures described in Parts 3.04(B) and 3.04(C), and it shall be subject to test provisions of Parts 3.05 (non-destructive testing) and 3.06 (destructive testing – if conducted).

3.09 PROTRUSIONS AND CONNECTIONS TO GEOMEMBRANE

A. If required, the Geomembrane Installer shall install geomembrane around utility poles, guy wires, and other structures according to the Contract Drawings and the following requirements:

1. Use minimum 1-ft long geomembrane pipe boots and steel clamps to seal the geomembrane around pole or structure.

2. Use standard welding procedures to seam the geomembrane boot to the geomembrane.

3. Seaming performed on and around penetrations, and other appurtenances shall be non-destructively tested using the vacuum testing method.

3.10 SURVEY DOCUMENTATION

A. The Geomembrane Installer shall survey the completed geomembrane prior to covering and provide the Geosynthetic Quality Assurance Consultant with 24-hour notification of survey. The Contractor shall document the location of all seams (panel corners acceptable), destructive test samples (if conducted) and repairs. The Contractor shall provide survey data to the Geosynthetic Quality Assurance Consultant within two working day of survey completion.

3.11 DAILY FIELD INSTALLATION REPORTS

A. At the beginning of each day, the Geomembrane Installer shall provide the Geosynthetic Quality Assurance Consultant with a report for all work completed the previous day.

B. The Daily Field Installation Report shall include the following:

1. The total amount and location of geomembrane placed.

2. The total length and location of seams completed, technician name and welding unit numbers.

3. A drawing or sketch depicting the geomembrane installed the previous day including the panel number, seam number and locations of non-destructive and destructive testing (if conducted).

4. Results of pre-qualification test seams, if available.

5. Results of non-destructive testing.

C. Destructive test results (if conducted) shall be reported within 48 hours or prior to covering the geomembrane, whichever is practical.

3.12 MATERIAL ABOVE GEOMEMBRANE

A. The Geosynthetic Quality Assurance Consultant and Geomembrane Installer shall verify the area of geomembrane completion prior to placement of material over the geomembrane.

B. Soils - Apply following general criteria for covering of the geomembrane:

1. Do not place soils on the geomembrane at an ambient temperature below 32 degrees F, (0 degrees C) nor above 104 degrees F (40 degrees C), unless otherwise specified.

2. Do not drive equipment used for placing soil directly on the geomembrane.

3. A minimum thickness of 1 foot of soil is specified between a low ground pressure dozer (maximum contact pressure of 5 lb/sq. inch) and the geomembrane.

4. A minimum thickness of 2 feet of soil is required between rubber-tired vehicles and the geomembrane.

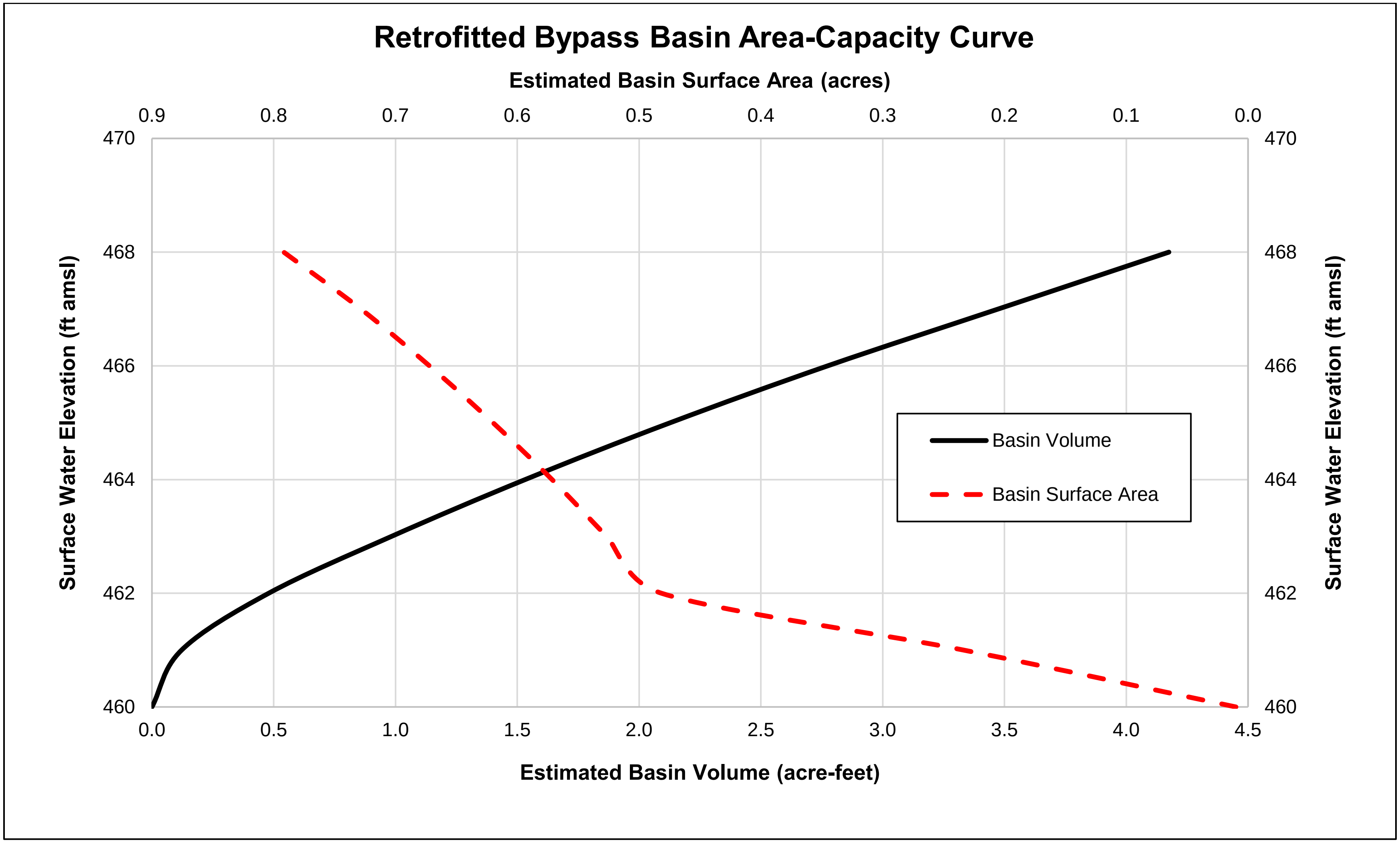
5. Do not compact soils placed directly on geomembrane.

6. Damage to the geomembrane resulting from placement of cover soils shall be repaired in accordance with Part 3.08 by the Geomembrane Installer at the Contractor's expense.

7. Do not push soil downslope. Soil shall be placed over the geomembrane starting from base of the slope, up to top of the slope.

END OF SECTION

ATTACHMENT 1-4
RETROFITTED BYPASS BASIN
AREA-CAPACITY CURVE


Retrofitted Bypass Basin Area-Capacity Curve
Estimated Basin Surface Area (acres)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
470
468
466
464
462
460
Surface Water Elevation (ft amsl)
Basin Volume
Basin Surface Area
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Estimated Basin Volume (acre-feet)

ATTACHMENT 2-1
CCR CHEMICAL CONSTITUENTS ANALYSIS

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-201436-1
Client Project/Site: Ash

For:
Midwest Generation EME LLC
13082 E Manito Road
Pekin, Illinois 61554

Attn: Joseph Kotas

Diana Mockler

Authorized for release by:
7/12/2021 3:51:25 PM

Diana Mockler, Project Manager I
(219)252-7570
Diana.Mockler@Eurofinset.com

1 2 3 4 5 6 7 8 9 10 11 12 13

Table of Contents

1 2 3 4 5 6 7 8 9 10 11 12 13

Job ID: 500-201436-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-201436-1

Comments
No additional comments.

Receipt
The samples were received on 6/24/2021 3:35 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.6º C.

Metals
Method 6010B: The following samples were diluted due to the abundance of non-target analytes: ASH BASIN (500-201436-2) and METALS CB (500-201436-3). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Method Summary

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL CHI
7471A	Mercury (CVAA)	SW846	TAL CHI
9056A	Anions, Ion Chromatography	SW846	TAL CHI
Moisture	Percent Moisture	EPA	TAL CHI
SM 4500 Cl- E	Chloride, Total	SM	TAL CHI
SM 4500 F C	Fluoride	SM	TAL CHI
300_Prep	Anions, Ion Chromatography, 10% Wt/Vol	MCAWW	TAL CHI
3050B	Preparation, Metals	SW846	TAL CHI
7471A	Preparation, Mercury	SW846	TAL CHI

Protocol References:

EPA = US Environmental Protection Agency

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-201436-1	FAB	Solid	06/23/21 13:30	06/24/21 15:35	
500-201436-2	ASH BASIN	Solid	06/23/21 14:23	06/24/21 15:35	
500-201436-3	METALS CB	Solid	06/23/21 15:00	06/24/21 15:35	

Client Sample ID: FAB

Lab Sample ID: 500-201436-1

Date Collected: 06/23/21 13:30

Matrix: Solid

Date Received: 06/24/21 15:35

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<2.0		2.0		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Arsenic	**1.8**		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Barium	**88**		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Beryllium	**1.9**		0.40		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Boron	**64**		4.9		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Cadmium	<0.20		0.20		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Calcium	**13000**		20		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Chromium	**34**		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Cobalt	**5.2**		2.5		mg/Kg		07/08/21 08:24	07/09/21 11:48	5
Lead	**4.1**		0.49		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Lithium	**10**		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Molybdenum	**2.4**		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Selenium	<0.99		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1
Thallium	<0.99		0.99		mg/Kg		07/08/21 08:24	07/09/21 11:25	1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.032**		0.016		mg/Kg		07/06/21 14:50	07/07/21 07:00	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**52**		2.0		mg/Kg		07/12/21 11:07	07/12/21 12:47	1
Chloride	**27**		20		mg/Kg		07/05/21 13:55	07/05/21 16:18	1
Fluoride	**1.3**		1.0		mg/Kg		07/05/21 13:55	07/05/21 17:39	1

Client Sample Results

Client: Midwest Generation EME LLC
Job ID: 500-201436-1
Project/Site: Ash

Client Sample ID: ASH BASIN
Lab Sample ID: 500-201436-2

Date Collected: 06/23/21 14:23
Matrix: Solid
Date Received: 06/24/21 15:35

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<8.6		8.6		mg/Kg		07/08/21 08:24	07/09/21 11:51	5
Arsenic	**2.2**		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Barium	**1800**		4.3		mg/Kg		07/08/21 08:24	07/09/21 11:51	5
Beryllium	**0.90**		0.34		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Boron	**46**		4.3		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Cadmium	<0.17		0.17		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Calcium	**39000**		17		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Chromium	**16**		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Cobalt	<11		11		mg/Kg		07/08/21 08:24	07/09/21 12:04	25
Lead	**5.5**		0.43		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Lithium	**12**		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Molybdenum	**1.0**		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Selenium	<0.86		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1
Thallium	**1.2**		0.86		mg/Kg		07/08/21 08:24	07/09/21 11:28	1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.094**		0.015		mg/Kg		07/06/21 14:50	07/07/21 07:02	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**230**		9.7		mg/Kg		07/12/21 11:07	07/12/21 13:42	5
Chloride	**88**		20		mg/Kg		07/05/21 13:55	07/05/21 16:18	1
Fluoride	**4.7**		1.0		mg/Kg		07/05/21 13:55	07/05/21 17:42	1

Client Sample Results

Client Sample ID: METALS CB

Lab Sample ID: 500-201436-3

Date Collected: 06/23/21 15:00

Matrix: Solid

Date Received: 06/24/21 15:35

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<1.8		1.8		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Arsenic	**7.6**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Barium	**1900**		8.9		mg/Kg		07/08/21 08:24	07/09/21 12:00	10
Beryllium	**1.5**		0.36		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Boron	**100**		4.5		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Cadmium	**4.3**		0.18		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Calcium	**120000**		180		mg/Kg		07/08/21 08:24	07/09/21 12:00	10
Chromium	**52**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Cobalt	<22		22		mg/Kg		07/08/21 08:24	07/09/21 12:27	50
Lead	**66**		0.45		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Lithium	**16**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Molybdenum	**5.3**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Selenium	**7.1**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1
Thallium	**4.0**		0.89		mg/Kg		07/08/21 08:24	07/09/21 11:32	1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.26**		0.015		mg/Kg		07/06/21 14:50	07/07/21 07:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**21000**		2000		mg/Kg		07/12/21 11:07	07/12/21 14:09	1000
Chloride	**110**		20		mg/Kg		07/05/21 13:55	07/05/21 16:18	1
Fluoride	**22**		0.99		mg/Kg		07/05/21 13:55	07/05/21 17:49	1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Metals

Prep Batch: 607902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	7471A	
500-201436-2	ASH BASIN	Total/NA	Solid	7471A	
500-201436-3	METALS CB	Total/NA	Solid	7471A	
MB 500-607902/12-A	Method Blank	Total/NA	Solid	7471A	
LCS 500-607902/13-A	Lab Control Sample	Total/NA	Solid	7471A	

Analysis Batch: 608143

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	7471A	607902
500-201436-2	ASH BASIN	Total/NA	Solid	7471A	607902
500-201436-3	METALS CB	Total/NA	Solid	7471A	607902
MB 500-607902/12-A	Method Blank	Total/NA	Solid	7471A	607902
LCS 500-607902/13-A	Lab Control Sample	Total/NA	Solid	7471A	607902

Prep Batch: 608328

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	3050B	
500-201436-2	ASH BASIN	Total/NA	Solid	3050B	
500-201436-3	METALS CB	Total/NA	Solid	3050B	
MB 500-608328/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 500-608328/2-A	Lab Control Sample	Total/NA	Solid	3050B	

Analysis Batch: 608625

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	6010B	608328
500-201436-1	FAB	Total/NA	Solid	6010B	608328
500-201436-2	ASH BASIN	Total/NA	Solid	6010B	608328
500-201436-2	ASH BASIN	Total/NA	Solid	6010B	608328
500-201436-2	ASH BASIN	Total/NA	Solid	6010B	608328
500-201436-3	METALS CB	Total/NA	Solid	6010B	608328
500-201436-3	METALS CB	Total/NA	Solid	6010B	608328
500-201436-3	METALS CB	Total/NA	Solid	6010B	608328
MB 500-608328/1-A	Method Blank	Total/NA	Solid	6010B	608328
LCS 500-608328/2-A	Lab Control Sample	Total/NA	Solid	6010B	608328

General Chemistry

Analysis Batch: 606811

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	Moisture	
500-201436-2	ASH BASIN	Total/NA	Solid	Moisture	
500-201436-3	METALS CB	Total/NA	Solid	Moisture	

Prep Batch: 607760

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	300_Prep	
500-201436-2	ASH BASIN	Total/NA	Solid	300_Prep	
500-201436-3	METALS CB	Total/NA	Solid	300_Prep	
MB 500-607760/1-A	Method Blank	Total/NA	Solid	300_Prep	
LCS 500-607760/2-A	Lab Control Sample	Total/NA	Solid	300_Prep	
LCSD 500-607760/3-A	Lab Control Sample Dup	Total/NA	Solid	300_Prep	

General Chemistry

Analysis Batch: 607876

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	SM 4500 F C	607760
500-201436-2	ASH BASIN	Total/NA	Solid	SM 4500 F C	607760
500-201436-3	METALS CB	Total/NA	Solid	SM 4500 F C	607760
MB 500-607760/1-A	Method Blank	Total/NA	Solid	SM 4500 F C	607760
LCS 500-607760/2-A	Lab Control Sample	Total/NA	Solid	SM 4500 F C	607760
LCSD 500-607760/3-A	Lab Control Sample Dup	Total/NA	Solid	SM 4500 F C	607760

Analysis Batch: 607925

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	SM 4500 Cl- E	607760
500-201436-2	ASH BASIN	Total/NA	Solid	SM 4500 Cl- E	607760
500-201436-3	METALS CB	Total/NA	Solid	SM 4500 Cl- E	607760
MB 500-607760/1-A	Method Blank	Total/NA	Solid	SM 4500 Cl- E	607760
LCS 500-607760/2-A	Lab Control Sample	Total/NA	Solid	SM 4500 Cl- E	607760
LCSD 500-607760/3-A	Lab Control Sample Dup	Total/NA	Solid	SM 4500 Cl- E	607760

Prep Batch: 608902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	300_Prep	
500-201436-2	ASH BASIN	Total/NA	Solid	300_Prep	
500-201436-3	METALS CB	Total/NA	Solid	300_Prep	
MB 500-608902/1-A	Method Blank	Total/NA	Solid	300_Prep	
LCS 500-608902/2-A	Lab Control Sample	Total/NA	Solid	300_Prep	

Analysis Batch: 608919

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-201436-1	FAB	Total/NA	Solid	9056A	608902
500-201436-2	ASH BASIN	Total/NA	Solid	9056A	608902
500-201436-3	METALS CB	Total/NA	Solid	9056A	608902
MB 500-608902/1-A	Method Blank	Total/NA	Solid	9056A	608902
LCS 500-608902/2-A	Lab Control Sample	Total/NA	Solid	9056A	608902

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 500-608328/1-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608625
Prep Batch: 608328

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<2.0		2.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Arsenic	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Barium	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Beryllium	<0.40		0.40		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Boron	<5.0		5.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Cadmium	<0.20		0.20		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Calcium	<20		20		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Chromium	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Cobalt	<0.50		0.50		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Lead	<0.50		0.50		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Lithium	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Molybdenum	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Selenium	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1
Thallium	<1.0		1.0		mg/Kg		07/08/21 08:24	07/09/21 10:31	1

Lab Sample ID: LCS 500-608328/2-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608625
Prep Batch: 608328

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	50.0	48.6		mg/Kg		97	80 - 120
Arsenic	10.0	9.39		mg/Kg		94	80 - 120
Barium	200	194		mg/Kg		97	80 - 120
Beryllium	5.00	4.65		mg/Kg		93	80 - 120
Boron	100	85.0		mg/Kg		85	80 - 120
Cadmium	5.00	4.62		mg/Kg		92	80 - 120
Calcium	1000	967		mg/Kg		97	80 - 120
Chromium	20.0	18.8		mg/Kg		94	80 - 120
Cobalt	50.0	47.4		mg/Kg		95	80 - 120
Lead	10.0	9.35		mg/Kg		94	80 - 120
Lithium	50.0	50.9		mg/Kg		102	80 - 120
Molybdenum	100	97.0		mg/Kg		97	80 - 120
Selenium	10.0	8.53		mg/Kg		85	80 - 120
Thallium	10.0	9.13		mg/Kg		91	80 - 120

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 500-607902/12-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608143
Prep Batch: 607902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.017		0.017		mg/Kg		07/06/21 14:50	07/07/21 06:11	1

Method: 7471A - Mercury (CVAA) (Continued)

Lab Sample ID: LCS 500-607902/13-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608143
Prep Batch: 607902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.167	0.174		mg/Kg		105	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 500-608902/1-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608919
Prep Batch: 608902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	<2.0		2.0		mg/Kg		07/12/21 11:07	07/12/21 12:20	1

Lab Sample ID: LCS 500-608902/2-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 608919
Prep Batch: 608902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	50.0	53.7		mg/Kg		107	80 - 120

Method: SM 4500 Cl- E - Chloride, Total

Lab Sample ID: MB 500-607760/1-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 607925
Prep Batch: 607760

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<20		20		mg/Kg		07/05/21 13:55	07/05/21 16:17	1

Lab Sample ID: LCS 500-607760/2-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 607925
Prep Batch: 607760

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	200	205		mg/Kg		103	85 - 115

Lab Sample ID: LCSD 500-607760/3-A
Client Sample ID: Lab Control Sample Dup
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 607925
Prep Batch: 607760

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	200	206		mg/Kg		103	85 - 115	0	20

Method: SM 4500 F C - Fluoride

Lab Sample ID: MB 500-607760/1-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 607876
Prep Batch: 607760

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<1.0		1.0		mg/Kg		07/05/21 13:55	07/05/21 17:23	1

Method: SM 4500 F C - Fluoride (Continued)

Lab Sample ID: LCS 500-607760/2-A
Matrix: Solid
Analysis Batch: 607876

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 607760

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Fluoride			100	112		mg/Kg		112	80 - 120		

Lab Sample ID: LCSD 500-607760/3-A
Matrix: Solid
Analysis Batch: 607876

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 607760

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Fluoride			100	112		mg/Kg		112	80 - 120	1	20

Client Sample ID: FAB
Lab Sample ID: 500-201436-1

Date Collected: 06/23/21 13:30
Matrix: Solid
Date Received: 06/24/21 15:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		1	608625	07/09/21 11:25	JJB	TAL CHI
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		5	608625	07/09/21 11:48	JJB	TAL CHI
Total/NA	Prep	7471A			607902	07/06/21 14:50	MJG	TAL CHI
Total/NA	Analysis	7471A		1	608143	07/07/21 07:00	MJG	TAL CHI
Total/NA	Prep	300_Prep			608902	07/12/21 11:07	PSP	TAL CHI
Total/NA	Analysis	9056A		1	608919	07/12/21 12:47	EAT	TAL CHI
Total/NA	Analysis	Moisture		1	606811	06/29/21 16:58	LWN	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 Cl- E		1	607925	07/05/21 16:18	MS	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 F C		1	607876	07/05/21 17:39	MS	TAL CHI

Client Sample ID: ASH BASIN
Lab Sample ID: 500-201436-2

Date Collected: 06/23/21 14:23
Matrix: Solid
Date Received: 06/24/21 15:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		1	608625	07/09/21 11:28	JJB	TAL CHI
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		5	608625	07/09/21 11:51	JJB	TAL CHI
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		25	608625	07/09/21 12:04	JJB	TAL CHI
Total/NA	Prep	7471A			607902	07/06/21 14:50	MJG	TAL CHI
Total/NA	Analysis	7471A		1	608143	07/07/21 07:02	MJG	TAL CHI
Total/NA	Prep	300_Prep			608902	07/12/21 11:07	PSP	TAL CHI
Total/NA	Analysis	9056A		5	608919	07/12/21 13:42	EAT	TAL CHI
Total/NA	Analysis	Moisture		1	606811	06/29/21 16:58	LWN	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 Cl- E		1	607925	07/05/21 16:18	MS	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 F C		1	607876	07/05/21 17:42	MS	TAL CHI

Client Sample ID: METALS CB
Lab Sample ID: 500-201436-3

Date Collected: 06/23/21 15:00
Matrix: Solid
Date Received: 06/24/21 15:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		1	608625	07/09/21 11:32	JJB	TAL CHI
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		10	608625	07/09/21 12:00	JJB	TAL CHI

Lab Chronicle

Client: Midwest Generation EME LLC　　　　Job ID: 500-201436-1
Project/Site: Ash

Client Sample ID: METALS CB　　　　Lab Sample ID: 500-201436-3
Date Collected: 06/23/21 15:00　　　　**Matrix: Solid**
Date Received: 06/24/21 15:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			608328	07/08/21 08:24	BDE	TAL CHI
Total/NA	Analysis	6010B		50	608625	07/09/21 12:27	JJB	TAL CHI
Total/NA	Prep	7471A			607902	07/06/21 14:50	MJG	TAL CHI
Total/NA	Analysis	7471A		1	608143	07/07/21 07:04	MJG	TAL CHI
Total/NA	Prep	300_Prep			608902	07/12/21 11:07	PSP	TAL CHI
Total/NA	Analysis	9056A		1000	608919	07/12/21 14:09	EAT	TAL CHI
Total/NA	Analysis	Moisture		1	606811	06/29/21 16:58	LWN	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 Cl- E		1	607925	07/05/21 16:18	MS	TAL CHI
Total/NA	Prep	300_Prep			607760	07/05/21 13:55	MS	TAL CHI
Total/NA	Analysis	SM 4500 F C		1	607876	07/05/21 17:49	MS	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Midwest Generation EME LLC | Job ID: 500-201436-1
Project/Site: Ash

Laboratory: Eurofins TestAmerica, Chicago

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Illinois	NELAP	IL00035	04-29-22

1 2 3 4 5 6 7 8 9 10 11 12 13

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park IL 60484
Phone 708-534-5200 Fax. 708-534-5211

Chain of Custody Record

eurofins Environment Testing America

Client Information	Sampler:	Lab PM: Mockler Diana J	Carrier Tracking No(s):	COC No: 500-92457-41195 1
Client Contact: Joseph Kotas	Phone	E-Mail: Diana Mockler@Eurofinset.com	State of Origin	Page: Page 1 of 1
Company: Midwest Generation EME LLC	PWSID:	Analysis Requested		Job #: 500-201436
Address: 13082 E Manito Road	Due Date Requested:			Preservation Codes
City: Pekin	TAT Requested (days):			
State Zip: IL, 61554	Compliance Project: Δ Yes Δ No			
Phone: 815-372-4589(Tel)	PO #: 4502051132			
Email: joseph kotas@nrg com	WO #: 36733393			
Project Name: Powerton Station	Project #: 50000647			
Site:	SSOW#:			Other

500-201436 COC

Preservation Codes: A HCL, B NaOH, C Zn Acetate, D Nitric Acid, E NaHSO4, F MeOH, G Amchlor, H Ascorbic Acid, I Ice, J DI Water, K EDTA, L EDA, M Hexane, N None, O AsNaO2, P Na2O4S, Q Na2SO3, R Na2S2O3, S H2SO4, T TSP Dodecahydrate, U Acetone, V MCAA, W pH 4-5, Z other (specify)

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0, 904.0	Ra226Ra228_GFPC - Combined Rad 226/228	4500_F_C, 6010B, 7471A, 9056A, SM4500_Cl_E	Total Number of containers	Special Instructions/Note
			Preservation Code:				N	N	N		
1 FAB	6/23/21	13:30	G	Solid			X		X		
1 FAB2	6/23/21	1330	C	Solid				X			
				Solid							
2 ASH BASIN	6/23/21	1423	C	Sol				X			
1 ASH 2	6/23/21	14:23	C	Sol			X		X		
3 Metals 2	6/23/21	15:00	C	Sol				X			
1 Metals CB	6/23/21	15:00	C	Sol			X		X		

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ________ Months

Deliverable Requested I II III IV Other (specify)

Special Instructions/QC Requirements

Empty Kit Relinquished by:	Date	Time	Method of Shipment:		
Relinquished by: J N Kotas	Date/Time: 6/23/21 4:30	Company	Received by: Stephanie Hernandez	Date/Time: 6/24/21 1535	Company: ETA-CHI
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks: 4.9 → 4.6

Ver: 11/01/2020 7/12/2021

ORIGIN ID PIAA (309) 477-5216
JOSEPH KOTAS
MIDWEST GENERATION
POWERTON GENERATING STATION
13082 E MANITO ROAD
PEKIN, IL 61554
UNITED STATES US

SHIP DATE 23JUN21
ACTWGT 30 00 LB
CAD 100275867/INET4340
DIMS 14x12x22 IN

BILL SENDER

TO **ATTN: SAMPLE RECEIVING**
EUROFINS TESTAMERICA, CHICAGO
2417 BOND ST

UNIVERSITY PARK IL 60484
(708) 534-5200 X 153 REF
INV
PO DEPT

500-201436 Wayb

56DJ3/B38/FE4A

FedEx Express

E

J211321033101uv

THU - 24 JUN 4:30P
STANDARD OVERNIGHT

TRK# 0201 **7740 8262 9809**

60484
IL-US **ORD**

UF JOTA

48qt.

fter printing this label
Use the 'Print' button on this page to print your label to your laser or inkjet printer
Fold the printed page along the horizontal line
Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned

arning Use only the printed original label for shipping Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing
harges along with the cancellation of your FedEx account number
se of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex com FedEx will not be responsible
r any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher
alue, pay an additional charge, document your actual loss and file a timely claim Limitations found in the current FedEx Service Guide apply Your right to recover
om FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether
irect, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value Recovery cannot exceed actual documented
ss Maximum for items of extraordinary value is $1,000, e g jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide Written
aims must be filed within strict time limits, see current FedEx Service Guide

Login Sample Receipt Checklist

Client: Midwest Generation EME LLC

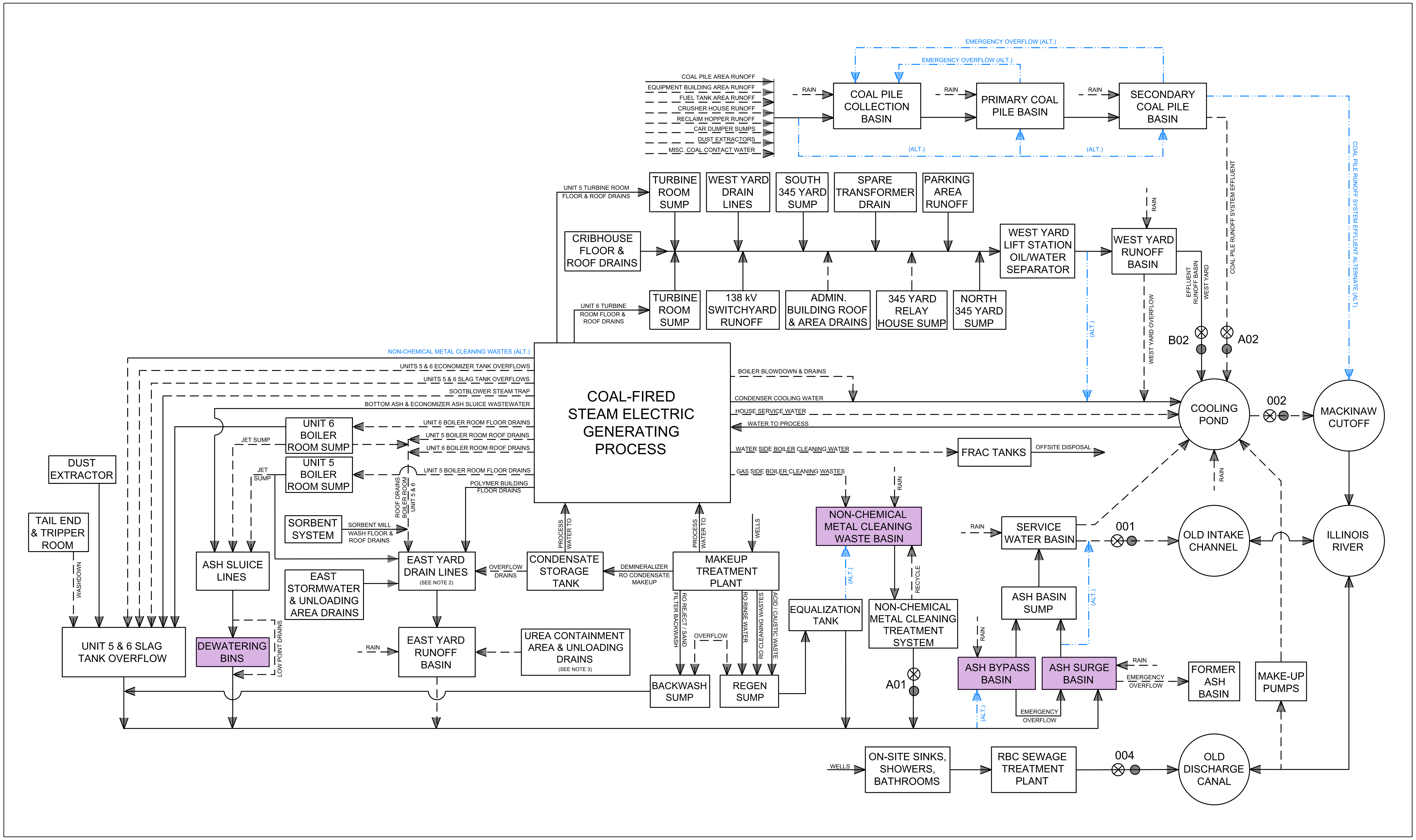
Job Number: 500-201436-1

Login Number: 201436
List Number: 1
Creator: Hernandez, Stephanie

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	4.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

ATTACHMENT 2-2
POWERTON PROCESS FLOW DIAGRAM



LEGEND

———	TYPICAL
– – –	INTERMITTENT
-·-·-	ALTERNATE
●	OUTFALL NUMBER
⊗	SAMPLING POINT
(shaded)	CCR TREATMENT/STORAGE FACILITY

NOTES

1. THIS DRAWING WAS DEVELOPED USING MIDWEST GENERATION, LLC DRAWING "GENERAL FLOW DIAGRAM WITH NPDES OUTFALLS, NPDES PERMIT NO. IL0002232," PREPARED BY APTIM ENVIRONMENTAL & INFRASTRUCTURE, LLC (DATED NOVEMBER 2019) AND USED WITH PERMISSION FROM MIDWEST GENERATION, LLC. SARGENT & LUNDY HAS NOT INDEPENDENTLY VERIFIED THE INFORMATION SHOWN ON THIS DRAWING.
2. "EAST YARD DRAIN LINES" INCLUDES FAN BAY DRAINS, DRAINS ON EAST HALF OF PROPERTY.
3. VALVE IS LOCATED ON SUMP FROM UREA CONTAINMENT AREA & UNLOADING DRAINS TO THE EAST YARD RUNOFF BASIN.
4. OUTFALL 006, TREATED ASBESTOS CONTAMINATED STORMWATER, IS NOT INCLUDED IN THIS DIAGRAM AND IS BEING PROPOSED FOR REMOVAL DUE TO THERE NO LONGER BEING DEMOLITION DEBRIS.

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	11-25-2020	FOR USE

ISSUE PURPOSE: FOR USE
SPECIFICATION: ---
PROJECT NO.: 12661-097

CAD FILE NAME: POW-CSK-PFD-001.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

Sargent & Lundy LLC

SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
UNITS 5 & 6

DRAWING TITLE

EXISTING WATER BLOCK FLOW DIAGRAM

DRAWING NUMBER	REVISION
POW-CSK-PFD-001	0

SHEET 1 OF 1

PD11153/OM1864/S:*CivilDesign*2-Powerton - CCR*Drawings*POW-CSK-PFD-001.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

11/24/2020 3:15:33 PM
...*Drawings*POW-CSK-PFD-001.dgn

ATTACHMENT 2-3
ON-SITE TRANSPORTATION PLAN

FIGURE	REV.	TITLE
FIGURE 2	0	BYPASS BASIN SITE TRANSPORTATION MAP

NORTH

150' 0' 150' 300'

GRAPHIC SCALE

LEGEND

(magenta line)	TYPICAL VEHICLE ACCESS TO BYPASS BASIN
(green line)	LARGE VEHICLE ACCESS TO BYPASS BASIN
(red line)	BYPASS BASIN BOUNDARY

NOTES

REFERENCE DRAWINGS

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

FOR PERMIT
NOT FOR CONSTRUCTION

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-15-2022	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	N/A
PROJECT NO.:	12661-130

CAD FILE NAME:	FIGURE 2.DGN
PREPARED BY:	J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

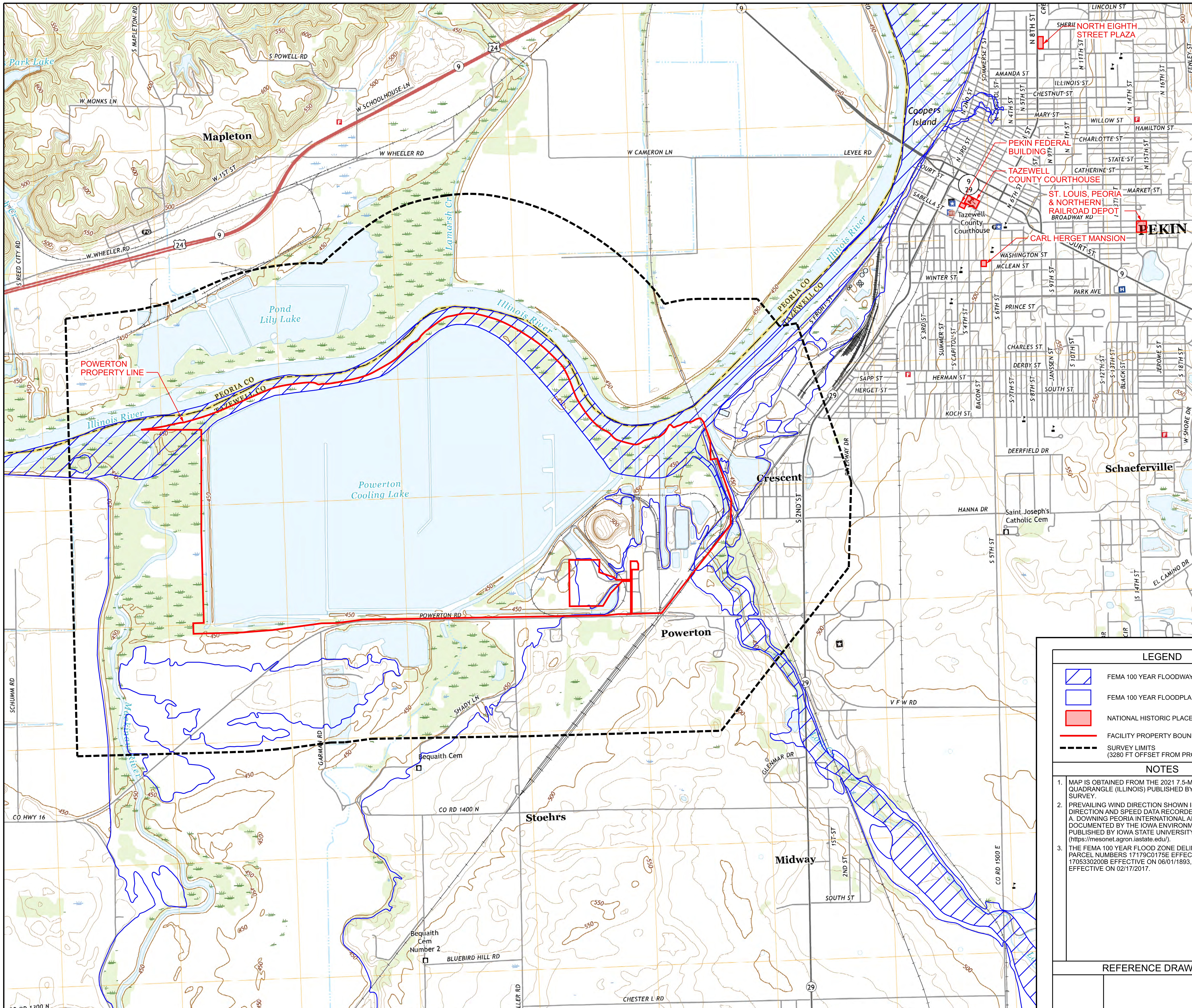
BYPASS BASIN
SITE TRANSPORTATION MAP

DRAWING NUMBER	REVISION
FIGURE 2	0
SHEET 1 OF 1	

PL12793/0M1864/E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Drawings\FIGURE 2.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7/15/2022 8:43:24 AM
...\Drawings\FIGURE 2.dgn

ATTACHMENT 3
SITE LOCATION MAP



LEGEND

	FEMA 100 YEAR FLOODWAY
	FEMA 100 YEAR FLOODPLAIN BOUNDARY
	NATIONAL HISTORIC PLACE
	FACILITY PROPERTY BOUNDARY LINE
	SURVEY LIMITS (3280 FT OFFSET FROM PROPERTY LINE)

NOTES

1. MAP IS OBTAINED FROM THE 2021 7.5-MINUTE PEKIN QUADRANGLE (ILLINOIS) PUBLISHED BY THE U.S. GEOLOGICAL SURVEY.
2. PREVAILING WIND DIRECTION SHOWN IS BASED ON WIND DIRECTION AND SPEED DATA RECORDED AT GENERAL WAYNE A. DOWNING PEORIA INTERNATIONAL AIRPORT AS DOCUMENTED BY THE IOWA ENVIRONMENTAL MESONET PUBLISHED BY IOWA STATE UNIVERSITY (https://mesonet.agron.iastate.edu/).
3. THE FEMA 100 YEAR FLOOD ZONE DELINEATION IS FROM FEMA PARCEL NUMBERS 17179C0175E EFFECTIVE 02/17/2017, 1705330200B EFFECTIVE ON 06/01/1893, AND 17179C0160E EFFECTIVE ON 02/17/2017.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

FOR PERMIT
NOT FOR CONSTRUCTION

PREVAILING WIND DIRECTION

NORTH

1000' 0' 1000' 2000'
GRAPHIC SCALE

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

CAD FILE NAME: ATTACHMENT 3.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: --

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SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

SITE LOCATION MAP

DRAWING NUMBER	REVISION
ATTACHMENT 3	0

SHEET 1 OF 1

PL12793\M1864\D:\00-Civil Home Work\2-Powerton CCR\New folder\POW-BBR-CSK-011.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7/15/2022 2:30:50 PM
..\New folder\POW-BBR-CSK-011.dgn

ATTACHMENT 4
SITE PLAN MAPS

NORTH

600' 0' 600' 1200'

GRAPHIC SCALE

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT

SPECIFICATION: N/A

PROJECT NO.: 12661-130

CAD FILE NAME: FIGURE 4-1.DGN

PREPARED BY: J. CHAVEZ

REVIEWED BY: T. DEHLIN

APPROVED BY: --

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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

SITE PLAN MAP

DRAWING NUMBER	REVISION
FIGURE 4-1	0

SHEET 1 OF 1

LEGEND

FACILITY PROPERTY BOUNDARY LINE

NOTES

REFERENCE DRAWINGS

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

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FOR PERMIT
NOT FOR CONSTRUCTION

7/15/2022 8:47:13 AM
..\Drawings\FIGURE 4-1.dgn

PL12793\DM1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Drawings\FIGURE 4-1.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7 6 5 4 3 2 1

NORTH

150' 0' 150' 300'
GRAPHIC SCALE

NOTES

1. AERIAL IMAGE IS FROM GOOGLE EARTH PRO V.7.3 AND IS DATED 09/14/2017.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

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FOR PERMIT
NOT FOR CONSTRUCTION

HOLD INFORMATION

NO.	DESCRIPTION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: ---
PROJECT NO.: 12661-097

CAD FILE NAME: FIGURE 4-2.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: --

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CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

BOTTOM ASH-HANDLING EQUIPMENT AND CCR SURFACE IMPOUNDMENTS

DRAWING NUMBER	REVISION
FIGURE 4-2	0

SHEET 1 OF 1

7/15/2022 9:17:56 AM
...\Drawings\FIGURE 4-2.dgn

PL12793/M1864/E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Drawings\FIGURE 4-2.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7 6 5 4 3 2 1

ATTACHMENT 5-1
CONSTRUCTION PLANS & SPECIFICATIONS

MWG
Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1400

BYPASS BASIN RETROFIT

S&L PROJECT NO.: 12661-130

REVISION 0C

ISSUE PURPOSE: PERMIT

ISSUE DATE: 07-15-2022

Sargent & Lundy

SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-28-2022	All
0B	Public Comment	04-15-2022	All
0C	Permit	07-15-2022	All

This is to confirm that this Specification has been prepared, reviewed, and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0407, Specifications and Bills of Materials, which is part of our Quality Management System.

Contributor Summary & Current Revision Signatures

Rev.	Prepared By	Reviewed By	Approved By
0A	T. Dehlin	D. Nielson	--
0B	T. Dehlin	D. Nielson	--
0C	Digitally signed by Thomas J. Dehlin Date: 2022.07.15 09:09:38 -05'00' T. Dehlin	Digitally signed by David E. Nielson Date: 2022.07.15 10:46:45 -05'00' D. Nielson	Digitally signed by Thomas J. Dehlin Date: 2022.07.15 11:08:22 -05'00' T. Dehlin

SECTION 000107

CERTIFICATION PAGE

Sargent & Lundy (S&L) is registered in the State of Illinois to practice engineering. S&L's Illinois Department of Financial and Professional Regulation registration number is 184-000106.

I certify that this Specification was prepared by me or under my direct supervision and that I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 15, 2022

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

Th. Dehlin
07/15/2022
Exp. 11/30/2023

SECTION 000110

TABLE OF CONTENTS

END OF SECTION 000110

SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

101. PROJECT INFORMATION

101.1	Owner:	Midwest Generation, LLC (MWG)
101.2	Design Engineer:	Sargent & Lundy (S&L)
101.3	Project Name:	Bypass Basin Retrofit
101.4	Project Location:	Powerton Generating Station 13082 E. Manito Rd. Pekin, IL 61554

102. DESCRIPTION OF THE PROJECT AND GENERAL BACKGROUND

102.1 The purpose of this project is to retrofit the Bypass Basin at Midwest Generation, LLC's Powerton Generating Station in accordance with the Illinois Pollution Control Board's Coal Combustion Residuals (CCR) Rule, 35 Ill. Adm. Code Part 845, and with the U.S. Environmental Protection Agency's (EPA) CCR Rule, 40 CFR Part 257 Subpart D.

102.2 The Bypass Basin will be retrofitted by removing all CCR and CCR-mixed materials stored in the basin and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following removal of CCR and CCR-mixed material from the basin and decontamination of the basin facilities remaining in-place, a new composite liner system and new leachate collection and removal system (LCRS) will be installed within the Bypass Basin over the basin's existing decontaminated and leak-tested geomembrane liner.

103. SCOPE OF WORK

103.1 In general, this Specification covers the technical requirements for a General Work (GW) Contractor to retrofit the Bypass Basin at the Powerton Generating Station. The Work includes the following activities:

a. Surveying the project area to verify the accuracy of the existing topographic data shown on the Design Drawings.

b. Establishing benchmark monuments for survey control throughout the project.

c. Furnishing and installing temporary sediment and erosion control best management practices (BMPs) prior to and during all phases of earth disturbance work.

d. Retrofitting the Bypass Basin by:

d1. Removing all CCR, gravel warning layer, and sand cushion layer materials above the basin's existing geomembrane liner with offsite disposal of dry waste material in a permitted landfill approved by the Owner and disposal of liquid waste in the Ash Surge Basin.

d2. Decontaminating the basin's existing geomembrane liner and appurtenant structures for re-use in the retrofitted basin, including conducting and documenting visual inspections and analytical testing to demonstrate the existing liner is no longer contaminated with CCR constituents.

d3. Ensuring all appropriate measures are taken to protect the Bypass Basin's existing HDPE geomembrane liner system from damage.

d4. Placing, compacting, and grading Structural Fill to establish the lines and grades for the basin's LCRS as specified on the Design Drawings.

d5. Installing a new composite liner system over the existing, decontaminated geomembrane liner and Structural Fill placed within the basin. The composite liner system consists of an HDPE geomembrane liner over a geosynthetic clay liner (GCL).

d6. Installing a new LCRS over the new composite liner system. The LCRS consists of drainage geocomposite – an HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet – over a perforated HDPE collection pipe, a pipe bedding layer, and an HDPE riser pipe.

d7. Installing a Sand Filter Layer above the drainage geocomposite.

d8. Installing a Protective Warning Layer above the Sand Filter Layer on the basin floor.

d9. Installing riprap on a gravel bedding layer above the Sand Filter Layer along the basin's side slopes to protect the Sand Filter Layer from erosion.

e. Restoring and cleaning the project site.

f. GW Contractor shall allow access to all work areas by Owner, Design Engineer, CQA Contractor staff, and other parties as approved by Owner. GW Contractor shall not install, modify, repair or work on any elements of the project that are subject to the CQA testing and inspection services without notifying the CQA firm at least 2 work days in advance. Work on weekends or holidays shall be scheduled as soon as possible with the CQA Contractor. Failure to provide CQA Contractor adequate advanced notice to staff the site shall result in a hold on work until the CQA contractor staff arrive on site.

g. Developing fueling and maintenance facilities and practices to protect the project site from hydrocarbon spills or other environmental impacts that may impact the project site, adjacent property, or the Illinois River and connected waterways.

103.2 In addition, the Work shall include but not be limited to the following:

a. Engineering and construction services required to perform or install the Work.

b. Surveying to ensure the Work is located as indicated on the Design Drawings in accordance with the benchmark monuments established by the GW Contractor.

c. Furnishing all installation equipment and tools including any calibrated instruments required for monitoring and testing.

d. Maintaining the project site in a dry condition that includes dewatering of all areas that collect storm water or groundwater in the area controlled by the GW Contractor, redirecting any surface water as a result of rainfall or water generated by the installation Work. Any groundwater and/or surface water which requires removal from the area of work shall be disposed of in compliance with the Powerton Generating Station's National Pollutant Discharge Elimination System (NPDES) discharge permit in effect at the time of the Work. The methods and proposed place of discharge shall be approved by the Owner prior to disposing of the water.

e. Excess excavated material and other construction related debris shall be disposed of offsite in a permitted landfill approved by the Owner.

f. Maintaining a record of the installation (i.e., as-built drawings) in accordance with the technical requirements of this Specification.

g. Furnishing the services of qualified personnel at the project site to perform the Work.

h. Progress reporting as specified in the Commercial Terms and Conditions.

i. Daily site cleanup and disposal of waste and debris.

j. Participation in the Owner's on-site safety program, including the Owner's CCR Safety and Health Plan Training.

103.3 The Work shall conform to the requirements of this Specification and shall be performed and supervised by personnel who are experienced and knowledgeable in the crafts and trades required by the Scope of Work. The Work shall be performed exclusively by the GW Contractor's trained and competent personnel or, where permitted, that of its subcontractor(s); and shall comply with all applicable safety laws, regulations, programs, and practices to ensure the safety of all people located on the work site, including the Contractor's personnel (or that of its subcontractor(s)) performing the Work.

103.4 Performance of the Work shall include all the labor, supervision, administration, management, material procurement, tools, installation and testing equipment, miscellaneous material, and consumables to perform the Work specified herein.

103.5 Provide all installation equipment and all incidental items not shown or specified but reasonably implied for successful completion of the Work and in strict accordance with Design Drawings and this Specification, including inspection, testing and quality standards.

103.6 Provide installation quality assurance and quality control submittals where required.

103.7 Prepare red-lined as-built drawings for review upon completion of the Work to document any variances between the construction issue of the Design Drawings and the actual installation. Finalize as-built drawings after the Owner and the Design Engineer review.

103.8 All other work, as indicated on the Design Drawings, as specified herein or as required to properly complete the Work.

104. DIVISION OF RESPONSIBILITY & CONTRACTOR QUALIFICATIONS

104.1 Owner:

a. MWG is the Owner of the facility and has the authority to accept or reject materials and workmanship of the GW Contractor or reports and recommendations of the CQA Contractor.

b. The Owner will ultimately be responsible for the retrofit construction for the Bypass Basin and for assuring the Permitting Authority that the construction meets or exceeds the requirements specified in state regulations, permits, Project Specifications, and the Design Drawings.

104.2 Design Engineer:

a. S&L is the Design Engineer and is responsible for designing the retrofitted features for the Bypass Basin.

b. The Design Engineer will assure that the retrofit design meets the construction requirements of the Owner and meets or exceeds the requirements of the Permitting Authority.

c. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes to the permitted design shall require approval of the Owner and Design Engineer to ensure that the original design objectives are still maintained. All changes shall meet state regulatory requirements and the rules promulgated thereunder and may include Permitting Authority-approved variances to the rules.

104.3 Permitting Authority – Illinois EPA:

a. The Illinois EPA is the Permitting Authority and is responsible for reviewing the permit application for retrofitting the Bypass Basin to assure compliance with state regulations and for granting the construction permit for the project.

b. The Permitting Authority may review any design revisions during construction and any requests for variance submitted by the Owner. The Permitting Authority has the authority to review and approve all CQA documentation and reports and to confirm the Bypass Basin was retrofitted as specified in Project Specifications and the Design Drawings.

104.4 GW Contractor:

a. The GW Contractor is the firm with whom the Owner establishes a contract for the satisfactory performance of the Work.

b. The GW Contractor is responsible for the work, quality, and safety of their staff and all subcontractors and suppliers.

c. The GW Contractor may devise the Work into the following division of responsibilities between an Earthwork Contractor and a Geosynthetics Contractor.

104.5 Earthwork Contractor:

a. The Earthwork Contractor is the contractor responsible for earthwork and sitework, removal of existing CCR and protective layers above the Bypass Basin's existing geomembrane liner, placement of fill material to support the basin's new composite liner system and to establish the lines and grades of the basin's new LCRS, excavation and backfill of crest anchor trenches, placement of bedding material around the leachate collection pipe, installation of the leachate collection pipe, and installation of the granular materials above the basin's new LCRS.

b. The GW Contractor may self-perform or subcontract the Earthwork Contractor's scope of work.

104.6 Geosynthetics Contractor:

a. The Geosynthetics Contractor is the contractor responsible for the supply and installation of all geosynthetic materials for the project, including geosynthetic clay liner (GCL), high-density polyethylene (HDPE) geomembrane, drainage geocomposite, and non-woven geotextile.

b. The GW Contractor may self-perform or subcontract the Geosynthetics Contractor's scope of work.

c. Qualifications:

c1. The Geosynthetics Contractor shall be approved by the manufacturer(s) of the geosynthetics materials for installation of the geosynthetic materials supplied for the project.

c2. The Geosynthetics Contractor shall be approved by the Owner.

c3. The Geosynthetics Contractor shall have a minimum 5-year history of successfully performing similar work.

104.7 Construction Quality Assurance (CQA) Contractor:

a. The CQA Contractor is the firm with whom the Owner establishes a contract to perform all CQA work as specified on the Design Drawings and in Specification P-1401.

b. The CQA Contractor is independent of the GW Contractor and their subcontractors.

105. MATERIAL AND SERVICES FURNISHED BY OTHERS

105.1 The following work has been, or will be, performed and/or provided by Others:

a. Initial dewatering and removal of a significant quantity of CCR from the Bypass Basin. The GW Contractor shall be responsible for dewatering (if necessary) and removing all CCR and CCR-mixed materials remaining in the Bypass Basin after the GW Contractor mobilizes to the site. Estimated quantity of CCR and existing protective layers that are considered to be impacted by CCR to be removed from the basin will be provided by Owner during the bid period for the Work.

b. Construction Quality Assurance services as detailed in Specification P-1401 will be procured by the Owner.

106. DEFINITIONS

106.1 The term "Design Drawing" means the Design Engineer's drawings indicating the Work to be performed.

106.2 The term "Work" means the material and services furnished to retrofit the Bypass Basin as identified on the Design Drawings and as specified herein.

106.3 The term "Owner-approved equal" means an acceptable equivalent to a specified material that has been accepted by the Owner.

107. INTENT OF DOCUMENTS

107.1 The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labor, material, equipment, and transportation necessary for the proper execution of the Work.

107.2 Discrepancies between the Design Drawings and this Specification, or errors or omissions, ambiguities, or mis-description in either the Design Drawings or in this Specification, shall be referred to the Design Engineer for interpretation and adjustment prior to beginning the Work. Do not proceed without the Design Engineer's written acceptance.

108. PERFORMANCE OF THE WORK

108.1 The GW Contractor shall provide materials and employ construction practices that are sustainable to the greatest extent possible, including disposal of waste.

108.2 The GW Contractor shall provide a representative that will input and provide daily force reports and daily production reports.

108.3 The performance of the Work, as specified herein and as indicated on the Design Drawings, shall comply with the current safety and health standards authorized by the U.S. Department of Labor's Occupational Safety and Health Administration, as well as state and local jurisdictional requirements.

108.4 The GW Contractor shall take all appropriate precautions to ensure the safety of all people working on site.

108.5 The GW Contractor shall maintain the necessary skilled and qualified labor force for the Work to ensure the on-time completion of the Work.

108.6 The GW Contractor's personnel shall be competent, capable, qualified, and able to perform the duties required to the satisfaction of the Owner. A supervisor vested with authority to make decisions binding on the GW Contractor shall be assigned to the task to resolve installation problems as they arise so as not to delay completion of the Work.

108.7 The GW Contractor shall be solely responsible for advising the Design Engineer in writing of any conflicts between this Specification and the Design Drawings and the GW Contractor's drawings, including performance and levels of quality. The Contractor agrees that its obligations, liabilities, and warranties shall not be diminished or extinguished due to its meeting the requirements of this Specification and the Design Drawings.

109. REGULATORY REQUIREMENTS

109.1 The GW Contractor shall at all times be solely responsible for complying with all applicable laws, ordinances, regulations, and codes, including those relating to safety of all persons, in connection with the Work. No obligation of the Owner or Design Engineer shall impose upon them any duty to review the GW Contractor's compliance with safety measures.

110. PROTECTION OF PROPERTY AND PERSONNEL SAFETY

110.1 The GW Contractor shall take adequate precautions to protect existing structures, fences, pavements, aboveground utilities and underground utilities and to avoid damage thereto. The GW Contractor shall, at its own expense, repair any damage caused by its operations.

110.2 The GW Contractor shall conduct safety training of all its personnel (including any subcontractors) in accordance with the Owner's safety requirements, including the Owner’s CCR Safety and Health Plan.

110.3 The GW Contractor shall take adequate precautions to protect the Illinois River, other waterways, and adjacent properties from environmental damage.

111. CLEAN-UP AND DISPOSAL OF DEBRIS

111.1 The Contractor shall be responsible for clean-up and disposal of all debris resulting from the installation work. All excess excavated material and other construction related debris shall be properly disposed of (i.e., in an environmentally responsible way) offsite in a permitted landfill approved by the Owner.

111.2 Clean up, disposal, and site restoration, if required, shall be in compliance with the applicable requirements of all access permits. If any additional permits are required for disposal of debris, these shall be the responsibility of the GW Contractor.

111.3 Work areas shall be kept clean and orderly at all times with as little disturbance as possible to existing conditions. Upon completion of work at each site, all tools, equipment, material, and debris shall be completely removed and the area left in a clean condition.

112. EXISTING SITE CONDITIONS

112.1 Prior to performing any Work in any part of the project site, the GW Contractor shall make a thorough field check for the purposes of verifying existing conditions that may affect the Work. The GW Contractor shall include a thorough investigation of the potential interferences and difficulties that it may encounter in the proper and complete execution of the Work, including the field location and identification of underground and overhead utilities within and adjacent to the limits of the Work. The GW Contractor shall advise the Owner immediately of the discovery of any conditions, including the existence of underground and overhead utilities that may affect the timely and safe execution of the Work.

112.2 The GW Contractor shall be responsible for location of underground utilities and obstructions prior to performance of the Work and shall promptly notify Owner of any potential interferences that may impact performance of the Work. Modifications to the design to resolve these interferences shall not be implemented until approved by the Owner.

112.3 The GW Contractor further acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface material and obstacles, including underground or embedded utilities, to be encountered insofar as this information is reasonably ascertainable from:

a. An inspection of the site (including field location and identification of underground utilities).

b. Reference drawings made available by the Owner.

c. Drawings and specifications that are a part of the Contract.

d. The character and extent of existing work within or adjacent thereto.

e. Any other work being performed thereon at the time of the submission of bids.

112.4 Should the GW Contractor fail to perform any of the obligations set forth above, the GW Contractor's later plea of ignorance of existing or foreseeable conditions which create difficulties or hindrances in the execution of the Work will not be considered as an excuse for any failure on the part of the GW Contractor to fulfill in every detail the requirements of the Contract nor will such a plea be acceptable as the basis of a claim for additional compensation or time to complete the work.

113. VERIFICATION OF DIMENSIONS ON DRAWINGS AND MEASUREMENTS AT SITE

113.1 The GW Contractor shall make a thorough field check for the purpose of verifying existing conditions that may affect the Work, such as existing topographic data shown on the Design Drawings, difficulties that might be encountered in the execution of the Work for any reason, and dimensions and other questions relating to interconnection of the Work with the existing ash basin construction.

113.2 The GW Contractor shall satisfy itself as to the accuracy of the dimensions of the existing ash basin construction as such dimensions relate to the dimensions given on any drawing issued by the Design Engineer. It shall be understood that neither the Design Engineer nor the Owner guarantee the exactness of such dimensions.

113.3 Should the GW Contractor discover any variation in the dimensions of existing conditions and the dimensions given on any drawings issued by the Design Engineer, the GW Contractor shall give immediate notice thereof to the Owner and the GW Contractor shall not proceed with the Work until such variation is resolved.

114. SOIL DATA

114.1 A structural stability and factor of safety assessment for the Bypass Basin was prepared in October 2016. Site specific soil data and geotechnical recommendations are provided and referenced therein. The geotechnical information in and referenced by this assessment indicates the general character of the subsurface conditions at the site. This information is made available for the GW Contractor's information and for interpretation of soil and water conditions that may be encountered at the site. The logs and test data that are provided are not to be taken as a complete description of the site soil and water information, but only display what was found in borings at the indicated locations. The Owner and the Design Engineer take no responsibility for the accuracy of this information.

114.2 The GW Contractor may obtain additional subsurface information, as it deems necessary, for installation purposes.

115. LINES AND GRADES

115.1 The GW Contractor shall furnish and install a minimum of two (2) benchmark monuments as approved by the Owner to lay out lines and grades on the site during the lifetime of the project. All GW Contractor-installed benchmark monuments shall be shown on the red-lined as-built drawings. The GW Contractor is fully responsible for the correctness of such lines and grades and for proper execution of work to such lines and grades.

115.2 The Owner reserves the right to verify correctness of lines and grades during progress of the Work. Such verification by the Owner will not relieve the GW Contractor of responsibility as herein specified.

116. CONTROL AND CHARGE OF CONTRACTOR'S WORK

116.1 The Design Engineer shall have no authority to stop the Work by the GW Contractor for any reason.

116.2 The GW Contractor shall be responsible for the safety of its employees and subcontractors and for maintaining the safety of the job site.

116.3 The GW Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures used in the construction of the Work. The Owner, however, reserves the right to request, and the Contractor shall supply, detailed information regarding the Work such as procedures or work methods.

116.4 Only the Owner (or its authorized representative) has the authority to stop the Work (in accordance with the Commercial Terms and Conditions) if such Work is determined to be not in accordance with this Specification, the Design Drawings, or the Contract documents.

117. DESIGN DRAWINGS

117.1 The Design Drawings prepared by the Design Engineer indicate the physical dimensions of the Work to be installed as defined by the Scope of Work and form a part hereof. Refer to Attachment 1 of this Specification for the applicable Design Drawings for this project.

118. REFERENCE DOCUMENTS

118.1 The reference documents assembled by the Design Engineer are for information only. Refer to Attachments 3 through 4 of this Specification for applicable reference documents for this project.

END OF SECTION 011100

SECTION 319005

EARTHWORK

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the material and work requirements associated with preparation for, and placement of, Structural Fill to be placed in the Bypass Basin and other tasks associated with the installation of a new composite liner system for the Bypass Basin. The Structural Fill will support the basin's new composite liner system and will establish the lines and grades for the basin's new leachate collection and removal system (LCRS). This work is further defined and depicted on the Design Drawings.

101.2 The work shall include, but not be limited to, the following items:

a. Clearing, and grubbing, and topsoil stripping.

b. Excavation of the granular protective layers covering the basin's existing liner.

c. Excavation of the existing access ramp surface materials above the basin's existing liner.

d. Cleaning and decontaminating the existing liner system.

e. Placement and compaction of Structural Fill.

f. Preparation of the Structural Fill surface to be lined with the Bypass Basin's new composite liner system.

g. Preparation of concrete surfaces that will come into contact with geosynthetic materials.

h. Excavation and backfill of crest anchor trenches for geosynthetic materials.

i. Placement of crushed stone to re-surface existing roads on the top of the Bypass Basin's dikes.

j. Offsite disposal of excess or unsuitable excavated earthen material and debris.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification (P-1400):

a1. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a2. Section 319025 – Geosynthetic Clay Liner.

a3. Section 319050 – Leachate Collection and Removal System.

a3.1 Refer to Section 319050 for material and installation requirements for granular materials associated with the Bypass Basin's new LCRS.

b. CQA Specification (P-1401):

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local codes having jurisdiction.

103.2 References to these documents are to the latest issue of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

b. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

c. D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

d. D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

103.5 IDOT – Illinois Department of Transportation:

a. Standard Specifications for Road and Bridge Construction (Adopted January 1, 2022).

103.6 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

b. 96 Resistance by Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

c. 104 Soundness of Aggregate by Use of Sodium Sulfate

104. SUBMITTALS

104.1 The GW Contractor shall submit drawings and data as specified. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems specified by the Owner.

104.2 Submittals with Bid Proposal:

a. Catalog data on all compaction equipment and proofrolling equipment the Earthwork Contractor plans to use on the project.

b. Earthwork Contractor's plan for placing Structural Fill material to meet the requirements specified herein while preventing damage to the Bypass Basin's existing geomembrane liner.

104.3 Submittals After Award:

a. Earthwork Equipment:

a1. Earthwork Contractor's demonstration that all earthwork equipment to be used to transport and place Structural Fill material will not exert a ground pressure greater than 8 psi.

b. Structural Fill Material:

b1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Structural Fill material signed by the supplier or a qualified geotechnical engineering consultant that certify the following items comply with or exceed specifications for the material:

Property		Standard(1)	Data Required
b1.1	Sieve Analysis	ASTM C136	Percent Passing Selected Sieves
b1.2	Classification of Material	ASTM D2487	Classification
b1.3	Organic Content	ASTM D2974	Percent of Organic Material
b1.4	Atterberg Limits(2)	ASTM D4318	Liquid Limit and Plasticity Index

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

(2) Atterberg limits are only required if cohesive/fine grained materials are to be used for Structural Fill.

c. Crushed Stone Surfacing for Roads:

c1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the crushed stone material to be used to re-surface the existing roads on top of the basin dikes, which shall be signed by the supplier or a qualified geotechnical engineering consultant certifying the following items comply with or exceed specifications for the material:

Property		Standard(1)	Data Required
c1.1	Sieve Analysis	ITP 27	Percent Passing Selected Sieves
c1.2	Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
c1.3	Los Angeles Abrasion	ITP 96	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

105. QUALITY ASSURANCE

105.1 Material and construction procedures shall be subject to inspection and testing by the CQA Contractor hired by Owner. Such inspections and tests will not relieve the Earthwork Contractor of responsibility for providing and placing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject material not complying with the specified requirements. The Earthwork Contractor shall correct all deficiencies which inspections, laboratory tests, or field tests have indicated are not in compliance with specified requirements. The Earthwork Contractor shall perform additional tests, at their expense, as may be necessary to reconfirm any noncompliance of the original work, and as may be necessary to show compliance of corrected work.

105.3 The Earthwork Contractor shall promptly correct errors or flaws in the work or material identified during construction and which prevent proper installation. The Earthwork Contractor shall make immediate substitution of the noncomplying material or shall make field changes to make the noncomplying material acceptable. The correction or substitution shall be performed at no cost to the Owner.

105.4 CQA activities shall be performed as described herein and in Specification P-1401.

PART 2 - PRODUCTS

201. MATERIAL FOR STRUCTURAL FILL

201.1 Definitions:

a. Structural Fill is fill placed within the Bypass Basin to support the basin's new composite liner system as identified on the Design Drawings.

201.2 Satisfactory Material:

a. Granular Material:

a1. Granular material for use as Structural Fill shall be rounded and not crushed, with less than two percent organic or other deleterious material, free of excess moisture, and a maximum particle size less than one inch.

a2. Acceptable granular materials are soils which are classified as coarse-grained soils in the Unified Soil Classification System, ASTM D2487. Classifications are GW, GP, GC, SW, SP, or SC, or combinations of these such as SP-SC.

a3. No material with a silt content of greater than 12 percent (i.e., SM or GM) shall be used for Structural Fill.

b. Cohesive Material:

b1. Cohesive material is suitable for use as Structural Fill if it contains not more than two percent organic or other deleterious material, has a maximum particle size of one inch, has a liquid limit of less than 45, and has a plasticity index of less than 25.

b2. Acceptable cohesive materials are soils which are classified as fine-grained soils in the Unified Soil Classification System, ASTM D2487. Classification is CL.

201.3 Unsatisfactory Material:

a. Material unsatisfactory use as Structural Fill is as follows:

a1. Soils classified as silt, silty, or organic soils in the Unified Soil Classification System, ASTM D2487. Classifications are SM, GM, ML, MH, PT, OL and OH.

a2. Clay soils classified as CH in the Unified Soil Classification System, ASTM D2487.

a3. Soils classified as CL-ML (plasticity index of 4 to 7) in the Unified Soil Classification System, ASTM D2487.

a4. Rock material without a soil matrix in which nesting of rocks could occur.

a5. Uncontrolled fill.

a6. Debris.

b. Material Sources:

b1. Structural Fill material shall be obtained from an offsite borrow source identified by the Earthwork Contractor and approved by the Owner.

202. <u>RESTRICTIONS ON THE USE OF MATERIAL FOR ANY PURPOSE</u>

202.1 Any material which is frozen is considered unsatisfactory for use as fill.

202.2 Fill and backfill soils placed by previous construction shall be considered unsatisfactory for use as fill unless they meet the requirements for satisfactory material. This specifically includes using any of the existing protective layers below the Bypass Basin's new composite liner system or on roads outside of the basin.

203. <u>CRUSHED STONE SURFACING FOR ROADS</u>

203.1 Material Requirements:

a. Crushed stone for re-surfacing existing roads on the top of the basin dikes shall be composed of gravel, crushed gravel, or crushed stone that is processed to meet the following requirements:

a1. The material shall conform to Gradation CA 6 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality shall be Class D or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

203.2 Material Sources:

a. Crushed stone surfacing material shall be obtained from an offsite borrow source identified by the Earthwork Contractor and approved by the Owner.

<u>PART 3 - EXECUTION</u>

301. <u>DEMOLITION, CLEARING, GRUBBING AND STRIPPING</u>

301.1 General:

a. The work required is shown on the Design Drawings. No work shall be performed outside of the designated area without prior written approval of the Owner.

b. All work incidental to excavation or fill work will not be specifically indicated on the Design Drawings but shall be performed as part of the work.

301.2 Demolition:

a. Concrete Infills:

a1. The Earthwork Contractor shall remove concrete infills from inlet, outlet, and emergency overflow structures as indicated on the Design Drawings.

a2. All concrete surfaces impacted by demolition work that will also come into contact with the Bypass Basin's new composite liner system shall be ground smooth in accordance with Article 305.

b. Demolition and removal of minor items which are incidental to the earthwork may be required. The Earthwork Contractor shall identify any such items during their pre-bid walkdown. The Earthwork Contractor shall demolish such items as required as part of the performance of the work.

c. All waste resulting from demolition work shall be disposed of by the Earthwork Contractor in an offsite disposal area.

301.3 Clearing, Grubbing, and Topsoil Stripping:

a. All vegetation within areas to be excavated or to receive fill shall be cleared and grubbed, stripped of topsoil and debris, and shall be inspected and approved by the Owner prior to beginning the earthwork operations.

b. Weeds, small roots, heavy grass, and other vegetation remaining after clearing and grubbing operations shall be removed with the topsoil.

c. Disposal:

c1. Stripped topsoil shall be placed in an onsite stockpile area as directed by Owner. Topsoil may be removed from the stockpile area at a later date and used to cover finished slopes and other designated areas.

c2. If any material remains in the topsoil stockpile area after construction is complete, the stockpile area side slopes shall be graded to a maximum slope of 20 percent (five horizontal to one vertical), the top of the pile shall be sloped to drain properly and provided with devices to control erosion, and the stockpile shall be seeded.

302. <u>EXCAVATION</u>

302.1 All material within the Bypass Basin and above the basin's existing liner shall be carefully removed. The limits and specifications for this excavation work are specified on the Design Drawings.

302.2 All material excavated from the Bypass Basin shall be disposed of in a permitted landfill approved by the Owner.

303. <u>PLACEMENT OF STRUCTURAL FILL</u>

303.1 Acceptable Placement Methods:

a. Acceptable placement methods for Structural Fill include:

a1. Using a conveyor truck to place material from outside of the basin.

a2. Using a crane to place material from outside of the basin.

a3. Transporting material into the basin to the point of dumping using trucks or scrapers, while complying with maximum ground pressure requirements.

a4. Alternate placement method(s) proposed by the Earthwork Contractor and approved by the Owner.

b. Requirements for Transportation of Structural Fill Materials into Basin:

b1. Under no circumstances shall any equipment (wheeled or tracked) traverse the Bypass Basin’s existing geomembrane liner or new liner when less than 10 inches of earthen material are above the subject liner.

b2. Equipment transporting material into the basin shall use the permanent ramp along the basin’s east dike. Following removal of the existing ramp surface layer, Structural Fill shall be installed above the existing geomembrane liner along the ramp surface as detailed on the Design Drawings and as specified herein before any equipment uses the ramp to access the basin floor.

b3. Only earthmoving equipment with low ground pressure shall be used to transport material inside of the basin. The Earthwork Contractor shall demonstrate that equipment entering the basin will not exert a ground pressure greater than 8 psi. The ground pressure is influenced by the tread pattern / tire contact area and is not the reading from a tire pressure gauge.

b4. Equipment operating within the basin shall avoid hard braking on ramps and avoid sharp turns or quick stops that could pinch or tear the existing geomembrane liner.

b5. Structural Fill shall be placed by the “dump and spread” method in which lightweight equipment with low ground pressure is used to spread the material.

b6. Material placement over the geomembrane liner during periods of warm weather can cause wrinkling and damage to the geosynthetic materials. Placement of the initial lift of Structural Fill shall be halted when the air temperature is greater than 85°F or less than 40°F.

b7. When Structural Fill is being placed, a worker shall safely walk alongside earthmoving equipment spreading the material to spot and remove rocks, stones, roots, and other debris that may be present in the Structural Fill that could cause damage to the liner.

303.2 Moisture Content of Structural Fill Material:

a. At the time of compaction, the moisture content of Structural Fill material shall be within ±3 percent of optimum moisture content as determined by ASTM D1557.

b. Fill material containing excessive moisture shall not be compacted unless the material has dried and the moisture content is within the specified limits.

c. Fill material that is too dry shall have moisture added and then be blended so that the moisture content is uniform prior to compaction.

d. For granular materials, non-compliance with moisture content shall not be the sole criteria for rejection of the work.

303.3 Lift Thickness:

a. Fill shall be placed in horizontal layers in thicknesses compatible with the material being placed, equipment being used and the compaction requirements.

b. Unless otherwise approved by the Owner the loose thickness shall not exceed the following:

b1. 12 inches maximum loose lift thickness for the lowest lift in contact with the Bypass Basin’s existing geomembrane liner.

b2. 8 inches maximum loose lift thickness for compaction by self-propelled equipment.

b3. 4 inches maximum loose lift thickness for compaction by hand-operated equipment.

303.4 Placement Structural Fill:

a. Each layer of fill shall be evenly spread and moistened or aerated as required to achieve the required moisture content.

b. Each lift of Structural Fill in the Bypass Basin shall be uniformly placed to cover the entire length and width of the basin prior to compaction or placement of the next lift.

c. As allowed by the design of the LCRS, the top surface of each layer shall be approximately level but shall have sufficient crown or cross fall to provide adequate drainage of water at all times during the construction period. The crown or crossfall shall be at least 1 in 50 (2 percent) but no greater than 1 in 20 (5 percent).

d. Fill placed on slopes steeper than 20 percent (i.e., 5 horizontal to 1 vertical) shall be overfilled a minimum of 6 inches beyond the face of the slope, measured horizontally, and then cut back and trimmed to the required line and grade to expose a smooth surface uniformly compacted to the required density. Installing the fill slope to lines and grades shown on the Design Drawings and then compacting is not acceptable on the basin side slopes.

303.5 Compacting Structural Fill:

a. Equipment:

a1. Sheepsfoot, modified sheepsfoot, padfoot, or other non-smooth drums shall not be used to compact Structural Fill placed for this work.

a2. Each layer of fill shall be compacted by tamping, pneumatic-tired roller, or other mechanical means acceptable to the Owner that will produce the specified compaction.

a3. At locations where it would be impractical because of inaccessibility to use self-propelled compacting equipment, fill layers shall be compacted using hand directed compaction equipment.

a4. When soils are used that develop a densely packed surface as a result of spreading or compacting equipment, the surface of each layer of fill shall be sufficiently roughened after compaction to ensure bonding of the succeeding layer.

b. Inspection and Testing:

b1. All work is subject to inspection and testing by the CQA Contractor. The CQA Contractor shall have access to the work at all times. Testing shall be in accordance with the Contract. Refer to Specification P-1401 for inspection and testing requirements.

b2. Each layer of compacted fill shall be tested before proceeding with the next layer.

b3. It is the Earthwork Contractor’s responsibility to request inspection prior to proceeding with further work that would make parts of the work inaccessible for inspection.

b4. If the fill material fails to meet the required density, the material shall be removed and replaced or reworked, altering the construction method as necessary to obtain the required density and compaction. Sufficient time shall be allotted between lifts for the necessary testing of the soils.

c. Compaction Density:

c1. Structural Fill shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557

303.6 Fine Grading:

a. Structural Fill shall be fine graded using equipment with low ground pressure.

303.7 Reporting Damage:

a. If damage occurs to the Bypass Basin's existing geomembrane liner while placing Structural Fill material, the Earthwork Contractor shall report the damage(s) to the Owner and Geosynthetics Contractor immediately so that repairs can be performed without delay.

b. Repairs to the existing geomembrane liner shall be made by the Geosynthetics Contractor as specified in Section 319020 at no additional cost to the Owner.

304. REQUIREMENTS FOR PREPARATION AND ACCEPTANCE OF STRUCTURAL FILL SURFACE SUPPORTING COMPOSITE LINER

304.1 Intersections Between Planes:

a. Intersections between planes shall be rounded as specified below to provide a firm bearing without abrupt change:

	Intersection of Slope	Radius of Rounding
a1.	Side slope and bottom plane	3 feet minimum
a2.	Side slope and top of dike or grade	6 inch minimum
a3.	Intersection of 2 bottom planes (planes sloped at 10% or less)	Straight line is acceptable

304.2 Responsibility:

a. The Earthwork Contractor shall be responsible for preparing the surface of the Structural Fill beneath the composite liner system prior to placement of the liner. The subgrade is subject to inspection and acceptance by the Owner and the Geosynthetics Contractor prior to installation of the lower component of the composite liner system.

304.3 Inspection:

a. The Earthwork Contractor, the Owner, the Geosynthetics Contractor, and the CQA Contractor shall inspect and document the following:

a1. Lines, grades, and slopes are in conformance with the Design Drawings.

a2. Surface has been graded and rolled such that it is free of irregularities, protrusions, loose soil, and abrupt changes in grade.

a3. The surface is free of debris, clods, stones, roots, and organic material.

a4. That no settlement or erosion has occurred.

a5. That there are no side slope failures.

a6. That there are no moisture seeps, puddling or ponding.

a7. That there are no soft spots.

304.4 Certification:

a. The Geosynthetics Contractor shall provide written certification that the surface is acceptable. The acceptance shall be recorded and copies of the certification given to both the Earthwork Contractor, the CQA Contractor, and the Owner.

b. Only as much surface as will be lined the following day shall be inspected, certified, and documented as acceptable.

305. <u>PREPARATION OF CONCRETE SURFACES</u>

305.1 All concrete surfaces that will come in contact with the Bypass Basin's new composite liner system shall be free of sharp edges or rough spots that can puncture or abrade the new liner materials. Where necessary, the concrete shall be ground smooth by the Earthwork Contractor.

306. <u>CREST ANCHOR TRENCH EXCAVATION AND BACKFILLING</u>

306.1 Excavation and Shaping:

a. The anchor trench for geosynthetic materials shall be excavated by the Earthwork Contractor at the top of the basin slope to the lines and widths shown on the Design Drawings prior to the Geosynthetics Contractor deploying the geosynthetic clay liner component of the Bypass Basin's new composite liner system.

b. A slightly rounded corner shall be provided in the trench where the geosynthetic materials adjoin the trench to avoid sharp bends in the geosynthetic materials. The radius of rounding is shown on the Design Drawings. No loose soil shall be allowed to underlie the geosynthetic materials in the anchor trench.

c. The anchor trench shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open.

306.2 Backfilling:

a. The anchor trench shall be backfilled by the Earthwork Contractor after all geosynthetic materials are in place and seams are welded.

b. Backfilling of the anchor trench shall occur during the morning or during extended periods of overcast skies when the geosynthetic materials are at their most contracted states.

c. The first lift of fill above the geosynthetic materials in the anchor trench may be 12 inches in thickness.

d. If compacted using hand-operated equipment, backfill shall be placed in lifts not exceeding 4 inches loose thickness and shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557.

e. If compacted using self-propelled equipment, backfill shall be placed in lifts not exceeding 8 inches loose thickness and shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557.

307. GRADING TOLERANCES

307.1 The acceptable deviation from lines and grades indicated on the Design Drawings shall be as shown in Table 319005-1.

307.2 Slopes shall be finished in conformance with the lines and grades shown on the Design Drawings. When completed, the average plane of a slope shall conform to the slope indicated on the Design Drawings and no point on the completed slope shall vary from the designated plane by more than 6 inches measured at right angles to the slope.

308. CLEAN-UP

308.1 All waste, excess materials and debris shall be disposed of in an offsite disposal area approved by the Owner.

TABLE 319005-1
ACCEPTABLE DEVIATIONS FROM DESIGN LINES AND GRADES

Type of Installation (Excavation or Fill)	Maximum Acceptable Deviation from Line (feet)	Maximum Acceptable Deviation from Grade(1) (feet)
General Earthwork		
Top of Structural Fill	±0.3	+0.1 to -0.0
Roads		
Road Embankment	±0.2	+0.1 to -0.0
Leachate Collection & Removal System		
Leachate Collection Pipe Trench	±0.3	+0.1 to -0.0

Note:

(1) After initial settlement has taken place. Initial settlement is that settlement that will occur up to the time of determination and acceptance of final grade elevation as approved by the Owner.

END OF SECTION 319005

SECTION 319020

HIGH-DENSITY POLYETHYLENE GEOMEMBRANE LINER WITH GEOCOMPOSITE

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for the high-density polyethylene (HDPE) geomembrane liner to be used as the upper component of the retrofitted Bypass Basin's new composite liner system, and the minimum material and installation requirements for the drainage geocomposite to be used in the retrofitted Bypass Basin's new leachate collection and removal system (LCRS), all in accordance with the Design Drawings and as specified herein.

101.2 The Work shall include, but not be limited to, the following items:

a. Manufacture, shipping, handling, and storage of HDPE geomembrane and drainage geocomposite materials.

b. Preparation and inspection of surfaces to be lined.

c. Placement and seaming of geomembrane.

d. Placement and joining drainage geocomposite.

e. Crest anchorage of geomembrane and drainage geocomposite.

f. Attachment of the geomembrane to concrete structures and existing marker posts and an existing corrugated metal pipe (CMP) riser.

g. Non-destructive field testing of geomembrane seams.

h. Removal of samples of geomembrane seams and transportation to an independent third-party laboratory for destructive testing.

i. Repair of defective geomembrane seams.

j. Repair of defects in the geomembrane and at locations where samples were taken.

k. Visual inspection of the completed geomembrane liner.

101.3 Definitions and Qualifications:

a. The following definitions of terms shall apply throughout this section:

a1. CQA Geosynthetics Inspector: An inspector who works for the CQA Contractor and is responsible for inspection of the Geosynthetics Contractor's work.

a2. GM/GC Manufacturer: The manufacturer who is responsible for manufacture of geomembrane and drainage geocomposite materials and for transporting geomembrane and drainage geocomposite materials to the site.

b. Qualifications:

b1. The GM/GC Manufacturer shall be approved by the Owner. Owner's considerations when approving the GM/GC Manufacturer may include, but are not limited to, financial, safety, and prior performance aspects of the manufacturer, as well as ongoing litigation.

b2. The GM/GC Manufacturer shall have an internal QA/QC program to ensure and to verify the manufactured products consistently meet or exceed the requirements of this section.

b3. The GM/GC Manufacturer shall have at least 10 years manufacturing products similar to those required for this Work.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification (P-1400):

a1. Section 319005 – Earthwork.

a2. Section 319025 – Geosynthetic Clay Liner.

b. CQA Specification (P-1401):

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes, and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local codes having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM –- ASTM International:

a. A276 Specification for Stainless and Heat Resisting Steel Bars and Shapes.

b. B633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

c. D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

d. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

e. D1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

f. D1505 Test Method for Density of Plastics by the Density-Gradient Technique.

g. D1603 Standard Test Method for Carbon Black Content in Olefin Plastics.

h. D4218 Standard Test Method for Determination of Carbon Black Content of Polyethylene Compounds by the Muffle-Furnace Technique.

i. D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus.

j. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

k. D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

l. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

m. D4716 Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

n. D4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

o. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

p. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

q. D5261 Test Method for Measuring Mass per Unit Area of Geotextiles.

r. D5397 Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.

s. D5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

t. D5641 Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

u. D5721 Standard Practice for Air-Oven Aging of Polyolefin Geomembranes.

v. D5820 Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.

w. D5885 Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Colorimetry.

x. D5994 Test Method for Measuring Core Thickness of Textured Geotextile.

y. D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

z. D6364 Standard Test Method for Determining Short-Term Compression Behavior of Geosynthetics.

aa. D6392 Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-fusion Methods.

bb. D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

cc. D7179 Standard Test Method for Determining Geonet Breaking Force

dd. D7466 Standard Test Method for Measuring Asperity Height of Textured Geomembranes

ee. D8117 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by Differential Scanning Calorimetry.

103.5 Geosynthetic Research Institute (GRI):

a. GM6 Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembrane.

b. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet.

c. GM13 Standard Specification for Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

d. GM14 Standard Guide for Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes.

e. GM19a Standard Specification for Seam Strength and Related Properties of Thermally Bonded Homogenous Polyolefin Geomembranes/Barriers.

103.6 Industrial Fabrics Association International (IFAI):

a. Field Sewing of Geotextiles by V. Diaz and B. Myles, 1989.

104. <u>SUBMITTALS</u>

104.1 The GW Contractor shall submit the following drawings and data as specified. The GW Contractor’s drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner’s information systems specified by the Owner.

104.2 Submittals with the Bid Proposal:

a. Geosynthetics Contractor:

a1. Geosynthetics Contractor’s name, address, and telephone number.

a2. Geosynthetics Contractor’s qualifications, including letter or certificate from the GM/GC Manufacturer documenting the manufacturer’s approval of the Geosynthetics Contractor (or subcontracted Installer) to install the geomembrane and drainage geocomposite materials supplied for the project.

a3. Installer’s qualifications if the Geosynthetics Contractor is proposing to subcontract the geomembrane and/or drainage geocomposite installation work.

b. HDPE Geomembrane and Drainage Geocomposite Materials:

b1. Certification of Compliance from the GM/GC Manufacturer , signed by its authorized representative, indicating that the materials meet the criteria specified herein and that those requirements are guaranteed by the manufacturer.

b2. One representative sample of each type of geosynthetic material.

b3. GM/GC Manufacturer's Quality Control and Quality Assurance Policies and Procedures for the geomembrane and drainage geocomposite materials being supplied for the project.

c. Warranty:

c1. Written warranties from the GM/GC Manufacturer and the Geosynthetics Contractor covering the quality of the material and workmanship as applicable.

c2. Warranty conditions proposed, including limits of liability, will be evaluated by the Owner in approving the GM/GC Manufacturer and the Geosynthetics Contractor.

104.3 Submittals After Award:

a. Geomembrane Resin:

a1. Certification signed by the GM/GC Manufacturer’s authorized representative stating that the resin meets the criteria specified herein.

a2. Certification signed by the GM/GC Manufacturer’s authorized representative stating the origin of the resin and that all resin is from the same supplier (including resin supplier’s name, identification brand name, and number).

a3. Copies of GM/GC Manufacturer’s and resin supplier’s QA/QC certificates. Certificates shall include a summary report of test results conducted to verify the quality of the resin used in each batch used to manufacture geomembrane for this project. As a minimum, the report shall include tests on specific gravity, melt flow index and percent carbon black.

b. Geomembrane Sheeting:

b1. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the geomembrane to be shipped to the site, along with chain of custody and certification that the samples submitted are from the geomembrane material to be delivered to the site. The number of samples shall be determined in accordance with the number of CQA conformance tests specified in Specification P-1401.

b2. Signed certification that the properties of the manufactured sheeting meet the criteria specified herein and are guaranteed by the GM/GC Manufacturer.

b3. Statement certifying that no post consumer resin (PCR) has been added to the formulation.

b4. Statement certifying that the manufactured sheeting is free of per- and polyfluoroalkyl substances (PFAS).

b5. Copies of all of the GM/GC Manufacturer’s QA/QC certificates. The certificates shall include documents of test results.

c. Drainage Geocomposite:

c1. Copy of the raw material producers’ certificates describing the origin and identification of the raw materials.

c2. Copy of the raw material producers’ QC certificates.

c3. Statement certifying that the manufactured drainage geocomposite is free of per- and polyfluoroalkyl substances (PFAS).

c4. Copy of the GM/GC Manufacturer’s QA/QC certificates on tests performed on the geonet core, geotextile cap and carrier, and double-sided laminated geocomposite as specified in Table 319020-2 and a summary of the results of the tests.

c5. Certification that the properties of the manufactured material meet the criteria specified herein and are guaranteed by the GM/GC Manufacturer.

d. Extrudate Resins or Rod for Seaming Geomembranes:

d1. Certification that all extrudate is the same resin type as the geomembrane and was obtained from the same resin supplier as the resin used to manufacture the geomembrane.

e. Installation Data:

e1. GM/GC Manufacturer's proposed geomembrane panel layout for each installation.

e2. GM/GC Manufacturer's recommended procedures for making and testing seams if different from those specified herein.

e3. GM/GC Manufacturer's recommended procedures for repairing damaged geomembrane sections and seams if different from those specified herein.

e4. GM/GC Manufacturer's details of geomembrane liner anchorage and attachment to structures if different from those specified herein and from the details shown on the Design Drawings.

104.4 Submittals After Construction is Complete:

a. Geosynthetics Contractor:

a1. As-built panel layout.

a2. Drawing showing locations of repairs and types of repairs made.

a3. Locations of destructive tests.

a4. Results of destructive tests.

a5. Results of non-destructive tests.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Geosynthetics Contractor of the responsibility for providing materials and installation in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Geosynthetics Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1401.

PART 2 - PRODUCTS

201. HIGH-DENSITY POLYETHYLENE GEOMEMBRANE

201.1 Manufacturers of HDPE Geomembrane Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. AGRU America, 500 Garrison Road, Georgetown, SC 29440.

a2. Solmax, 19103 Gundle Road, Houston, TX 77073.

a3. Others as approved by the Owner.

201.2 General Requirements:

a. All HDPE geomembrane shall be white, textured, and meet the requirements of Table 319020-2.

b. The location of HDPE geomembrane to be used for each installation shall be as shown on the Design Drawings.

c. The top surface of the geomembrane shall be white.

d. The textured liner shall be manufactured using a co-extrusion process.

e. The textured coating shall be applied to both sides of the base sheet.

f. Textured HDPE geomembrane shall have uniform texturing appearance. It shall be free from agglomerated texturing material and such defects that would affect the specified properties of the HDPE geomembrane.

g. Each roll shall have 6-inch (minimum) wide smooth edges to provide suitable seaming surfaces. Textured HDPE geomembrane without smooth edges may be provided if approved by the Owner.

h. The HDPE geomembrane shall be manufactured from first quality, virgin resin. Blending of resins shall not be allowed. No recycled or reworked geomembrane may be used except edge trim generated during the manufacturing process (no more than 10%). No post-consumer resin (PCR) of any type shall be added to the formulation.

i. The resin used to produce the geomembrane shall be formulated to be resistant to chemical and ultraviolet degradation.

j. The geomembrane shall be free of plasticizers.

k. The geomembrane shall be free of leachable additives.

l. The geomembrane shall be free of per- and polyfluoroalkyl substances (PFAS).

m. During manufacture, each roll of geomembrane shall be continuously monitored across the width to assure uniformity of thickness. Thickness measurements shall meet the requirements of Table 319020-1.

n. The geomembrane shall be free of factory seams.

o. The geomembrane shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, blisters, pits, tears, holes, pores, pinholes, voids, undispersed raw material, any sign of contamination or other defects that may affect serviceability, and shall be uniform in color, thickness, and surface texture.

p. The geomembrane shall be capable of being seamed in the field to yield seams that are as resistant to waste liquids as the sheeting.

q. The geomembrane shall be manufactured in the United States or Canada.

r. The minimum period of warranty for materials shall be 20 years with first year non-prorated. The minimum period of warranty for installation shall be 5 years with the first year non-prorated.

TABLE 319020-1

HIGH-DENSITY POLYETHYLENE TEXTURED GEOMEMBRANE REQUIREMENTS[(1)]

Property	ASTM Test Method	Polyethylene Base Compound	Geomembrane	Testing Frequency
Nominal Thickness (mil)	--	--	60	--
Resin Properties				
Density of Base Resin, g/cc (min.)	D1505 / D792	0.932		5,000 lbs. of Resin
Oxidative Induction Time (OIT) (min. ave.)				
a. Standard OIT (minutes)	D8117	100	--	5,000 lbs. of Resin
– or –				
b. High Pressure OIT (minutes)	D5885	400	--	5,000 lbs. of Resin
Oven Aging at 85°C	D5721	--	--	
a. Standard OIT (min. ave.), % retained after 90 days	D8117	55	--	One per Formulation
– or –				
b. High Pressure OIT (min. ave.), % retained after 90 days	D5885	80	--	One per Formulation
UV Resistance				
High Pressure OIT (min. ave.), % retained after 1600 hrs.	D5885	50	--	One per Formulation
Analytical Properties				
Formulated Density, g/cc (min.)	D1505 / D792	--	0.940	5,000 lbs. of Resin
Carbon Black Content, % (range)	D4218	2.0 – 3.0	--	5,000 lbs. of Resin
Carbon Black Dispersion for 10 Different Views	D5596	Note (2)	--	5,000 lbs. of Resin
Mechanical Properties				
Thickness, mils	D5994	--	--	One per Roll
Minimum Average			57	
Lowest Individual for 8 out of 10 Values			54	
Lowest Individual for 10 out of 10 Values			51	
Asperity Height, mils (min. ave.)	D7466	--	16	Every Second Roll[(3)]
Tensile Properties in Each Direction (min. ave.)	D6693 (Type IV Specimen at 2 ipm)			5,000 lbs. of Resin
Tensile Stress at Yield, ppi (min.)		--	126	
Elongation at Yield, % (min.)		--	12	
Tensile Stress at Break, ppi (min.)		--	90	
Elongation at Break, % (min. 2” gage length)		--	100	
Tear Resistance, lbs. (min. ave.)	D1004		42	5,000 lbs. of Resin
Puncture Resistance, lbs. (min. ave.)	D4833		90	5,000 lbs. of Resin
Bonded Seam Strength[(4)]	D6392	--	--	
Shear Strength, ppi		--	120	
Peel Adhesion (Hot Wedge), ppi		--	91	
Peel Adhesion (Extrusion Fillet), ppi		--	78	
Environmental Aging Effect on Properties				
Stress Crack Resistance, hours (min.)	D5397	--	500	Per GRI GM10

Notes:

(1) Requirements shown in this table meet the minimum requirements of GRI Standard GM13, Revision 16 (March 17, 2021) except for bonded seam strength.
(2) Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3.
(3) Alternate measurement side for double-sided textured sheet.
(4) Seam strength requirements shown in this table meet the minimum requirements of GRI Standard GM19a, Revision 10 (March 18, 2021).

201.3 Panel Layout:

a. Prior to manufacture of the geomembrane, a panel layout of the surface to be lined shall be made. Each panel to be used for the installation shall be given a numeric or alphanumeric identification number.

b. The panel identification number shall be related in writing to the manufacturing roll number that identifies the resin type, batch number, and date of manufacturer.

c. The panel layout shall be made considering the following requirements:

c1. Panel lengths shall include slope gain and anchorage.

c2. Perpendicular tie-ins shall be made a minimum of 5 feet beyond the toe of the slope.

c3. A minimum 6-inch overlap shall be allowed at double fusion welded seams.

c4. All field seams on slopes shall be oriented parallel to the slope (oriented along, not across the slope).

c5. The number of seams in corners or odd shaped geometric locations shall be minimized.

201.4 Packaging and Shipping:

a. The geomembrane shall be shipped to the project site in rolls. No material shall be folded.

b. Packaging and transportation shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility until the geomembrane is accepted at the site by the Geosynthetics Contractor.

c. A label shall be attached or adhered to each roll of the geomembrane identifying the following:

c1. Name of GM/GC Manufacturer.

c2. Product Identification, which can be traced back to the origin of the base material (resin supplier’s name, resin production plant, resin brand name type, and production date of the resin).

c3. Date of manufacture of the geomembrane.

c4. Roll identification number.

c5. Geomembrane thickness and type.

c6. Roll dimensions (length and width).

c7. Manufacturing lot number.

c8. Panel number and weight.

c9. Order number.

202. <u>DRAINAGE GEOCOMPOSITE</u>

202.1 Manufacturers of Drainage Geocomposite Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. AGRU America, 500 Garrison Road, Georgetown, SC 29440.

a2. Solmax, 19103 Gundle Road, Houston, TX, 77073

a3. Others as approved by the Owner.

202.2 General Requirements:

a. The drainage geocomposite shall consist of a HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet.

b. HDPE Geonet:

b1. The geonet shall be a profiled geonet manufactured by extruding two sets of polyethylene strands to form a three-dimensional structure in a diamond shape to provide planar water flow.

b2. The HDPE geonet formulation shall consist of a minimum of 97 percent of polyethylene resin, with the balance being carbon black and antioxidants for protection during extrusion and long-term service performance. No fillers, extenders, or other materials shall be mixed into the formulation.

b3. Regrind or reworked polymer which is previously processed HDPE geonet in chip form is acceptable if:

b3.1 It is the same formulation as the geonet being produced.

b3.2 No more than 25% rework material is used in the formulation.

b4. No PCR of any type shall be added to the formulation.

c. Non-Woven Geotextiles:

c1. The geotextiles shall be non-woven, spun bonded fabric manufactured from long chain polymeric filaments, yarns, staple fibers, or other structural components of polyester or polypropylene formed into a stable network (mesh).

c2. The nominal weight of each geotextile shall be 8 oz/sy.

d. The minimum period of warranty for materials shall be 20 years with first year non-prorated. The minimum period of warranty for installation shall be 5 years with the first year non-prorated.

202.3 Material Requirements:

a. The drainage geocomposite shall meet the requirements of Table 319020-2.

TABLE 319020-2
DRAINAGE GEOCOMPOSITE MATERIAL REQUIREMENTS

Property	Value	ASTM Test Method	Test Frequency
Geonet Core (Before Lamination)			
Thickness(1)	300 mil (min. ave.)	D5199	Per 50,000 lb.
Density of Formulated Material(2)	0.95 g/cm^3 (min. ave.)	D1505 / D792	Per 50,000 lb.
Carbon Black Content	1.5% to 3.0%	D1603 / D4218	Per 100,000 lb.
Tensile Strength	75 lb/in. (min. ave.)(3)	D7179	Per 50,000 lb.
Compressive Strength	120 psi (min. ave.)	D6364(4)	Per 100,000 lb.
Geotextile Cap and Carrier (Before Lamination)			
Mass per Unit Area	8 oz/sy (Min. ARV)	D5261	Varies(5)
Grab Strength	200 lb (Min. ARV)	D4632	
Grab Elongation	50% (Min. ARV)	D4632	
Tear Strength	80 lb (Min. ARV)	D4533	
Puncture Strength	430 lb (Min. ARV)	D6241	
Permittivity	0.2 sec^{-1} (Min. ARV)	D4491	
AOS	0.25 (Max. ARV)	D4751	
UV Stability	50% Retained (500 hr)	D4355	
Double-Sided Laminated Composite			
Flow Rate / Width Hydraulic Gradient Pressure Seating Dwell Time	0.42 gpm / ft (min. ave.) 0.03 1,200 psf 15 min.	D4716(6)	Per 200,000 lb.
Ply Adhesion	1.0 lb/in. (min. ave.)(7)	D7005	Per 100,000 lb.

Notes:

(1) The diameter of the presser foot shall be 2.22 in. and the pressure shall be 2.9 psi.

(2) The density of the base resin will be slightly lower than the density of the formulated material.

(3) This is the average peak value for five equally spaced machine direction tests across the roll width.

(4) Test shall be conducted using ASTM D6364 Section 6.3, the movable plate method.

(5) Because the specified geotextile properties are based on average roll values (ARV), the statistics needed to obtain such values will dictate the frequency of testing.

(6) Geocomposite shall be tested for ASTM D4716 flow rate per unit width between rigid end plates. Test values are for machine direction only.

(7) This is the average of five equally spaced machine direction tests across the roll width. Both sides of the geocomposite shall be tested for ply adhesion.

202.4 Packing and Shipping:

a. The drainage geocomposite shall be shipped to the project site in rolls. No material shall be folded.

b. Packaging and transportation shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility until the drainage geocomposite is accepted at the site by the Geosynthetics Contractor.

c. A label shall be attached or adhered to each roll of the drainage geocomposite identifying the following:

c1.1 Name of GM/GC Manufacturer.

c1.2 Product identification (brand name, product code).

c1.3 Date of manufacture of drainage geocomposite.

c1.4 Roll identification number.

c1.5 Drainage geocomposite thickness and type.

c1.6 Roll dimensions (length and width).

c1.7 Lot number.

c1.8 Panel number and weight.

c1.9 Order number.

203. <u>MATERIALS FOR ATTACHMENT OF GEOMEMBRANE TO CONCRETE</u>

203.1 Batten Strip:

a. Batten strip material shall be hot rolled, annealed, and pickled Type 316L stainless steel in accordance with ASTM A276.

b. Strips shall be 1/4 inch thick by 2 inches wide. Random lengths are acceptable.

203.2 Expansion Anchors:

a. Expansion anchors shall be stud type with a single piece three section wedge and zinc plated in accordance with ASTM B633. Wedges shall be manufactured from ANSI Type 304 stainless steel. Hilti Kwik Bolt 3 Expansion Anchors, or equal, are acceptable.

b. Wedge-type anchors shall have a minimum yield strength of 60,000 psi. Stud-type anchors shall have a minimum tensile strength of 65,000 psi.

c. Anchors shall be 3/8-inch diameter by 3 1/2-inches long.

d. Washers for anchors shall be Type 18-8 stainless steel flat washers for 3/8-inch diameter bolt size.

203.3 Neoprene Gasket:

a. Neoprene gaskets shall be ¼-inch thick by 2-inches wide, closed cell neoprene sponge sealing strips. Operating temperature range of neoprene shall be -40°F to +220°F.

b. Neoprene gaskets placed against concrete shall have a pressure sensitive adhesive on the side of the gasket placed against the concrete.

PART 3 - EXECUTION

301. ONSITE HANDLING AND STORAGE

301.1 Receipt/Unloading:

a. Unloading and storage of materials shall be responsibility of the GM/GC Manufacturer.

b. The unloading and other handling of materials shall be performed by the GM/GC Manufacturer to ensure that the material is handled with care and not damaged.

301.2 Storage:

a. The GW Contractor shall provide on-site storage space in a location near the area to be lined such that on-site transportation and handling are minimized. The GW Contractor shall be responsible for protecting stored material from theft and vandalism.

b. The rolls of geomembrane and drainage geocomposite shall be placed on a smooth surface free of rocks and standing water.

301.3 Inspection:

a. Upon delivery of the material to the project site, the Geosynthetics Contractor shall conduct a visual inspection of all rolls of geomembrane and drainage geocomposite for damage or defects. This inspection shall be done without unrolling any rolls unless damage to the inside of a roll is found or suspected.

b. Any damage or defects shall be noted and immediately reported to the Owner, the GM/GC Manufacturer and to the carrier that transported the material. Any roll or portion thereof, which, in the judgement of the Owner (or their authorized representative), is seriously damaged, shall be removed from the project site and replaced with complying material at no additional cost to the Owner.

302. PREPARATION OF SURFACES TO BE LINED

302.1 Preparation of Concrete Surfaces:

a. All concrete surfaces that will come in contact with a geomembrane shall be free of sharp edges or rough spots that can puncture or abrade the geomembrane. Where necessary, the concrete shall be ground smooth by the Earthwork Contractor.

b. Where specified on the Design Drawings, one or more layers of geomembrane scuff strips shall be placed between the concrete and the geomembrane liner to act as a protective layer for the geomembrane liner.

302.2 Geosynthetic Clay Liner:

a. See Section 319025 regarding installation, inspection, and acceptance of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner.

303. INSTALLATION OF HDPE GEOMEMBRANE LINER

303.1 Weather:

a. Geomembrane shall not be placed when the air temperature is above 104ºF or below 41ºF unless it can be demonstrated to the approval of the Owner by trial welds that acceptable welds can be made at the prevailing temperature. Trial welds shall be as described in Paragraph 303.7c.

b. Geomembrane shall not be placed when there is any rainfall or snowfall, in the presence of excessive moisture due to fog or dew, in ponded water, on a frozen subgrade, or during high winds.

303.2 Panel Layout:

a. The panels shall be placed in accordance with the Manufacturer's panel layout drawing to ensure that they are placed in the proper direction for seaming.

b. If panels are installed in a location other than indicated on the panel layout drawing, the revised location shall be indicated on an "as-built" layout drawing. The "as-built" record drawing shall be submitted to the Owner at the completion of the project.

303.3 Panel Deployment:

a. Only the panels that can be anchored and seamed together in one shift shall be unrolled.

b. Unroll and layout panels in as close to the final position as possible. Pulling geomembrane panels should be minimized to reduce the chance of permanent tension.

c. The methods and equipment used to deploy the panels shall not damage the geomembrane or the supporting surface.

d. Wrinkles shall be minimized. However, enough slack shall be provided in both directions so that there will be no tension in the geomembrane at the lowest expected operating temperature.

303.4 Precautions to Prevent Wind Damage:

a. If possible, work shall be oriented in the direction of the prevailing wind.

b. Provide adequate temporary loading and/or anchoring of the geomembrane by the use of sandbags, tires or other means which will not damage the geomembrane, to prevent uplift of the geomembrane by wind.

303.5 Other Precautions to Prevent Damage:

a. Protection of the geomembrane from damage due to foot traffic on the slopes shall be provided.

b. Provisions of facilities for safe entrance and egress of employees from sloped depressions is required.

303.6 Replacement of Damaged Geomembrane:

a. Any area of a panel, which, in the judgement of the Owner and/or the CQA Contractor, becomes seriously damaged (torn, twisted, or crimped permanently) shall be replaced at no additional cost to the Owner.

303.7 Field Seaming:

a. Method of Seaming:

a1. The primary welding procedure for seams shall be double wedge fusion welding.

a2. Extrusion welding shall be used only for repairs, detail work, and for seaming where double wedge fusion welding is not possible.

a3. The rods used for extrusion welding shall be the same type of resin as the geomembrane, unless otherwise approved by the Owner.

a4. The use of solvents or adhesives is not permitted.

b. General Requirements for Seaming:

b1. On slopes steeper than 10 horizontal to 1 vertical, seams shall be oriented parallel to the line of maximum slope (oriented up and down, not across the slope) when possible. No seams oriented across the slope shall be used unless approved by the Owner.

b2. Seams parallel to the toe of the slope shall be located a minimum of 5 feet from the toe.

b3. Seams parallel to the crest of the slope shall be located a minimum of 2 feet from the crest.

b4. Seams at the bottom of a slope shall be overlapped so that the upslope sheet is positioned above the downslope sheet.

b5. Seaming shall extend to the outside edge of panels to be placed in the anchor trench. Seams at sheet corners of three or four sheets shall be completed with a patch having a minimum dimension of 24 inches, extrusion welded to the parent sheets.

b6. All cross seams between the two rows of seamed panels shall be welded during the coolest time of the day to allow for contraction of geomembrane.

c. Trial Welds Prior to Beginning Seaming:

c1. Trial welds are required for pre-qualification of personnel, equipment, and procedures for making seams on identical geomembrane material under the same climatic conditions as the actual field production seams will be made.

c2. Trial welds shall be made as follows:

c2.1 Prior to each seaming period.

c2.2 Every 4 to 5 hours (i.e., at the beginning of the work shift and after the lunch break).

c2.3 Whenever personnel or equipment are changed.

c2.4 When climatic conditions result in wide changes in geomembrane temperature.

c2.5 When requested by CQA Geosynthetics Inspector for any seaming crew or piece of welding equipment if problems are suspected.

c3. Once qualified by passing a trial weld, welding technicians shall not change parameters without performing another trial weld.

c4. Trial welds shall be made on both double wedge fusion welds and on extrusion welds.

c5. A test strip shall be prepared by joining two pieces of geomembrane, each piece shall be at least 6 inches wide. The length of double wedge fusion welded seams shall be a minimum of 10 feet long. The length of an extrusion welded seam shall be a minimum of 4 feet long. The CQA Geosynthetics Inspector shall witness the fabrication of each test strip.

c6. All test welds shall be tested by destructive testing. Testing can be done as soon as the seam cools.

c7. A minimum of three (3) one (1) inch wide sample strips shall be cut from each test strip, one from each end and one from the middle. The location of each sample shall be selected by the CQA Geosynthetics Inspector. The test strips shall be tested in peel at 2 inches per minute using a field tensiometer. The CQA Geosynthetics Inspector shall witness all tests.

c8. If any of the test specimens fail, a new test strip shall be fabricated and the tests repeated for the new strip. If additional specimens fail, the seaming apparatus and the seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and successful trial welds have been achieved.

c9. The trial weld is considered acceptable if, when tested for peel adhesion using the field tensiometer, all three specimens meet the criteria specified in Table 319020-1 for both peel and shear under Bonded Seam Strength, or the three specimens exhibit Film Tear Bond (FTB) (yielding of the parent material before seam failure). In the case of a double wedge fusion welded seam, both welds must pass in order to be considered acceptable.

c10. If the specimens pass the tests, production seaming operations can begin.

c11. The GW Contractor shall document all data on each trial weld, including:

c11.1 Date.

c11.2 Time.

c11.3 Operator.

c11.4 Machine number.

c11.5 Ambient temperature.

c11.6 Operating temperature.

c11.7 Speed setting.

c11.8 Pass/Fail designation.

d. Preparation for Seaming:

d1. Prior to seaming, the surface of the geomembrane shall be wiped with a clean cloth to ensure that it is clean and free from moisture, grease, dust, dirt, and debris of any kind before seam welding is started.

d2. The panels shall be adjusted so that the seams are aligned to eliminate wrinkles and fish mouths. Where necessary, fish mouths and wrinkles shall be cut to achieve flat overlap.

e. Seaming:

e1. Seaming shall be performed in accordance with the Manufacturer's accepted procedure.

e2. Double Wedge Fusion Welds:

e2.1 The panels shall be overlapped a minimum of 4 inches prior to welding.

e2.2 Vehicle mounted automated hot wedge welding apparatus shall be used to make the seam.

e3. Extrusion Fillet Welding:

e3.1 Geomembrane overlap shall be a minimum of 3 inches for extrusion welding.

e3.2 Geomembrane panels shall be temporarily bonded using a hot air device prior to extrusion welding.

e3.3 The edge of the geomembrane to be fillet welded shall be pre-beveled before heat-tacking the seam in place.

e3.4 The seam overlap shall be ground (abraded) no more than one hour prior to welding.

e3.5 Grinding shall be performed in accordance with the Manufacturer's instructions in a manner that does not damage the geomembrane.

e3.6 Grinding shall not extend more than 1/4 inch past the area to be covered with extrudate during welding.

e3.7 All grind marks shall be covered with extrudate.

303.8 Non-Destructive Field Testing

a. General:

a1. All non-destructive field testing shall be performed and documented by the Geosynthetics Contractor.

a2. The CQA Geomembrane Inspector shall observe all non-destructive test procedures.

a3. One hundred (100) percent of the seam length shall be tested using non-destructive procedures to check the continuity of the field seams. Non-destructive testing is not meant to qualify seam strength.

a4. Air pressure testing shall be performed in accordance with ASTM D5820 and GRI GM6.

a5. Vacuum box testing shall be performed in accordance with ASTM D5641 and as specified herein.

a6. Continuity testing shall be performed as seaming progresses or as soon as a suitable length of seam is available, not at the completion of all field seaming.

b. Double Wedge Fusion Welded Seams:

b1. Double wedge fusion welded seams shall be tested using air pressure testing.

b2. The procedure for testing shall be as specified in GRI GM6 for the type and thickness of geomembrane in use.

b3. The following pressures are applicable to all HDPE geomembrane. After an initial 2-minute pressure stabilization period, the pressure shall be maintained between 27 and 30 psi for 60 mil HDPE geomembrane. The pressure shall be sustained for a minimum of 5 minutes. The loss of pressure shall not exceed a maximum of 3 psi in 5 minutes. If the pressure does not stabilize in the first two minutes or the pressure loss exceeds the loss specified, the seam test shall be considered a failure.

b4. The leak or suspected leak shall be located and repaired.

b5. The repaired seam shall be re-tested as required until all leaks are identified, and repaired, and the seam passes a subsequent air pressure test.

b6. When the geometry of a double wedge fusion weld makes air testing impossible or impractical, vacuum testing may be used to test the seam.

c. Extrusion Welded Seams:

c1. Extrusion welded seams shall be tested using vacuum chamber testing in accordance with ASTM D5641.

c2. The completed seam shall exhibit no leakage when tested between 4 and 8 psi minimum vacuum for approximately 10 seconds.

c3. If leaks are discovered during vacuum box testing, they shall be located, marked, and repaired.

c4. The repaired area shall be re-tested and exhibit no leakage.

d. Inaccessible Seams:

d1. Where extrusion welded seam locations make use of vacuum box testing impractical, then the electric wire method of testing shall be used or the seam shall be cap stripped as approved by the Owner.

d2. If cap stripping is approved by the Owner, the seams shall be cap stripped as described in Paragraph 303.11d with strips of the same type and thickness of geomembrane being installed. The cap stripping shall be performed in the presence of the CQA Geosynthetics Inspector and the Owner’s representative.

d3. The electric wire test method shall consist of placing a 24-gauge copper wire 1/8 inch beneath the top sheet overlap of the two sheets prior to welding with the extruder. The wire shall be embedded in the seam. After welding, a holiday spark detector, operating at 20,000 volts, shall be connected to one end of the wire, and slowly moved over the length of the seam. A seam defect between the probe and the embedded wire shall result in an audible alarm indicating where the defect is located.

e. Test Reports:

e1. Test reports for all air pressure tests shall contain all data specified in ASTM D5820 and GRI GM6.

e2. Test reports for vacuum box testing shall contain all of the data specified in ASTM D5641.

e3. Test report for other types of non-destructive tests shall contain the following data for each test as a minimum:

e3.1 Location.

e3.2 Type of test.

e3.3 Test parameters.

e3.4 Test data.

e3.5 Test number.

e3.6 Name of tester.

e3.7 Outcome of the test.

303.9 Destructive Testing

a. Testing:

a1. Destructive testing shall be performed by an independent third-party laboratory employed by the CQA Contractor on samples cut from production welds in the field by the Geosynthetics Contractor.

a2. Samples shall be taken by the Geosynthetics Contractor to the third-party laboratory and tested for shear strength and peel adhesion. For double wedge seam samples, both welds shall be tested for peel adhesion.

b. Location and Frequency:

b1. Test locations shall be determined after seaming. The location where the test samples shall be taken shall be marked by the CQA Geosynthetics Inspector. Locations may be prompted by the appearance of excessive heating, contaminations, offset welds, or a suspected defect. Destructive test samples shall be taken at a minimum average frequency of one per every 500 linear feet of seam length.

b2. The Method of Attributes described in GRI GM14 may be exercised to minimize the number of test samples taken if more than 100 destructive seam samples will be required based on the sampling strategy given in Paragraph 303.9.b1.

b3. Each sample location shall be numbered and marked with permanent identification and the location of the sample and these locations shall be indicated on a plan drawing prepared and maintained by the Geosynthetics Contractor. The following shall be recorded for each sample:

b3.1 Date and time.

b3.2 Ambient temperature.

b3.3 Seam number and location.

b3.4 Welding apparatus used.

b3.5 Name of Master Geomembrane Seamer.

b3.6 Reason for taking the sample.

b3.7 Size of sample.

b3.8 Test results.

b3.9 Name of tester.

b4. Samples shall be cut by the Geosynthetics Contractor. The CQA Geosynthetics Inspector shall witness test sample cutting.

b5. Test samples shall be cut every shift and taken by the Geosynthetics Contractor to the third-party laboratory the same day that the sample is prepared.

c. Sample Size:

c1. The minimum sample size shall be 12-inches wide with a seam 16-inches long centered length wise in the sample. As agreed to with Owner, a sample may be increased in size to accommodate the requirements of the testing laboratory.

d. Field Testing:

d1. A one-inch wide specimen shall be cut from each end of each sample for field testing.

d2. Each one-inch wide specimen shall be tested with a field tensiometer for peel adhesion.

d3. The CQA Geosynthetics Inspector shall witness each field test.

d4. A test is considered acceptable if a specimen meets the criteria specified in Table 319020-1 for both peel and shear under Bonded Seam Strength, or exhibits Film Tear Bond (FTB). For double wedge fusion welds, both welds must pass the test. If either sample fails the field test, it shall be assumed that the seam will not pass the specified laboratory testing and the sample shall be given a fail designation.

e. Laboratory Testing:

e1. Full size (12-inch minimum length) samples shall be taken to the independent third-party laboratory for testing.

e2. Samples shall be tested for shear strength and peel adhesion in accordance with ASTM D6392. Five specimens shall be tested for each test method. All samples shall meet minimum requirements for shear strength and peel adhesion given in Table 319020-1 under Bonded Seam Strength.

f. Test Results:

f1. Verbal test results shall be given to the Geosynthetics Contractor within 24 hours of receipt of the samples. Written results shall follow within one week.

f2. All test locations shall be marked with a pass/fail designation on the liner and on the drawings maintained by the Geosynthetics Contractor for submittal to the Owner after construction is complete.

g. Re-Testing if Failure Occurs:

g1. If a seam fails testing, one additional sample shall be taken 10 feet on each side of the location of the failed test. Additional samples shall continue to be taken at 10-foot intervals until tests show that seam strength is adequate and the zone in which the seam requires reconstruction is identified. Additional field and laboratory tests required to determine failed seams and any necessary patching and rework shall be performed at no additional cost to the Owner.

g2. All passing seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken.

g3. The entire seam length failing strength tests shall be reconstructed at no additional cost to the Owner.

g4. If the length of reconstructed seam exceeds 150 feet, a sample shall be taken of the reconstructed seam every 150 feet and shall pass destructive testing.

303.10 Inspection:

a. After seaming is complete, the Geosynthetics Contractor and the CQA Geosynthetics Inspector shall conduct a detailed walk-down to visually check all seams and non-seam areas of the HDPE geomembrane liner.

b. All defects, holes, blisters, tears, signs of damage during installation, areas of undispersed carbon and holes from destructive or non-destructive testing shall be marked and repaired.

303.11 Repair of Defects and Seams

a. Patching:

a1. Patching shall be used to repair large holes, tears, and destructive sample locations.

a2. All patches shall be round or oval, or shall have rounded corners.

a3. All patches shall be made of the base HDPE geomembrane material and shall extend a minimum of 3 inches beyond the edges of the defect.

a4. Patches shall be extrusion welded to the base sheet.

b. Grinding and Welding:

b1. Grinding and welding shall be used to repair sections of extruded fillet seams with small defects.

c. Spot Welding:

c1. Spot welding shall be used to repair small tears, pinholes, or other minor localized flaws.

d. Capping:

d1. Capping shall be used to repair lengths of extrusion welded seams with large defects and to repair double wedge fusion welded seams.

d2. Cap strips shall be made with strips of the same type and thickness of geomembrane being installed. Strips shall extend a minimum of 6 inches beyond the weld, and shall have rounded corners.

d3. Cap strips shall be extrusion welded to the base sheet.

e. Cut Out and Replacement:

e1. When approved by the Owner, a length of defective seam may be cut out and replaced with a strip of new material seamed into place.

f. Verification of Repairs:

f1. All repairs shall be non-destructive tested using one of the procedures described in Paragraph 303.8.

f2. Repairs passing non-destructive testing shall be deemed acceptable.

f3. Repairs of a seam in excess of 150 feet in length shall have one destructive seam test per 150 feet in length.

304. INSTALLATION OF DRAINAGE GECOMPOSITE

304.1 General Requirements:

a. In the presence of wind, all drainage geocomposite shall be weighted with sand bags or the equivalent. Weights shall be installed during deployment and shall remain in place until deployment of the cover material.

b. The drainage geocomposite shall not be welded to the geomembrane liner.

c. All necessary precautions shall be taken to prevent damage to underlying geomembrane during placement of the drainage geocomposite.

d. During placement of the drainage geocomposite, care shall be taken not to entrap dirt or excessive dust that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the drainage geocomposite, it shall be cleaned and all dirt removed prior to placement of the cover material. Care shall be taken in the handling of sand bags to prevent rupture or damage of the sand bag.

304.2 Placement of Drainage Geocomposite:

a. On slopes, the drainage geocomposite shall be secured in the anchor trench and then rolled down the slope in such a manner as to continuously keep the net in tension. If necessary, the net shall be positioned by hand after unrolling to minimize wrinkles.

b. The drainage geocomposite shall be placed on side slopes with no horizontal seams along the slope and so that the long dimension is parallel to the slope.

c. No horizontal seam shall be located within 5 feet of the toe of a slope.

d. The drainage geocomposite shall be positioned on both the slopes and the bottom so that the geonet core overlaps by a minimum of 4 inches.

e. Drainage geocomposite placed in the corners of the side slope shall be cut to eliminate excessive overlap of material.

e1. The drainage geocomposite shall only be cut using scissors or other cutting tools approved by the GM/GC Manufacturer that will not damage the underlying geomembrane.

e2. Care shall be taken not to leave tools in the drainage geocomposite.

304.3 Joining Geonet Cores:

a. The geonet cores between adjacent drainage geocomposite panels shall be joined using white or yellow self-locking straps. Metal fastening devices are not permitted and shall not be used.

b. Adjacent panels on slopes shall be joined on 5-foot centers.

c. Adjacent panels on the basin floor shall be joined on 10-foot centers.

d. End seams on the basin floor shall be joined on 12-inch centers.

e. Horizontal and end seams in anchor trenches shall be joined on 12-inch centers.

304.4 Joining Geotextile Caps:

a. Sewing on Basin Floor:

a1. On the basin floor and interior slopes flatter than 10H:1V (i.e., 10%), the geotextile caps between adjacent drainage geocomposite panels shall be continuously sewn or continuously heat bonded in accordance with the GM/GC Manufacturer’s recommendations.

a2. Spot seaming is not allowed.

b. Sewing on Basin Slopes:

b1. On basin slopes greater than 10H:1V (i.e., 10%), the geotextile caps between adjacent drainage geocomposite panels shall be continuously sewn. All seams shall be vertical (i.e., parallel with the slope). No horizontal seams (i.e., across the slope) shall be permitted on basin slopes greater than 10H:1V (i.e., 10%).

b2. Spot seaming and heat bonding are not allowed.

c. Sewing Requirements:

c1. Sewing shall be done using polyester or heat-set UV stabilized polypropylene sewing thread with chemical and ultraviolet light resistance properties equal to or exceeding the values specified in Table 319020-2. The thread color shall contrast with the color of the geotextile cap to assist in inspection of the seam. Tex size or denier number of the thread shall be specified by the Geosynthetics Contractor.

c2. Seams shall be “prayer” or “flat” seams. Seams shall be formed by mating the edge of the geotextile caps and sewing the caps together with continuous stitches located a minimum of four inches from the mated edges.

c3. Sewing procedures shall conform to the latest procedures recommended by the GM/GC Manufacturer.

c4. Stitching:

c4.1 For drainage geocomposites placed on the interior slopes of the basin, stitching shall be two rows (SSa-2) of stitching using a 01 two-thread locking chain stitch as described in the IFAI with 6 to 10 stitches per inch. Thread strength shall be such field seam strength will be a minimum of 90 percent of the tensile strength of the geotextile cap.

c4.2 For drainage geocomposites used elsewhere in the basin, stitching shall be one row (SSa-1) of stitching using a Type 401 two-thread locking chain stitch as described in the IFAI with a minimum of 5 stitches per inch, or the seam shall be heat bonded. Thread strength shall be selected by the Geosynthetics Contractor.

c5. Seam Inspections:

c5.1 Visual examinations shall be conducted to ensure that 100 percent of the seams are sewn or heat bonded as required.

c5.2 Seam sampling and testing are not required.

304.5 Protection of HDPE Geomembrane:

a. The Geosynthetics Contractor shall be responsible for protection of the HDPE geomembrane liner during installation of the drainage geocomposite and shall be responsible for repair of any damage caused to the liner by installation of the drainage geocomposite.

304.6 Repair of Holes or Tears:

a. All holes or tears in the drainage geocomposite shall be repaired by placing a patch of drainage geocomposite over the hole or tear. The patch shall extend 2 feet beyond the edges of the hole or tear. If the hole or tear width across the role is more than 50% of the width of the roll, the damaged drainage geocomposite shall be removed and replaced.

b. A patch's geonet core shall be secured to the original geonet core by tying every 12 inches.

c. A patch's geotextile cap shall be sewn into place by hand or machine so as the patch will not accidentally shift out of position or be moved when it is covered. The thread shall be the same as specified for sewing seams.

305. CREST ANCHORAGE

305.1 The HDPE geomembrane liner and the drainage geocomposite shall be anchored in an anchor trench at the top of the slope.

305.2 Prior to the placement of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner, the Earthwork Contractor shall excavate the crest anchor trench to the lines and widths shown on the Design Drawings and in accordance with the excavation, shaping, and backfilling requirements specified in Section 312201.

306. ATTACHMENT TO CONCRETE

306.1 Geomembrane shall be attached to concrete using batten strips in accordance with details on the Design Drawings.

307. ATTACHMENT TO PIPE PENETRATIONS

307.1 Geomembrane shall be attached to pipe penetrations through the lining in accordance with details on the Design Drawings.

307.2 Prefabricated or field fabricated HDPE sleeves (pipe boots) used for attaching the geomembrane to the pipe shall be supplied by the GM/GC Manufacturer.

END OF SECTION 319020

SECTION 319025
GEOSYNTHETIC CLAY LINER

PART 1 – GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for the geosynthetic clay liner (GCL) to be used as the lower component of the retrofitted Bypass Basin's new composite liner system, all in accordance with the Design Drawings and as specified herein.

101.2 The work shall include, but not be limited to, the following items:

a. Manufacturing, shipping, handling, and storage of GCL.

b. Preparation and inspection of surfaces to be lined.

c. Placement and seaming of GCL.

d. Crest anchorage of GCL.

e. Sealing GCL around existing marker posts and an existing corrugated metal pipe (CMP) riser.

f. Sealing GCL at vertical walls of existing inlet and outlet structures and existing marker posts within the basin.

g. Visual inspection of the completed GCL.

h. Patching and repairs.

101.3 Definitions and Qualifications:

a. The following definitions of terms shall apply throughout this section:

a1. CQA Geosynthetics Inspector: An inspector who works for the CQA Contractor and is responsible for inspection of the Geosynthetics Contractor's work.

a2. GCL Manufacturer: The manufacturer who is responsible for manufacture of GCL materials and for transporting GCL materials to the site.

b. Qualifications:

b1. The GCL Manufacturer shall be approved by the Owner. Owner's considerations when approving the GCL Manufacturer may include, but are not limited to, financial, safety, and prior performance aspects of the manufacturer, as well as ongoing litigation.

b2. The GCL Manufacturer shall have an internal QA/QC program to ensure and to verify the manufactured products consistently meet or exceed the requirements of this section.

b3. The GCL Manufacturer shall have at least 10 years of experience manufacturing products similar to those required for this Work.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification (P-1400):

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

b. CQA Specification (P-1401):

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes, and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local codes having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D4643 Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.

b. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

c. D5887 Standard Test Method for Measurement of Index Flux through Saturated Geosynthetic Clay Liner Specimens using a Flexible Wall Permeameter.

d. D5889 Standard Practice for Quality Control of Geosynthetic Clay Liners.

e. D5890 Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

f. D5891 Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

g. D5993 Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.

h. D6243 Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by Direct Shear Method.

i. D6496 Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners

j. D6768 Standard Test Method for Tensile Strength of Geosynthetic Clay Liners

104. SUBMITTALS

104.1 The GW Contractor shall submit the following drawings and data as specified. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems specified by the Owner.

104.2 Submittals with Bid Proposal:

a. Geosynthetics Contractor:

a1. Geosynthetics Contractor's name, address, and telephone number.

a2. Geosynthetics Contractor's qualifications, including letter or certificate from GCL Manufacturer documenting the manufacturer's approval of the Geosynthetics Contractor (or subcontracted Installer) to install the GCL materials supplied by the GCL Manufacturer.

a3. Installer's qualifications if the Geosynthetics Contractor is proposing to subcontract the GCL installation work.

b. GCL Material:

b1. Copies of the GCL Manufacturer's catalog data describing the GCL material proposed for use on this project.

b2. Copies of GCL Manufacturer's QA certificates on tests performed on the material and a summary of results after the tests.

b3. Certification of Compliance from the GCL Manufacturer, signed by its authorized representative, stating that the GCL material meets the specification requirements and that those requirements are guaranteed by the GCL Manufacturer.

b4. GCL Manufacturer's Quality Control and Quality Assurance Policies and Procedures.

c. Warranty:

c1. Written warranties from the GCL Manufacturer and the Geosynthetics Contractor covering the quality of the material and workmanship as applicable.

c2. Warranty conditions proposed, including limits of liability, will be evaluated by the Owner in approving the GCL Manufacturer and the Geosynthetics Contractor.

104.3 Submittals After Award:

a. Installation Data:

a1. GCL Manufacturer's proposed GCL panel layout for each installation.

a2. GCL Manufacturer's recommended procedures for making seams if different from those specified herein.

a3. GCL Manufacturer's recommended procedures for repairing damaged GCL sections and seams if different from those specified herein.

a4. GCL Manufacturer's details of GCL anchorage and attachment to structures and penetrations if different from those specified herein and from the details shown on the Design Drawings.

104.4 Submittals Upon Shipment:

a. Two representative samples of each GCL material to be used for the project.

b. GCL Manufacturer's QA/QC certificates with each shipment of GCL. The QA/QC certificates shall include:

b1. GCL lot and roll numbers with corresponding shipping information.

b2. GCL Manufacturer's test data for the geotextile materials used in GCL production including, at a minimum, mass per unit area data and tensile test data.

b3. Certificates of analyses for the bentonite clay used in GCL production including, at a minimum, test data for the properties shown in Table 319025-1.

b4. GCL Manufacturer's test data for the finished GCL product including, at a minimum, test data for the properties shown in Table 319025-2.

104.5 Submittals After Construction is Complete:

a. Plan drawing showing locations of repairs and types of repairs made.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Geosynthetics Contractor of the responsibility for providing and installing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Geosynthetics Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1401.

PART 2 - PRODUCTS

201. GEOSYNTHETIC CLAY LINER (GCL)

201.1 Approved GCL Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. CETCO BENTOMAT®.

a2. Solmax BentoLiner®.

a3. AGRU America GeoClay®.

b. Other GCL products meeting the requirements herein as approved by the Owner.

201.2 General Requirements:

a. The GCL shall be a needle punched GCL. The GCL shall be manufactured by placing a uniform layer of high-swell sodium bentonite encapsulated between two geotextiles and then needle punching through both layers of the geotextile and the bentonite to push fibers from the non-woven geotextile cap through the bentonite layer and embed them in the geotextile carrier on the other side.

b. The upper and lower support materials shall protect the bentonite but shall be sufficiently porous to allow bentonite flow-through to create a positive bentonite-to-bentonite seal at the seams.

c. The support materials used in the manufacturing shall not interfere with the swelling, self-healing or low permeability characteristics of the GCL.

d. The GCL shall be fabricated such that bentonite will not be displaced when the liner is cut.

e. Six-inch and nine- or twelve-inch overlap marks shall be marked longitudinally on both edges of the geotextile cap by the GCL Manufacturer to assist in obtaining the proper overlap. The lines shall be printed in easily visible, non-toxic ink.

f. The minimum period of warranty for GCL materials shall be 5 years.

201.3 GCL Material Specifications:

a. Sodium Bentonite: The bentonite utilized in the manufacture of the GCL, as well as any accessory bentonite provided for seaming and detail work, shall be Wyoming-grade sodium bentonite with the properties listed in Table 319025-1.

TABLE 319025-1
PROPERTIES OF BASE BENTONITE IN GCL MATERIALS

Property(1)	ASTM Test Method	Value	Min. Testing Frequency(2)
Free Swell	D5890	24 mL / 2g min.	1/100,000 lb
Fluid Loss	D5891	18 mL max.	1/100,000 lb
Moisture Content	D4643	12% max.	1/100,000 lb

Notes:

(1) Properties of the base bentonite prior to incorporation into the finished GCL product.
(2) Minimum testing frequencies are per ASTM D5889. One test per 50 tonnes is also acceptable.

b. Geosynthetic Clay Liner: The finished GCL manufactured using both a non-woven cap and a non-woven carrier shall have the properties listed in Table 319025-2.

TABLE 319025-2
PROPERTIES OF FINISHED GCL MATERIALS WITH NON-WOVEN CAP & NON-WOVEN CARRIER

Property	ASTM Test Method	Value	Min Testing Frequency(1)
Geotextile Properties			
Non-Woven Cap	D5261	6.0 oz/yd^2 min.	1/20,000 SF
Non-Woven Carrier	D5261	6.0 oz/yd^2 min.	1/20,000 SF
Finished GCL Properties			
Bentonite Mass/Area	D5993	0.75 lb/ft^2 min. at 0% moisture content	1/20,000 SF
Moisture Content	D5993	35% max.	1/20,000 SF
Hydrated Internal Shear Strength	D6243	500 psf min.(2)	1/20,000 SF
Tensile Strength(3)	D6768	45 lb/in. min.	1/20,000 SF
Peel Strength	D6496	3.5 lb/in. min.	1/20,000 SF
Index Flux(4)	D5887	$2x10^{-9}$ $m^3/m^2/sec$ max.	1/20,000 SF
Hydraulic Conductivity(4)	D5887	$1x10^{-9}$ cm/sec max.	1/20,000 SF

Notes:

(1) Minimum testing frequencies listed are in accordance with ASTM D5889.
(2) Typical peak value for specimen sheared under a 200 psf normal stress.
(3) Machine (warp) direction of primary backing.
(4) Index flux and hydraulic conductivity measured at 5 psi effective confining stress and 2 psi head.

b1.1 Acceptable Products:

b1.1.1 Solmax BentoLiner® NW

b1.1.2 CETCO BENTOMAT® DN

b1.1.3 AGRU America GeoClay® NN66

b1.1.4 Owner approved equal.

201.4 Packing and Shipping:

a. The finished GCL shall be completely wrapped and adequately secured with a durable polyethylene protective cover in order to provide protection from ultraviolet degradation of the Primary Backing Material (PBM) and excessive loss of moisture during shipping and storage.

b. The GCL shall be shipped to the project site in rolls.

c. A label shall be attached or adhered to each roll of the GCL identifying the following:

c1. Name of GCL Manufacturer.

c2. Product identification (brand name, product code).

c3. Date of manufacture.

c4. Roll identification number and weight.

c5. Panel number.

c6. GCL thickness.

c7. Roll dimensions (length, width).

c8. Manufacturing lot number.

c9. Order number.

d. The GCL shall be stenciled throughout each roll with the product name and name of the GCL Manufacturer, which can be cross-referenced to the roll number marked on the label and to the production and quality control data sheets.

202. BENTONITE SEALING COMPOUND (BSC) AND GRANULAR BENTONITE (GB)

202.1 The BSC and GB shall be supplied by the GCL Manufacturer and shall be comprised of the same bentonite used in the manufacturing of the GCL. The BSC shall be a mixture of non-aqueous liquid suspension agents which creates a paste-like texture. The GB shall be furnished in 50 lb bags.

202.2 The suspension agents used in the manufacture of the BSC shall be non-toxic, water-soluble and shall not restrict the bentonite's ability to swell and absorb water upon hydration.

PART 3 - EXECUTION

301. ONSITE HANDLING AND STORAGE

301.1 Unloading:

a. Handling and unloading shall be the responsibility of the Geosynthetics Contractor.

b. Upon arrival at the site, the rolls of the GCL shall be carefully unloaded by the Geosynthetics Contractor in accordance with the GCL Manufacturer's recommendations.

301.2 Storage:

a. The Owner shall provide on-site, outdoor storage space in a location near the area to be lined such that on-site transportation and handling are minimized. The Geosynthetics Contractor shall be responsible for protection of materials from damage, moisture, theft, and vandalism.

b. The rolls of GCL shall be stored horizontally in their original, unopened, wrapped cover in a clean, dry area. The material shall be stored off the ground on pallets or plywood in small stacks not to exceed five (5) rolls in height. The rolls shall be covered with a heavy, protective tarpaulin or plastic sheeting or enclosed within a storage facility. Care shall be used to keep the GCL clean and free from debris prior to installation.

c. Rolls shall be stacked in a manner recommended by the GCL Manufacturer that prevents them from sliding or rolling from the stacks.

d. Any rolls that come in contact with moisture while in storage shall be set aside by the Geosynthetics Contractor to await examination by the Owner. Damaged rolls shall also be set aside and inspected to determine suitability of the material for use.

301.3 Inspection:

a. Upon delivery of the material to the project site, the Geosynthetics Contractor shall conduct a visual inspection of the polyethylene sleeves of all rolls of GCL for damage or rips or tears. Sleeve damage shall be repaired immediately with tape or additional plastic sheeting.

b. Any damage shall be noted and immediately reported to the Owner, the GCL Manufacturer, and to the carrier that transported the material. Any roll or portion thereof, which, in the judgement of the Owner, is seriously damaged, shall be removed from the project site and replaced with complying material at no additional cost to the Owner.

302. PREPARATION OF SURFACE TO BE LINED

302.1 The Earthwork Contractor shall be responsible for the initial preparing and maintaining of the surfaces to be lined as specified in the Section 319005 prior to placement of the GCL.

302.2 The Geosynthetics Contractor shall provide written certification to both the Earthwork Contractor and the Owner that the surface on which the GCL is to be installed is acceptable. The surface then becomes the responsibility of the Geosynthetics Contractor.

302.3 The surface upon which the GCL is to be placed shall be free of standing water and maintained in a firm, clean and smooth condition during liner installation.

303. FIELD PLACEMENT OF THE GEOSYNTHETIC CLAY LINER

303.1 Weather:

a. GCL shall not be placed during a rainfall or snowfall, in ponded water, or during high winds.

303.2 Panel Layout:

a. Horizontal panel seams are not allowed on slopes, except as required at the intersection of two slopes (valley). All panel seams on slopes shall be parallel to the flow line down the slope.

b. The panels shall be placed in accordance with the GCL Manufacturer's panel layout drawing to ensure that they are placed in the proper direction for overlapping.

c. If panels are installed in a location other than indicated on the panel layout drawing, the revised location shall be indicated on an "as-built" layout drawing prepared by the Geosynthetics Contractor. The as-built record drawing of the panel layout shall be submitted to the Owner at the completion of the project.

304. PANEL DEPLOYMENT

304.1 The rolls of GCL shall be brought to the area to be lined with a front-end loader and support pipes set up such that the GCL roll is fully supported across its length and freely suspended so that it can unroll freely. The core bar and spreader bar shall not flex or bend excessively when a full roll is lifted.

304.2 Any rutting of the subgrade (i.e., Structural Fill) shall be smoothed and leveled prior to covering that area with GCL.

304.3 Deploy only as much GCL as can be covered with the HDPE geomembrane liner by the end of the day or in a reasonably short time in the event of precipitation.

304.4 The anchor trench for the area to be lined shall be excavated before installation of the GCL begins.

304.5 The cap material (non-woven geotextile) shall face upwards, toward the installer. The GCL shall be placed over the prepared surface in such a manner as to assure minimum handling.

304.6 Installation shall begin at a high elevation and proceed to a low elevation.

304.7 Pulling GCL panels shall be minimized to reduce the chance of permanent tension.

304.8 Wrinkles shall be minimized. However, enough slack shall be provided in both directions so that there will be no tension in the GCL at the lowest expected operating temperature.

305. <u>PRECAUTIONS TO PREVENT WIND DAMAGE</u>

305.1 When possible, work shall be oriented in the direction of the prevailing wind.

305.2 Provide adequate temporary anchoring of the edges of the exposed sheets using sandbags, tires, or other means which will not damage the GCL to prevent uplift of the GCL by wind.

306. <u>OTHER PRECAUTIONS TO PREVENT DAMAGE</u>

306.1 Protection of the GCL from damage due to foot traffic on the slopes shall be provided.

306.2 Provisions of facilities for safe entrance and egress of employees from sloped depressions shall be provided.

307. <u>FIELD SEAMING</u>

307.1 General Requirements for Seaming:

a. Horizontal seams shall be located not less than five (5) feet from the toe of the slope.

b. On slopes, all runs shall be continuous with the long dimension of all panels oriented parallel to the slope.

c. Panels placed on the basin floor require no particular orientation.

d. Once the first run has been laid, adjoining runs shall be laid with a six (6) inch minimum overlap on the longitudinal seams and twenty-four (24) inch minimum overlap on end seams. If the GCL Manufacturer recommends larger overlap seams, then the GCL Manufacturer’s recommendations shall be followed.

e. The edges of GCL panels shall be adjusted to smooth out wrinkles, creases, or “fishmouths” in order to maximize contact with the underlying panel.

f. If the air temperature is higher than 85°F and the humidity is low, contraction may occur soon after placement when no confining stress has been placed over the GCL. To allow for the possibility of contraction under these conditions, the minimum seam overlap shall be increased to a minimum of twelve (12) inches on longitudinal seams and thirty-six (36) inches on end seams, or to 4% of the distance to the next parallel seams, whichever is greater.

307.2 Seaming:

a. Seaming shall be performed in accordance with the GCL Manufacturer's accepted procedure.

b. All seams shall be formed by executing a bentonite-enhanced overlap to ensure that a continuous seal is achieved.

c. The side of the overlying panel shall be pulled back to expose and examine the overlap areas. Seam overlap areas shall be clean and free from moisture, free from dust and debris of any kind before seaming is started. Any contamination shall be removed.

d. A fillet of dry granular bentonite shall be poured in a continuous manner along the overlap zone (between the edge of the panel and the six-inch line) at a rate of at least one-quarter pound per linear foot.

e. Seam overlap on the bottom shall be placed such that the direction of flow is from the top sheet to the bottom sheet to form a shingle effect and prevent flow into the seam.

308. SEALING AROUND AND AGAINST EXISTING STRUCTURES

308.1 The GCL shall be sealed to the existing structures within the Bypass Basin.

308.2 A wedge of GB shall be installed at the point of intersection of an existing structure and the basin floor or sideslope. This GB wedge shall be placed between the existing liner and the new GCL and shall be at least 1.0 lbs per foot.

308.3 At the intersection of the GCL and an existing structure, the GCL shall extend higher on the structure than the termination point for the existing geomembrane liner.

308.4 If the attachment hardware for the existing geomembrane liner are sharp or protrude to the extent that they could damage the GCL, a supplement HDPE geomembrane rub sheet shall be installed between the GCL and existing attachment hardware.

308.5 Vertical GCL shall be anchored to an existing structure at an elevation higher than the existing HDPE geomembrane liner and lower than the new HDPE geomembrane liner as shown on the Design Drawings. As an alternate, the Geosynthetics Contractor may propose a self-adhering GCL product that demonstrates similar properties to the base GCL in accordance with GCL Manufacturer's written recommendations.

309. INSPECTION

309.1 After seaming is complete, the Geosynthetics Contractor and the CQA Contractor shall conduct a detailed walkdown to visually check all seams and non-seam areas of the GCL.

309.2 All defects, holes, blisters, tears and signs of damage during installation shall be marked for repair.

310. PATCHING AND REPAIRS

310.1 Patching shall be used to repair small defects, blisters, holes, and tears.

310.2 All dirt and debris present in the patched area shall be removed.

310.3 All patches shall be round or oval or shall have rounded corners.

310.4 All patches shall be made of the base GCL and shall extend a minimum of twelve (12) inches beyond the edges of the defect. Accessory bentonite shall be placed around the perimeter of the affected area at a rate of one-half pound per lineal foot prior to placing the patch. Adhesive, such as wood glue, may be used if necessary to secure the patch.

311. CREST ANCHORAGE

311.1 The GCL shall be anchored in an anchor trench at the top of the slope.

311.2 Prior to the placement of the GCL, the Earthwork Contractor shall excavate the crest anchor trench to the lines and widths shown on the Design Drawings and in accordance with the excavation, shaping, and backfilling requirements specified in Section 319005.

312. PROTECTIVE COVER

312.1 The GCL shall be covered the same day with the HDPE geomembrane liner as shown on the Design Drawings in accordance with Section 319020. Precautions shall be taken to prevent damage to the GCL by restricting heavy equipment traffic.

312.2 To prevent premature contraction or hydration, only the amount of GCL that can be installed, inspected, repaired, and covered in the same day shall be installed.

312.3 Any leading edge or panels of GCL left unprotected shall be covered with a heavy, waterproofing tarp which is adequately secured and protected with sand bags or other ballast.

313. ACTIVATION OF GCL

313.1 Pre-hydration of the GCL is not required or allowed.

END OF SECTION 319025

SECTION 319050

LEACHATE COLLECTION AND REMOVAL SYSTEM

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for the components of the Bypass Basin's new leachate collection and removal system (LCRS) including high-density polyethylene (HDPE) leachate collection and sideslope riser pipes, Coarse Aggregate Bedding Material, Sand Filter Layer material, Protective Warning Layer material, Riprap Bedding Layer material, and riprap, all in accordance with the Design Drawings and as specified herein.

101.2 The components and dimensions of the LCRS are shown on the Design Drawings. The division of work shall include, but not be limited to, the following items:

a. The following items shall be furnished and installed by the Earthwork Contractor:

a1. Coarse Aggregate Bedding Material.

a2. Sand Filter Layer.

a3. Protective Warning Layer.

a4. Perforated leachate collection pipe.

a5. Solid sideslope riser pipe and cover.

b. The following items shall be furnished and installed by the Geosynthetics Contractor in accordance with Sections 319020 and 319025:

b1. HDPE geomembrane.

b2. HDPE scruff strips.

b3. Drainage geocomposite.

b4. Geotextiles.

b5. Geosynthetic clay liner (GCL).

c. The following items will be furnished and installed by Others:

c1. Wheeled submersible pump with flexible hose.

c2. Flowmeters.

c3. Control station for pumps and meters.

c4. Electrical and instrument conduit.

101.3 Definitions:

a. The following definitions of terms shall apply throughout this section:

a1. Pipe Manufacturer: The manufacturer who is responsible for manufacture of LCRS pipe materials and fittings and for transporting these materials to the site.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification (P-1400):

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a3. Section 319025 – Geosynthetic Clay Liner.

b. CQA Specification (P-1401):

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents in addition to federal, state, or local codes having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D2434 Standard Test Method for Permeability of Granular Soils (Constant Head)

b. D2487 Standard Practice for Classification of Soils for Engineering Purposes.

c. D2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

d. D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

e. D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

f. D6473 Standard Test Method for Specific Gravity and Absorption of Rock for Erosion Control

g. D6825 Standard Guide for Placement of Riprap Revetments

h. F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

103.5 IDOT – Illinois Department of Transportation:

a. Standard Specifications for Road and Bridge Construction (Adopted January 1, 2022).

103.6 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

b. 96 Resistance by Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

c. 104 Soundness of Aggregate by Use of Sodium Sulfate

d. 203 Deleterious Particles in Coarse Aggregate

103.7 NSF – National Sanitation Foundation International:

a. NSF Listings: Plastics and Plumbing System Components.

104. SUBMITTALS

104.1 The GW Contractor shall submit drawings and data at least 30 days prior to use. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems specified by the Owner.

104.2 Submittals with Bid Proposal:

a. HDPE Pipe:

a1. Pipe Manufacturer's name, address, and telephone number.

a2. Pipe Manufacturer's literature providing specifications of the pipes that will be supplied for the project.

a3. Pipe Manufacturer's signed certification that the pipes that will be supplied comply with the requirements of this Specification.

a4. Pipe Manufacturer's signed certification that no reclaimed polymer has been added to the resin.

104.3 Submittals After Award:

a. Coarse Aggregate Bedding Material:

a1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Coarse Aggregate Bedding Material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
a1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
a1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
a1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.
a1.4 Deleterious Materials	ITP 203	Shale, Percent Max. Clay Lumps, Percent Max. Soft & Unsound Fragments, Percent Max. Other Deleterious, Percent Max. Total Deleterious, Percent Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

b. Sand Filter Layer Material:

b1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Sand Filter Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
b1.1 Classification of Material	ASTM D2487	Classification
b1.2 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
b1.3 Hydraulic Conductivity	ASTM D2434	Hydraulic Conductivity

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

c. Protective Warning Layer Material:

c1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Protective Warning Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
c1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
c1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
c1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

d. Riprap Bedding Layer Material:

d1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Riprap Bedding Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
d1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
d1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
d1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.
d1.4 Deleterious Materials	ITP 203	Shale, Percent Max. Clay Lumps, Percent Max. Soft & Unsound Fragments, Percent Max. Other Deleterious, Percent Max. Total Deleterious, Percent Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

e. Riprap:

e1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the riprap material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
e1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
e1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

104.4 Submittals Upon Shipment:

a. HDPE Pipe:

a1. Copies of Pipe Manufacturer's QA/QC certificates on tests performed during fabrication.

104.5 Submittals After Construction is Complete:

a. HDPE Pipe:

a1. Logs indicating the location of each joint that did not pass visual examination and the work done to correct improper fusion weld.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Earthwork Contractor of the responsibility of providing and placing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Earthwork Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1401.

PART 2 - PRODUCTS

201. PIPE

201.1 Pipe Materials:

a. Leachate Collection Pipe and Sideslope Riser shall meet the general and material requirements presented in Table 319050-1.

201.2 Pipe Requirements:

a. Gravity leachate collection piping shall be single wall piping.

201.3 Fittings:

a. All fittings shall be prefabricated and manufactured by the same manufacturer as the pipe.

TABLE 319050-1
MATERIAL REQUIREMENTS FOR LEACHATE COLLECTION PIPE

General Requirements for Leachate Collection Pipes & Fittings			
Item	Leachate Collection Pipe		
Service	Leachate Collection		
Location	Leachate Collection Trench		
Material	Perforated High-Density Polyethylene, Thermal Butt Fusion Welded Joints(1)		
Listing	NSF Listed and Approved		
Rating	Maximum Working Temperature: Ambient Maximum Working Pressure: Atmospheric		
Material Requirements for Leachate Collection Pipes & Fittings			
Item	**ASTM Test Method**	**Size (in.)**	**Remarks**
Pipe(1)	ASTM F714, Pipe Grade PE4710 Resin	6	SDR 11
Joints	Not Applicable	All	Thermal Butt Fusion Welded
Fittings(2): 30°, 45°, 60°, and 90° Bends	ASTM D2513 and ASTM D3261	6	SDR 11 (reduced pressure) Injection molded butt fittings from same resins as pipe.
Fittings(2): Tees, Wyes, and Reducers	Not Applicable	6	SDR 11 (reduced pressure) Mitered fittings fabricated from angular cut sections of pipe.
Cleanout	Not Applicable	6	Lockable Cap
Approved Manufacturers of Leachate Collection Pipes and Fittings			
Manufacturer		**Trade Name**	**Size Range (in.)**
Chevron Phillips Chemical Company		Performance Pipe DriscoPlex® 4100	6
KWH Pipe		Sclairpipe	6
JM Eagle		HDPE Water Sewer C906	6
Others as Approved by the Owner		--	--

Notes:

(1) Solid or perforated pipe shall be provided as specified on the Design Drawings. Perforated pipe shall be perforated in accordance with the details shown on the Design Drawings.
(2) Fittings are reduced pressure rating fittings.

202. COARSE AGGREGATE BEDDING MATERIAL:

a. The bedding material for the leachate collection pipe shall be washed gravel or washed crushed coarse aggregate. Crushed slag or Portland cement concrete shall not be used.

b. The gradation for Coarse Aggregate Bedding Material shall conform to Gradation CA 7 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

c. The material quality for Coarse Aggregate Bedding Material shall be Class B or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

203. SAND FILTER LAYER MATERIAL:

a. The “Sand Filter Layer” placed on top of the HDPE geonet and geotextile shall be composed of washed sand imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that is processed to meet the following requirements:

a1. The material shall be classified as SP, SM, or SP-SM in the Unified Soil Classification System, ASTM D2487.

a2. The material shall conform to Gradations FA 1 or FA 2 in accordance with Paragraph 1003.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a3. The material shall have a permeability of greater than 1×10^{-5} cm/sec when tested in accordance with ASTM D2434.

a4. The material shall be free from all organic material and deleterious material.

a5. Fine aggregate produced by crushing slag or Portland cement concrete is not acceptable.

204. PROTECTIVE WARNING LAYER MATERIAL:

a. The “Protective Warning Layer” placed on top of the Sand Filter Layer along the basin floor shall be composed of gravel, crushed gravel, or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that is processed to meet the following requirements:

a1. The material shall conform to Gradation CA 6 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality for Protective Warning Layer material shall be Class D or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

205. RIPRAP BEDDING LAYER MATERIAL

a. The “Riprap Bedding Layer” placed on top of the Sand Filter Layer along the basin side slopes shall be composed of gravel, crushed gravel, or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that meets the following requirements:

a1. The material shall conform to Gradation CA 16 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality for Riprap Bedding Layer material shall be Class B or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

206. RIPRAP

a. Riprap placed along the basin side slopes shall consist of quarried or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that meets the following requirements:

a1. Riprap stones shall have 100% of all faces angular or crushed and shall be free from structural defects, laminations, seams, weak cleavage planes, and undesirable effects of weathering. Stone containing shale, unsound sandstone, or any other material which will readily disintegrate under handling and placing or under weathering shall not be used. All riprap material shall be clean and free from deleterious material and impurities, including but not limited to earth, clay, and refuse.

a2. Riprap material shall conform to Gradation RR 2 in accordance with Paragraph 1005.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a3. Riprap material shall meet Quality A requirements in accordance with Paragraph 1005.01(b) of the IDOT Standard Specifications for Road and Bridge Construction, except that the bulk specific gravity of the riprap shall not be less than 2.55 per ASTM D6473 (approximate unit weight of 160 pounds per cubic foot).

a4. Riprap color shall be gray unless otherwise approved by the Owner.

PART 3 - EXECUTION

301. LEACHATE COLLECTION AND SIDESLOPE RISER PIPE INSTALLATION

301.1 The perforated leachate collection pipe and solid wall sideslope riser pipe shall be installed according to the elevations and locations indicated on the Design Drawings.

301.2 The maximum vertical variation from the correct profile and section shall not exceed ±0.1 ft. The slope of each pipeline shall not vary from the specified slopes by more than ±0.1%. The Earthwork Contractor shall regrade any area which does not meet the specified tolerances.

301.3 The perforated leachate collection pipe shall have two rows of 1/2-inch diameter perforations spaced 6 inches apart along the length of the pipe. The perforations shall face down in the collection and cleanout trenches.

301.4 All PE pipes shall be joined by the thermal butt-fusion process described in Article 302. The inside of the pipe shall be ground smooth so that it will not impede the sliding of the pumps.

301.5 The Earthwork Contractor shall provide hydraulic jet cleaning of all pipelines following installation. The jet cleaning shall verify that each pipe is intact and unobstructed. Defects in any pipeline identified by the cleaning process shall be repaired by the Earthwork Contractor.

302. WELDING AND TESTING OF HDPE PIPE JOINTS

302.1 Joints for HDPE Pipe:

a. HDPE pipe shall be joined together by the thermal butt fusion method in accordance with ASTM D2657 Procedure 2. Fittings shall be fabricated to provide a smooth inside surface. The hot plate butt fusion procedure shall be performed using apparatus recommended by the Pipe Manufacturer and which complies with ASTM D2657.

302.2 Bent Strap Test

a. Test Requirements:

a1. A bent strap test shall be made on each diameter of pipe prior to the start of joint welding procedures. A test joint shall be made and a specimen cut from the joint and destructively tested to confirm fusion joint integrity, operator procedure, and fusion machine settings, including temperature and pressure.

a2. Additional bent strap tests may be required by the Owner and/or CQA Contractor during the joint welding process if it is found that the joints of unacceptable quality are being made. These tests shall be used to adjust fusion machine settings and/or operator procedures as required. Test joints shall be prepared at no additional cost to the Owner.

b. Test Procedure:

b1. Using waste pieces of pipe, a joint specimen shall be prepared and then butt fusion welded and allowed to cool to ambient temperature.

b2. A test strap shall be cut from the specimen:

b2.1 The width of the strap shall be 1-1/2 times the pipe wall thickness, but not less than one inch.

b2.2 The length of the strap on each side of the fusion weld shall be 15 times the pipe wall thickness, but not less than six inches.

b3. The cut shall be bent so that the ends of the strap touch. If any separation, cracks or voids are observed, the fusion is unacceptable and indicates poor fusion quality.

b4. If failure occurs, fusion procedures and/or machine settings shall be changed, and a new trial fusion weld and new bent strap specimen shall be prepared and tested.

b5. The CQA Contractor shall witness all bent strap tests.

b6. Field fusion of pipe shall not proceed until a test joint has passed the bent strap test and visual inspection indicates that the fusion beads and “V” groove are the correct size.

303. <u>VISUAL INSPECTION OF HDPE PIPE DURING INSTALLATION</u>

303.1 General:

a. The Earthwork Contractor shall visually inspect all pipes during installation for:

a1. Verification that all perforated pipe has been placed with the perforations facing down.

a2. Surface damage.

a3. Weld quality.

303.2 Surface Damage:

a. Surface damage to a pipe that occurs during handling or installation shall be minimized. The maximum acceptable depth of damage is 10 percent of wall thickness of the pipe. If excessive damage occurs, the damaged portions of pipe shall be cut out and replaced. Deep, sharp notches may be filled with extudite and dressed smooth.

b. Butt fuse on misalignment shall not exceed 10 percent of the pipe wall thicknesses. Misaligned butt fusions shall be cut out and redone.

303.3 Butt-Fusion Joint Weld Quality:

a. All butt fusion welded joints shall be visually inspected to ensure joint quality. The size and shape of the fusion beads shall be used as an indicator of joint quality. Specifically:

a1. The double bead width shall be 2 to 2-1/2 times the height of the bead measured from the pipe surface.

a2. Both beads shall be uniform in size and shape around the joint.

a3. The depth of the "V" between the two beads shall not be more than half the bead height.

b. If the "V" groove is too deep a "cold" fusion may have occurred (uneven heating or insufficient heating time, or excessive pressure during heating or during joining). A non-uniform bead shape around the pipe indicates uneven heating.

c. A joint with cold fusion or a non-uniform bead is a poor quality joint that shall be removed (i.e., cut-out) and remade.

304. <u>INSTALLATION OF GRANULAR AND RIPRAP MATERIALS</u>

304.1 "Granular Materials" in this article include Coarse Aggregate Bedding Material, Sand Filter Layer material, Protective Warning Layer material, and Riprap Bedding Layer material.

304.2 Acceptable Placement Methods:

a. Acceptable placement methods for Granular Materials include:

a1. Using a conveyor truck to place material from outside of the basin.

a2. Using a crane to place material from outside of the basin.

a3. Transporting material into the basin to the point of dumping using trucks or scrapers.

a4. Alternate placement method(s) proposed by the Earthwork Contractor and approved by the Owner.

b. Requirements for Transportation of Granular and Riprap Materials into Basin:

b1. Under no circumstances shall there be direct equipment travel over any geosynthetic material (GCL, geomembrane, geotextile, geonet, etc.).

b2. Equipment transporting material into the basin shall use the permanent ramp along the basin's east dike. Structural Fill shall be installed above the existing HDPE geomembrane liner along the ramp surface as detailed on the Design Drawings and as specified in Section 319005 before any equipment uses the ramp to access the basin floor.

b3. Only earthmoving equipment with low ground pressure shall be used to transport material inside of the basin. The Earthwork Contractor shall demonstrate that equipment entering the basin will not exert a ground pressure greater than 8 psi. The ground pressure is influenced by the tread pattern / tire contact area and is not the reading from a tire pressure gauge.

b4. Equipment operating within the basin shall avoid hard braking on ramps and avoid sharp turns or quick stops that could pinch or tear the geosynthetic materials.

b5. The Sand Filter Layer, Protective Warning Layer, and Riprap Bedding Layer Materials shall be placed by the "dump and spread" method in which appropriate lightweight equipment with low ground pressure are used to spread the material.

b6. No travel over piping shall be allowed without sufficient protection of the piping.

b7. Material placement over geosynthetic materials during periods of warm weather can cause wrinkling in the geosynthetic materials. The wrinkling effect can cause damage to the geosynthetic materials. Placement of Granular Materials shall be halted when the air temperature is greater than 85°F or less than 40°F.

b8. When Sand Filter Layer, Protective Warning Layer, or Riprap Bedding Layer materials are being placed, a worker shall walk alongside earthmoving equipment spreading the material to spot and remove all rocks, stones, roots, and other debris that may be remaining in the materials that could cause damage to a geosynthetic material.

b9. Placement of Granular Materials and riprap on the basin's side slopes shall begin at the toe of the slope and proceed up the slope.

304.3 Placement of Coarse Aggregate Bedding Material:

a. Coarse Aggregate Bedding Material shall be placed under and around the leachate collection and sideslope riser pipes to the thicknesses shown on the Design Drawings.

b. All piping shall be installed over an initial layer of Coarse Aggregate Bedding Material. After a pipe is installed, Coarse Aggregate Bedding Material shall be placed by hand beneath the haunches and above the pipe and compacted to ensure complete and uniform support of the pipe.

304.4 Placement of Sand Filter Layer Material:

a. Installation of the Sand Filter Layer shall not begin until Geosynthetics Contractor has finished installing the non-woven geotextile and HDPE geonet components of the LCRS, the CQA Contractor has finished inspecting those geosynthetic components of the LCRS, and the area has been released to the Earthwork Contractor in writing to proceed.

b. Sand Filter Layer material shall be placed in a single layer to the thickness shown on the Design Drawings without compaction or working of the material that could cause intrusion through the non-woven geotextile into the underlying HDPE geonet.

c. The Sand Filter Layer shall be fine graded using low ground pressure equipment.

304.5 Placement of Protective Warning Layer Material:

a. Protective Warning Layer materials shall be placed to the thickness shown on the Design Drawings.

b. Compaction:

b1. Protective Warning Layer materials shall be placed and maintained to a uniform thickness, free of ruts and irregularities.

b2. The Protective Warning Layer shall be compacted by a minimum of four passes in each direction (perpendicular to each other) by the equipment spreading the material. The upper surface shall then be compacted with a minimum of four passes each way by a vibratory drum roller with a minimum static weight of 13 tons.

b3. Acceptance of the fill shall be based on ruts less than 1 inch between the last successive passes. Compaction testing is not required.

c. The Protective Warning Layer shall be fine graded using low ground pressure equipment.

304.6 Placement of Riprap Bedding Layer Material:

a. Riprap Bedding Layer materials shall be placed to the full thickness shown on the Design Drawings in one operation using methods which will not cause segregation of particle sizes.

b. Riprap Bedding Layer materials shall not be dropped onto the underlying Sand Filter Layer from a height exceeding 3 feet.

c. Compaction of the Riprap Bedding Layer is not required; however, the surface shall be reasonably even and free from mounds or windrows.

d. The Riprap Bedding Layer shall be fine graded using low ground pressure equipment.

304.7 Placement of Riprap:

a. Riprap shall be placed in general accordance with the methods described in ASTM D6825 in designated areas to the lines, grades, and thickness specified on the Design Drawings. Riprap shall be placed to the full thickness in one operation.

b. Riprap placement operations – including handling, stockpiling, and transporting – shall be accomplished in such a manner as to produce a reasonably well graded mass of rock with minimum percentage of voids, free from objectionable pockets of small stone and clusters of large stones. The larger stones shall be well distributed and the entire mass of stones in their final positions shall be roughly graded to conform to the gradation specified.

c. Riprap shall be placed by dragline, clamshell, appropriately-sized excavators, or similar equipment, which shall be operated so as to place each load of material in approximately its final position without reworking and without excessive height drop (i.e., more than 12 inches).

d. Placing riprap in layers is not permitted.

e. Placing stones by dumping into chutes or other methods, which cause segregation of various stone sizes, is not permitted.

304.8 Grading Tolerances:

a. Horizontal and vertical tolerances for the Sand Filter Layer and Protective Warning Layer shall be as specified in Table 319050-2.

b. Thickness determination of riprap and Riprap Bedding Layer materials will be made at points selected by the CQA Contractor. When the average constructed thickness is less than the thickness specified on the Design Drawings, additional material shall be added to obtain the specified thickness at no additional cost to the Owner.

304.9 Reporting Damage:

a. If damage occurs (or is suspected to have occurred) to any portion of the LCRS, composite liner system, or existing HDPE geomembrane liner under the composite liner system while placing Granular Materials, the Earthwork Contractor shall report the damage(s) to the Owner immediately so that repairs can be performed without delay.

b. Repairs to a geosynthetic material shall be made as specified in the Section 319020. The Geosynthetics Contractor shall perform all geosynthetic repair work at no additional cost to the Owner.

c. Repairs to components of the LCRS shall be repaired as specified herein. The Earthwork Contractor shall perform all LCRS repair work at no additional cost to the Owner.

TABLE 319050-2
ACCEPTABLE DEVIATIONS FROM DESIGN LINES AND GRADES

Type of Installation (Excavation or Fill)	Maximum Acceptable Deviation from Line (feet)	Maximum Acceptable Deviation from Grade[1] (feet)
Granular Materials		
Top of Sand Filter Layer	±0.3	+0.1 to -0.0
Top of Protective Warning Layer		
Top of Riprap Bedding Layer		

END OF SECTION 319050

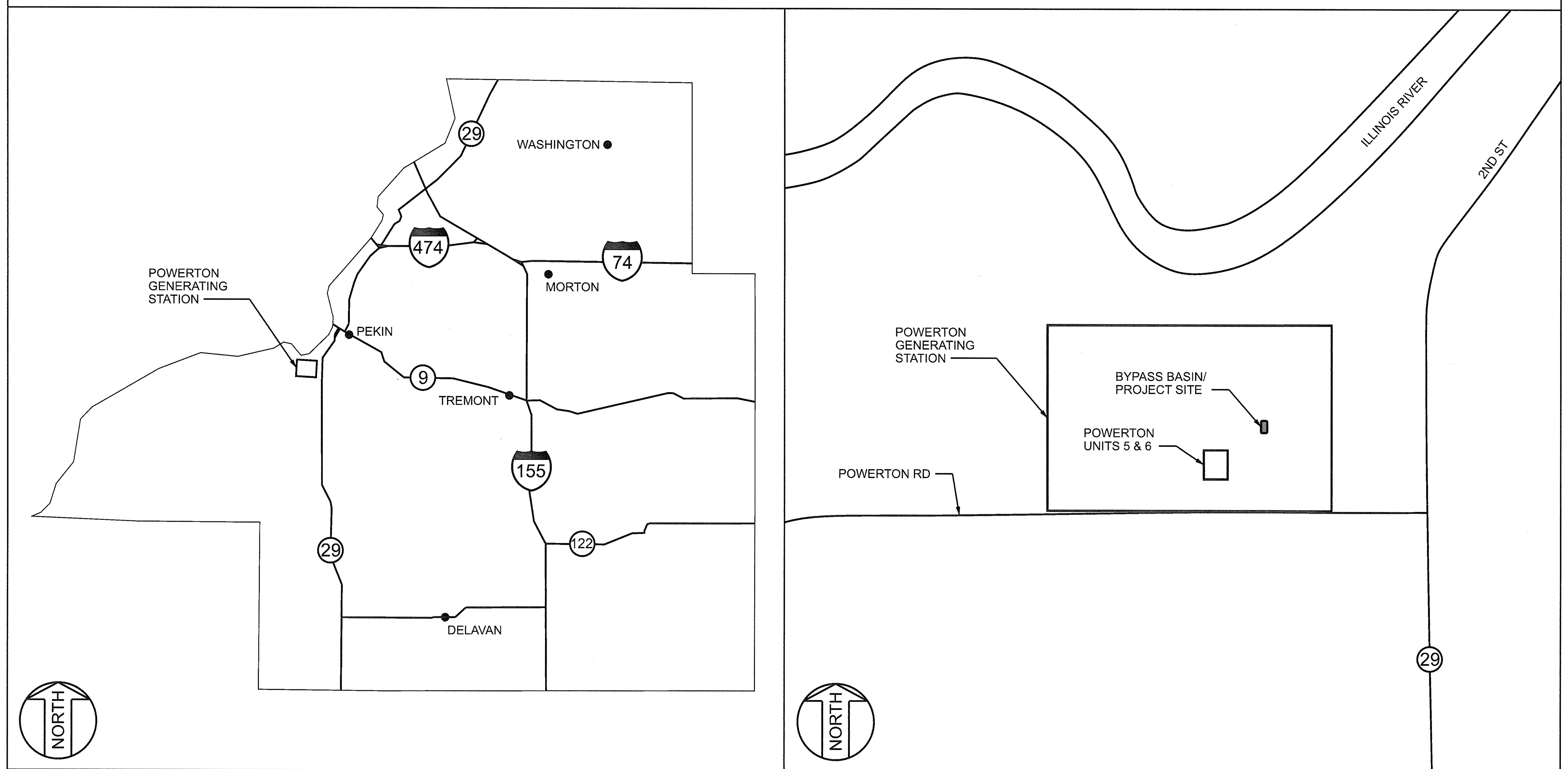
ATTACHMENT 1

DESIGN DRAWINGS

DRAWING NO.	REV.	TITLE
POW-BBR-CSK-001	C	BYPASS BASIN RETROFIT COVER SHEET
POW-BBR-CSK-002	C	BYPASS BASIN RETROFIT GENERAL NOTES
POW-BBR-CSK-003	C	BYPASS BASIN EXISTING CONDITIONS
POW-BBR-CSK-004	C	BYPASS BASIN EXCAVATION PLAN
POW-BBR-CSK-005	C	BYPASS BASIN EXCAVATION SECTIONS & DETAILS
POW-BBR-CSK-006	C	RETROFITTED BYPASS BASIN STRUCTURAL FILL GRADING PLAN
POW-BBR-CSK-007	C	RETROFITTED BYPASS BASIN COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-BBR-CSK-008	C	RETROFITTED BYPASS BASIN SECTIONS & DETAILS
POW-BBR-CSK-009	B	RETROFITTED BYPASS BASIN INLET & OUTLET STRUCTURE DETAILS SHEET 1
POW-BBR-CSK-010	B	RETROFITTED BYPASS BASIN INLET & OUTLET STRUCTURE DETAILS SHEET 2

MIDWEST GENERATION, LLC
POWERTON GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

VICINITY MAP



TAZEWELL COUNTY MAP (N.T.S) | SITE LOCATION ENLARGED PLAN (N.T.S)

PREPARED FOR:
MIDWEST GENERATION, LLC
POWERTON GENERATING STATION
13082 E. MANITO RD.
PEKIN, IL 61554

PREPARED BY:
SARGENT & LUNDY
55 E. MONROE ST.
CHICAGO, IL 60603

POWERTON BYPASS BASIN RETROFIT PROJECT DRAWING LIST	
DWG NO.	DRAWING TITLE
POW-BBR-CSK-001	BYPASS BASIN RETROFIT COVER SHEET
POW-BBR-CSK-002	BYPASS BASIN RETROFIT GENERAL NOTES
POW-BBR-CSK-003	BYPASS BASIN EXISTING CONDITIONS
POW-BBR-CSK-004	BYPASS BASIN EXCAVATION PLAN
POW-BBR-CSK-005	BYPASS BASIN EXCAVATION SECTIONS & DETAILS
POW-BBR-CSK-006	RETROFITTED BYPASS BASIN STRUCTURAL FILL GRADING PLAN
POW-BBR-CSK-007	RETROFITTED BYPASS BASIN COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-BBR-CSK-008	RETROFITTED BYPASS BASIN SECTIONS & DETAILS
POW-BBR-CSK-009	RETROFITTED BYPASS BASIN INLET & OUTLET STRUCTURE DETAILS SHEET 1
POW-BBR-CSK-010	RETROFITTED BYPASS BASIN INLET & OUTLET STRUCTURE DETAILS SHEET 2

FOR PERMIT
NOT FOR CONSTRUCTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	03-11-2022	FOR CLIENT COMMENT
B	04-15-2022	FOR PUBLIC COMMENT
C	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS.

Th. Dehlin
THOMAS DEHLIN
07-15-2022

MY LICENSE RENEWAL DATE IS: 11-30-2023
PAGES OR SHEETS COVERED BY THIS SEAL:
THIS DOCUMENT ONLY.

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

CAD FILE NAME: POW-BBR-CSK-001.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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Sargent & Lundy LLC

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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

BYPASS BASIN RETROFIT
COVER SHEET

DRAWING NUMBER	REVISION
POW-BBR-CSK-001	C

SHEET 1 OF 1

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED ACCORDING TO THE REQUIREMENTS OF SPECIFICATION P-1400 UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS.
2. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND HAVE CONTROL AND CHARGE OF CONSTRUCTION MEANS, METHODS, TECHNIQUES, WORK SEQUENCING, AND PROCEDURES IN CONNECTION WITH THE WORK. THE CONTRACTOR SHALL CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, COMPOSED OF THE DESIGN DRAWINGS AND SPECIFICATIONS.
3. ALL WORK DONE BY CONTRACTOR/INSTALLER PURSUANT TO THESE DRAWINGS SHALL: (A) CONFORM TO THE GOVERNING CONTRACT DOCUMENTS; (B) BE PERFORMED EXCLUSIVELY BY ITS TRAINED, COMPETENT PERSONNEL OR, WHERE PERMITTED, THAT OF ITS SUBCONTRACTOR(S); AND (C) COMPLY WITH ALL APPLICABLE SAFETY LAWS, REGULATIONS, PROGRAMS AND PRACTICES TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING THE CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.
4. THE CONTRACTOR SHALL PERFORM INSTALLATION AND REMOVAL WORK IN A NEAT AND SKILLFUL MANNER, CAREFULLY TERMINATING WORK NEAR MATERIAL TO REMAIN IN PLACE. PRECAUTIONS SHALL BE TAKEN NOT TO DAMAGE OR DEFACE WORK, EXISTING FACILITIES, AND/OR MATERIAL TO REMAIN IN PLACE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY SUCH DAMAGE OR REPAIR THEREOF.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF FEDERAL, STATE OR LOCAL CODES, STANDARDS AND SPECIFICATIONS.
6. COMPACTION:

   SEE SPECIFICATION P-1400 FOR COMPACTION AND EARTHWORK REQUIREMENTS UNLESS OTHERWISE NOTED.
7. SOIL EROSION AND SEDIMENTATION CONTROL:

   PROPER SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED TO MEET THE APPLICABLE REGULATORY CODES AND THE PERMIT REQUIREMENTS.
8. CONSTRUCTION QUALITY ASSURANCE:

   ANY WORK FOUND DEFECTIVE OR NOT IN COMPLIANCE WITH THE REQUIREMENTS OF THE PROJECT SPECIFICATIONS OR THE DESIGN DRAWINGS SHALL BE REPLACED/FIXED AT NO ADDITIONAL COST TO THE OWNER.
9. TOPOGRAPHIC MAP & COORDINATES:
   - A. THE TOPOGRAPHIC MAP OF THE PLANT SITE SHOWN ON THE DESIGN DRAWINGS WAS PREPARED IN 2008.
   - B. THE PLANT COORDINATE SYSTEM SHOWN ON THE DESIGN DRAWINGS IS BASED ON THE ILLINOIS STATE PLANE, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (2011) (NAD 83/2011), U.S. SURVEY FEET.
10. HORIZONTAL AND VERTICAL CONTROL:
    - A. THE BASIS FOR HORIZONTAL CONTROL IS AS DESCRIBED IN NOTE 9.
    - B. THE BASIS FOR VERTICAL CONTROL IS THE LOCAL PLANT DATUM.
    - C. PRIOR TO BEGINNING ANY BASIN RETROFIT WORK, THE CONTRACTOR SHALL:
      - I. MAKE A TOPOGRAPHICAL ASSESSMENT TO VERIFY THE ACCURACY OF THE EXISTING SURVEY DATA SHOWN ON THE DESIGN DRAWINGS. CONTRACTOR SHALL NOTIFY THE OWNER OF THE RESULTS OF THIS ASSESSMENT IN WRITING, AND SHALL IDENTIFY ANY DIFFERENCES BETWEEN THE 2008 SURVEY AND THE CONTRACTOR'S SURVEY THAT MIGHT AFFECT THE WORK SHOWN ON THE DESIGN DRAWINGS.
      - II. FURNISH AND INSTALL A MINIMUM OF TWO BENCHMARK MONUMENTS TO PERFORM THE WORK. CONTRACTOR SHALL PROVIDE A BENCHMARK PLAN IDENTIFYING THE LOCATIONS AND TYPES OF BENCHMARKS TO BE INSTALLED FOR OWNER REVIEW AND APPROVAL. CONTRACTOR SHALL LAY OUT LINES AND GRADES FROM THESE CONTRACTOR-FURNISHED BENCHMARKS.
11. GEOTECHNICAL WORK:

    A STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT FOR THE ASH SURGE AND BYPASS BASINS WAS PREPARED BY GEOSYNTEC CONSULTANTS IN OCTOBER 2016. SITE SPECIFIC SOIL DATA AND GEOTECHNICAL RECOMMENDATIONS ARE PROVIDED AND REFERENCED THEREIN.
12. EXISTING CONDITIONS:
    - A. DIMENSIONS OF EXISTING WORK SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF WORK IN ACCORDANCE WITH THE SPECIFICATION AS FIELD CONDITIONS MAY VARY FROM INFORMATION SHOWN ON THE DESIGN DRAWINGS. DIMENSIONS NOTED FOR REFERENCE (REF) INDICATE NOMINAL DIMENSIONS FOR THE EXISTING STRUCTURE, UTILITY, ETC. NEW WORK SHALL NOT BE LOCATED BASED ON THE REFERENCE DIMENSIONS.
    - B. PRIOR TO COMMENCING THE WORK, THE CONTRACTOR SHALL EXAMINE THE AREAS AND CONDITIONS UNDER WHICH THE RETROFIT WORK IS TO TAKE PLACE, AND NOTIFY THE OWNER IN WRITING OF CONDITIONS WHICH MAY IMPACT THE PROPER AND TIMELY COMPLETION OF THE WORK.
    - C. UNDERGROUND OR EMBEDDED UTILITIES MAY EXIST WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK. THE LOCATION OR IDENTIFICATION OF SUCH UTILITIES HAS NOT BEEN VERIFIED BY THE OWNER OR BY S&L. CONTRACTOR/INSTALLER IS RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING UNDERGROUND OR EMBEDDED UTILITIES AND ANY OTHER UNDERGROUND OR EMBEDDED UTILITY DIMENSIONS.
    - D. REFERENCES USED HAVE BEEN IDENTIFIED ON EXCAVATION/FOUNDATION/DEMOLITION DRAWINGS AND HAVE BEEN PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING EXISTING UTILITIES AND OTHER POTENTIAL UNDERGROUND OR EMBEDDED INTERFERENCES. THESE REFERENCES ONLY SHOW THE APPROXIMATE LOCATION OF POTENTIAL UNDERGROUND OR EMBEDDED UTILITIES AND MAY NOT INDICATE OR REFLECT ALL EXISTING UNDERGROUND OR EMBEDDED UTILITIES OR THEIR ACTUAL LOCATIONS.
    - E. REFERENCES IDENTIFIED SHALL NOT SUBSTITUTE FOR THE CONTRACTOR'S/INSTALLER'S OBLIGATION TO FIELD LOCATE ANY UNDERGROUND OR EMBEDDED UTILITIES OR INTERFERENCES THAT MAY AFFECT THE WORK.
    - F. DUE CAUTION SHALL BE TAKEN DURING ANY EXCAVATION/FOUNDATION/DEMOLITION WORK WITHIN THE AREA OF, AND ADJACENT TO THE LIMITS OF THE WORK DUE TO POSSIBLE INTERFERENCES THAT MAY NOT BE REFLECTED ON THE REFERENCES IDENTIFIED.
    - G. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION AND RESTORATION OF THE EXISTING UTILITIES IF DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

ABBREVIATIONS

ROAD AND GRADING

T/RD	TOP OF ROAD ELEVATION
EL OR ELEV	GRADE ELEVATION
INV	INVERT ELEVATION
HP	HIGH POINT
LP	LOW POINT
HPFS	HIGH POINT FINISH SURFACING
BC	BEGINNING OF CURVE (HORIZONTAL CURVE)
EC	END OF CURVE (HORIZONTAL CURVE)
PI	POINT OF INTERSECTION (HORIZONTAL CURVE)
PT	POINT OF TANGENT
PC	POINT OF CURVE
STA	STATION
VC	VERTICAL CURVE
BVC	BEGINNING OF VERTICAL CURVE
EVC	END OF VERTICAL CURVE
PIVC	POINT OF INTERSECTION OF VERT. CURVE
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
R	RADIUS
T	TANGENT
L	LENGTH OF CURVE
D	DEGREE OF CURVE
I	INTERIOR/DEFLECTION ANGLE OF CURVE
UN	UNLESS NOTED
ROW	RIGHT OF WAY
OHL	OVERHEAD LINE
OC	ON CENTER
WL	WATER LEVEL
HWL	HIGH WATER LEVEL
YR	YEAR
DS	DOWNSTREAM
US	UPSTREAM
CL	CENTERLINE
AC	ACRE
N.T.S.	NOT TO SCALE
LWL	LOW WATER LEVEL

SYMBOLS

	CENTERLINE OF NATURAL DRAINAGE PATTERN
	VALLEY LINE OR "V" DITCH
	SWALE
	CENTERLINE OF TRAPEZOIDAL DRAINAGE
	TRAPEZOIDAL DRAINAGE DITCH WITH BOTTOM WIDTH GREATER THAN 2'. BOTTOM WIDTH AND SIDE SLOPE SHOWN ON PLAN OR DETAIL
	RIPRAP EROSION PROTECTION
C-1	PIPE CULVERT CULVERT NUMBER SHOWN
DOWN	TOP OF EMBANKMENT SLOPE OR DITCH SIDE SLOPE AND DIRECTION OF SLOPE
3:1	HORIZONTAL TO VERTICAL SLOPE WHEN SLOPE IS CONSTANT
SLOPE VARIES	SLOPE IS NOT CONSTANT
1%	DIRECTION OF ROAD OR AREA SLOPE. PERCENT OF SLOPE SHOWN WHERE APPLICABLE
	TOP OF DIKE
R=50'	RADIUS OF CURVATURE
1	SECTION NUMBER (FIRST NUMBER=DRAWING SECOND NUMBER=SECTION NUMBER)
	CHAIN LINK FENCE
PLAN SECTION	WATER LINE
—G—G—	BURIED GAS LINE
—E—E—	BURIED ELECTRICAL CABLE
	INDEX CONTOUR
	INTERMEDIATE CONTOUR
405	ELEVATION CONTOUR
	EXISTING DEPRESSION
x 408.8	SPOT ELEVATION
x	VERTICAL CONTROL POINT
	HORIZONTAL CONTROL POINT
	EXISTING FIRE HYDRANT
	EXISTING UTILITY POLE
	EXISTING UTILITY POLE WITH GUY
	WOOD OR BRUSH OUTLINE
	GRATING
	SINGLE SIGN ON POST
	DOUBLE SIGN ON POST
	GUARD POST

SYMBOLS & ABBREVIATIONS

EROSION CONTROL SYMBOLS

—S—	SILT FENCE
—IP—	INLET PROTECTION
	ROCK CHECK

SEWERS AND UNDERGROUND PIPE

CB	CATCH BASIN
CO	CLEANOUT
MH	MANHOLE
RE	RIM ELEVATION
℄	CENTERLINE
S	SLOPE
BOP	BOTTOM OF PIPE
PVC	POLY VINYL CHLORIDE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE
CISP	CAST IRON SOIL PIPE
DIWP	DUCTILE IRON WATER PIPE
STL	CARBON STEEL PIPE
IP	IN PLACE
SWS	STORM WATER SEWER
OWS	OILY WATER SEWER
SAN	SANITARY SEWER
PWS	PROCESS WASTE SEWER
C.S.	CARBON STEEL

ROAD, PAVEMENT AND SURFACING SYMBOLS

	ASPHALT OR CONCRETE PAVED ROAD. OUTER LINES SHOW OVERALL WIDTH. INTERIOR LINES SHOW EDGES OF PAVEMENT.
	ROCK SURFACED ROAD
—I—	ISOLATION JOINT
—IT—	THICKENED EDGE ISOLATION JOINT
—TE—	THICKENED EDGE EXPANSION JOINT
—T—	PAVEMENT THICKENED EDGE
—C—	CONTRACTION JOINT
	CONCRETE PAVING
	CRUSHED ROCK SURFACING
	ASPHALT PAVEMENT
	6" THICK CRUSHED STONE GROUND COVER SURFACING
	4" THICK SEEDED TOPSOIL

FOR PERMIT
NOT FOR CONSTRUCTION

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THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	03-11-2022	FOR CLIENT COMMENT
B	04-15-2022	FOR PUBLIC COMMENT
C	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS.

THOMAS DEHLIN
07-15-2022

LICENSED PROFESSIONAL ENGINEER
THOMAS J. DEHLIN
062-069314
OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
PAGES OR SHEETS COVERED BY THIS SEAL:
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CAD FILE NAME: POW-BBR-CSK-002.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

Sargent & Lundy LLC

SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

BYPASS BASIN RETROFIT
GENERAL NOTES

DRAWING NUMBER	REVISION
POW-BBR-CSK-002	C

SHEET 1 OF 1

7/12/2022 10:51:36 AM
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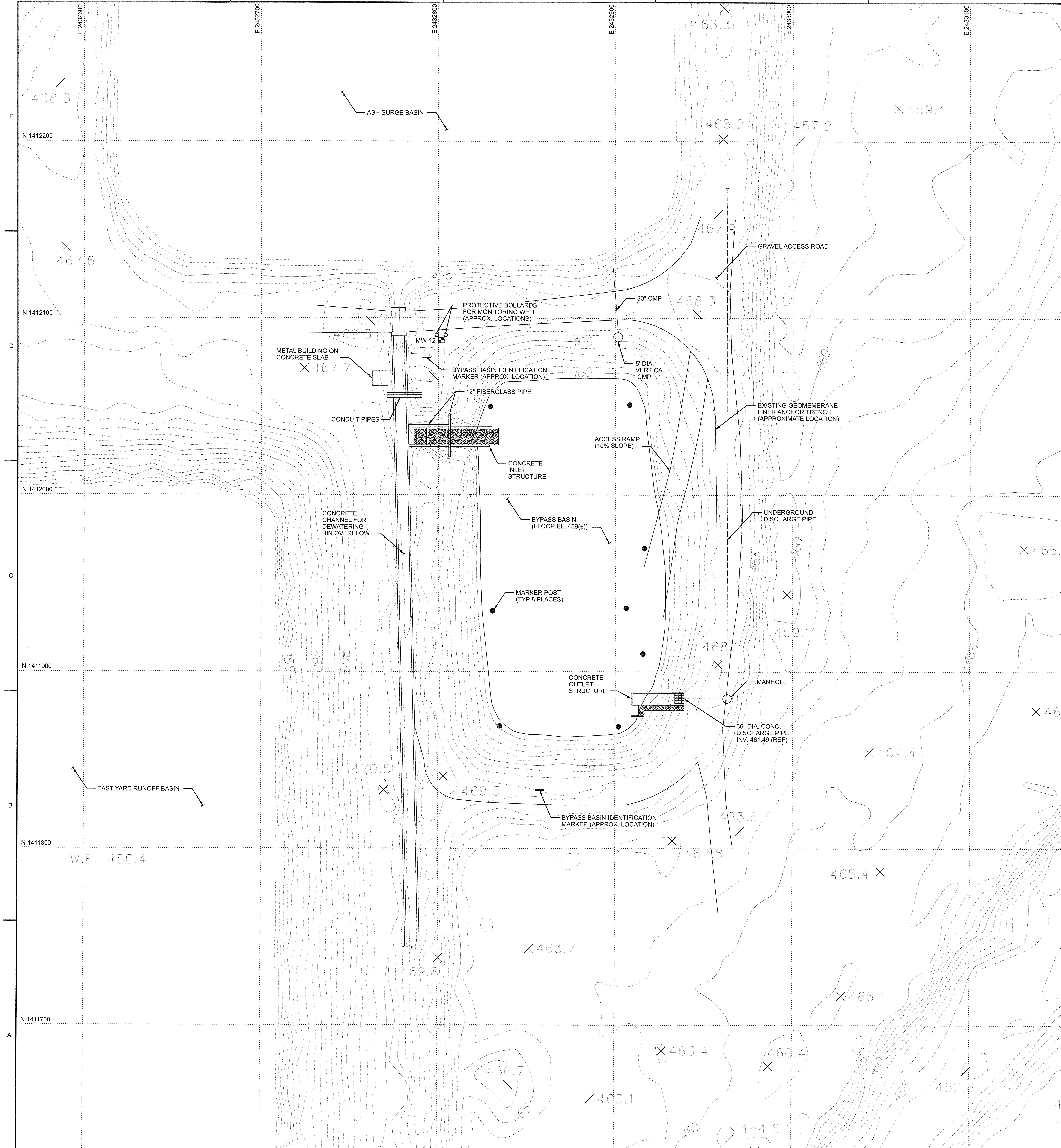
PL12793\0M1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Drawings\POW-BBR-CSK-002.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



FOR PERMIT
NOT FOR CONSTRUCTION

LEGEND

MW-12 MONITORING WELL

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1400 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.
3. EXISTING CONDITIONS FOR THE BYPASS BASIN ARE BASED ON TOPOGRAPHIC DATA COLLECTED IN 2008. PRIOR TO BEGINNING ANY RETROFIT WORK, THE GW CONTRACTOR SHALL MAKE A TOPOGRAPHIC ASSESSMENT TO VERIFY THE ACCURACY OF THE EXISTING CONDITIONS SHOWN PER NOTE 10 ON DRAWING POW-BBR-CSK-002.

REFERENCE DRAWINGS

D1965C030-02	BYPASS BASIN LINER REPLACEMENT WARNING LAYER PLAN

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

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THOMAS DEHLIN
07-15-2022

MY LICENSE RENEWAL DATE IS: 11-30-2023
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LICENSED PROFESSIONAL ENGINEER THOMAS J DEHLIN 062-069314 OF ILLINOIS

CAD FILE NAME: POW-BBR-CSK-003.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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Sargent & Lundy LLC
SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

BYPASS BASIN
EXISTING CONDITIONS

DRAWING NUMBER	REVISION
POW-BBR-CSK-003	C

SHEET 1 OF 1

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Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7/12/2022 10:50:46 AM
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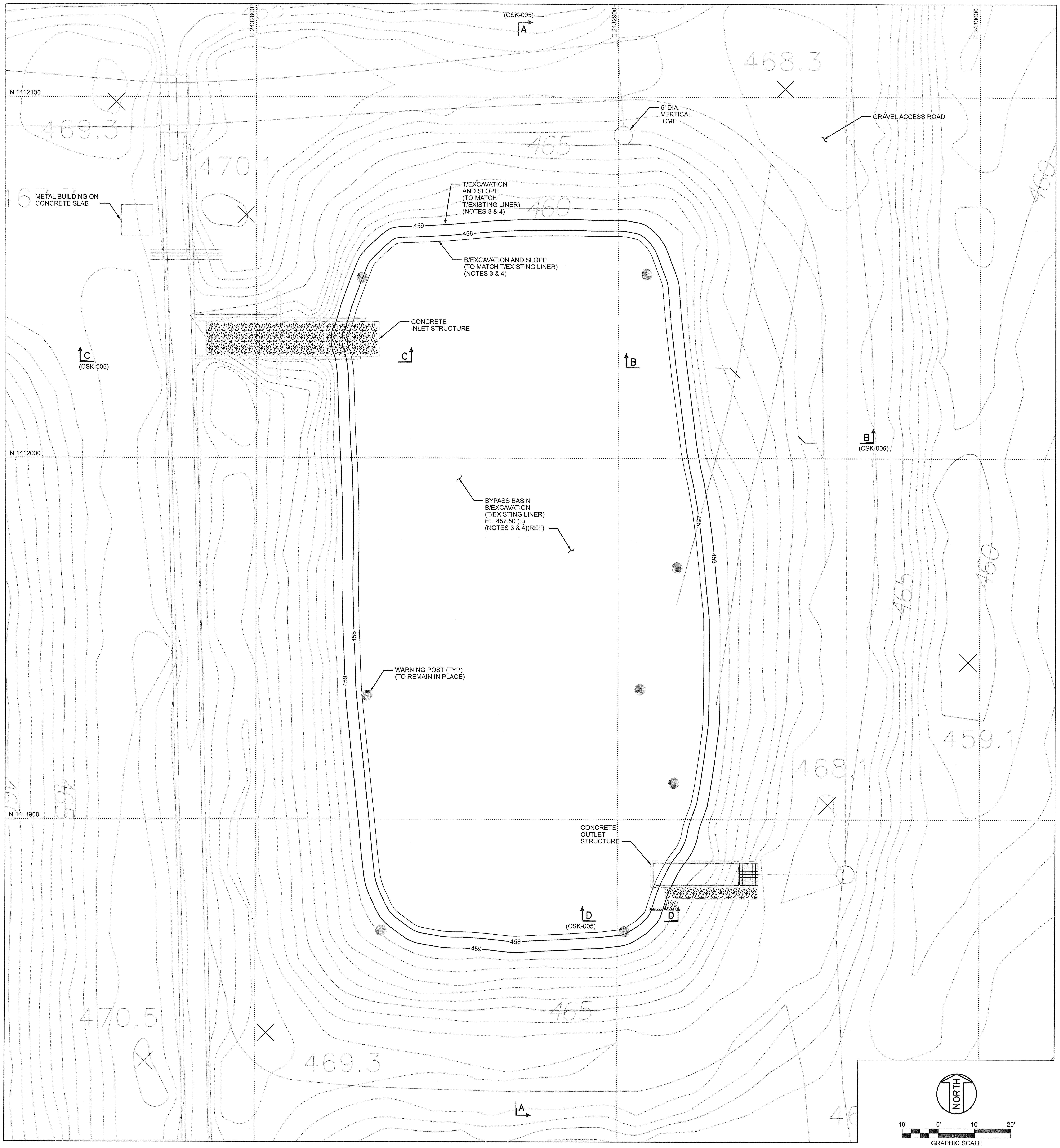

FOR PERMIT
NOT FOR CONSTRUCTION

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1400 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.
3. MATERIAL REMOVAL / EXCAVATION:
   A. ALL MATERIAL ABOVE THE EXISTING GEOMEMBRANE LINER SHALL BE REMOVED. BOTTOM-OF-EXCAVATION (I.E., TOP-OF-EXISTING LINER SURFACE) SHOWN ON THIS DRAWING IS APPROXIMATE.
   B. DURING REMOVAL OF MATERIAL FROM THE BYPASS BASIN, GW CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO AVOID DAMAGING THE BASIN'S EXISTING GEOMEMBRANE LINER. GW CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY BALLASTING AS NECESSARY TO PREVENT UPLIFT OF THE GEOMEMBRANE BY WIND BY THE USE OF SANDBAGS AND/OR OTHER MEANS WHICH WILL NOT DAMAGE THE GEOMEMBRANE. FOR ALL AREAS OF EXISTING LINER THAT ARE DAMAGED, THE GW CONTRACTOR SHALL:
      I. TAKE APPROPRIATE MEASURES TO PREVENT ANY FLUID OR SOLID MATERIALS FROM ENTERING THE SUBGRADE BELOW THE LINER.
      II. NOTIFY THE OWNER IMMEDIATELY.
      III. INSPECT THE EXPOSED SOILS BELOW THE LINER TO DETERMINE WHETHER ANY FLUIDS, CCR CONSTITUENTS, OR CCR-MIXED SOILS HAVE BEEN RELEASED INTO THE BASIN SUBGRADE. IF SUCH MATERIAL HAS BEEN RELEASED INTO THE BASIN SUBGRADE, THE GW CONTRACTOR SHALL REMOVE THE IMPACTED SOILS UNTIL THE AFFECTED AREA HAS BEEN DECONTAMINATED. CONTAMINATED SOILS REMOVED FROM THE BASIN SUBGRADE SHALL BE REPLACED WITH STRUCTURAL FILL IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
      IV. REPAIR THE DAMAGED GEOMEMBRANE LINER AREA IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
   C. MATERIAL REMOVED FROM THE BYPASS BASIN AREA SHALL BE DISPOSED OF AS FOLLOWS:
      I. ALL DRY WASTE SHALL BE DISPOSED OF IN AN OFF-SITE DISPOSAL FACILITY PERMITTED TO RECEIVE CCR WASTE. ALL OFF SITE TRANSPORTATION OF MATERIAL REMOVED FROM THE BYPASS BASIN SHALL BE PERFORMED IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(1).
      II. ALL LIQUID WASTE SHALL BE DISPOSED OF IN THE ASH SURGE BASIN.
   D. GW CONTRACTOR SHALL DEVELOP AND IMPLEMENT FUGITIVE DUST CONTROLS DURING MATERIAL REMOVAL FROM THE BYPASS BASIN AREA IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(2).
   E. GW CONTRACTOR SHALL DEVELOP AND IMPLEMENT MEASURES TO PREVENT CONTAMINATION OF SURFACE WATER, GROUNDWATER, SOIL, AND SEDIMENTS DURING MATERIAL REMOVAL FROM THE BYPASS BASIN AREA IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(4).
   F. AT THE END OF EACH MONTH DURING WHICH MATERIAL REMOVAL FROM THE BYPASS BASIN AREA, GW CONTRACTOR SHALL PREPARE A REPORT DOCUMENTING THE GW CONTRACTOR'S PROGRESS IN REMOVING CCR AND CCR-MIXED SOILS FROM THE AREA. THE MONTHLY REPORT SHALL BE PREPARED IN ACCORDANCE WITH THE RECORDKEEPING REQUIREMENTS STIPULATED IN 35 ILL. ADM. CODE 845.740(D).
4. LINER & CONCRETE DECONTAMINATION :
   A. AFTER REMOVAL OF MATERIAL ABOVE THE EXISTING GEOMEMBRANE LINER AND REPAIR OF ANY DAMAGED AREAS, THE GW CONTRACTOR SHALL DECONTAMINATE THE LINER AND POND APPURTENANT STRUCTURES. AT A MINIMUM, THE EXPOSED GEOMEMBRANE SHALL BE PRESSURE WASHED IN A SYSTEMATIC MANNER TO REMOVE ALL CCR AND RESIDUALS OF CCR. WASH AND RINSE WATER SHALL BE COLLECTED AND DISPOSED OF IN THE ASH SURGE BASIN OR AS OTHERWISE DIRECTED BY THE OWNER.
   B. AS AN AREA WITHIN THE BYPASS BASIN IS DECONTAMINATED, THE GW CONTRACTOR AND CQA CONTRACTOR (P-1401) SHALL VISUALLY INSPECT THE SUBJECT AREA WITH THE OWNER'S REPRESENTATIVE(S) TO ENSURE THE AREA IS NO LONGER CONTAMINATED WITH CCR CONSTITUENTS AND REMAINS COMPETENT FOR RE-USE (I.E., NO REPAIRS ARE REQUIRED).
   C. UPON COMPLETION OF DECONTAMINATION ACTIVITIES FOR A GIVEN AREA OF EXISTING GEOMEMBRANE LINER BY THE GW CONTRACTOR, THE CQA CONTRACTOR (P-1401) SHALL:
      I. PERFORM AN ELECTRICAL LEAK LOCATION SURVEY OVER THE DECONTAMINATED LINER AREA IN ACCORDANCE WITH ASTM D7953. IF THE SURVEY LOCATES A BREACH (HOLE, PUNCTURE, TEAR, DEFECT, ETC.) IN THE GEOMEMBRANE, THE CQA CONTRACTOR SHALL NOTIFY THE OWNER AND GW CONTRACTOR IMMEDIATELY, AND THE GW CONTRACTOR SHALL ADDRESS THE BREACH IN ACCORDANCE WITH NOTE 3.B.
      II. CUT-OUT AND REMOVE A MINIMUM OF THREE SAMPLES OF THE DECONTAMINATED GEOMEMBRANE LINER. THE GW CONTRACTOR SHALL REPAIR THE GEOMEMBRANE LINER AT ALL SAMPLE LOCATIONS IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
      III. ALL SAMPLES SHALL BE ANALYZED BY A CERTIFIED LABORATORY IN ACCORDANCE WITH EPA SW-846 TEST METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE. IF THE CONCENTRATIONS OF CCR CONSTITUENTS MEASURED BY THIS TEST METHOD MEET THE GROUNDWATER PROTECTION STANDARDS SPECIFIED IN THE OPERATING PERMIT ISSUED BY THE ILLINOIS EPA FOR THE BYPASS BASIN, THEN THE AREA OF EXISTING GEOMEMBRANE LINER REPRESENTATED BY THAT SAMPLE IS CONSIDERED TO BE DECONTAMINATED. OTHERWISE, THAT AREA OF EXISTING GEOMEMBRANE LINER IS NOT CONSIDERED TO BE DECONTAMINATED.
   D. GW CONTRACTOR SHALL RECLEAN ANY AREAS THAT ANALYTICAL TESTING INDICATES ARE NOT DECONTAMINATED (I.E., ANALYTICAL TESTING OF A COLLECTED SAMPLE DETECTS AT LEAST ONE CCR CONSTITUENT EXCEEDS THE CONSTITUENT'S GROUNDWATER PROTECTION STANDARD LISTED IN IN THE OPERATING PERMIT ISSUED BY THE ILLINOIS EPA FOR THE BYPASS BASIN). AFTER RECLEANING A GIVEN AREA, THE CQA CONTRACTOR (P-1401) SHALL COLLECT AND TEST ONE ADDITIONAL SAMPLE FROM THE AREA PER NOTE 4.C.
   E. LINER DECONTAMINATION IS CONSIDERED COMPLETE WHEN ALL COLLECTED LINER SAMPLES MEET THE DECONTAMINATION CRITERIA IN NOTE 4.C.III.

REFERENCE DRAWINGS

CSK-005	BYPASS BASIN EXCAVATION SECTIONS & DETAILS
D1965C010-02	BYPASS BASIN LINER REPLACEMENT PRE-CONSTRUCTION CONDITIONS

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

NO.	DESCRIPTION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	03-11-2022	FOR CLIENT COMMENT
B	04-15-2022	FOR PUBLIC COMMENT
C	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

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THOMAS DEHLIN
07-15-2022

LICENSED PROFESSIONAL ENGINEER THOMAS J DEHLIN 062-068314 OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
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CAD FILE NAME: POW-BBR-CSK-004.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BYPASS BASIN
BYPASS BASIN EXCAVATION
PLAN

DRAWING NUMBER	REVISION
POW-BBR-CSK-004	C

SHEET 1 OF 1

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Revision 11A, Revision Date: 04-30-2010

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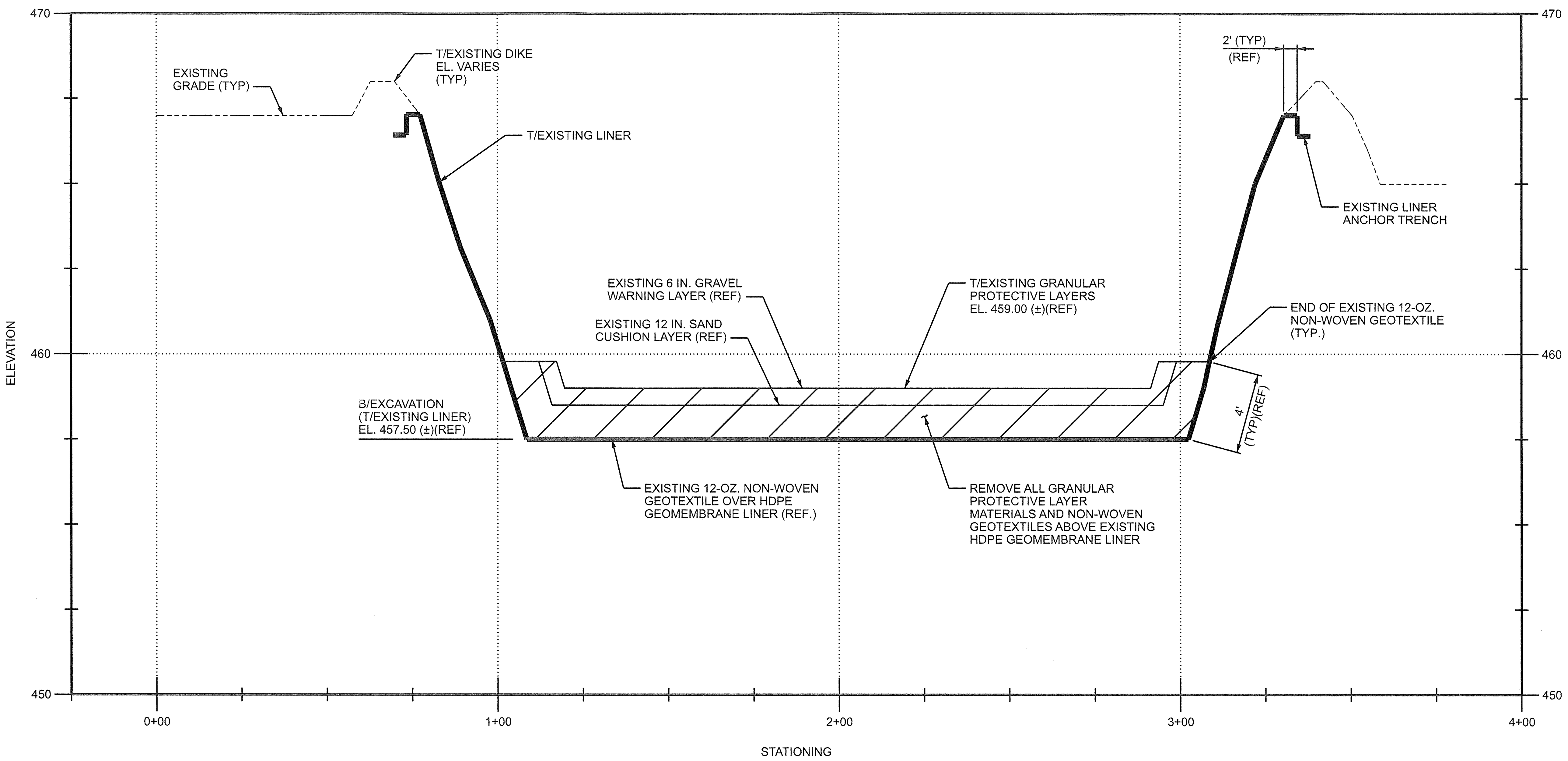
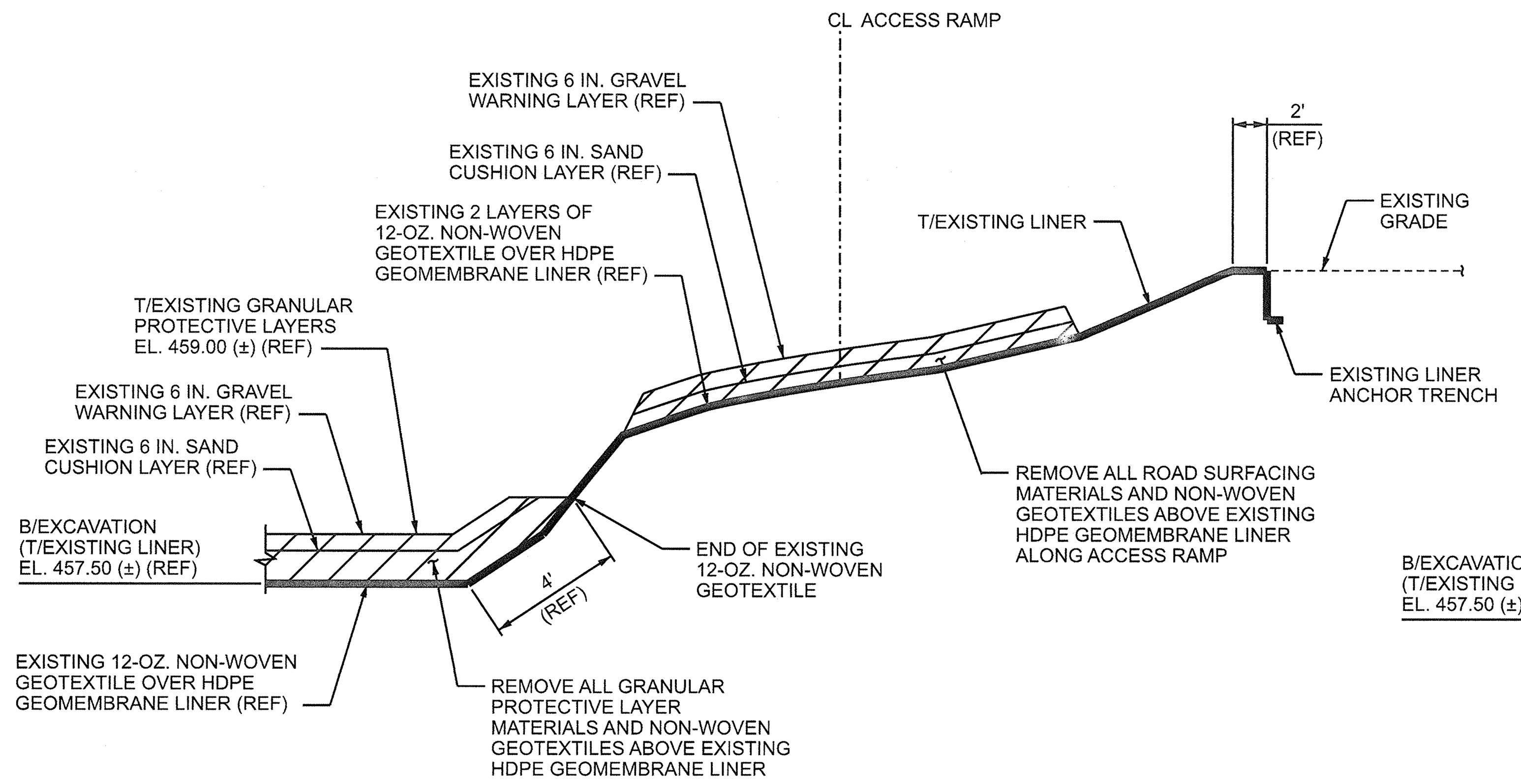


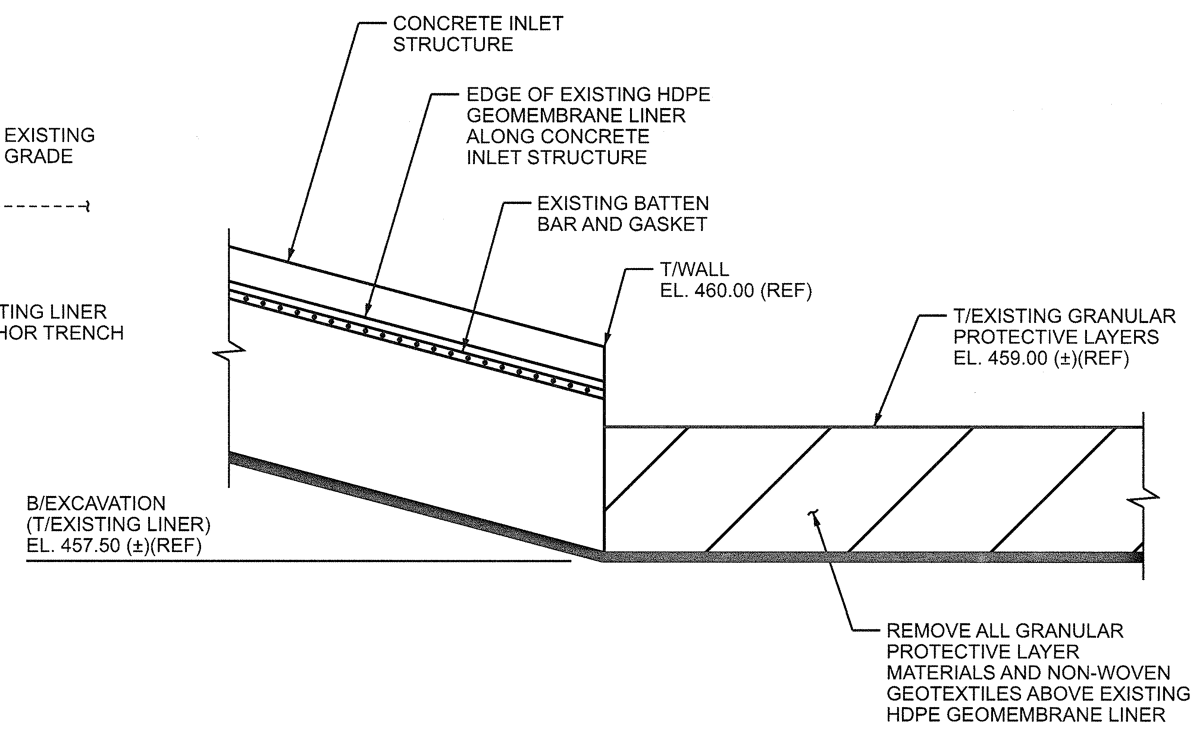
SECTION A

HORIZONTAL SCALE 1"=20'
VERTICAL SCALE 1"=2'
(CSK-004)



SECTION B

SCALE: N.T.S.
(CSK-004)



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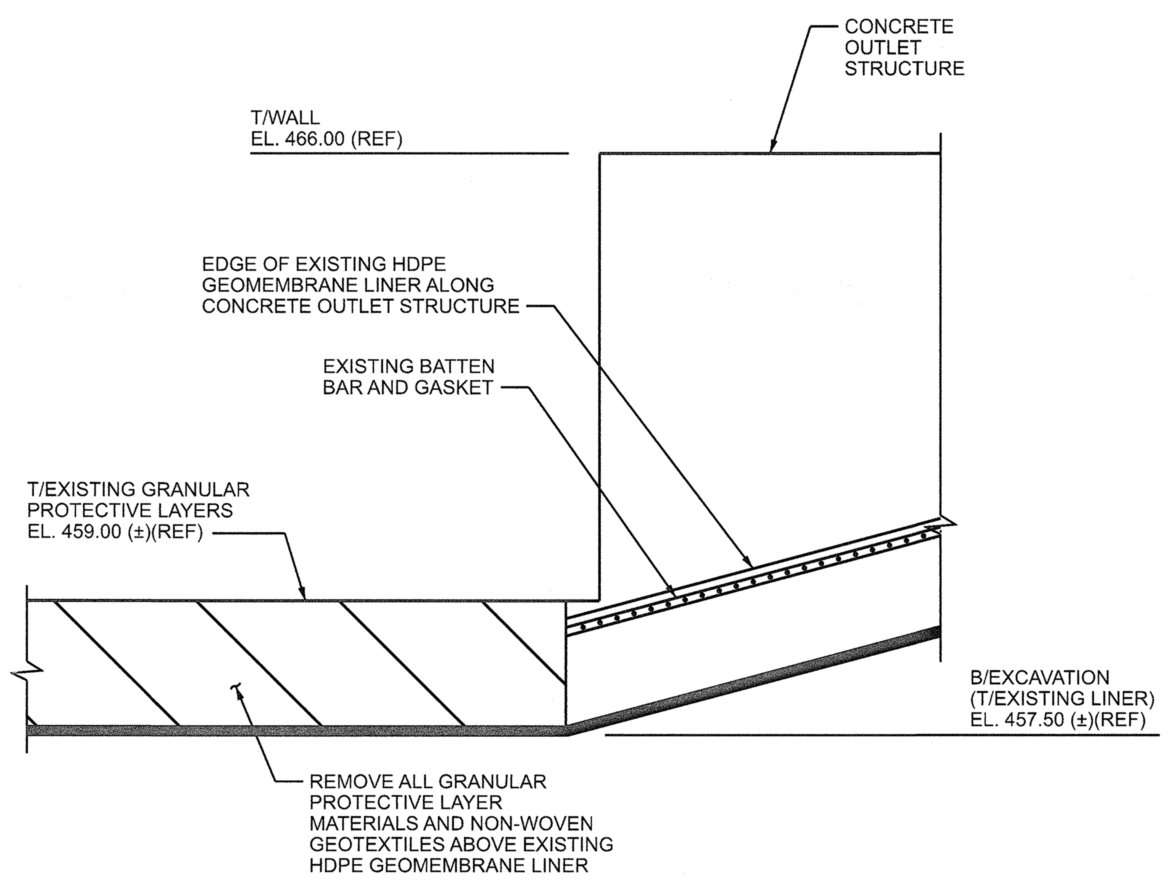
(CSK-004)



SECTION D

SCALE: N.T.S.
(CSK-004)

NOTES

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2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.

REFERENCE DRAWINGS

CSK-004	BYPASS BASIN EXCAVATION PLAN
D1965C031-02	BYPASS BASIN LINER REPLACEMENT DETAILS AND SECTIONS

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

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ISSUE PURPOSE:	PERMIT
SPECIFICATION:	P-1400
PROJECT NO.:	12661-130

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THOMAS DEHLIN
07-15-2022

LICENSED PROFESSIONAL ENGINEER THOMAS J. DEHLIN 062-068314 OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
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CAD FILE NAME:	POW-BBR-CSK-005.DGN
PREPARED BY:	J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	T. DEHLIN

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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BYPASS BASIN
BYPASS BASIN EXCAVATION
SECTIONS & DETAILS

DRAWING NUMBER	REVISION
POW-BBR-CSK-005	C

SHEET 1 OF 1

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Revision 11A, Revision Date: 04-30-2010

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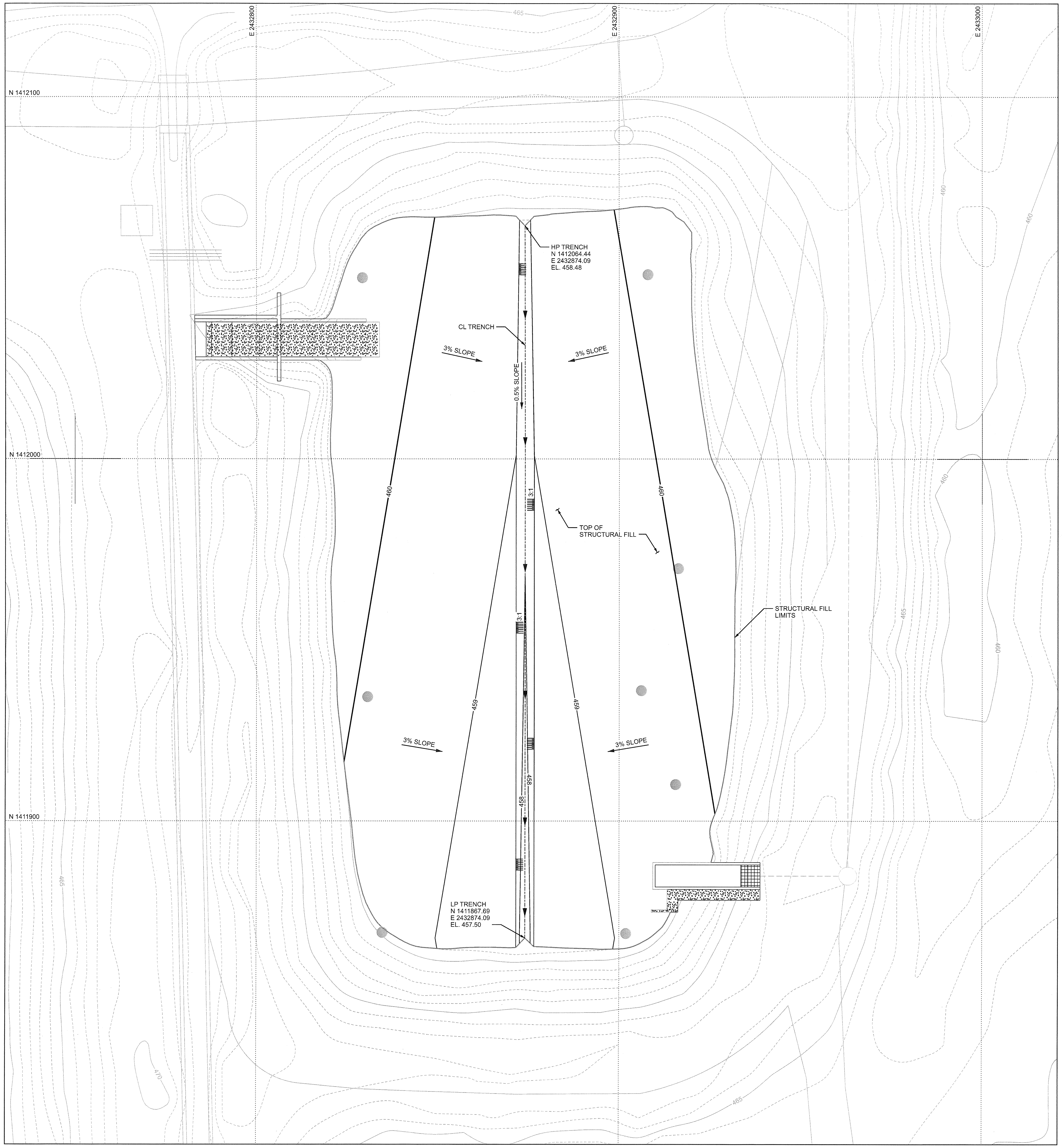

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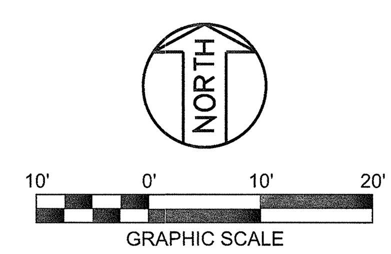

LEGEND

——465——	MAJOR CONTOUR
——464——	MINOR CONTOUR

NOTES

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REFERENCE DRAWINGS

CSK-004	BYPASS BASIN EXCAVATION PLAN
CSK-008	BYPASS BASIN SECTIONS & DETAILS

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ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

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Th. Dhlo
THOMAS DEHLIN
07-15-2022

MY LICENSE RENEWAL DATE IS: 11-30-2023
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LICENSED PROFESSIONAL ENGINEER
THOMAS J. DEHLIN
062-068314
OF ILLINOIS

CAD FILE NAME: POW-BBR-CSK-006.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BYPASS BASIN STRUCTURAL FILL GRADING PLAN

DRAWING NUMBER	REVISION
POW-BBR-CSK-006	C

SHEET 1 OF 1

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Revision 11A, Revision Date: 04-30-2010

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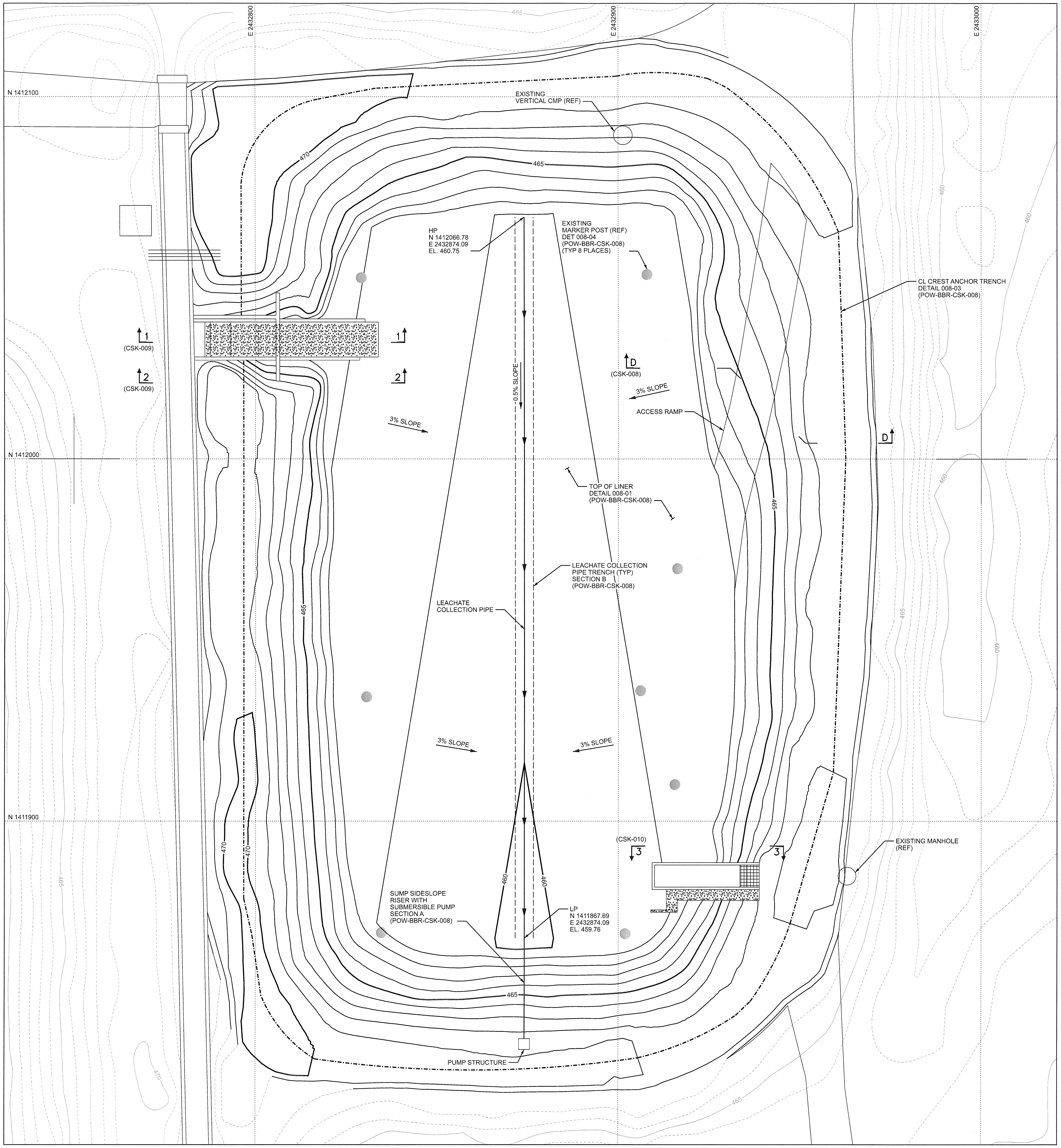

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NORTH

10' 0' 10' 20'
GRAPHIC SCALE

LEGEND

465	MAJOR CONTOUR
464	MINOR CONTOUR

NOTES

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2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.

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CSK-004	BYPASS BASIN EXCAVATION PLAN
CSK-008	BYPASS BASIN SECTIONS & DETAILS

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07-15-2022

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REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BYPASS BASIN COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN

DRAWING NUMBER	REVISION
POW-BBR-CSK-007	C

SHEET 1 OF 1

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Revision 11A, Revision Date: 04-30-2010

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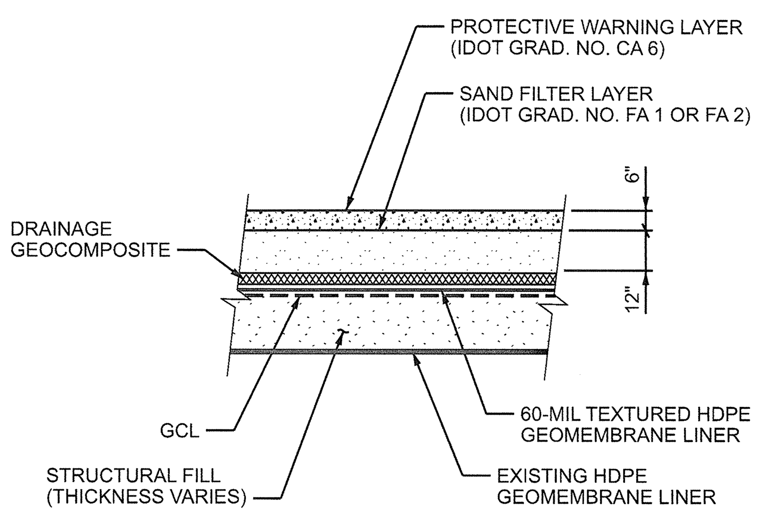

TYPICAL LINER BASE DETAIL
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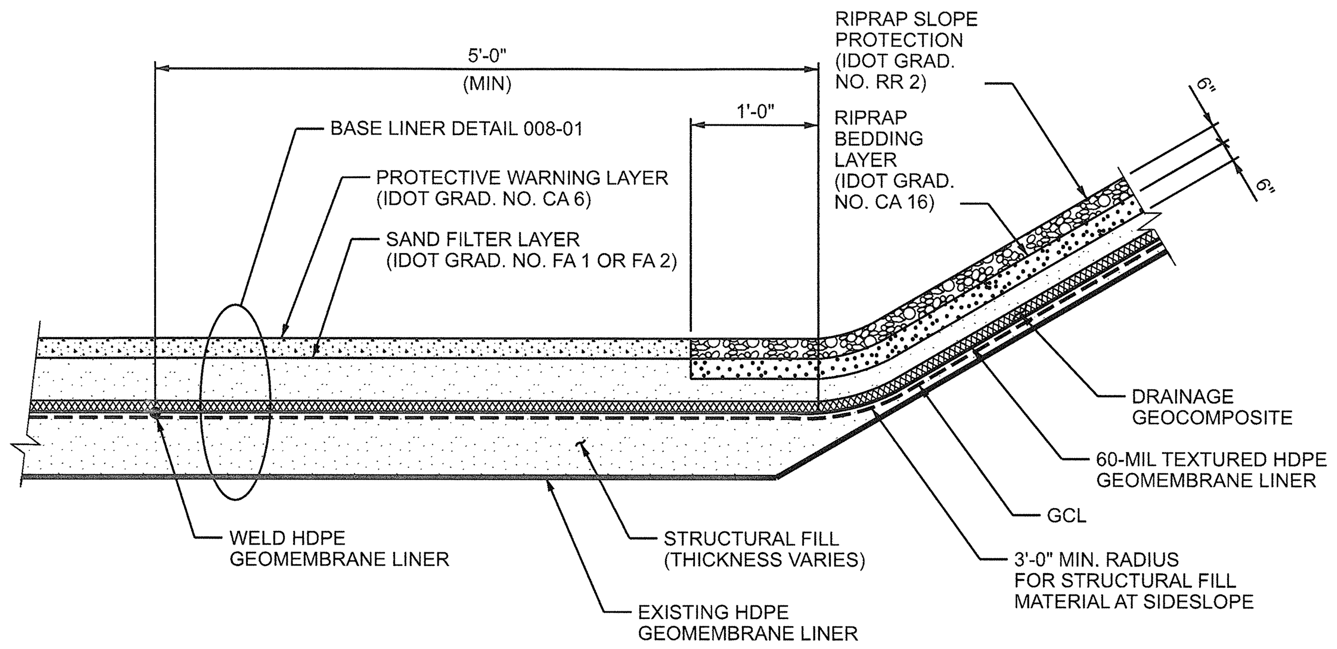

TYPICAL SLOPE TRANSITION DETAIL
DETAIL 008-02
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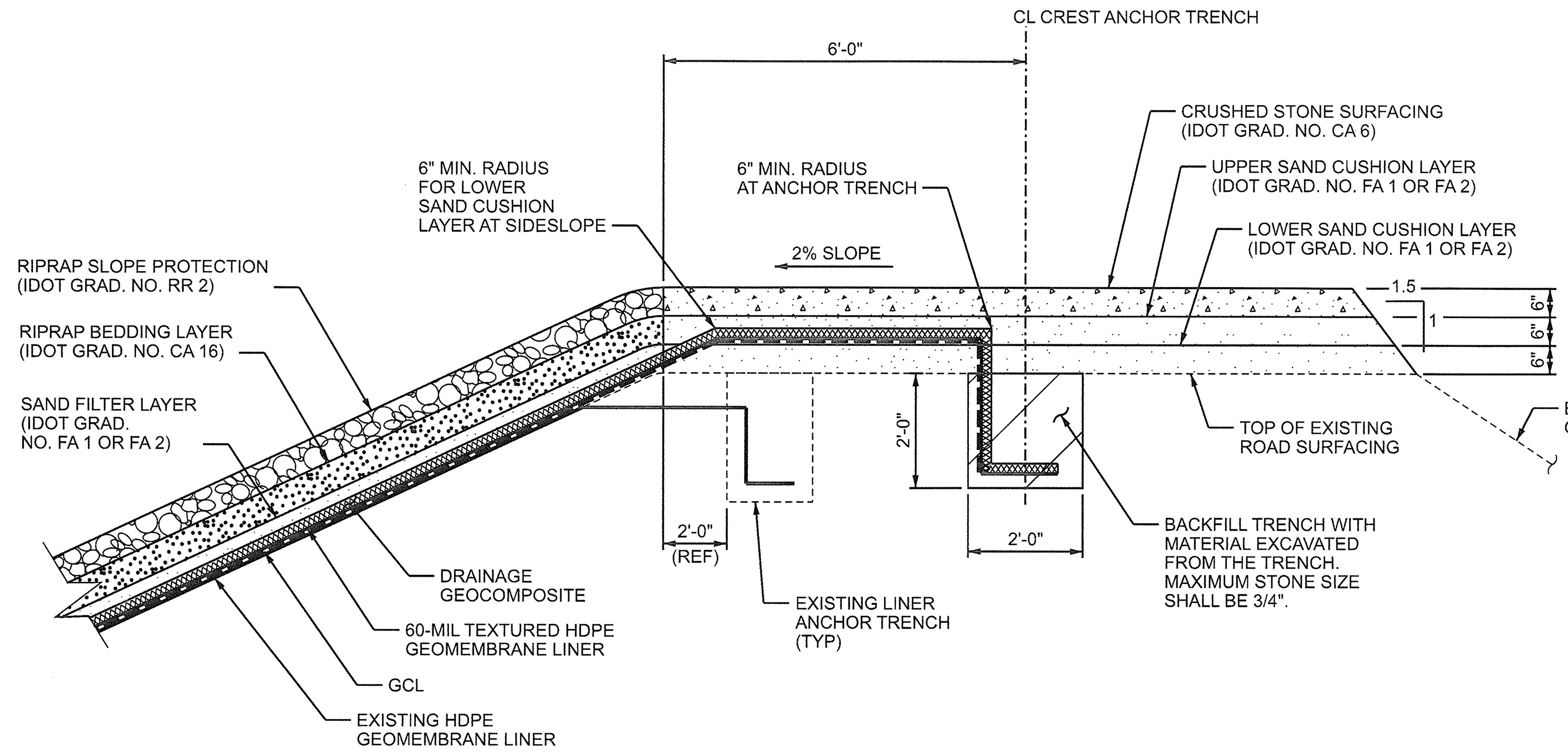
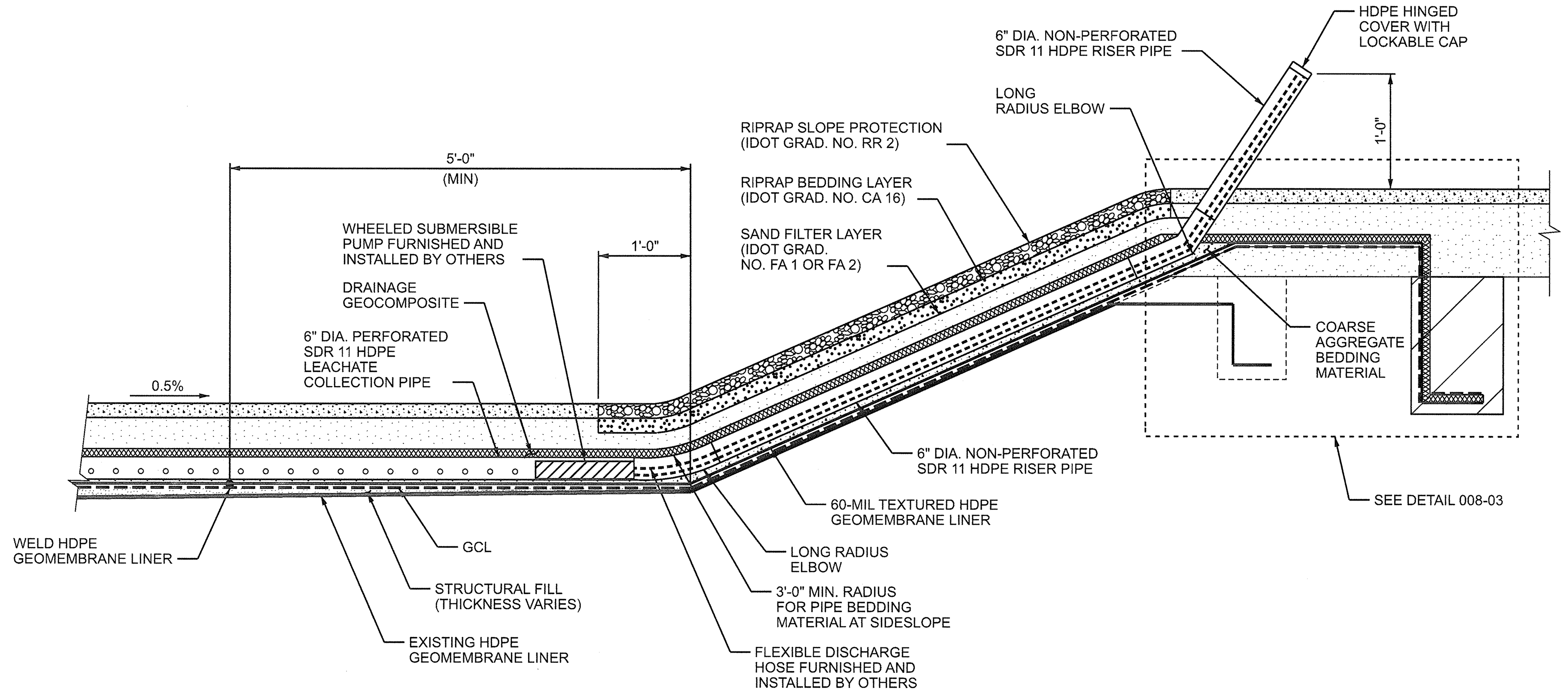
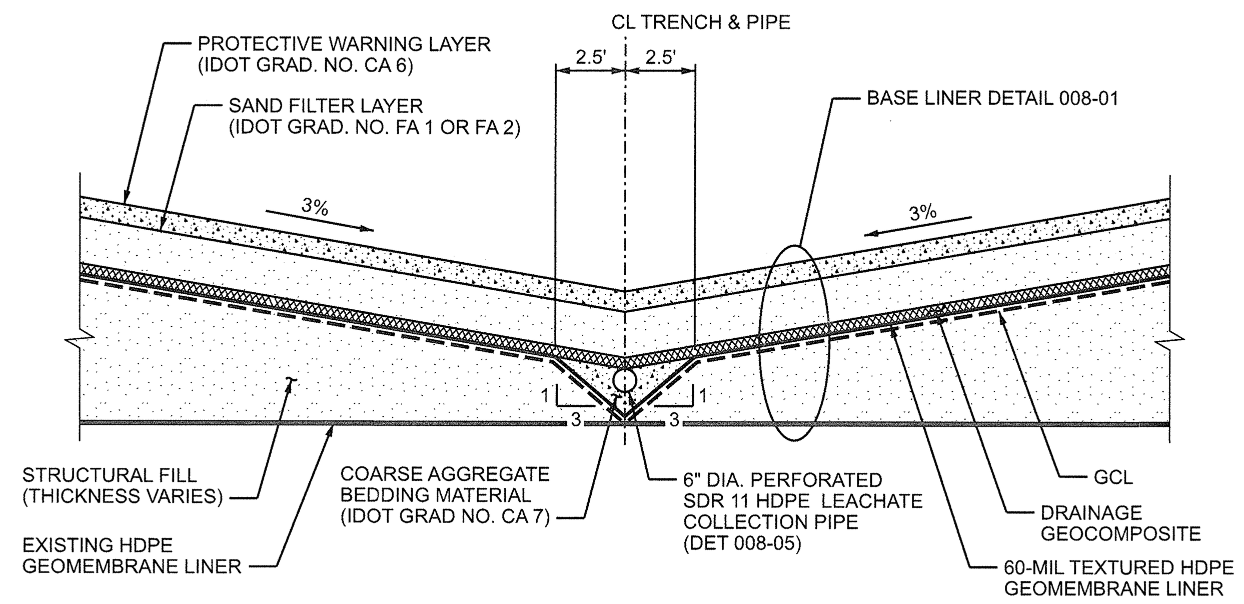


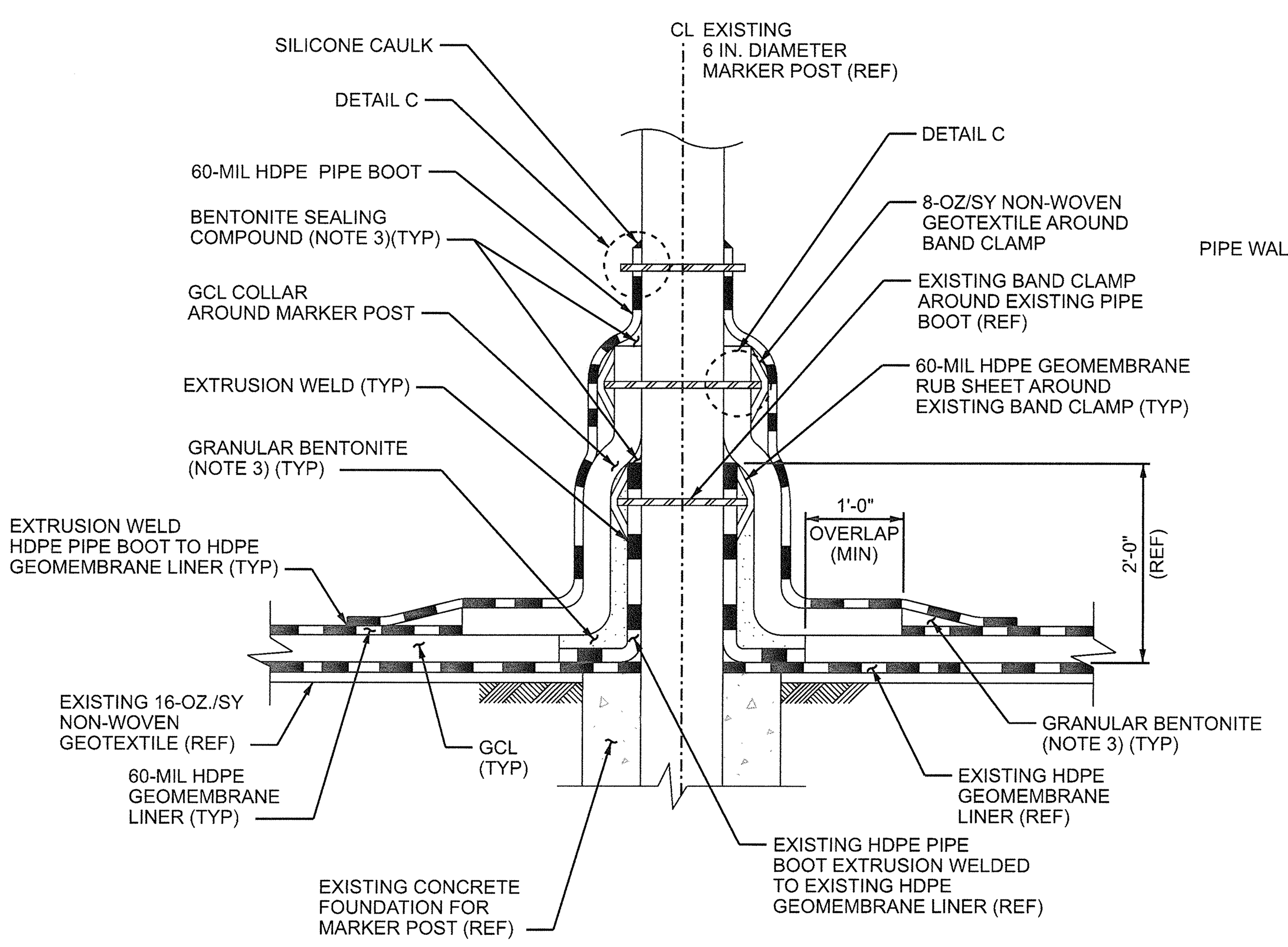
TYPICAL CREST ANCHOR TRENCH DETAIL
DETAIL 008-03
N.T.S.



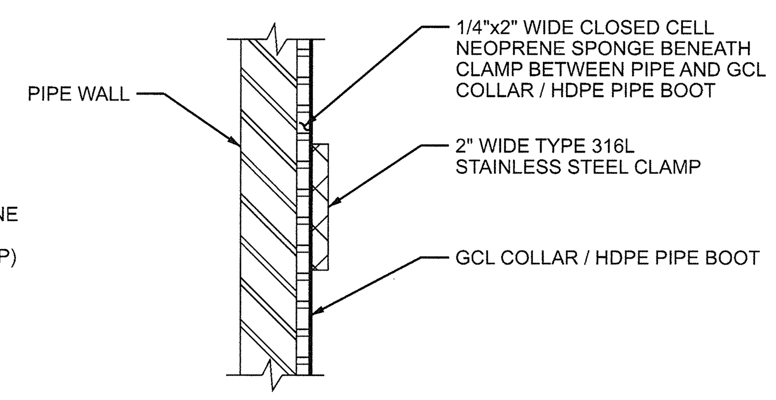
TYPICAL SECTION AT LEACHATE COLLECTION SUMP PUMP
SECTION A
N.T.S.



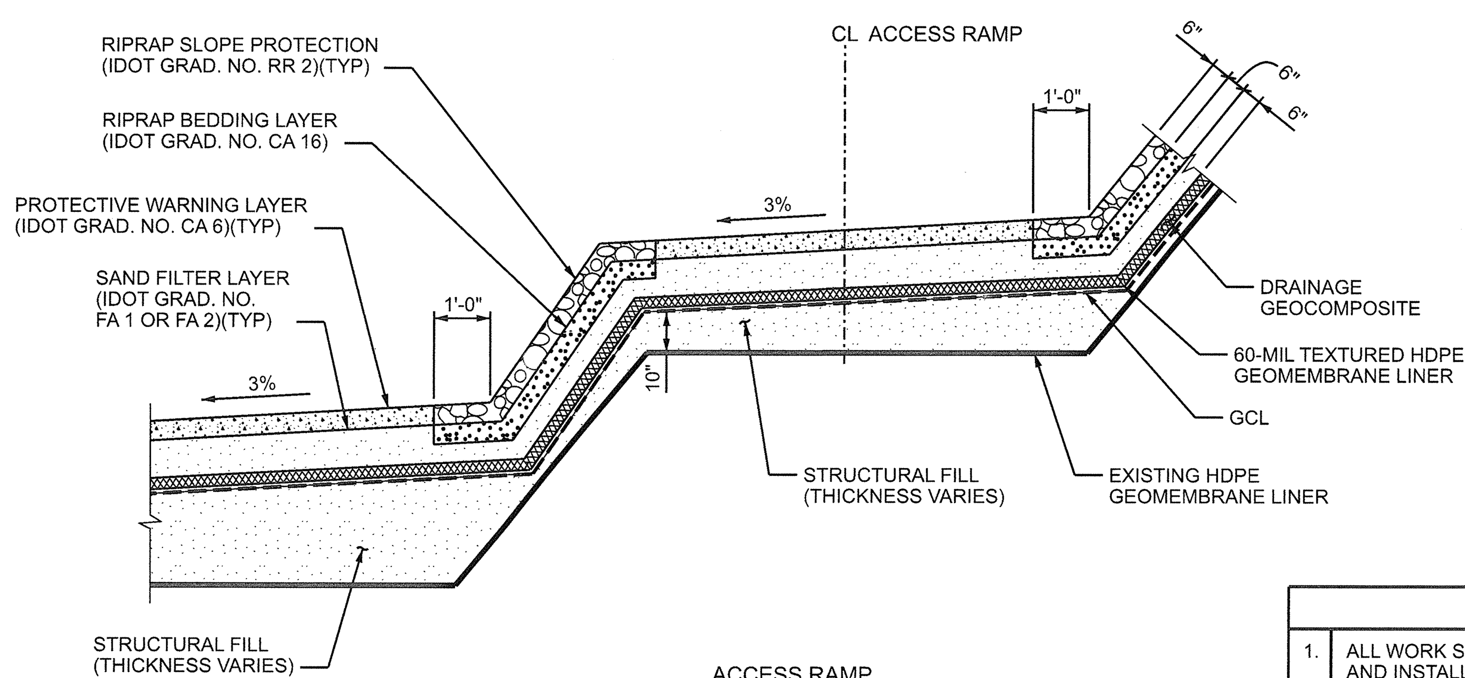
TYPICAL SECTION AT LEACHATE COLLECTION TRENCH
SECTION B
N.T.S.



LINER CONNECTION AT EXISTING MARKER POST
DETAIL 008-04
N.T.S.
NOTE: PROTECTIVE WARNING LAYER, SAND FILTER LAYER, AND DRAINAGE GEOCOMPOSITE ARE NOT SHOWN FOR CLARITY



DETAIL C
N.T.S.



ACCESS RAMP
SECTION D
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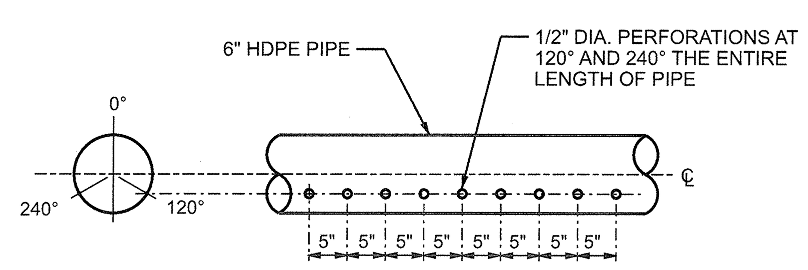

6" DIAMETER PERFORATED HDPE LEACHATE COLLECTION PIPE

TYPICAL PERFORATED PIPE DETAIL
DETAIL 008-05
N.T.S.

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1400 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.
3. GW CONTRACTOR SHALL APPLY GRANULAR BENTONITE AND BENTONITE SEALING COMPOUND IN BETWEEN EXISTING HDPE GEOMEMBRANE LINER AND GCL AS SPECIFIED AT A MINIMUM RATE OF 1 LB PER LINEAR FOOT.

REFERENCE DRAWINGS

D1965C031-02	BYPASS BASIN LINER REPLACEMENT DETAILS AND SECTIONS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	03-11-2022	FOR CLIENT COMMENT
B	04-15-2022	FOR PUBLIC COMMENT
C	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS.

THOMAS DEHLIN
07-15-2022

MY LICENSE RENEWAL DATE IS: 11-30-2023
PAGES OR SHEETS COVERED BY THIS SEAL:
THIS DOCUMENT ONLY.

LICENSED PROFESSIONAL ENGINEER THOMAS J. DEHLIN 062-068314 OF ILLINOIS

CAD FILE NAME: POW-BBR-CSK-008.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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Sargent & Lundy LLC

SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BASIN RETROFIT
SECTIONS & DETAILS

DRAWING NUMBER	REVISION
POW-BBR-CSK-008	C

SHEET 1 OF 1

$PINFO1$
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

$TIME$
$DATE$
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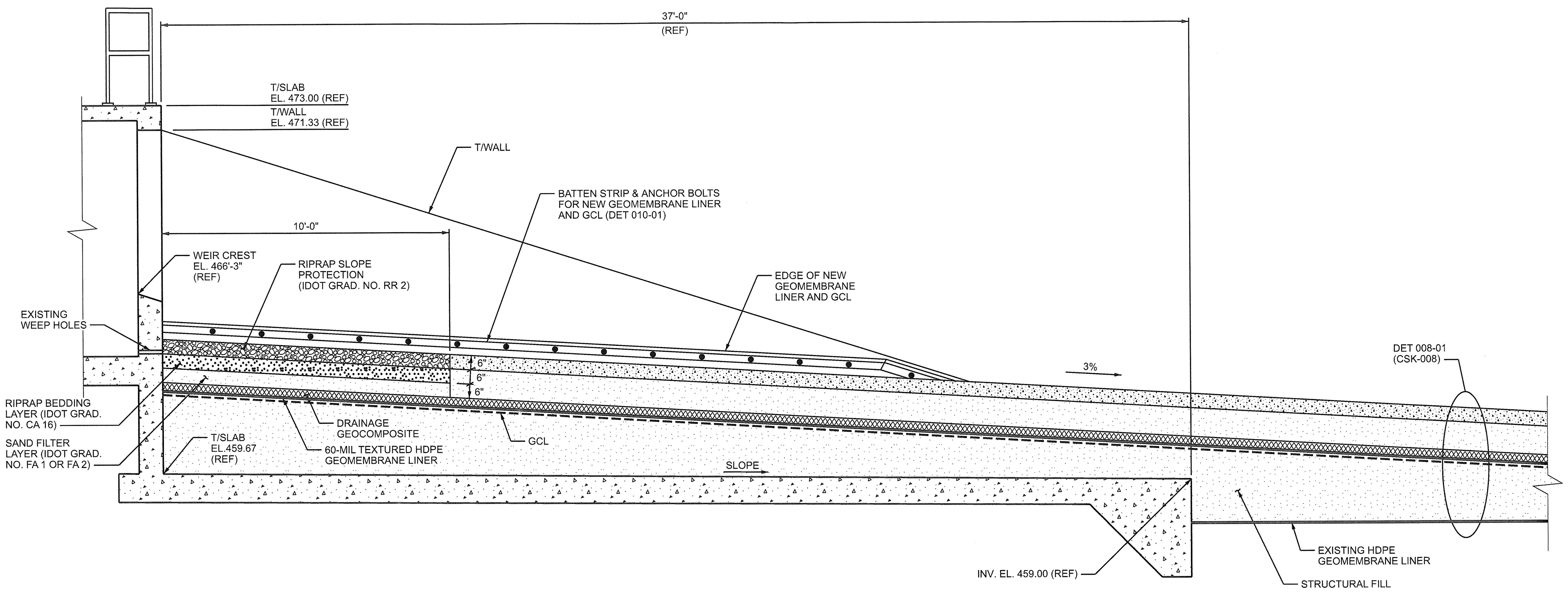
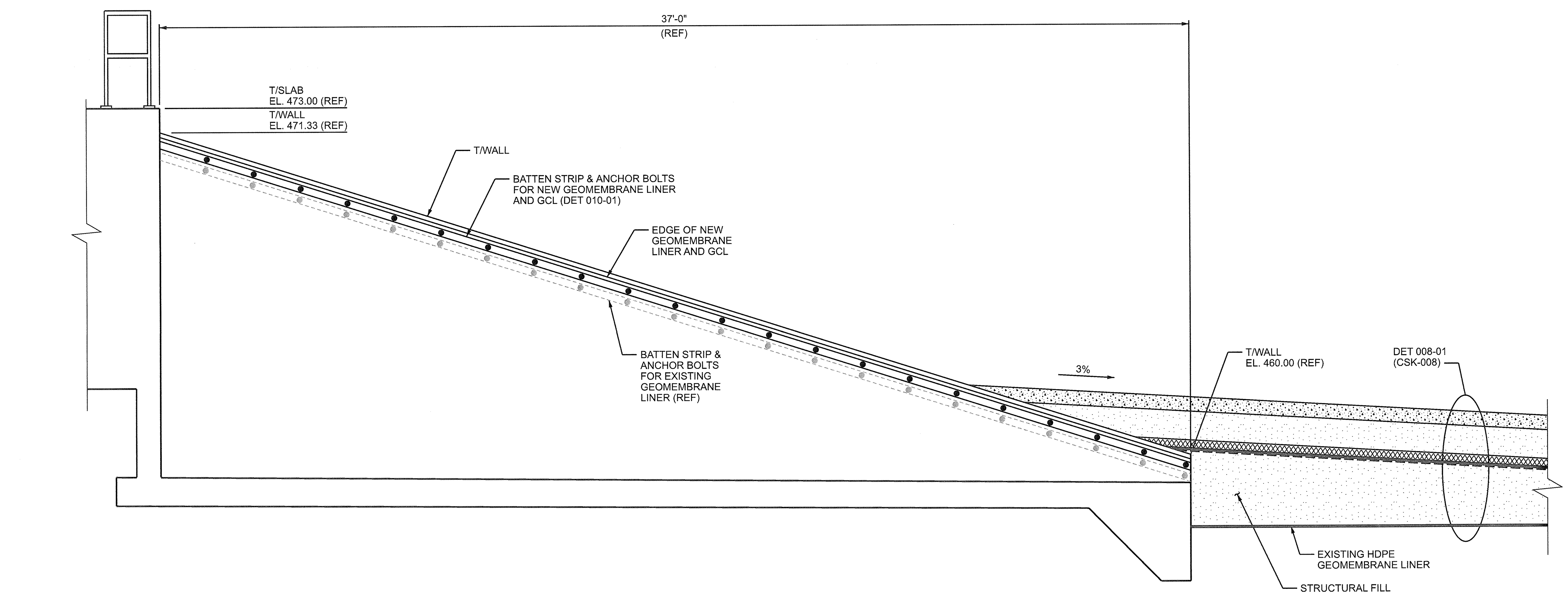


INTERIOR OF CONCRETE INLET STRUCTURE
SECTION 1
N.T.S.



EXTERIOR OF CONCRETE INLET STRUCTURE
SECTION 2
N.T.S.

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1400 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-BBR-CSK-002.

REFERENCE DRAWINGS

D1965C032-02	BYPASS BASIN LINER REPLACEMENT DETAILS AND SECTIONS
5295-C-5501	ASH SURGE BASIN BYPASS BASIN INLET STRUCTURE

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FOR PERMIT
NOT FOR CONSTRUCTION

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B	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

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07-15-2022

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PREPARED BY: J. CHAVEZ
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MWG
Midwest Generation, LLC

PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

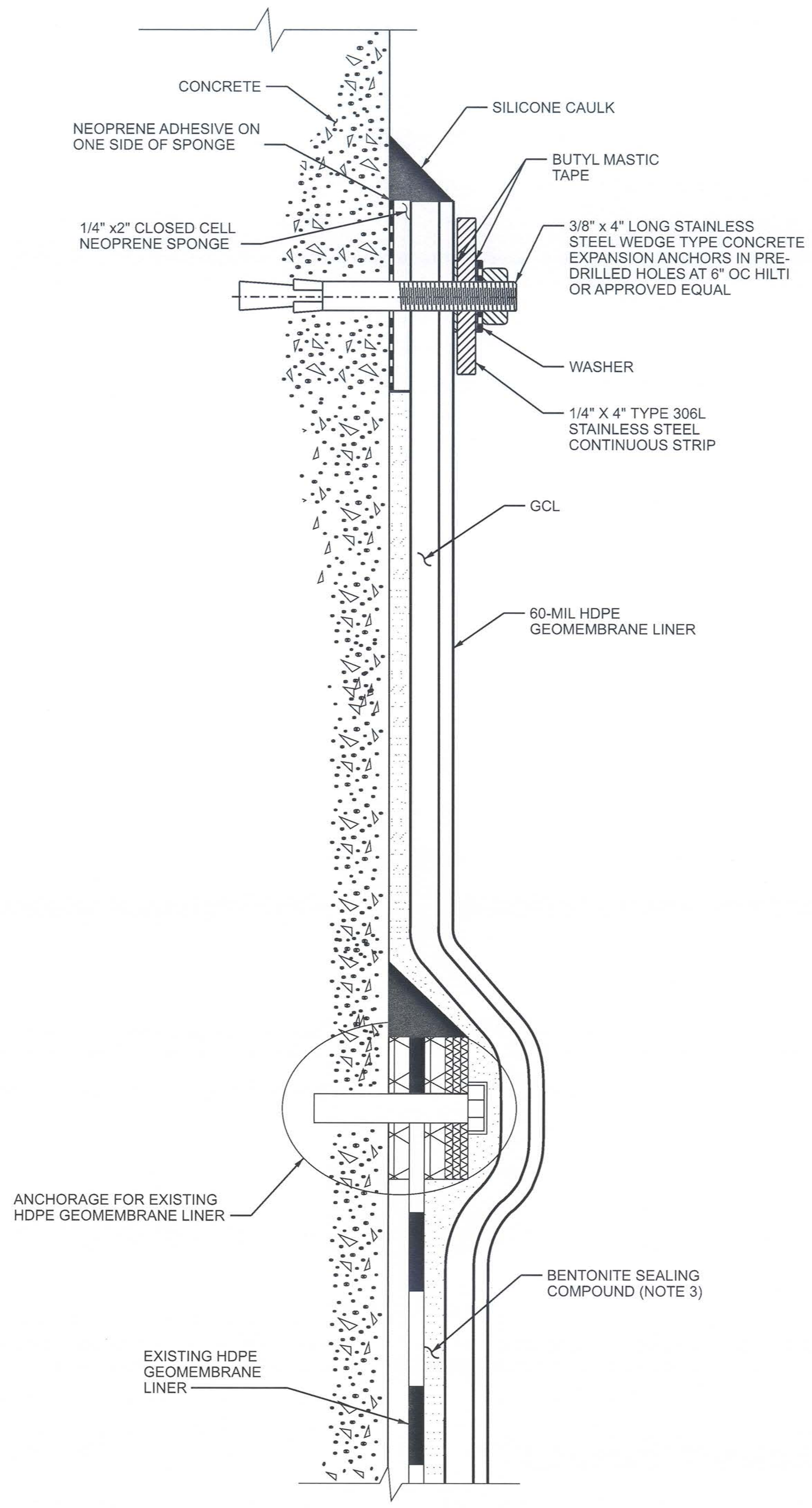
RETROFITTED BASIN RETROFIT
INLET & OUTLET STRUCTURE
DETAILS

DRAWING NUMBER	REVISION
POW-BBR-CSK-009	B

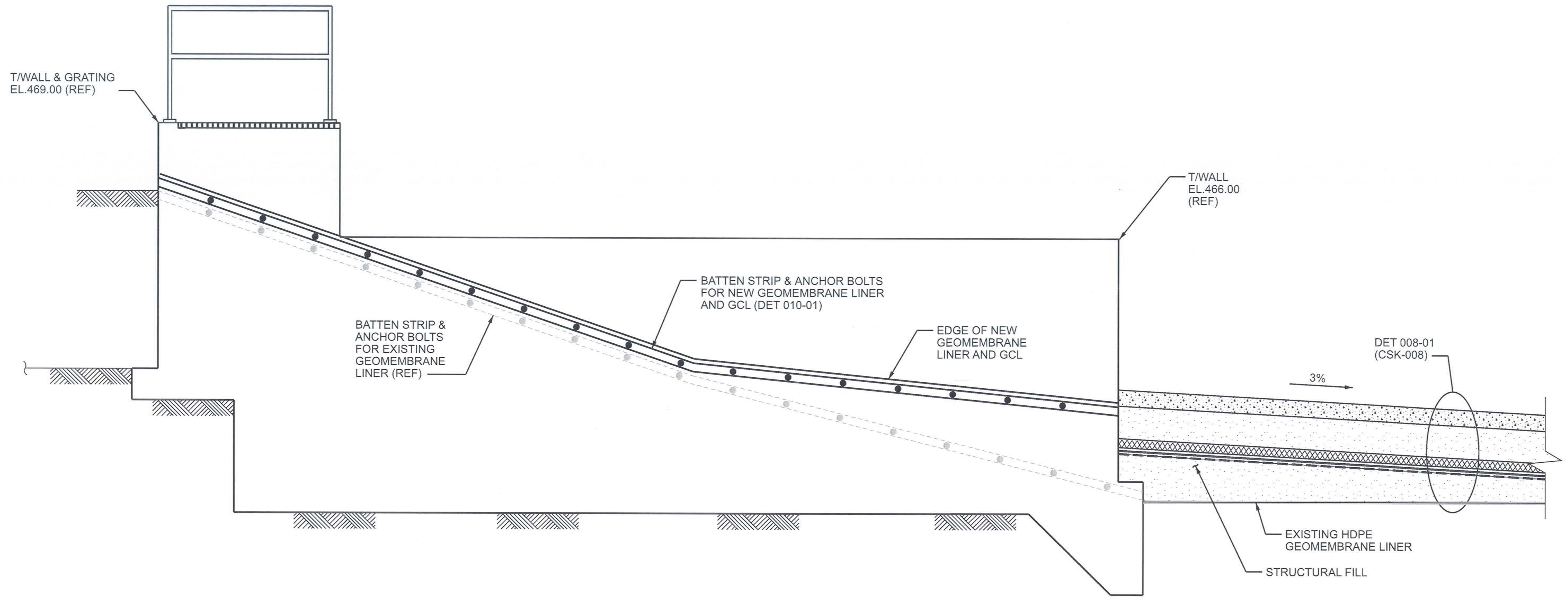
SHEET 1 OF 1

$PNFO1$
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

$TIME$ $DATE$ $FILEABBREV$



GCL & GEOMEMBRANE LINER ANCHORING TO CONCRETE
DETAIL 010-01
N.T.S.



EXTERIOR OF CONCRETE OUTLET STRUCTURE
SECTION 3
N.T.S.

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1400 UNLESS NOTED OTHERWISE.
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REFERENCE DRAWINGS

D1965C031-02	BYPASS BASIN LINER REPLACEMENT DETAILS AND SECTIONS
5295-C-5502	ASH SURGE BASIN BY-PASS BASIN OUTLET STRUCTURE

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A	04-15-2022	FOR PUBLIC COMMENT
B	07-15-2022	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1400
PROJECT NO.: 12661-130

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Th. Dehlin
THOMAS DEHLIN
07-15-2022

LICENSED PROFESSIONAL ENGINEER
THOMAS J. DEHLIN
062-068314
OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
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CAD FILE NAME: POW-BBR-CSK-010.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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PROJECT

MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
BYPASS BASIN RETROFIT PROJECT

DRAWING TITLE

RETROFITTED BASIN RETROFIT
INLET & OUTLET STRUCTURE
DETAILS

DRAWING NUMBER: POW-BBR-CSK-010
REVISION: B
SHEET 1 OF 1

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Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

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ATTACHMENT 2

SPECIFICATION P-1401 – CONSTRUCTION QUALITY ASSURANCE FOR BYPASS BASIN RETROFIT

Note: See Attachment 5-2 for Specification P-1401

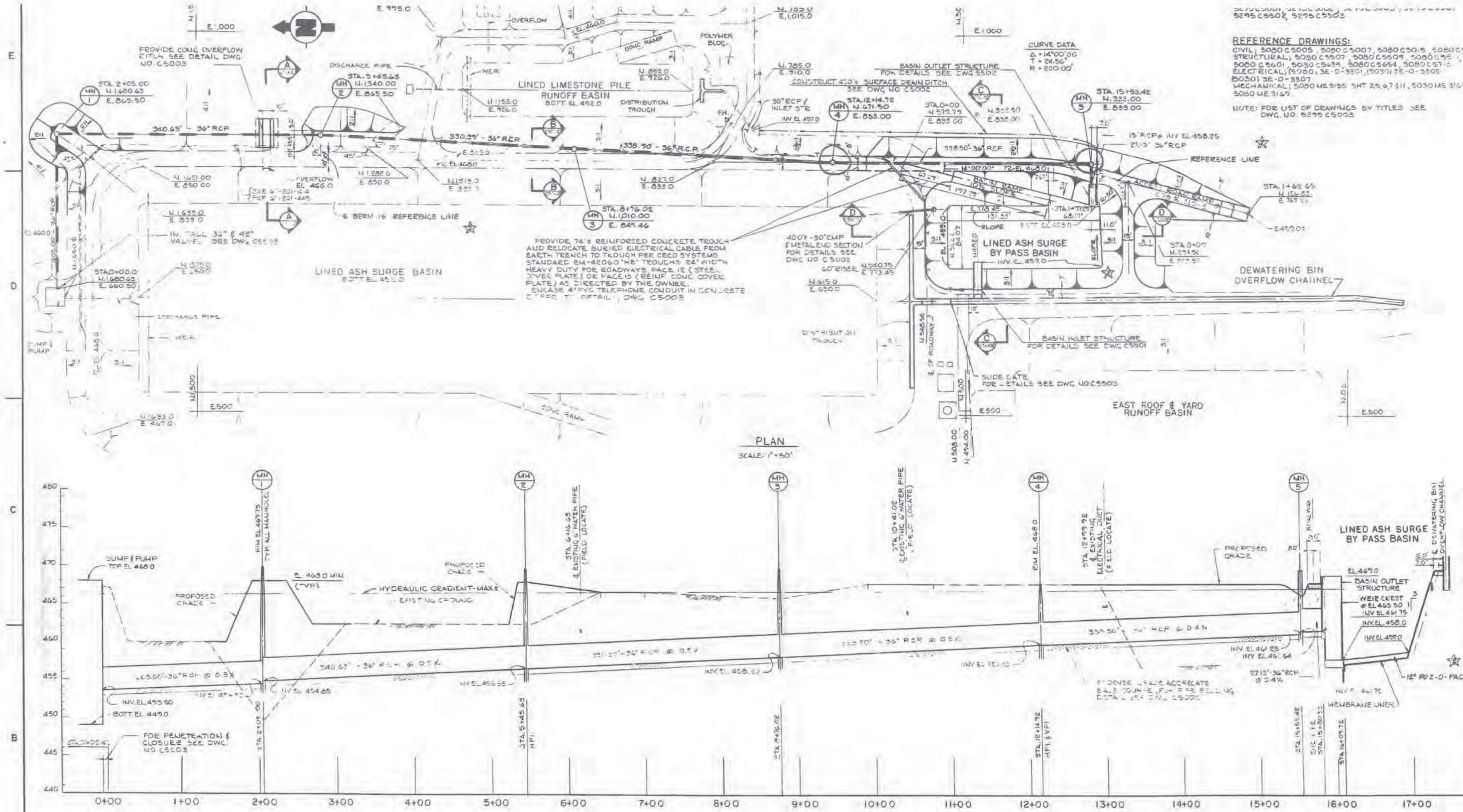
ATTACHMENT 3

REFERENCE DRAWINGS

ATTACHMENT 3-1

1980 CONSTRUCTION DRAWINGS

DRAWING NO.	TITLE
5925-C-5001	ASH SURGE BASIN BY PASS PLAN AND PROFILE
5925-C-5002	ASH SURGE BASIN BY PASS SECTIONS AND RAMP PROFILES
5295-C-5003	ASH SURGE BASIN BY PASS MISCELLANEOUS DETAILS
5295-C-5501	ASH SURGE BASIN BY PASS BASIN INLET STRUCTURE
5925-C-5502	ASH SURGE BASIN BY PASS BASIN OUTLET STRUCTURE
5925-C-5503	MISCELLANEOUS SLIDE GATES



REFERENCE DRAWINGS:
CIVIL; 5080C5005, 5080C5007, 5080C5015, 5080C5121
STRUCTURAL; 5080C5507, 5080C5509, 5080C5511, 5080C5601, 5080C5638, 5080C5654, 5080C5713
ELECTRICAL; (5080) 3E-0-3301, (5080) 3E-0-3305, (5080) 3E-0-3307
MECHANICAL; 5080ME3156 SHT 2,5,6,7 & 11, 5080ME3165, 5080ME3167

NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG. NO. 5295C5003

2 (a) REMOVED 9" SELECT FILL AND 9" GRAVEL BLANKET (TOTAL 1'-6") FROM BOTTOM BY-PASS BASIN. REPLACED WITH 12" POZ-O-PAC
(b) ADDED ELEV., SLOPE AND REFERENCE LINE NOTATIONS TO PLAN.

DRFTSMN
CHKR
COG ENGR
DISCIP MGR
PROJ MGR

SPECIFICATION:

3. MANHOLES
MANHOLES SHALL BE THE SIZE AND AT THE LOCATIONS AND GRADES SHOWN ON THE CONTRACT DRAWINGS. MATERIAL FOR THE WALL SHALL BE EITHER CAST IN-PLACE REINFORCED CONCRETE OR PRECAST REINFORCED CONCRETE SECTIONS. PRECAST MANHOLES SHALL BE MANUFACTURED TO THE REQUIREMENTS OF ANSI/ASTM C478-78 A STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS. JOINTS ARE TO BE SEALED WITH O-RING GASKETS. MANHOLES SHALL BE CONSTRUCTED FOR 15 FOOT HYDROSTATIC HEAD. THE COMPLETED CHANNEL THROUGH THE MANHOLE SHALL BE U-SHAPED ... THE DIAMETER. CAST FRAME (370 LBS) AND COVER (115 LBS) SHALL BE GRAY IRON ILLINOIS DOT STANDARD 1213-4 TYPE 1 (NEENAH CAT NO. R-1015, REF R-1712) OR EQUAL. CONTRACTOR TO SUBMIT VENDOR DRAWINGS FOR APPROVAL.

MANHOLE SCHEDULE

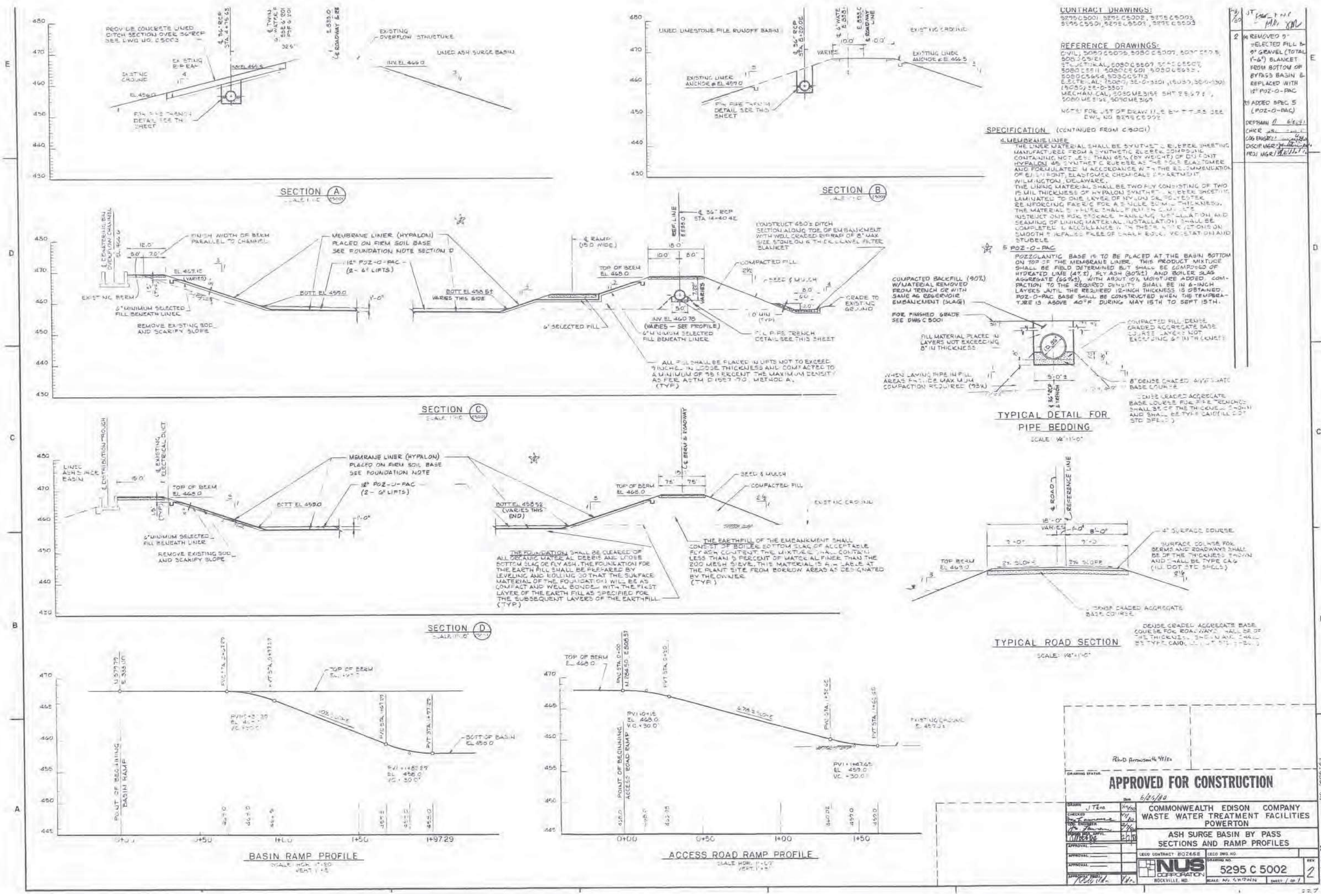
MH NO.	BY PASS STATION	EL. TOP CONE	EL. 36"IN PIPE INV. IN	EL. 36"IN PIPE INV. OUT	MH DEPTH (MIN.)	NOTES
—	0+00	—	455.40	—	—	EXIST PUMP SUMP
1	2+05	469.0	454.85	454.55	14.45'	HPI & ±90°
2	5+45.63	469.0	456.57	456.53	12.47'	HPI & ±02°27'
3	8+76.02	469.0	458.22	458.18	10.82'	STRAIGHT RUN
4	12+14.92	467.25	459.92	459.88	7.37'	HPI & ±2°27' USE GRADE RINGS ...
5	15+53.42	469.0	461.64	461.25	7.75'	HPI & ±90°
—	15+80.55	—	—	461.75	—	OUTLET STRUCTURE

NOTE: MAX HYDRAULIC GRADIENT EL. 467.85±

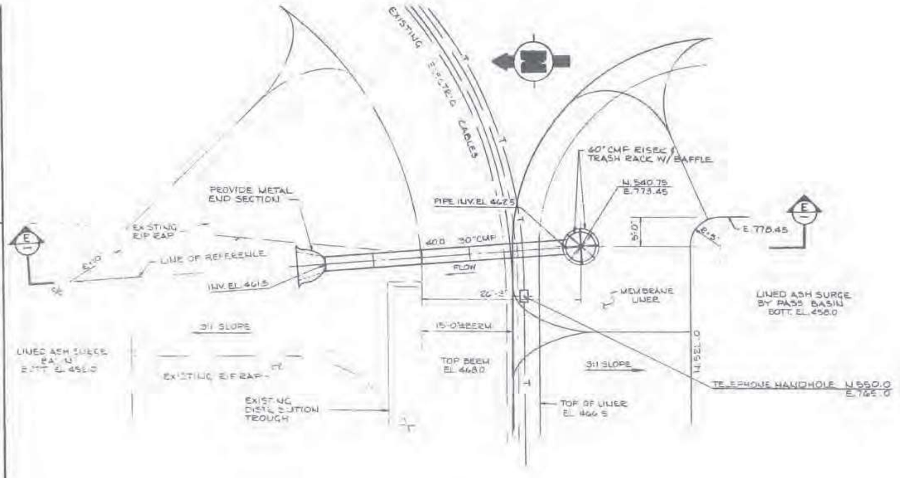
Peter D. Armsworth 6/18/80

DRAWING STATUS
APPROVED FOR CONSTRUCTION
Date 6/26/80

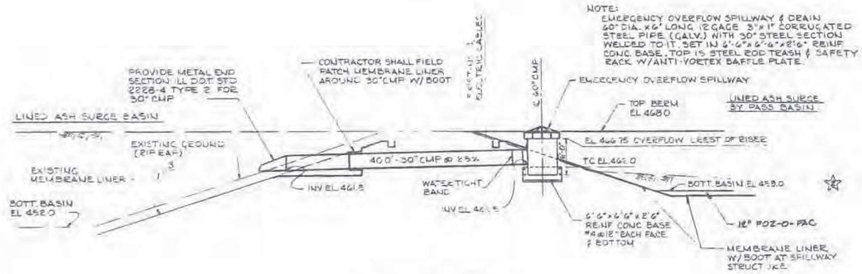
DRAWN J. Tre		COMMONWEALTH EDISON COMPANY WASTE WATER TREATMENT FACILITIES POWERTON
CHECKED	3/16/80	ASH SURGE BASIN BY PASS PLAN AND PROFILE
COG. ENGINEER	3/7/80	CECO CONTRACT: 802668
DISCIPLINE APVL.		CECO DWG. NO.
APPROVAL		NUS CORPORATION ROCKVILLE, MD.
APPROVAL		DRAWING NO. 5295 C 5001 REV. 2
APPROVAL PROJ.		SCALE: AS SHOWN SHEET 1 OF 1



CONTRACT DRAWINGS:
REFERENCE DRAWINGS:
SECTION A
SECTION B
SECTION C
SECTION D
PROVIDE CONCRETE LINED DITCH SECTION OVER 36"RCP SEE DWG NO. C5003
EXISTING OVERFLOW STRUCTURE
LINED ASH SURGE BASIN
LINED LIMESTONE PILE RUNOFF BASIN
EXISTING GROUND
EXISTING LINER ANCHOR @ EL 457.0
EXISTING LINER ANCHOR @ EL 466.5
FINISH WIDTH OF BERM PARALLEL TO CHANNEL
MEMBRANE LINER (HYPALON) PLACED ON FIRM SOIL BASE SEE FOUNDATION NOTE SECTION D
12" POZ-O-PAC (2 - 6" LIPTS)
TOP OF BERM EL 468.0
CONSTRUCT 450'± DITCH SECTION ALONG TOE OF EMBANKMENT WITH WELL GRADED RIPRAP OF 8" MAX SIZE STONE ON 6" THICK GRAVEL FILTER BLANKET
COMPACTED FILL
SEED & MULCH
GRADE TO EXISTING GROUND
EXISTING BERM
6" MINIMUM SELECTED FILL BENEATH LINER
REMOVE EXISTING SOD AND SCARIFY SLOPE
6" SELECTED FILL
INV. EL 460.78 (VARIES — SEE PROFILE)
FILL PIPE TRENCH DETAIL SEE THIS SHEET
ALL FILL SHALL BE PLACED IN LIFTS NOT TO EXCEED 9 INCHES IN LOOSE THICKNESS AND COMPACTED TO A MINIMUM OF 95 PERCENT THE MAXIMUM DENSITY AS PER ASTM D1557-70, METHOD A. (TYP)
SPECIFICATION (CONTINUED FROM C5001)
4. MEMBRANE LINER
THE LINER MATERIAL SHALL BE SYNTHETIC RUBBER SHEETING MANUFACTURED FROM A SYNTHETIC RUBBER COMPOUND CONTAINING NOT LESS THAN 45% (BY WEIGHT) OF DU PONT HYPALON 45 SYNTHETIC RUBBER AS THE SOLE ELASTOMER AND FORMULATED IN ACCORDANCE WITH THE RECOMMENDATION OF DU PONT, ELASTOMER CHEMICALS DEPARTMENT, WILMINGTON, DELAWARE.
THE LINING MATERIAL SHALL BE TWO PLY CONSISTING OF TWO 15 MIL THICKNESS OF HYPALON SYNTHETIC RUBBER SHEETING LAMINATED TO ONE LAYER OF NYLON OR POLYESTER REINFORCING FABRIC FOR A SINGLE 30 MIL THICKNESS. THE MATERIAL SUPPLIER SHALL FURNISH COMPLETE INSTRUCTIONS FOR STORAGE, HANDLING, INSTALLATION AND SEAMING OF LINING MATERIAL. INSTALLATION SHALL BE COMPLETED IN ACCORDANCE WITH THESE INSTRUCTIONS ON SMOOTH SURFACES FREE OF SHARP ROCK, VEGETATION AND STUBBLE.
5 POZ-O-PAC
POZZOLANTIC BASE IS TO BE PLACED AT THE BASIN BOTTOM ON TOP OF THE MEMBRANE LINER. THIS PRODUCT MIXTURE SHALL BE FIELD DETERMINED BUT SHALL BE COMPOSED OF HYDRATED LIME (4%±), FLY ASH (30%±) AND BOILER SLAG AGGREGATE (66%±), WITH ABOUT 10% MOISTURE ADDED. COMPACTION TO THE REQUIRED DENSITY SHALL BE IN 6-INCH LAYERS UNTIL THE REQUIRED 12-INCH THICKNESS IS OBTAINED. POZ-O-PAC BASE SHALL BE CONSTRUCTED WHEN THE TEMPERATURE IS ABOVE 40°F DURING MAY 15TH TO SEPT 15TH.
COMPACTED BACKFILL (90%) W/MATERIAL REMOVED FROM TRENCH OR WITH SAME AS RESERVOIR EMBANKMENT (SLAG)
FOR FINISHED GRADE SEE DWG C5001
FILL MATERIAL PLACED IN LAYERS NOT EXCEEDING 8" IN THICKNESS
WHEN LAYING PIPE IN FILL AREAS ENSURE MAXIMUM COMPACTION REQUIRED (95%)
COMPACTED FILL DENSE GRADED AGGREGATE BASE COURSE LAYERS NOT EXCEEDING 6" IN THICKNESS
8" DENSE GRADED AGGREGATE BASE COURSE
TYPICAL DETAIL FOR PIPE BEDDING
SCALE: 1/4"=1'-0"
LINED ASH SURGE BASIN
THE FOUNDATION SHALL BE CLEARED OF ALL ORGANIC MATERIAL DEBRIS AND LOOSE BOTTOM SLAG OR FLY ASH. THE FOUNDATION FOR THE EARTH FILL SHALL BE PREPARED BY LEVELING AND ROLLING SO THAT THE SURFACE MATERIAL OF THE FOUNDATION WILL BE AS COMPACT AND WELL BONDED WITH THE FIRST LAYER OF THE EARTH FILL AS SPECIFIED FOR THE SUBSEQUENT LAYERS OF THE EARTHFILL. (TYP)
THE EARTHFILL OF THE EMBANKMENT SHALL CONSIST OF BOILER BOTTOM SLAG OF ACCEPTABLE FLY ASH CONTENT. THE MIXTURE SHALL CONTAIN LESS THAN 5 PERCENT OF MATERIAL FINER THAN THE 200 MESH SIEVE. THIS MATERIAL IS AVAILABLE AT THE PLANT SITE FROM BORROW AREAS AS DESIGNATED BY THE OWNER. (TYP)
4" SURFACE COURSE
TOP BERM EL 468.0
2% SLOPE
DENSE GRADED AGGREGATE BASE COURSE
TYPICAL ROAD SECTION
SCALE: 1/8"=1'-0"
BASIN RAMP PROFILE
ACCESS ROAD RAMP PROFILE
POINT OF BEGINNING BASIN RAMP
POINT OF BEGINNING ACCESS ROAD RAMP
BOTT OF BASIN EL 458.0
Peter D. Arrowsmith 4/8/80
DRAWING STATUS
APPROVED FOR CONSTRUCTION
6/25/80
COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
ASH SURGE BASIN BY PASS
SECTIONS AND RAMP PROFILES
CECO CONTRACT 802668
DRAWING NO. 5295 C 5002
REV. 2
NUS CORPORATION ROCKVILLE, MD.
SCALE AS SHOWN
SHEET 1 OF 1
2 (a) REMOVED 9" SELECTED FILL & 9" GRAVEL (TOTAL 1'-6") BLANKET FROM BOTTOM OF BYPASS BASIN & REPLACED WITH 12" POZ-O-PAC
(b) ADDED SPEC 5 (POZ-O-PAC)



PLAN



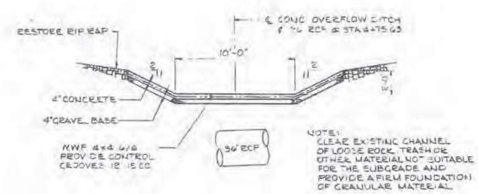
SECTION E

EMERGENCY OVERFLOW SPILLWAY

SCALE: 1/8"=1'-0"

CONTRACT DRAWINGS		
DRAWING NO.	REV.	DRAWING TITLES
5295 C5001	1	PLAN & PROFILE
5295 C5002	1	DETAILS & SECTIONS
5295 C5003	1	MISCELLANEOUS DETAILS
5295 C5501	1	INLET STRUCTURE
5295 C5502	1	OUTLET STRUCTURE
5295 C5503	1	MISCELLANEOUS GATES
REFERENCE DRAWINGS		
5080 C5005	2	DETAIL PLAN - EAST ROOF & YARD RUNOFF BASIN
5080 C5007	2	DETAIL PLAN ASH SURGE BASIN
5080 C5015	2	MISCELLANEOUS SECTIONS AND DETAILS, SHTS 1 & 2
5080 C5121	1	BASIN END SECTION
5080 C5507	1	RAMPS & ASH SURGE BASIN OVERFLOW STRUCTURE
5080 C5509	1	ASH SURGE BASIN & LIMESTONE BASIN DISTRIBUTION TROUGH SECTION & DETAILS
5080 C5511	2	DEWATERING BIN OVERFLOW CHANNEL SECTIONS & DETAILS
5080 C5601	2	STANDARD DETAILS
5080 C5638	2	ASH SURGE BASIN SUMP - CLARIFIER OVERFLOW SUMP
5080 C5654	1	PIPE SUPPORTS FRAMING PLAN & SECTIONS COL NO 74-75 (S)
5080 C5718	1	ASH SURGE BASIN SUMP PLAT FORM SECTIONS & DETAILS
(5080) 3E-0-3301	2	ELECTRICAL AREA LAYOUT EAST RUNOFF BASIN - NORTH
(5080) 3E-0-3305	3	ELECTRICAL AREA LAYOUT LIMESTONE PILE RUNOFF BASIN
(5080) 3E-0-3307	2	ELECTRICAL AREA LAYOUT ASH SURGE BASIN AREA
5080 ME 3155 SHT 2	4	PIPING ARRANGEMENT YARD AREA
SHT 5	3	
SHT 6	3	
SHT 7	3	
SHT 11	3	
5080 ME 3162 SHT 1	3	PIPING ARRANGEMENT YARD DETAIL EAST ROOF & YARD RUNOFF BASIN
5080 ME 3163 SHT 1	1	PIPING ARRANGEMENT YARD DETAIL LIMESTONE PILE RUNOFF BASIN AND ASH SURGE BASIN SUMPS

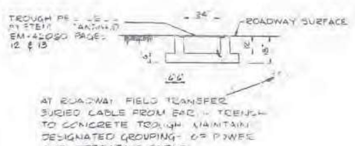
NOTE:
FOR ELECTRICAL CABLE TROUGH SEE CECO SYSTEMS STANDARD EM-42060 "HB" TROUGHS 24" WIDTH HEAVY DUTY FOR ROADWAYS PAGE 12 (STEEL COVER PLATE) OR PAGE 13 (REINFORCED CONCRETE COVER PLATE).



TYPICAL DETAIL
CONCRETE OVERFLOW DITCH

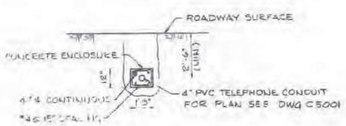
SCALE: 1/4"=1'-0"

2	(a) REMOVED COMBINED SELECT AND GRAVEL BLANKET FROM BOTTOM OF BASIN AND ADDED 12" POZ-O-PAC, SEC E (b) CHANGED BOTTOM EL. 458.0 TO 459.0



DETAIL
ELECTRICAL CABLE TROUGH

SCALE: 3/4"=1'-0"



DETAIL
CONCRETE ENCLOSURE FOR
TELEPHONE CONDUIT

SCALE: 3/8"=1'-0"

DRAWING STATUS

APPROVED FOR CONSTRUCTION

DATE 6/26/80

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

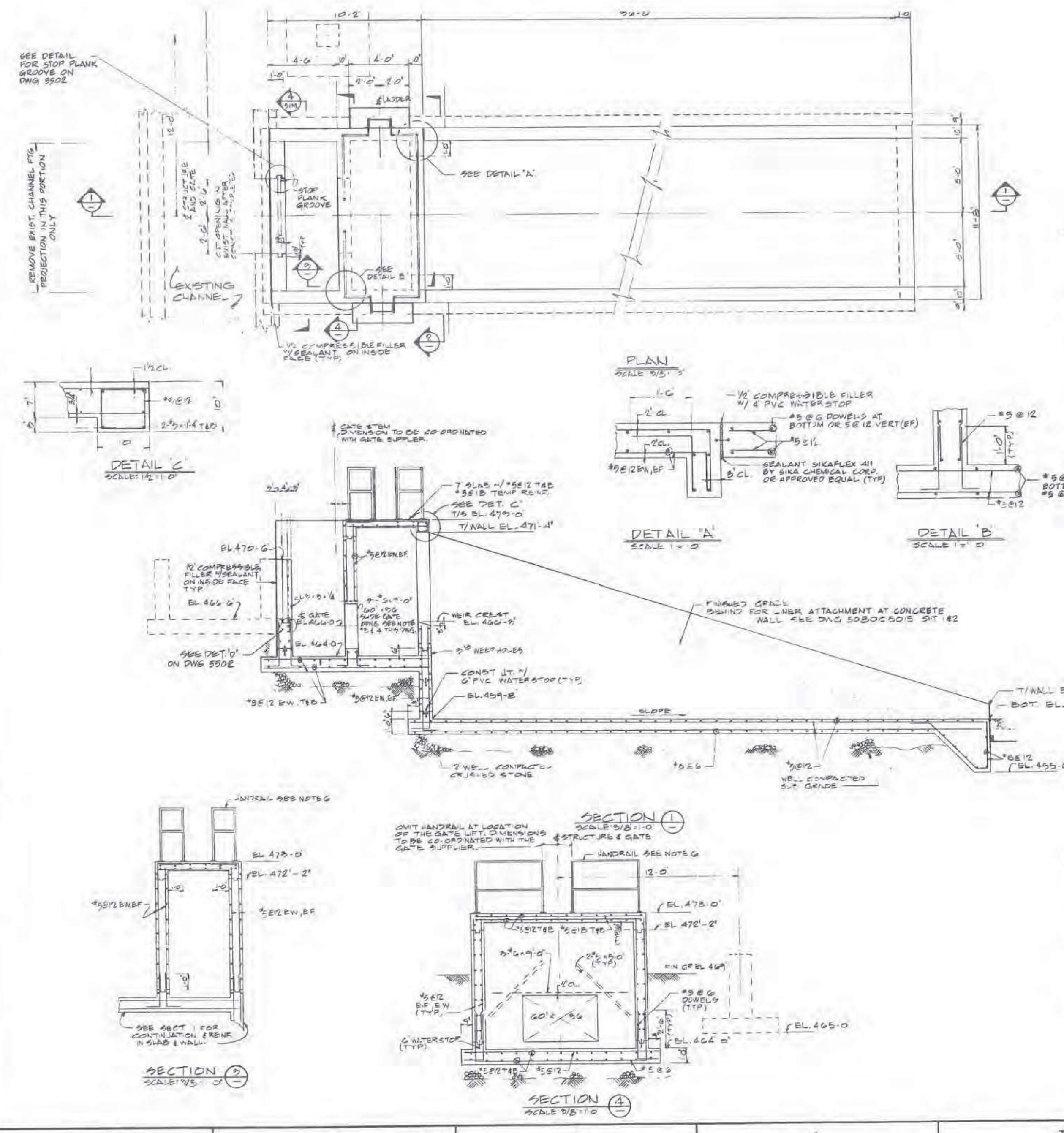
ASH SURGE BASIN BY PASS
MISCELLANEOUS DETAILS

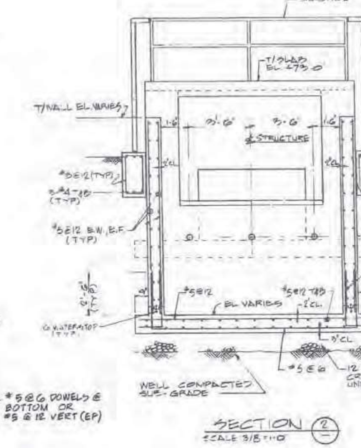
CECO CONTRACT: 802668 | CECO DWG. NO.

NUS CORPORATION, ROCKVILLE, MD.

DRAWING NO. 5295 C 5003 | REV. 2

SCALE: AS SHOWN | SHEET 1 OF 1





NOTES:

1. CONCRETE: f'c = 3000 PSI AT 28 DAYS
2. REINFORCING = ASTM A 615, GRADE 60
3. CONTRACTOR SHALL FURNISH AND INSTALL FAB STEEL GATE AND ACCESSORIES AS MANUFACTURED BY ARMCO STEEL CORP. CONFORMING TO THE FOLLOWING SPECS OR APPROVED EQUAL.
   a. GATE MODEL 10-00
      QUANTITY REQUIRED = 1
      OPENING SIZE = 60"x36"
      FRAME TYPE = FLAT BACK, STD BOTTOM
      MATERIAL COMBINATION = #2
      STEM DIA. = 1 1/2" ⌀
   b. ACCESSORIES
      TYPE OF LIFT = CPE 2
      LIFT SUPPORT = WALL BRACKET TO MATCH CPE 2
      STEM SUPPORT = ADJUSTABLE STEM GUIDES AT SPACING RECOMMENDED BY MANUFACTURER
4. CONTRACTOR SHALL COORDINATE WITH THE GATE SUPPLIER FOR THE NUMBER, SIZE AND LOCATION OF ANCHOR BOLTS REQUIRED TO ATTACH THE GATE, WALL BRACKET AND STEM GUIDES TO THE SUPPORTING WALL.
5. WORK THIS DWG. WITH CIVIL DWGS. 5295 C 5001 AND 5002.
6. FOR HANDRAIL & LADDER DETAILS SEE REF DWG. 5080 C 5601
7. FOR STOP PLANKS SEE DWG 5295 C 5502 NOTE 4

CONTRACT DRAWINGS:

5295 C 5001, 5002, 5003, 5501, 5502, 5503.

REFERENCE DRAWINGS:

CIVIL: 5080 C 5005, 5007, 5015, 5121

STRUCTURAL: 5080 C 5507, 5509, 5511, 5601, 5638, 5654, 5713

ELECTRICAL: (5080) 3E-0-3301, 3305, 3307

MECHANICAL: 5080 ME 3155 SHT 2,5,6,7 & 11, 3162, 3169

NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG NO. 5295 C 5003

Peter D. Aronson 4/8/80

DRAWING STATUS

APPROVED FOR CONSTRUCTION

DATE 2/8/80

DRAWN Kenneth Long

CHECKED

CIVIL ENGINEER

APPROVAL

APPROVAL

APPROVAL PROJ.

APPROVAL CLIENT

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

ASH SURGE BASIN BY PASS
BASIN INLET STRUCTURE

802668

NUS CORPORATION
ROCKVILLE, MD.

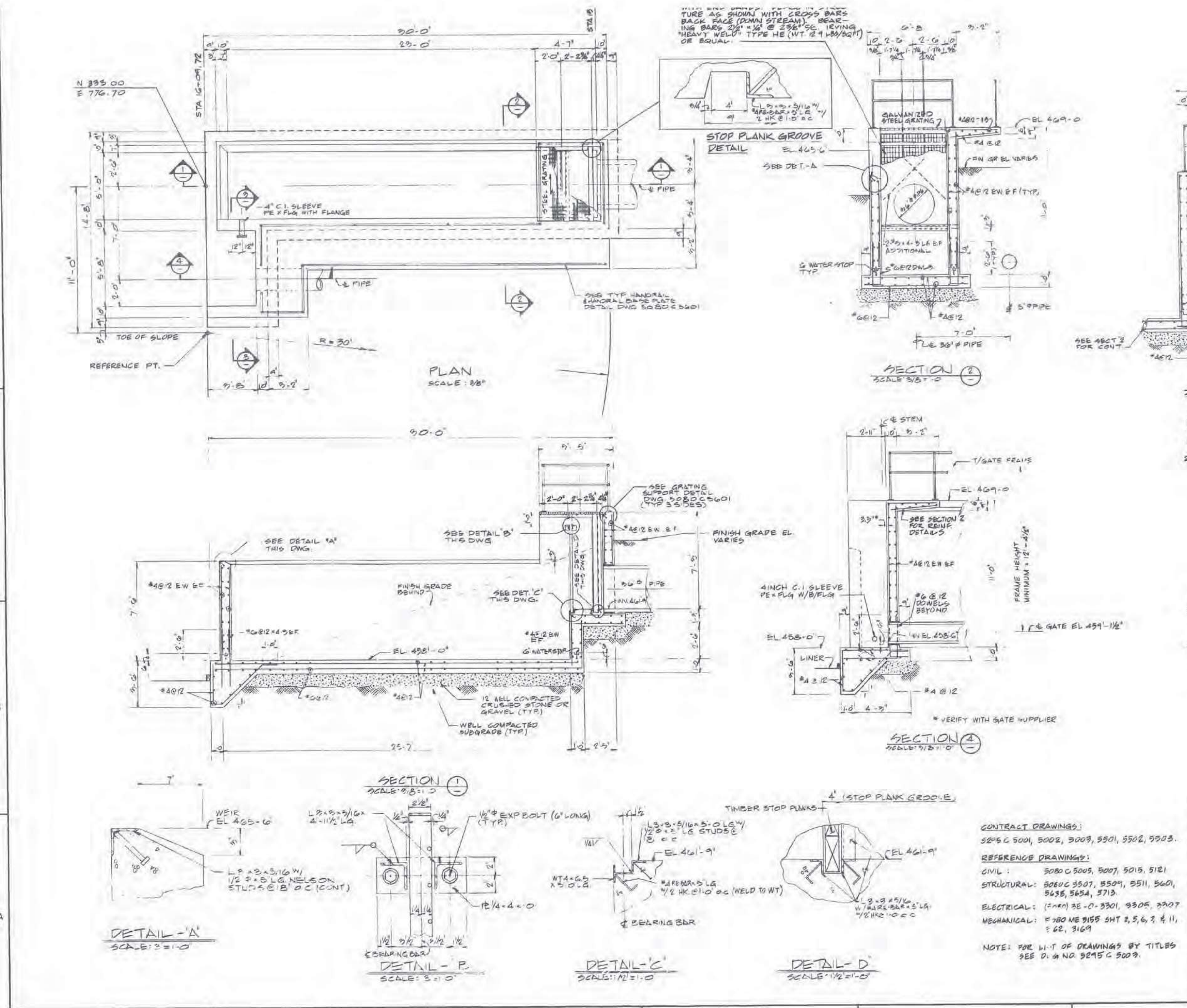
DRAWING NO. 5295 C 5501

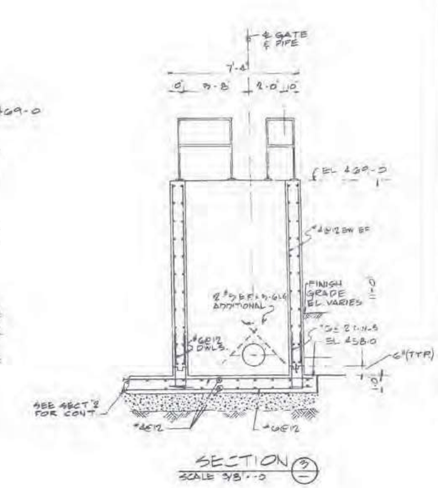
REV. 1

SCALE AS SHOWN

SHEET 1 OF 1

33-11





NOTES:

1. SEE NOTE NOS 1, 2, 4, 5 AND 6 ON DWG 5501.
2. CONTRACTOR SHALL FURNISH & INSTALL MEDIUM DUTY SLUICE GATE & ACCESSORIES AS MANUFACTURED BY ARMCO STEEL CORP. OR APPROVED EQUAL, CONFORMING TO FOLLOWING SPECS:
   a. GATE
      MODEL 20-10C
      QUANTITY REQD = 1
      OPENING SIZE = 15" DIA.
      FRAME TYPE = FLAT BACK
      MATERIAL COMBINATION = #2
      STEM DIA = 7/8"
   b. ACCESSORIES
      TYPE OF LIFT = H1-10
      FRAME HT = 12'-4 1/2" MINIMUM.
3. STEEL GRATING TO BE IRVING WELDED RECTANGULAR DESIGN TYPE IHB-2 WITH 1 1/4" x 1/4" MAIN BARS, AS MANUFACTURED BY IKG INDUSTRIES OR APPROVED EQUAL (GALVANIZED)
4. STOP PLANKS TO BE DOUGLAS FIR COMMERCIAL GRADE NO. 2 (WEST COAST)
   PROVIDE ONE SET OF 7 PLANKS 4" x 8" x 5'-5" LONG (DRESSED SIZE 3 1/2 x 7 1/4 x 5'-5")
   STOP PLANKS ARE INTERCHANGEABLE AT THREE LOCATIONS — SEE ALSO DWGS C5501 & C5503 (ONLY ONE SET REQUIRED UNLESS DIRECTED OTHERWISE BY OWNER)

CONTRACT DRAWINGS:
5295 C 5001, 5002, 5003, 5501, 5502, 5503.

REFERENCE DRAWINGS:
CIVIL: 5080 C 5005, 5007, 5015, 5121
STRUCTURAL: 5080C 3507, 5509, 5511, 5601, 5635, 5654, 5713.
ELECTRICAL: (C-RED) 3E-0-3301, 3305, 3307
MECHANICAL: F-380 ME 3155 SHT 2, 5, 6, 7, & 11, & 62, 3169

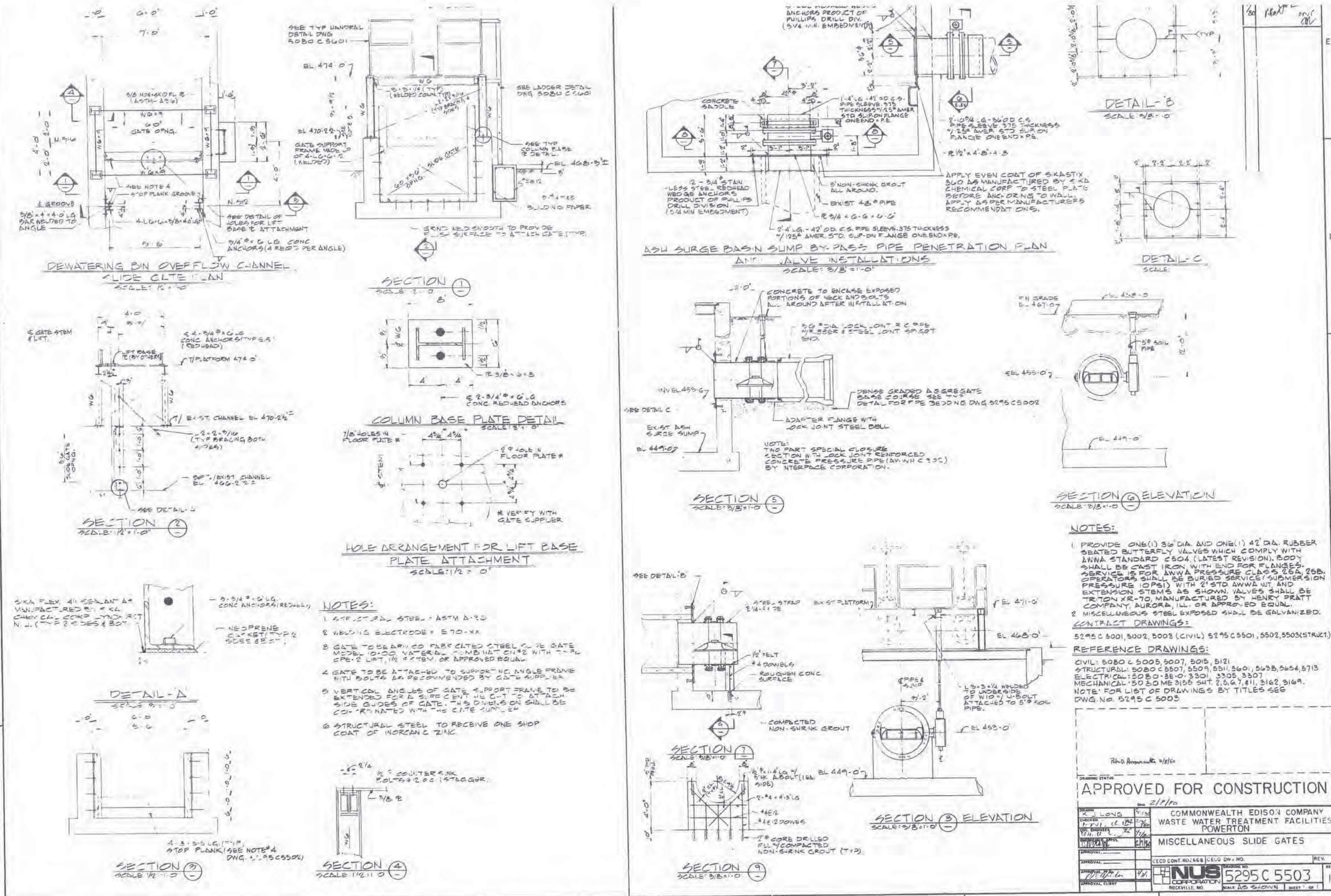
NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG NO. 5295 C 5003.

DRAWING STATUS
APPROVED FOR CONSTRUCTION
Date 2/9/80

DRAWN C. J. LONG 1/80
CHECKED 2/6/80
COG. ENGINEER 2/6/80
2/1/80
APPROVAL
APPROVAL
APPROVAL
APPROVAL, CLIENT

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
ASH SURGE BASIN BY PASS
BASIN OUTLET STRUCTURE

CECO CONTRACT: 802668 | CECO DWG NO. | REV.
NUS CORPORATION ROCKVILLE MD
DRAWING NO. 5295 C 5502 REV. 1
SCALE AS SHOWN SHEET 1 OF 1
SYS. CODE: 02
DWG. CODE: 12
3310



NOTES:

1. STRUCTURAL STEEL = ASTM A-36
2. WELDING ELECTRODE = E70-XX
3. GATE TO BE ARMCO FABRICATED STEEL SLIDE GATE MODEL 10-00, MATERIAL COMBINATION #2 WITH TYPE CPE-2 LIFT, 1 1/2" Ø STEM, OR APPROVED EQUAL.
4. GATE TO BE ATTACHED TO SUPPORTING ANGLE FRAME WITH BOLTS AS RECOMMENDED BY GATE SUPPLIER.
5. VERTICAL ANGLES OF GATE SUPPORT FRAME TO BE EXTENDED FOR A SUFFICIENT HEIGHT TO ATTACH SIDE GUIDES OF GATE. THIS DIMENSION SHALL BE CO-ORDINATED WITH THE GATE SUPPLIER.
6. STRUCTURAL STEEL TO RECEIVE ONE SHOP COAT OF INORGANIC ZINC.

NOTES:

1. PROVIDE ONE(1) 36" DIA. AND ONE(1) 42" DIA. RUBBER SEATED BUTTERFLY VALVES WHICH COMPLY WITH AWWA STANDARD C504 (LATEST REVISION). BODY SHALL BE CAST IRON WITH END FOR FLANGES. SERVICE IS FOR AWWA PRESSURE CLASS 25A, 25B. OPERATORS SHALL BE BURIED SERVICE/SUBMERSION PRESSURE 10PSI) WITH 2" STD AWWA NUT AND EXTENSION STEMS AS SHOWN. VALVES SHALL BE TRITON XR-70, MANUFACTURED BY HENRY PRATT COMPANY, AURORA, ILL. OR APPROVED EQUAL.
2. MISCELLANEOUS STEEL EXPOSED SHALL BE GALVANIZED.

CONTRACT DRAWINGS:

5295 C 5001, 5002, 5003 (CIVIL) 5295 C 5501, 5502, 5503 (STRUCT.)

REFERENCE DRAWINGS:

CIVIL: 5080 C 5005, 5007, 5015, 5121
STRUCTURAL: 5080 C 5507, 5509, 5511, 5601, 5638, 5654, 5713
ELECTRICAL: 5080-3E-0-3301, 3305, 3307
MECHANICAL: 5080 ME 3155 SHT. 2, 5, 6, 7, #11, 3162, 3169.
NOTE: FOR LIST OF DRAWINGS BY TITLES SEE DWG. NO. 5295 C 5003

Peter D. Arrowsmith 2/8/80

DRAWING STATUS
APPROVED FOR CONSTRUCTION
DATE 2/8/80

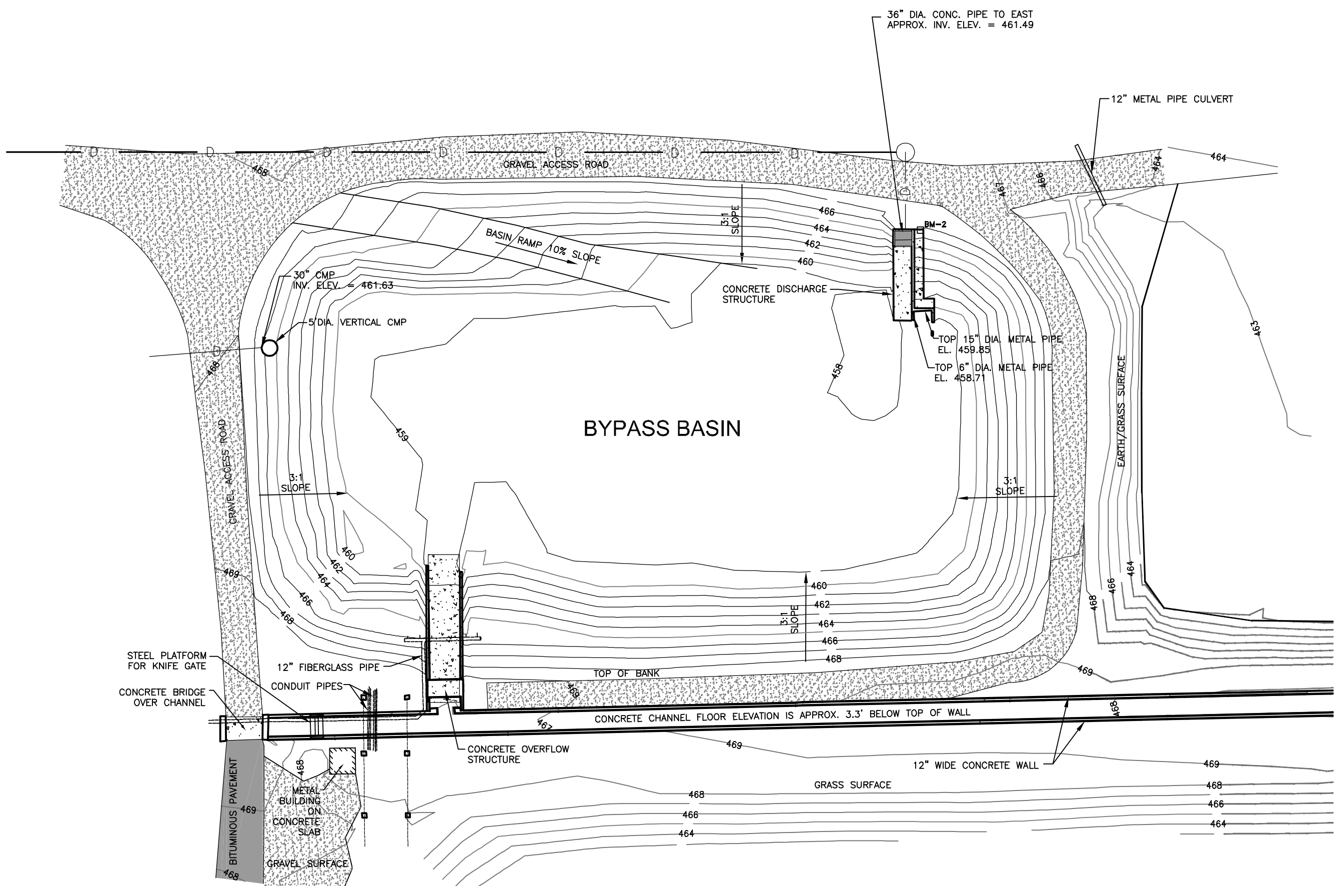
DRAWN K J LONG	1/30	COMMONWEALTH EDISON COMPANY WASTE WATER TREATMENT FACILITIES POWERTON
CHECKED	2/1/80	
COG. ENGINEER	2/3/80	MISCELLANEOUS SLIDE GATES
APPVL	2/1/80	
APPROVAL		CECO CONT. 80266B / CECO DW. NO. / REV.
APPROVAL		NUS CORPORATION ROCKVILLE, MD.
APPROVAL	2/1	DRAWING NO. 5295 C 5503 / REV. 1
APPROVAL, CLIENT		SCALE AS SHOWN / SHEET 1 OF 1

SYS CODE: 03
DWG. CODE: 03

ATTACHMENT 3-2

2011 LINER REPLACEMENT DRAWINGS

DRAWING NO.	TITLE
D1965C010-02	PRE-CONSTRUCTION CONDITIONS
D1965C020-02	LINER SUBGRADE PREPARATION
D1965C030-02	WARNING LAYER PLAN
D1965C031-02	DETAILS AND SECTIONS
D1956C032-02	DETAILS AND SECTIONS



LEGEND

UNDERGROUND DISCHARGE PIPE

ABOVEGROUND INTAKE PIPE

GROUND SURFACE CONTOUR

BM-2 BENCHMARK 2

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.

N

0 10 20 40
SCALE IN FEET

6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS
REVISION:		DATE:	APP'D BY:

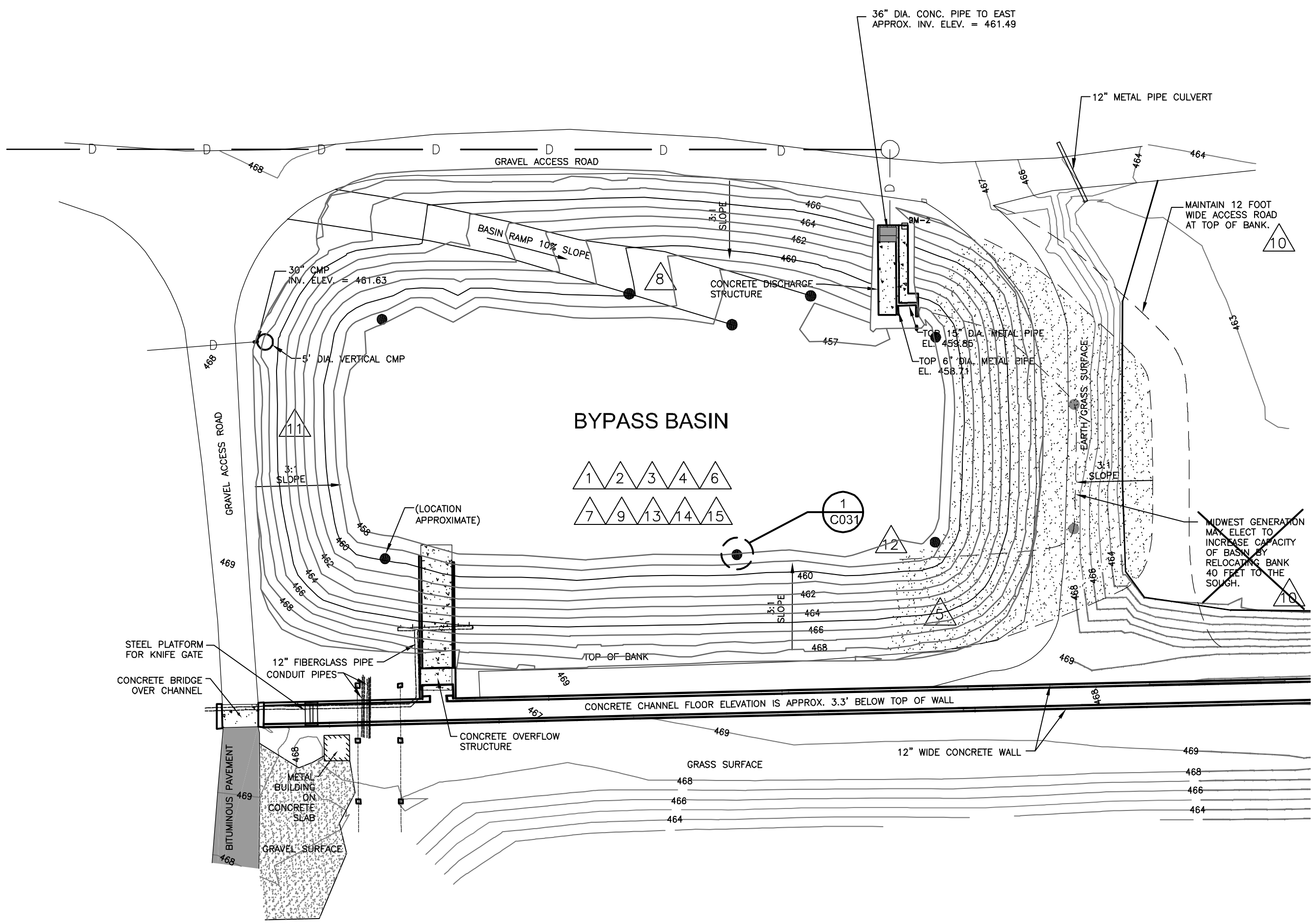
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965.5/5.4
DRAWN BY: KNW 06/30/10
CHECKED BY: RJG 06/30/10
APPROVED BY: HMS 06/130/10

PRE-CONSTRUCTION CONDITIONS

BYPASS BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C010-02
REFERENCE: -
SHEET NO. C010



LEGEND

Symbol	Description
—— D ——	UNDERGROUND DISCHARGE PIPE
	ABOVEGROUND INTAKE PIPE
460	PREPARED SUBGRADE SURFACE CONTOUR
	12 OZ. NON-WOVEN GEOTEXTILE
●	MARKER POST LOCATION
	ADDITIONAL MARKER POST LOCATION IF BANK IS RELOCATED.
	~~BANK/AREA FOR POSSIBLE RELOCATION~~
BM-2	BENCHMARK 2

CONTRACTOR NOTES: △

1. CONTRACTOR SHALL FIELD VERIFY LOCATION OF UNDERGROUND PIPES WITH ASSISTANCE OF OWNER'S UTILITY LOCATOR.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION OF CONCRETE STRUCTURES AND ABOVE GROUND PIPING.
3. CONTRACTOR SHALL STORE ALL GEOSYNTHETICS AND SUBGRADE MATERIALS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
4. CONTRACTOR SHALL STORE AND STAGE EQUIPMENT AT LOCATION APPROVED BY OWNER.
5. CLEAR AND GRUB ALL BRUSH ALONG TOP OF SLOPE OF BASIN.
6. PROTECT ALL CONCRETE AND UTILITY STRUCTURES THROUGHOUT PROJECT DURATION.
7. CONTRACTOR SHALL REMOVE ALL VEGETATION, ROCKS, AND OTHER DEBRIS FROM EXISTING LINER AND DISPOSE OF IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
8. CONTRACTOR SHALL CLEAN OFF THE RAMP SURFACE TO THE EXTENT PRACTICAL TO REMOVE ROCKS THAT MAY POSE A HAZARD TO GEOMEMBRANE, AS APPROVED BY GEOMEMBRANE INSTALLER, ENGINEER AND/OR OWNER.
9. CONTRACTOR SHALL REMOVE 12-INCH LAYER OF POZ-O-PAC AND 6-INCHES OF POZ-O-PAC SUBGRADE FROM THE BASE OF BASIN.
10. ~~CONTRACTOR SHALL RELOCATE SOUTHERN BANK 40 FEET TO THE SOUTH, AS DIRECTED BY OWNER. SEGREGATE GRAVEL ACCESS ROAD MATERIAL TO BE REUSED AS BASE COURSE MATERIAL. MATERIAL REMOVED FROM THE EXISTING BANK MAY BE USED TO RECONSTRUCT NEW SOUTHERN BANK IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.~~
11. CONTRACTOR SHALL REMOVE "SOFT" SUBGRADE MATERIAL BENEATH EXISTING HYPALON LINER, AS DIRECTED BY OWNER AND/OR ENGINEER. BACK FILL AREAS WITH FILL IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. CUT HYPALON AS NEEDED TO REPAIR THE "SOFT" SUBGRADE AREAS.
12. CONTRACTOR SHALL INSTALL MARKER POSTS ALONG THE TOE OF SLOPE AS SHOWN AND IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND DETAIL 1 ON SHEET C031.
13. CONTRACTOR SHALL PLACE 16 OZ. NONWOVEN GEOTEXTILE AT BASE OF BASIN AND WHERE HYPALON LINER DOES NOT EXIST OR WAS REMOVED OF THE PREPARED SUBGRADE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
14. SUBGRADE SHALL BE APPROVED BY OWNER AND/OR ENGINEER PRIOR TO INSTALLATION OF GEOMEMBRANE.
15. CONTRACTOR SHALL PROVIDE MEANS TO PROTECT SUBGRADE FROM EROSION, STORM WATER, AND HEAVY EQUIPMENT TRAFFIC. DAMAGE TO SUBGRADE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.
BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

N

0 10 20 40
SCALE IN FEET

REVISION:		DATE:	APP'D BY:
6.			
5.			
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2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS

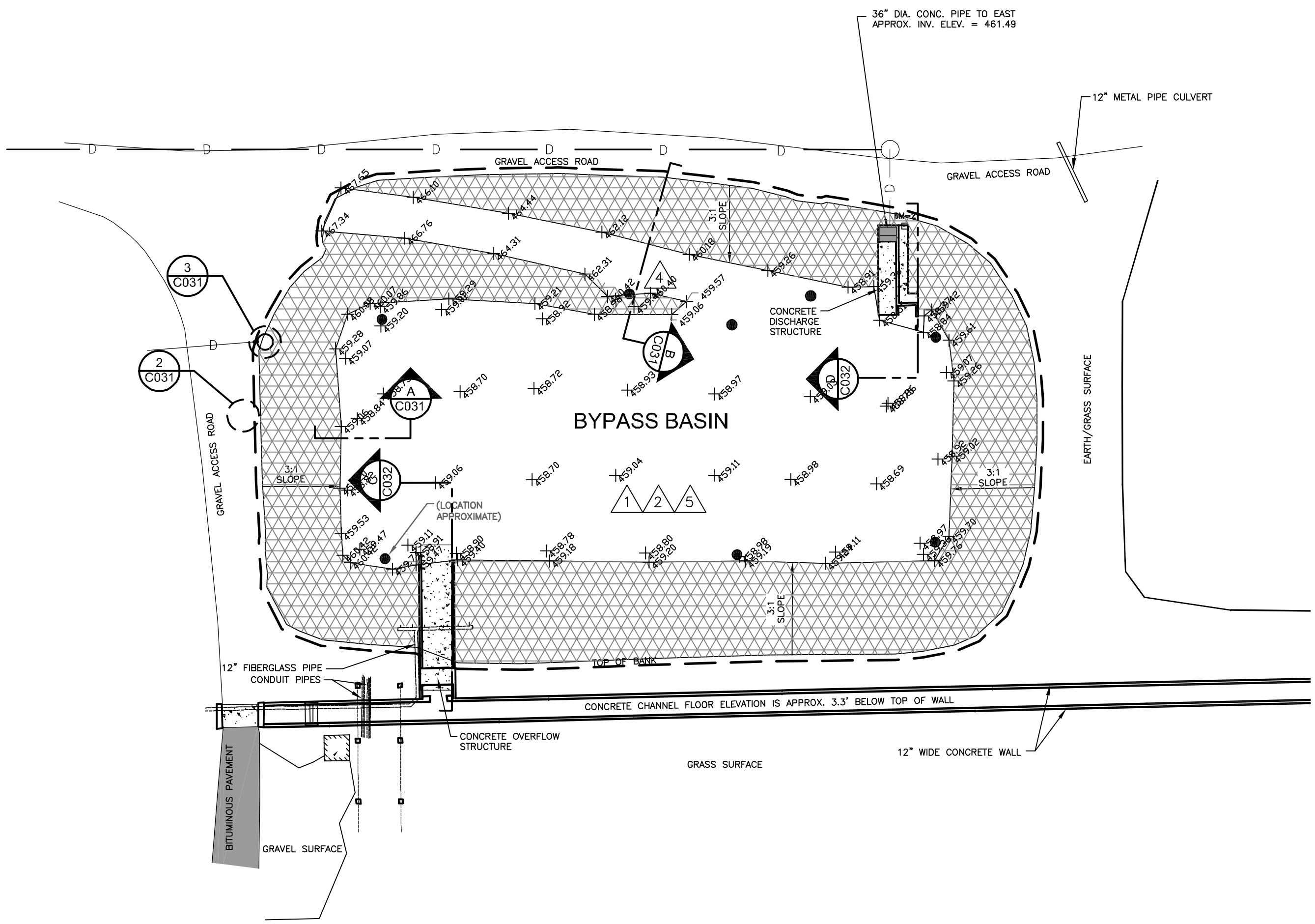
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.	1965/5.4
DRAWN BY:	KNW 06/30/10
CHECKED BY:	RJG 06/30/10
APPROVED BY:	HMS 06/30/10

LINER SUBGRADE PREPARATION

BYPASS BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C020-02
REFERENCE: -
SHEET NO. C020



LEGEND

—— D ——	UNDERGROUND DISCHARGE PIPE
	ABOVEGROUND INTAKE PIPE
	ANCHOR TRENCH
× 459.11	TOP OF WARNING LAYER (ELEVATION, FT.)
●	MARKER POST LOCATION
BM-2	BENCHMARK 2
	HDPE GEOMEMBRANE

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83.

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK 2:
NORTHEAST CORNER OF CONCRETE DISCHARGE STRUCTURE. CHISELED "+" IN CONCRETE ELEVATION 468.75 FT.

CONTRACTOR NOTES: △

1. CONTRACTOR SHALL INSTALL 60 MIL HDPE, WHITE, TEXTURED GEOMEMBRANE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION PRIOR TO PLACEMENT OF THE WARNING LAYER. CONTRACTOR SHALL PROVIDE AND FOLLOW AN APPROVED GEOMEMBRANE LAYOUT PLAN.
2. GEOMEMBRANE SHALL BE ANCHORED INTO 2.5 FEET DEEP TRENCHES ALONG TOP OF BASIN BANK, AS SHOWN ON SHEET C031. CONTRACTOR SHALL ADVISE OWNER AND/OR ENGINEER IF PROPOSED LOCATION FOR ANCHOR TRENCH IS NOT POSSIBLE.
3. CONTRACTOR SHALL PLACE 12-OZ. NON-WOVEN GEOTEXTILE, CUSHION MATERIAL AND WARNING LAYER MATERIAL OVER THE GEOMEMBRANE AT BASE AND 4 FEET ON SIDE SLOPES FOLLOWING ENGINEER APPROVAL AND PASSING QUALITY CONTROL RESULTS IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS (SEE SHEET C031).
4. CONTRACTOR SHALL PLACE 2 LAYERS OF 12-OZ. NONWOVEN GEOTEXTILE, CUSHION AND WARNING LAYER MATERIALS OVER THE GEOMEMBRANE ON THE RAMP, AS SHOWN ON SHEET C031.
5. RESTORE AREAS DISTURBED BY EQUIPMENT AND MATERIAL LAYDOWN.
6. CONTRACTOR SHALL PROVIDE SURVEY DOCUMENTATION OF THE ITEMS LISTED IN THE TECHNICAL SPECIFICATIONS.
7. CONTRACTOR SHALL PERFORM A LEAK LOCATION SURVEY IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A SURVEY MAURER STUTZ, INC. DATED SEPTEMBER 7, 2010, DRAWING NO. 23210023.
LOCATION OF BASIN AND ACCESS RAMP TAKEN FROM MIDWEST GENERATION DRAWING NO. 5295 C5001-2, DATED 6-26-1980.
BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICE, MARCH 2011.

N

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SCALE IN FEET

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5.			
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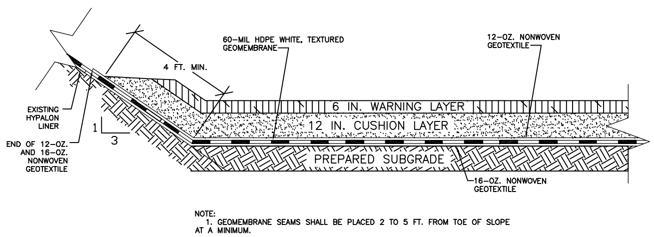
3.			
2.	RECORD DOCUMENTATION	06/08/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS
REVISION:		DATE:	APP'D BY:

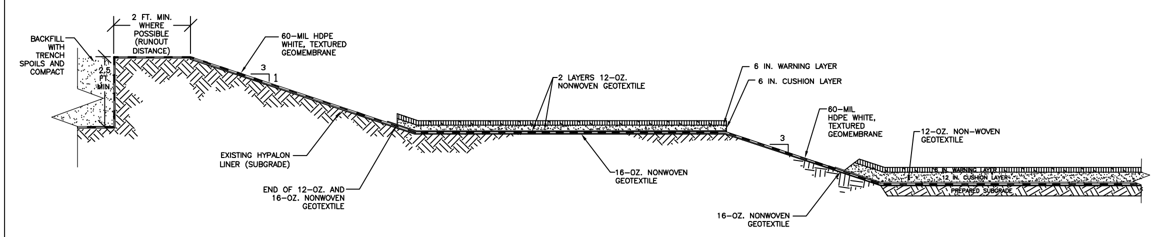
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965.5/5.4	**WARNING LAYER PLAN**
DRAWN BY: KNW 06/30/10	BYPASS BASIN LINER REPLACEMENT MIDWEST GENERATION POWERTON POWER STATION PEKIN, ILLINOIS
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/30/10	DRAWING NO: D1965C030-02 REFERENCE: -
	SHEET NO. C030



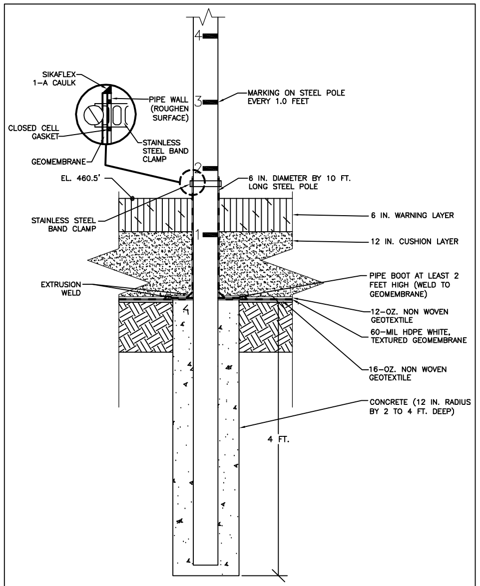
NOTE:
1. GEOMEMBRANE SEAMS SHALL BE PLACED 2 TO 5 FT. FROM TOE OF SLOPE AT A MINIMUM.

A / C030 SLOPE TRANSITION SECTION
NOT TO SCALE

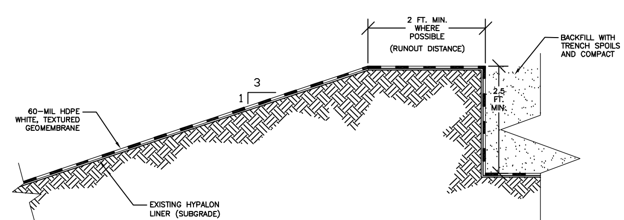


NOTE:
16-OZ. NONWOVEN GEOTEXTILE TO BE PLACED AT BASE OF BASIN AND WHERE HYPALON LINER DOES NOT EXIST OR WAS REMOVED OF PREPARED SUBGRADE

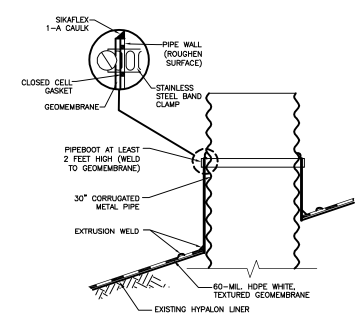
B / C030 RAMP SECTION
NOT TO SCALE



1 / C020 MARKER POST DETAIL
NOT TO SCALE



2 / C030 ANCHOR TRENCH DETAIL
NOT TO SCALE



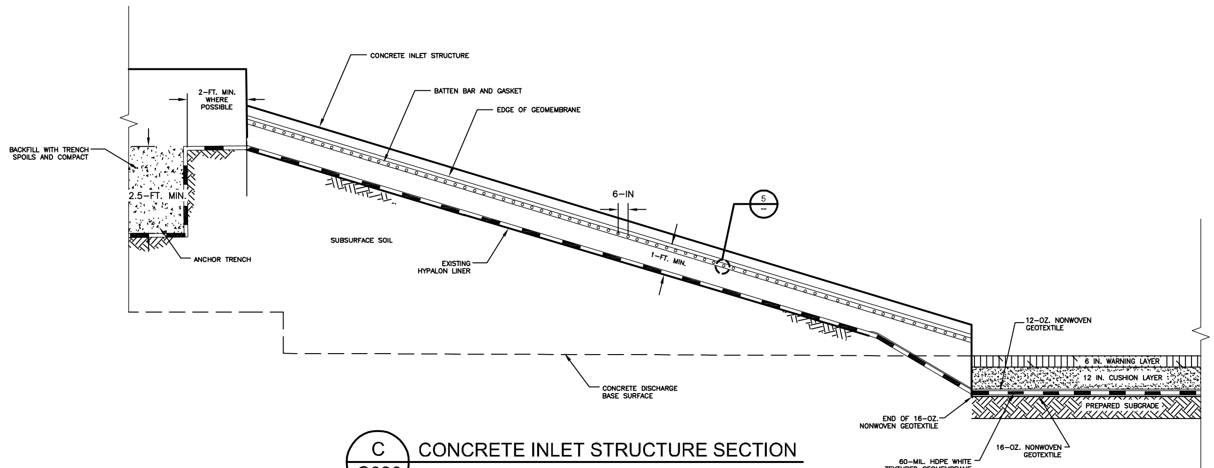
3 / C030 OVERFLOW PIPE DETAIL
NOT TO SCALE

NOT FOR CONSTRUCTION

REVISION:		DATE:	APP'D BY:
6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/16/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS

NATURAL RESOURCE TECHNOLOGY

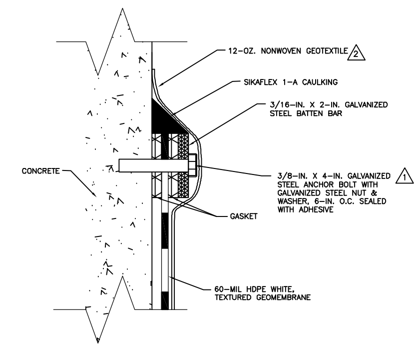
PROJECT NO. 1965/5.4	DETAILS AND SECTIONS
DRAWN BY: KNW 06/30/10	BYPASS BASIN LINER REPLACEMENT MIDWEST GENERATION POWERTON POWER STATION PEKIN, ILLINOIS
CHECKED BY: RJG 06/30/10	
APPROVED BY: HMS 06/30/10	DRAWING NO: D1965C031-02 REFERENCE:
SHEET NO.	C031



C
C030

CONCRETE INLET STRUCTURE SECTION

NOT TO SCALE



NOTE:
1. ANCHOR BOLTS 6 IN. ON CENTER.
2. 12-OZ. NONWOVEN GEOTEXTILE TO BE USED TO PROTECT GEOMEMBRANE BELOW CUSHION/WARNING LAYERS.

5
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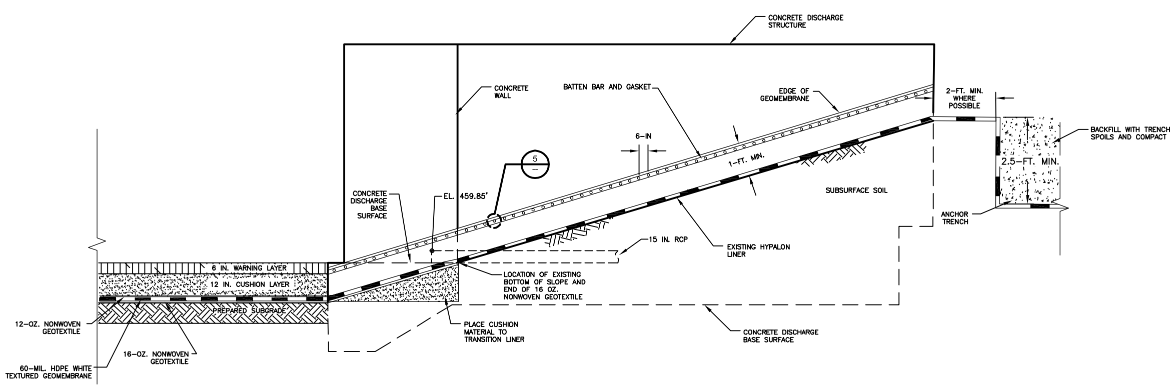
BATTEN BAR ATTACHMENT

NOT TO SCALE



D
-

CONCRETE DISCHARGE STRUCTURE SECTION

NOT TO SCALE

NOT FOR CONSTRUCTION

6.			
5.			
4.			
3.			
2.	RECORD DOCUMENTATION	06/16/11	HMS
1.	ISSUED FOR BID	10/06/10	HMS
0.	ISSUED FOR PERMIT	06/30/10	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/5.4
DRAWN BY: KNW 06/30/10
CHECKED BY: RJG 06/30/10
APPROVED BY: HMS 06/30/10

DETAILS AND SECTIONS

BYPASS BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C032-02
REFERENCE:
SHEET NO. C032

ATTACHMENT 4

2016 STRUCTURAL STABILITY & FACTOR OF SAFETY ASSESSMENT

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STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT
ASH SURGE BASIN AND BYPASS BASIN
POWERTON STATION
OCTOBER 2016

This report presents documentation of the initial periodic structural stability and initial safety factor assessments for the Ash Surge Basin and Bypass Basins (the Basins) at the Powerton Station (Site) in Pekin, Illinois (Figure 1). This report addresses the initial structural stability and safety factor assessment requirements of the Coal Combustion Residuals (CCR) regulations, Code of Federal Regulations Title 40, Part 257, Subpart D (referred to as the CCR Rule). These regulations were published in the Federal Register on 17 April 2015 and became effective on 19 October 2015. The Powerton Station is owned and operated by Midwest Generation, LLC (Midwest Generation). Based on the results provided in this report, the Ash Surge Basin and Bypass Basin meet the requirements of §257.73(d) and §257.73(e) of the CCR Rule.

The work presented in this report was performed under the direction of Ms. Jane Soule, P.E., of Geosyntec Consultants Inc. (Geosyntec) in accordance with §257.73(d) and §257.73(e). Mr. Robert White reviewed this report in accordance with Geosyntec's senior review policy.

1. Regulation Requirements - §257.73

Structural integrity criteria for existing CCR impoundments is described in §257.73 and includes structural stability and factor of safety assessments. The Ash Surge Basin and Bypass Basin meet the minimum size and capacity criteria under §257.73(b) and are subject to the structural stability and safety factor assessments required.

2. Site Conditions

The Ash Surge Basin is located east of the Main Wastewater Building, the cylindrical concrete clarifier and thickener structures, and the Metal Cleaning Basin, west of the inactive Limestone Basin, north of the Bypass Basin and East Roof and Yard Runoff (ERYR) Basin. The Ash Surge Basin is approximately 1,050 feet by 335 feet in plan dimensions (total plan area of approximately 8.1 acres). The surface impoundment is surrounded by a paved and a gravel perimeter access road around the western and eastern half of the impoundment, respectively.

The Bypass Basin is located east of the ERYR Basin and south of the southeast corner of the Ash Surge Basin. The Bypass Basin is approximately 160 feet by 255 feet in plan dimensions (total plan area of approximately 0.9 acres). A gravel perimeter access road is located along the northern and eastern boundaries of the Bypass Basin. A concrete-lined dewatering bin overflow channel is located along the crest of the berm between the Bypass Basin and the ERYR Basin. A temporary construction staging area is located south of the surface impoundment.

The Ash Surge Basin and the Bypass Basin are both lined with a 60-mil high density polyethylene (HDPE) geomembrane.

Based on available documentation and discussions with site personnel, the Basins, in their current configuration, were constructed in the late 1970s and early 1980s. A history of construction for the basins was prepared in accordance with §257.73(c) and describes the design of the basins and their construction (Geosyntec, 2016a).

3. Structural Stability Assessment

The following subsections address the components of §257.73(d)(1).

3.1 Foundations and Abutments – §257.73(d)(1)(i)

The Ash Surge Basin and the Bypass Basin consist of embankments on all sides. Because no formational materials provide lateral structural support for the embankments, the Basins do not include abutments. The remainder of this section addresses the foundation materials for the Basins.

Previous subsurface investigations performed at the Site indicate foundation materials underlying the embankments for the Ash Surge Basin and Bypass Basin generally consists of approximately 17 to 28 feet of fat and lean clay overlying approximately 35 to 40 feet of loose to very dense poorly graded sand and silty sand with some gravel associated with the Henry Formation (Geosyntec, 2016b).

Elastic settlement of the clay and sand layers underlying the embankments likely occurred very soon after construction in the late 1970s and early 1980s. Because of the age of the embankments (approximately 35 years old), the majority of consolidation and secondary compression settlement of the clay layer has likely already occurred. The initial annual inspection performed for the Basins in accordance with §257.83(b) did not identify any adverse effects on the Basins or their appurtenant structures resulting from settlement that may have occurred since construction (Geosyntec, 2016c). There are no proposed changes in operation which would increase loading conditions on the foundation materials; therefore, no significant settlement of the foundation materials underlying the embankments is anticipated to occur in the future. Further, the embankments of the Basins were not constructed with abutments or separate engineered zones that would be most susceptible to the adverse effects of differential settlement. Therefore, potential settlement of the foundation is not anticipated to impact the integrity of the impoundment embankments.

A factor of safety against the triggering of liquefaction was calculated for saturated foundation materials underlying the Ash Surge Basin and Bypass Basin embankments. The factor of safety was calculated based methods outlined in Idriss and Boulanger (2008) using information obtained from field explorations, including borings, Cone Penetration Test (CPT) soundings, laboratory data (Geosyntec, 2016b) and seismic data (Geosyntec, 2016g). Overall, the foundation materials underlying the Ash Surge Basin and Bypass Basin have a low susceptibility to liquefaction and liquefaction-induced strength loss (Geosyntec, 2016d).

3.2 Upstream Slope Protection – §257.73(d)(1)(ii)

The Ash Surge Basin and Bypass Basin are lined with a 60-mil HDPE geomembrane that protects the interior basin slopes from erosion, the effects of wave action, and mitigates potential effects of rapid drawdown.

3.3 Dike Compaction – §257.73(d)(1)(iii)

Documentation of as-built construction conditions for the Ash Surge Basin and Bypass Basin embankments was not available at the time of this report. Samples of embankment fill materials obtained during Geosyntec's geotechnical investigations at the Site indicate that the Ash Surge Basin embankments are compacted to relative densities on the order of 95 percent based on Standard Proctor testing (Geosyntec, 2016b). No quantitative evaluation of the degree of compaction of the embankments for the Bypass Basin was performed for the embankments in their current state. Slope stability analyses show that the embankments for the Ash Surge Basin and Bypass Basin are sufficient to withstand the range of loading conditions in the CCR units (Geosyntec, 2016e).

3.4 Downstream Slope Vegetation – §257.73(d)(1)(iv)

Downstream slopes of the Ash Surge Basin and Bypass Basin have erosion protection from either vegetation or geomembrane liners located on the interior slopes of adjacent basins.

3.5 Spillway – §257.73(d)(1)(v)

The Ash Surge Basin and the Bypass Basin both contain emergency spillway structures. A description of these structures and the design storm event identified for the Basins is included in the Inflow Design Flood Control System Plan (IDFCSP) prepared for the site in accordance with §257.82(c) (Geosyntec, 2016f). The IDFCSP identifies the design event for the Site as the 1,000 year flood. Because the Ash Surge Basin and Bypass Basin do not impound water from a natural stream and do not impound stormwater flows, except for direct precipitation that falls on the embankment crest or within the Basins, the IDFCSP identifies the design event as the 24-hour, 1,000-year precipitation event. When the operating freeboard for the Basins is taken into account, the water levels in the Basins estimated after the design precipitation event are estimated to be lower than the invert elevations of the emergency spillways and no discharge from the Basins is anticipated (Geosyntec, 2016f). Therefore, the hydraulic capacity of the spillways was not calculated.

3.6 Structural Integrity of Hydraulic Structures – §257.73(d)(1)(vi)

Hydraulic structures passing through or beneath the embankments of the Bypass Basin and Ash Surge Basin consist of several pipes and conveyance structures associated with the inlet and outlet structures of the Basins. These structures and pipes were inspected periodically between 10 May 2016 and 24 May 2016 by a company specializing in video camera pipe inspections. The inspected structures and pipes related to the Basins included are presented on Figure 2. The video inspections did not identify significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that would negatively affect operation of the pipes was observed.

3.7 Downstream Slopes Adjacent to Water Bodies – §257.73(d)(1)(vii)

Ponds or water bodies near downstream slopes of the Ash Surge Basin and Bypass Basin are identified on Figure 3 and include:

- The Metal Cleaning Basin located west of the Ash Surge Basin. This basin is lined with an HDPE geomembrane.
- The ERYR Basin located west of the Bypass Basin and south of the Ash Surge Basin;
- The inactive Limestone Basin located east of the Ash Surge Basin; and
- The FAB located northeast of the Ash Surge Basin.

For stability analyses performed, a "low pool" condition where the modeled groundwater depth is lowered so there is little or no stabilizing force present on the downstream slope of the Ash Surge Basin or Bypass Basin embankments was evaluated for the water bodies presented above (Geosyntec, 2016e).

Stability during rapid drawdown was also evaluated for the embankments affected by the ERYR Basin and the FAB. Rapid drawdown was not evaluated for the embankments affected by the Metal Cleaning Basin because its HDPE geomembrane minimizes potential inundation of the slopes and mitigates effects of rapid drawdown. Similarly, embankments affected by the inactive Limestone Basin were not evaluated for rapid drawdown because the volume of water in this basin is anticipated to be minimal (inflow is limited to direct precipitation) and there is no outlet structure associated with this basin that could create a rapid drawdown condition for the adjacent Ash Surge Basin embankment.

Slope stability analyses show that the embankments are designed and constructed to maintain structural stability during "low pool" and rapid drawdown conditions (Geosyntec, 2016e).

3.8 Structural Stability Assessment Deficiencies - §257.73(d)(2)

No structural stability deficiencies associated with the Ash Surge Basin and Bypass Basin were identified in this initial structural stability assessment and no corrective measures are required.

3.9 Annual Inspection Requirement - §257.83(b)(4)(ii)

In accordance with §257.83(b)(4)(ii), submittal of this structural stability assessment precludes the requirement of an annual inspection under §257.83(b) for the Ash Surge Basin and Bypass Basin during the 2016 calendar year. One deficiency identified in the initial annual inspection (Geosyntec, 2016c) for the Bypass Basin was corrected as documented in the Notice of Remedy prepared in response to the initial annual inspection.

4. Safety Factor Assessment

This section describes the initial safety factor assessment for the Ash Surge Basin and Bypass Basin and the methodology used to perform the assessment in accordance with §257.73(e)(1). This assessment includes slope stability analyses of the critical embankment cross-section for each basin, shown in Figure 3.

4.1 Slope Stability Methodology

Limit equilibrium slope stability analyses were performed to evaluate the stability of the embankments for the Ash Surge Basin and Bypass Basin. The process involved performing two-dimensional analyses on the critical cross-section for each basin using Spencer's Method as coded in the computer program SLOPE/W (Version 8.15.4.11512, www.geoslope.com) which satisfies vertical and horizontal force equilibrium and moment equilibrium. For each cross section analyzed, the program searches for the sliding surface that produces the lowest factor of safety (FS). Factor of safety is defined as the ratio of the shear forces/moments resisting movement along a sliding surface to the forces/moments driving the instability.

Subsurface stratigraphy, groundwater conditions, and engineering parameters for the embankment and foundation materials were developed based on previous subsurface investigations performed at the Site (Geosyntec, 2016b and Geosyntec, 2016e).

4.2 Slope Stability Analyses

Four cases were analyzed to satisfy the safety factor assessment requirements in §257.73(e) (Geosyntec, 2016e).

4.2.1 Static, Long-Term Maximum Storage Pool Loading – §257.73(e)(1)(i)

Pursuant to §257.73(e)(1)(i) a static, long-term condition with the maximum operating pool loading on the embankments was evaluated. For the Ash Surge Basin and Bypass Basin, this condition included a pool elevation at 465 feet MSL[1] for the Ash Surge Basin and 465.5 feet MSL for the Bypass Basin, and a groundwater elevation of 451.8 feet MSL (Geosyntec, 2016e).

4.2.2 Static, Maximum Storage Pool Loading – §257.73(e)(1)(ii)

The conditions for §257.73(e)(1)(ii) are identical to §257.73(e)(1)(i) with the exception of the pool elevation, which is set at the lowest points of the embankment crest (Geosyntec, 2016e).

4.2.3 Seismic – §257.73(e)(1)(iii)

Pursuant to §257.73(e)(1)(iii), a seismic condition for Ash Surge Basin and Bypass Basin was also analyzed. Seismic stability was evaluated with a pseudostatic analysis that uses constant horizontal accelerations to represent the effects of earthquake shaking. The horizontal accelerations are represented in SLOPE/W by a horizontal seismic coefficient. The horizontal seismic coefficient used for analysis was based on a peak ground acceleration with a 2 percent probability of exceedance in 50 years (Geosyntec, 2016g).

4.2.4 Liquefaction – §257.73(e)(1)(iv)

The majority of the embankment soils for the Ash Surge Basin and Bypass Basin are not considered susceptible to liquefaction because saturation of the embankment soils is unlikely based on the presence of a geomembrane liner system. Based on the design phreatic surface discussed in Geosyntec (2016b), a limited portion of the bottom of the embankments may become saturated from groundwater. Liquefaction triggering analyses of these saturated embankment soils show that liquefaction and associated post-liquefaction shear strength loss is unlikely for the seismic design event (Geosyntec, 2016d). Because the likelihood of liquefaction and associated shear strength loss of the embankment soils is very low, post-liquefaction conditions are represented by the static factor of safety analyses.

4.3 Results

The results of the slope stability analysis for the critical cross sections of the Ash Surge Basin and Bypass Basin embankments are summarized in Table 1 below and presented in Figures 4 through 9 (Geosyntec 2016e).

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[1] Mean Sea Level based on local plant vertical datum.

Table 1: Safety Factor Results

Section	Safety Factor			
	257.73(e)(1)(i)	257.73(e)(1)(ii)	257.73(e)(1)(iii)	257.73(e)(1)(iv)
1	≥1.50	≥1.40	≥1.00	≥1.20
2	≥1.50	≥1.40	≥1.00	≥1.20

These results meet the factor of safety requirements presented in §257.73(e)(1)(i) through §257.73(e)(1)(iv).

5. Limitations and Certification

This initial periodic structural stability and safety factor assessment meets the requirements of §257.73(d) and §257.73(e) of the Code of Federal Regulations Title 40, Part 257, Subpart D, and was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

JANE W. SOULE
062-067766
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

Jane W. Soule

Jane W. Soule, P.E.
Illinois Professional Engineer No. 062-067766
Expiration Date: 11/30/2017

6. References

Das, 2007. "Principles of Foundation Engineering," Sixth edition. Thomson Canada Limited.

Geosyntec, 2016a. History of Construction Report, Ash Surge Basin and Bypass Basin, Powerton Station, October.

Geosyntec, 2016b. Ash Surge Basin and Bypass Basin – Soil Properties Calculation, Powerton Station, October.

Geosyntec, 2016c. Annual Inspection Report, Ash Surge Basin and Bypass Basin, Powerton Station, 18 January 2016.

Geosyntec, 2016d. Ash Surge Basin and Bypass Basin – Liquefaction Calculations, Powerton Station, October.

Geosyntec, 2016e. Ash Surge Basin and Bypass Basin – Slope Stability Calculations, Powerton Station, October.

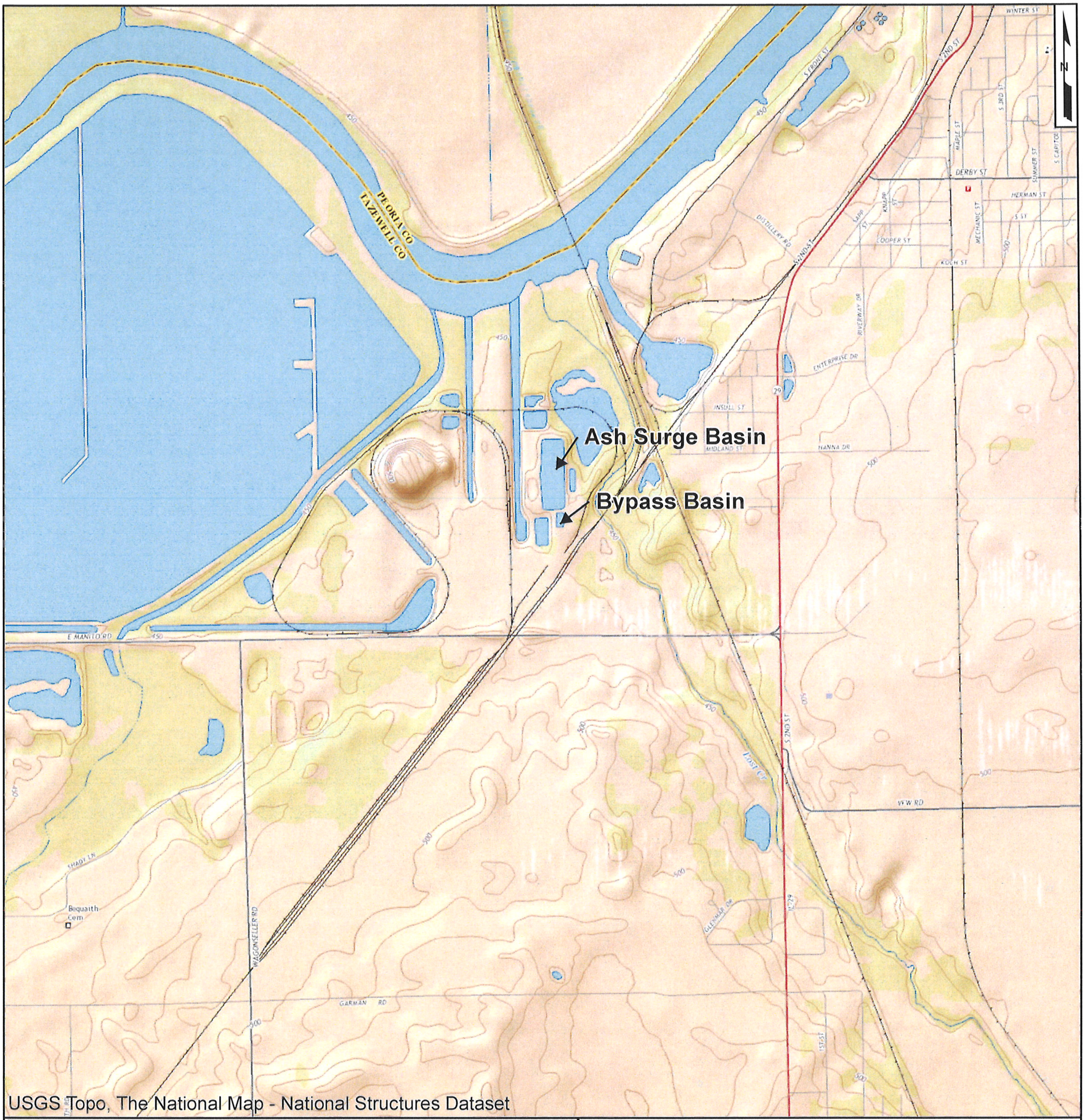
Geosyntec, 2016f. Inflow Design Flood Control System Plan, Ash Surge Basin and Bypass Basin, Powerton Generating Station, October.

Geosyntec, 2016g. Ash Surge Basin and Bypass Basin – Seismic Coefficient Calculations, Powerton Station, October.

Idriss and Boulanger, 2008. "Soil Liquefaction During Earthquakes". Earthquake Engineering Research Institute, MNO-12.

<u>Attachments</u>

Figure 1 – Site Location
Figure 2 – Hydraulic Structure Locations
Figure 3 – Stability Sections
Figure 4 – Slope Stability Output, Section 1 - 257.73(e)(1)(i)
Figure 5 – Slope Stability Output, Section 1 - 257.73(e)(1)(ii)
Figure 6 – Slope Stability Output, Section 1 - 257.73(e)(1)(iii)
Figure 7 – Slope Stability Output, Section 2 - 257.73(e)(1)(i)
Figure 8 – Slope Stability Output, Section 2 - 257.73(e)(1)(ii)
Figure 9 – Slope Stability Output, Section 2 - 257.73(e)(1)(iii)



2,000 1,000 0 2,000 Feet

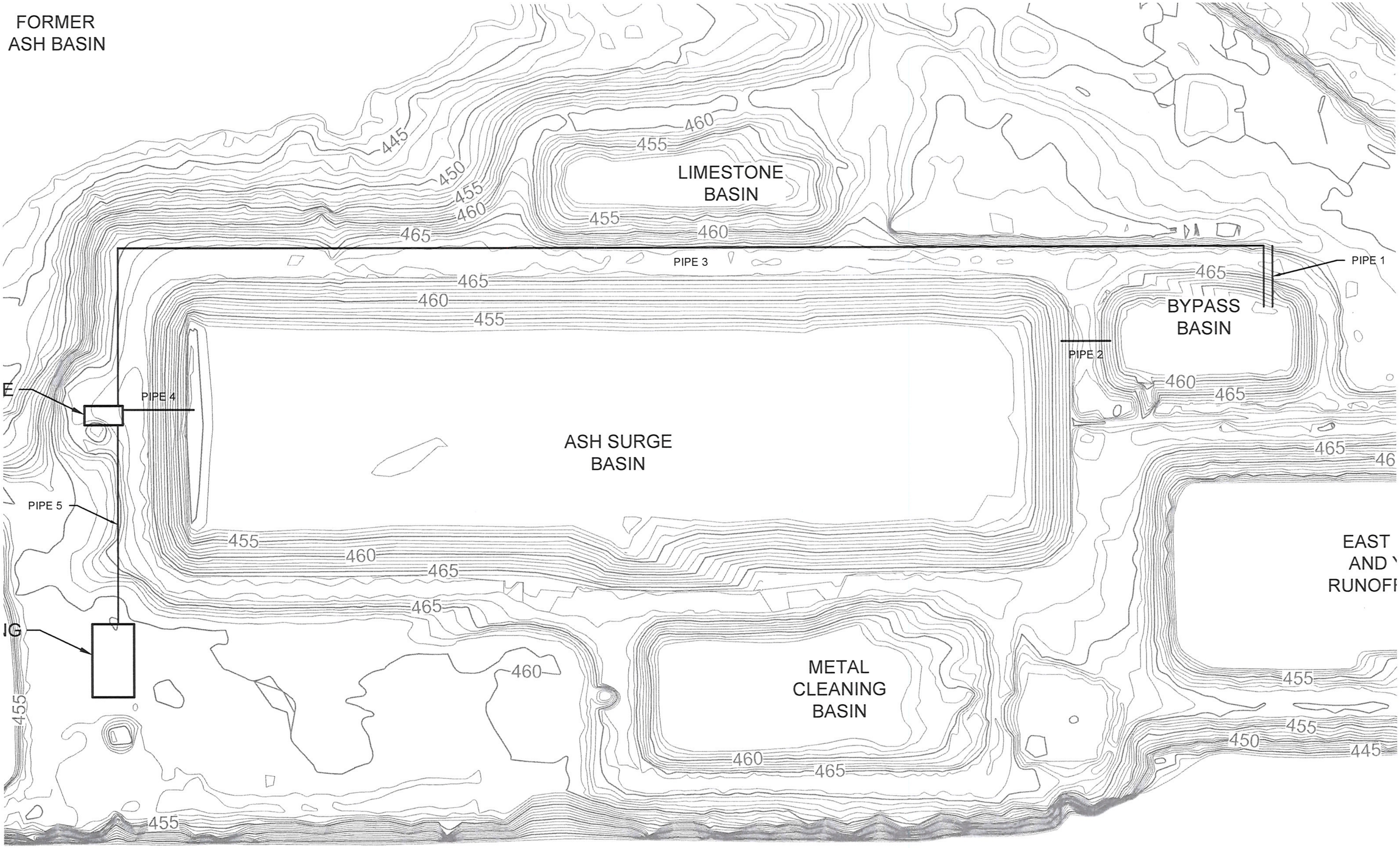
Site Location

Ash Surge and Bypass Basins
Powerton Station
Pekin, Illinois

Geosyntec consultants

San Diego | October 2016

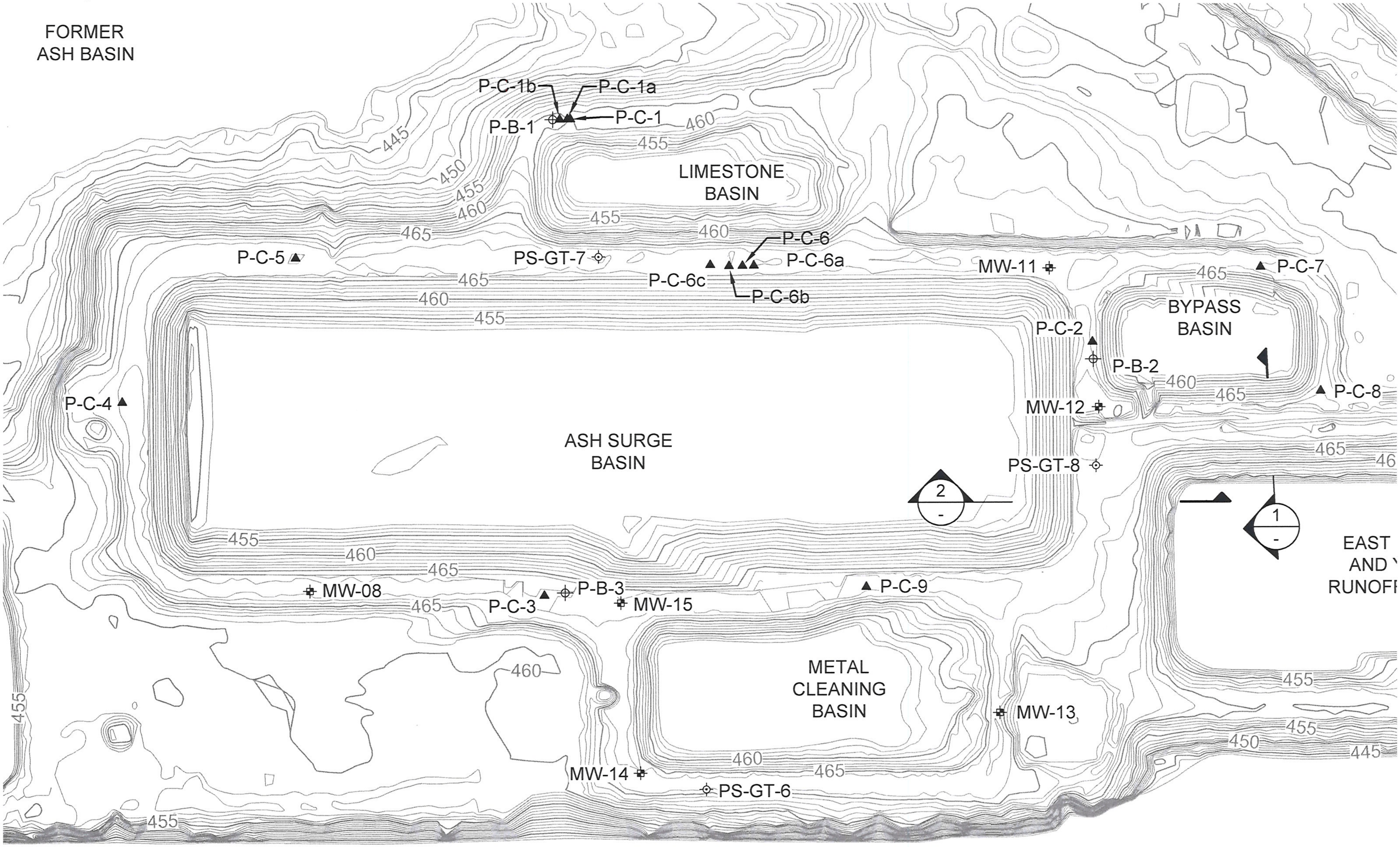
Figure 1



LEGEND

460	EXISTING GROUND MAJOR CONTOUR
	EXISTING GROUND MINOR CONTOUR
	PIPE LOCATION

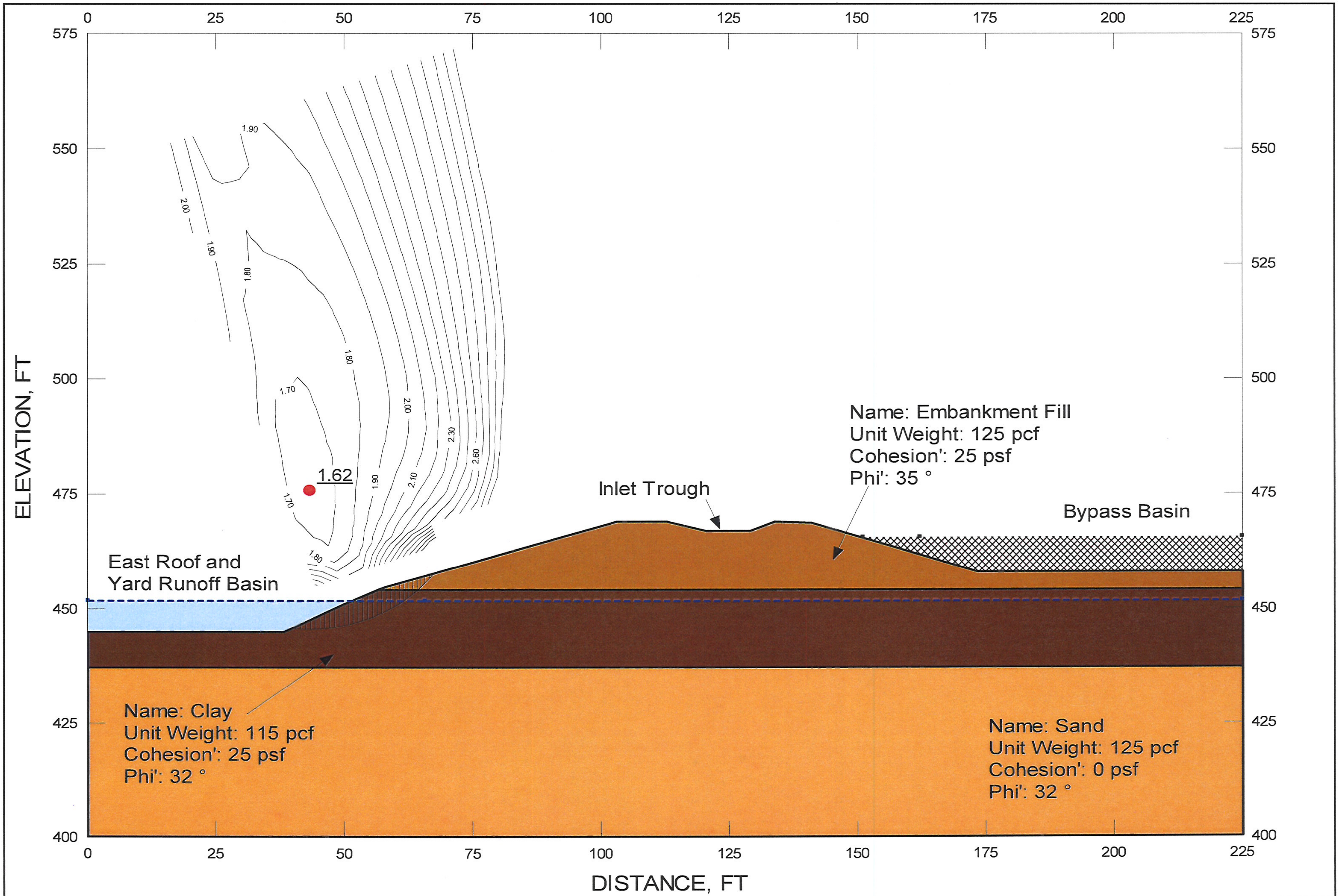
IRGE AND BYPASS BASINS IS BASED



LEGEND

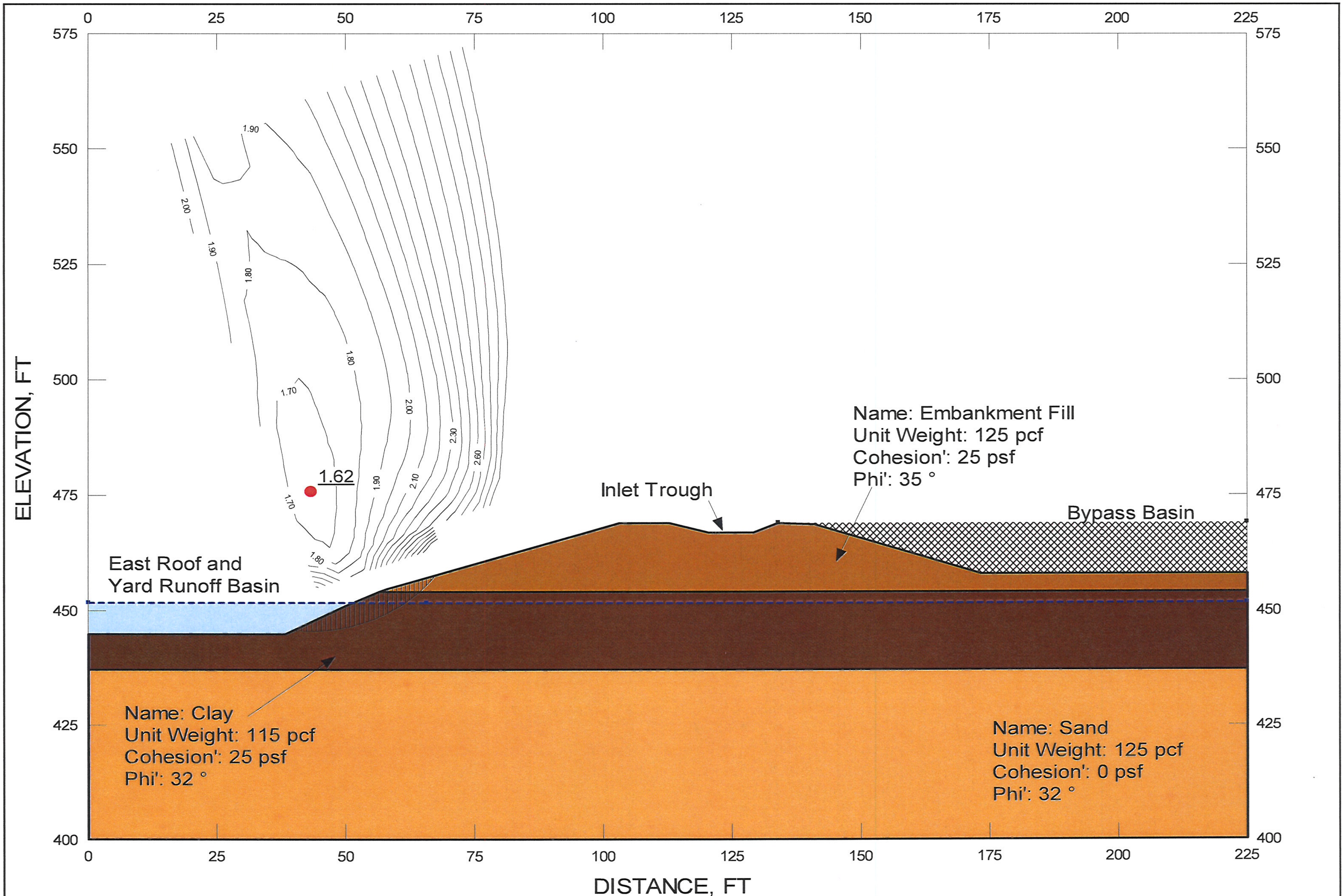
460	EXISTING GROUND MAJOR CONTOUR
	EXISTING GROUND MINOR CONTOUR
	MW-03 MONITORING WELL (PATRICK, 2011)
	P-B-1 BORING (GEOSYNTEC, 2016)
▲	P-C-1 CPT SOUNDING (GEOSYNTEC, 2016)
	PS-GT-5 BORING (KPRG, 2005)

URGE AND BYPASS BASINS IS BASED

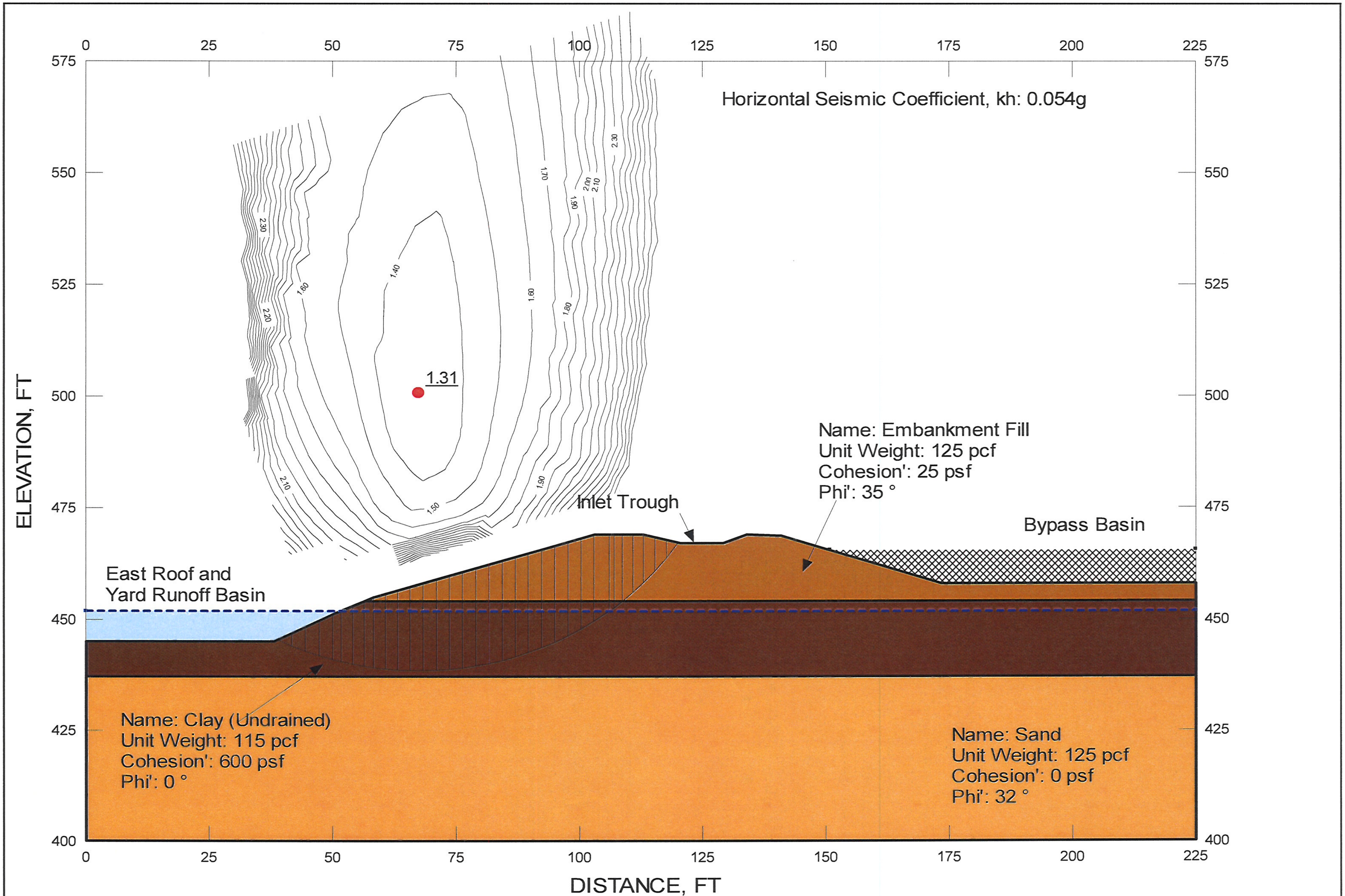


Geosyntec consultants

Analysis	Section 1 - §257.73(e)(1)(i): Long Term, Maximum Storage Pool Loading			FIGURE 4
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell	
File Name	Powerton Section 1.gsz	Date	October 2016	



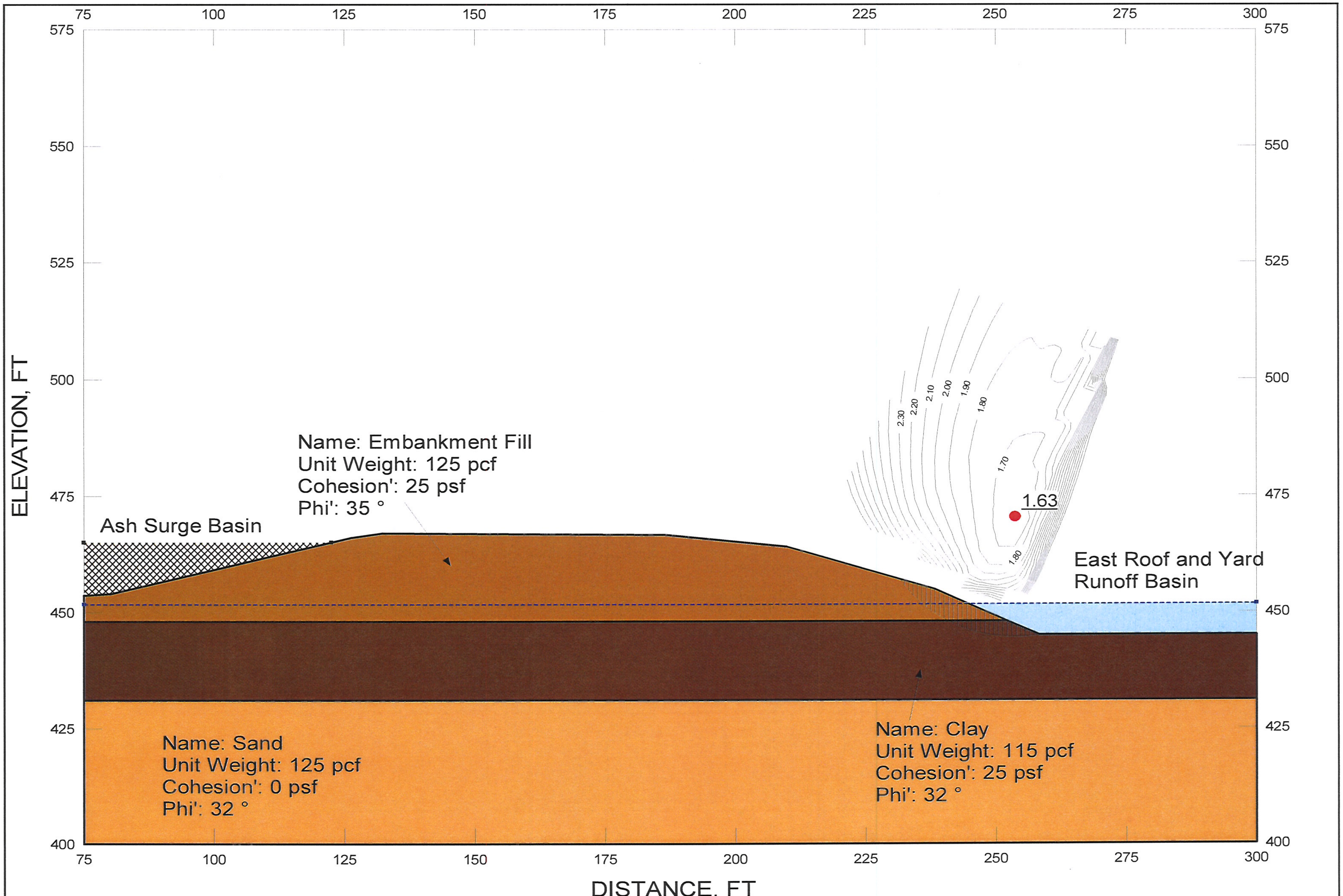
Geosyntec consultants	Analysis: Section 1 - §257.73(e)(1)(ii): Maximum Surcharge Pool Loading		FIGURE 5
	Project: Powerton Ash Surge and Bypass Basins	Analysis By: Cory Russell	
	File Name: Powerton Section 1.gsz	Date: October 2016	



Geosyntec consultants

Analysis	Section 1 - §257.73(e)(1)(iii): Long Term, Maximum Storage Pool Loading with Seismic (Undrained Conditions)		
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell
File Name	Powerton Section 7.gsz	Date	October 2016

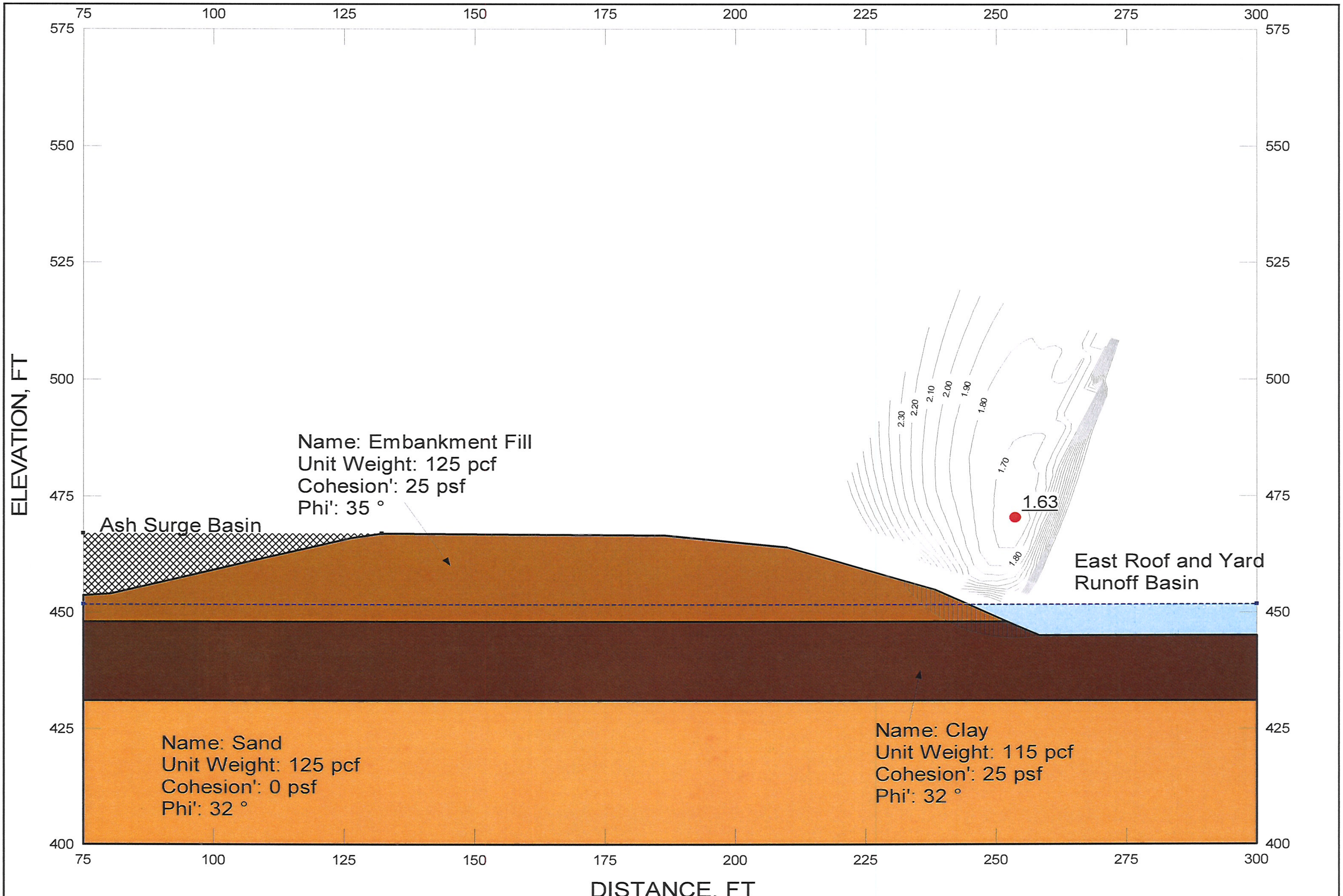
FIGURE 6



Geosyntec consultants

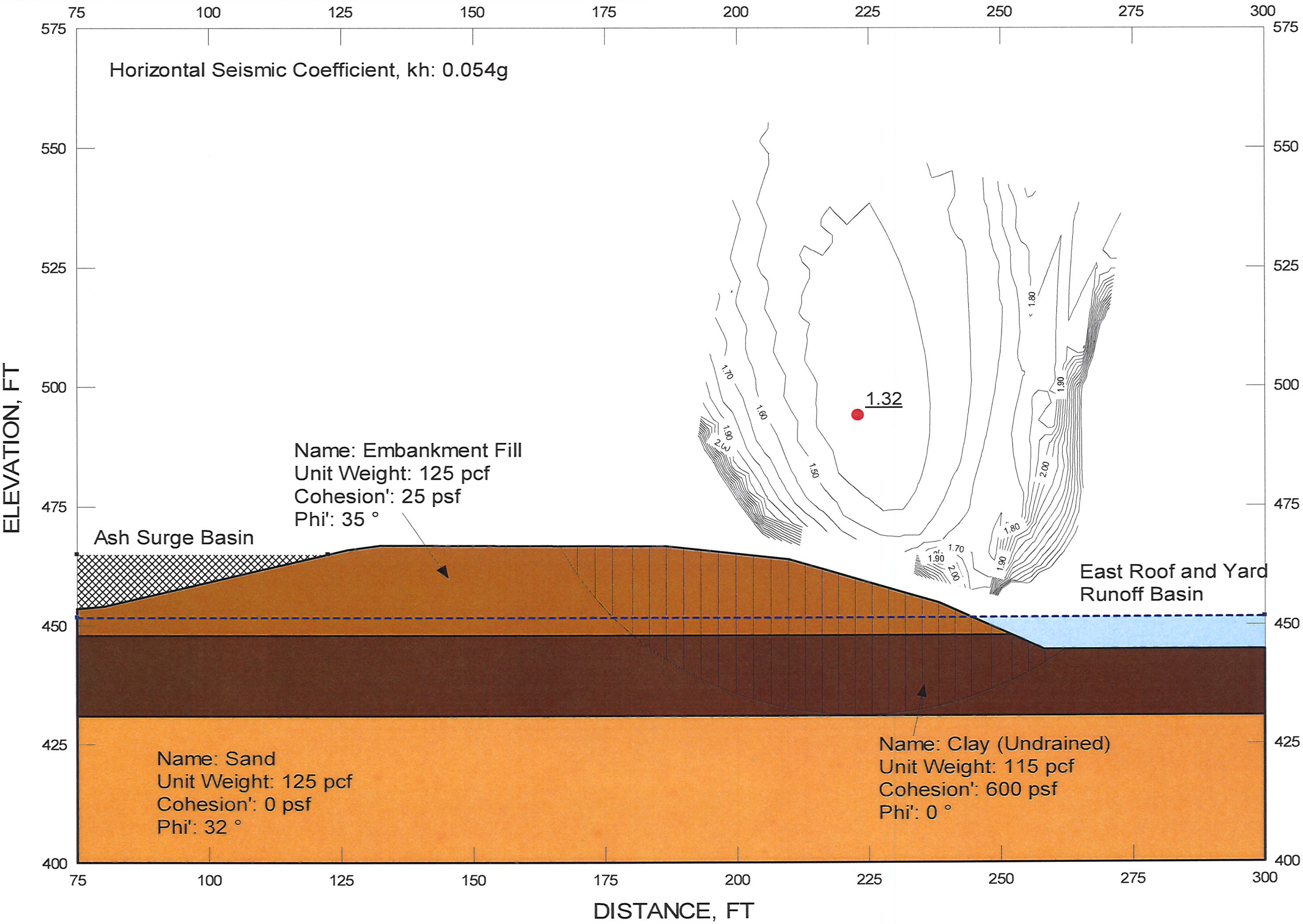
Analysis	Section 2 - §257.73(e)(1)(i): Long Term, Maximum Storage Pool Loading		
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell
File Name	Powerton Section 2.gsz	Date	October 2016

FIGURE 7



Geosyntec consultants

Analysis	Section 2 - §257.73(e)(1)(ii): Maximum Surcharge Pool Loading			FIGURE 8
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell	
File Name	Powerton Section 2.gsz	Date	October 2016	



Geosyntec consultants

Analysis	Section 2 - §257.73(e)(1)(iii): Long Term, Maximum Storage Pool Loading with Seismic (Undrained Conditions)		
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell
File Name	Powerton Section 2.gsz	Date	October 2016

FIGURE 9

ATTACHMENT 5-2
CQA SPECIFICATIONS

MWG
Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1401

CONSTRUCTION QUALITY ASSURANCE FOR BYPASS BASIN RETROFIT

S&L PROJECT NO.: 12661-130

REVISION 0C

ISSUE PURPOSE: PERMIT

ISSUE DATE: 07-15-2022

Sargent & Lundy

SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-28-2022	All
0B	Public Comment	04-15-2022	All
0C	Permit	07-15-2022	All

This is to confirm that this Specification has been prepared, reviewed, and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0407, Specifications and Bills of Materials, which is part of our Quality Management System.

Contributor Summary & Current Revision Signatures

Rev.	Prepared By	Reviewed By	Approved By
0A	T. Dehlin	D. Packard	--
0B	T. Dehlin	D. Packard	--
0C	Digitally signed by Thomas J. Dehlin Date: 2022.07.15 09:23:14 -05'00' T. Dehlin	Digitally signed by Darrel Packard Date: 2022.07.15 09:28:31 -05'00' D. Packard	Digitally signed by Thomas J. Dehlin Date: 2022.07.15 11:09:18 -05'00' T. Dehlin

SECTION 000107

CERTIFICATION PAGE

Sargent & Lundy (S&L) is registered in the State of Illinois to practice engineering. S&L's Illinois Department of Financial and Professional Regulation registration number is 184-000106.

I certify that this Specification was prepared by me or under my direct supervision and that I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin   Date: July 15, 2022

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

Th. Dehlin
07/15/2022
Exp. 11/30/2023

SECTION 000110

TABLE OF CONTENTS

END OF SECTION 000110

SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

101. PROJECT INFORMATION

101.1 Owner: Midwest Generation, LLC (MWG)

101.2 Design Engineer: Sargent & Lundy (S&L)

101.3 Project Name: Construction Quality Assurance for Bypass Basin Retrofit

101.4 Project Location: Powerton Generating Station
13082 E. Manito Rd.
Pekin, IL 61554

102. DESCRIPTION OF THE PROJECT AND GENERAL BACKGROUND

102.1 The purpose of this project is to retrofit the Bypass Basin at Midwest Generation, LLC's Powerton Generating Station in accordance with the Illinois Pollution Control Board's Coal Combustion Residuals (CCR) Rule, 35 Ill. Adm. Code Part 845, and with the U.S. Environmental Protection Agency's (EPA) CCR Rule, 40 CFR Part 257 Subpart D.

102.2 The Bypass Basin will be retrofitted by removing all CCR and CCR-mixed materials stored in the basin and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following removal of CCR and CCR-mixed material from the basin and decontamination of the basin facilities remaining in-place, a new composite liner system and a new leachate collection and removal system will be installed within the Bypass Basin over the basin's existing decontaminated and leak-tested geomembrane liner.

103. SCOPE OF WORK

103.1 In general, this Specification covers the field and laboratory activities for a Construction Quality Assurance (CQA) Contractor to provide assurance and documentation that the Bypass Basin at the Powerton Generating Station is retrofitted in accordance with the General Work (GW) Specification (P-1400), the Design Drawings, and permit requirements.

103.2 The CQA Work shall include but not be limited to the following:

a. Prepare a CQA Plan that provides a detailed description of the activities that will be performed by the CQA Contractor in accordance with the Design Drawings and this Specification.

b. Verify and document that all appropriate measures are taken by the GW Contractor to protect the Bypass Basin's existing geomembrane liner from damage during material removal and liner decontamination activities at the basin.

c. Verify and document decontamination of the Bypass Basin's existing geomembrane liner as specified in Section 014362 following material removal and liner decontamination activities performed by the GW Contractor.

d. Perform earthwork inspection and testing work specified in Section 014362 to:

d1. Verify compliance of materials with the GW Specification and Design Drawings.

d2. Perform specified field material and installation tests.

d3. Obtain samples and perform laboratory tests and/or contract to have laboratory tests performed and audit laboratory test results.

d4. Perform inspections during construction as specified.

e. Perform geosynthetics inspection and testing work specified in Section 014362 to:

e1. Verify compliance of materials with the GW Specification and Design Drawings.

e2. Perform field material and installation tests.

e3. Obtain samples and perform laboratory tests and/or contract to have laboratory tests performed and audit laboratory test results.

e4. Witness field testing and audit field test results as specified.

e5. Perform inspections during construction.

f. Identify non-conforming work.

g. Meetings, Documentation, and Reports:

g1. Participate in project meetings.

g2. Prepare CQA records and documents.

g3. Prepare CQA reports, including:

g3.1 Preparing an Index Report listing all CQA reports prepared throughout the project.

g3.2 Preparing and certifying Weekly Summary Reports until the end of the project.

g3.3 Preparing and certifying a Final Report at the end of the project.

103.3 The CQA Work shall conform to the requirements of this Specification and shall be performed and supervised by personnel who are experienced and knowledgeable in the crafts and trades required by the Scope of Work. The CQA Work shall be performed exclusively by the CQA Contractor's trained and competent personnel or, where permitted, that of its subcontractor(s); and shall comply with all applicable safety laws, regulations, programs, and practices to ensure the safety of those located on the work site and associated laboratories, including the CQA Contractor's personnel (or that of its subcontractor(s)) performing the CQA Work.

103.4 Performance of the CQA Work shall include all the labor, supervision, administration, management, tools, testing equipment, and consumables to execute the CQA Work identified herein.

103.5 Inspection and tests specified in this Specification shall be performed by personnel qualified to perform such inspections and tests.

104. RESPONSIBILITY AND AUTHORITY

104.1 The responsibilities and authority are described below for the organizations that will be involved in the design, permitting, and construction activities associated with the project.

a. Permitting Authority – Illinois EPA:

a1. The Illinois EPA is the Permitting Authority and is responsible for reviewing the permit application for retrofitting the Bypass Basin to assure compliance with state regulations and for granting the construction permit for the project.

a2. The Permitting Authority may review any design revisions during construction and any requests for variance submitted by the Owner. The Permitting Authority has the authority to review and approve all CQA documentation and reports and to confirm the Bypass Basin was retrofitted as specified in Project Specifications and the Design Drawings.

b. Owner:

b1. MWG is the Owner of the facility and has the authority to accept or reject materials and workmanship of the GW Contractor or reports and recommendations of the CQA Contractor.

b2. The Owner will ultimately be responsible for the retrofit construction for the Bypass Basin and for assuring the Permitting Authority that the construction meets or exceeds the requirements specified in state regulations, permits, Project Specifications, and the Design Drawings. The Owner will accomplish this by retaining a CQA Contractor for the project.

c. Design Engineer:

c1. S&L is the Design Engineer and is responsible for designing the retrofitted features for the Bypass Basin.

c2. The Design Engineer will assure that the retrofit design meets the construction requirements of the Owner and meets or exceeds the requirements of the Permitting Authority.

c3. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes to the permitted design shall require approval of the Owner and Design Engineer to ensure that the original design objectives are still maintained. All changes shall meet state regulatory requirements and the rules promulgated thereunder and may include Permitting Authority-approved variances to the rules.

d. GW Contractor:

d1. The GW Contractor shall be responsible for constructing the facility in accordance with the GW Specification (P-1400) and the Design Drawings and shall implement additional quality control and quality assurance procedures and techniques as necessary during construction.

d2. The GW Contractor will consist of an Earthwork Contractor performing the earthwork and a Geosynthetics Contractor installing the geosynthetic materials for the Bypass Basin's new composite liner system and new leachate collection and removal system. The GW Contractor may self-perform or subcontract the duties of the Earthwork Contractor and/or Geosynthetics Contractor.

e. CQA Contractor:

e1. The CQA Contractor shall be the company employed by the Owner who is responsible for performing the CQA Work. The CQA Contractor shall be objective, competent, and independent from the GW Contractor whose work is being inspected. The CQA Contractor shall remain independent throughout the duration of the project.

e2. The CQA Contractor's team shall include the CQA Officer and two or more CQA Inspectors.

f. CQA Officer:

f1. The CQA Officer shall be a professional engineer licensed in the State of Illinois who shall be responsible for implementation of the CQA Work. The CQA Officer shall be responsible to the Owner.

f2. The CQA Officer shall be responsible for the performance of activities specified herein such as auditing, inspecting, sampling, testing, documenting, and for preparing and certifying the Final Report. In addition, the CQA Officer and/or its inspectors shall have the responsibility of daily coordination with CQA Inspectors, the GW Contractor and its subcontractors, and the Owner to discuss daily progress, review completed work, plan for upcoming work, perform visual inspections, review test results, and discuss and assist in resolving any current or potential construction problems.

f3. Except as provided by Paragraph 104.1f4, the CQA Officer shall be present to provide supervision and assume responsibility for performing all inspections of the following activities, when applicable:

f3.1 Compaction of subgrade materials.

f3.2 Installation of the new composite liner system.

f4. If the CQA Officer is unable to be present as required by Paragraph 104.1f3, the CQA Officer shall provide the following in writing:

f4.1 The reasons for the CQA Officer's absence.

f4.2 A designation of a person who must exercise professional judgment in carrying out the duties of the CQA Officer-in-Absentia.

f4.3 A signed statement that the CQA Officer assumes full responsibility for all inspections performed and reports prepared by the designated CQA Officer-in-Absentia during the absence of the CQA Officer.

g. CQA Inspectors:

g1. The CQA Inspectors shall be responsible for performing visual examinations and for performing or obtaining field and laboratory tests. The CQA Inspectors shall be under the direct supervision of the CQA Officer.

g2. The CQA Inspectors shall be responsible for reporting to the CQA Officer and the Owner's representative the results of any inspections or tests indicating materials or installed work are of unacceptable quality or do not meet specified design requirements.

g3. The work shall be divided so that two or more CQA Inspectors, each with specialized knowledge and training, will be involved in inspection work.

105. QUALIFICATIONS

105.1 CQA Officer:

a. The CQA Officer shall be a registered professional engineer in the State of Illinois with at least 10 years of experience in design/construction/permitting/licensing, at least 5 years of which is CQA experience as a certifying engineer on landfills or ponds with geomembrane liner systems.

b. The CQA Officer shall be qualified by education, technical knowledge, and experience to complete the technical certifications required by this Specification.

105.2 CQA Inspectors:

a. The CQA Inspectors shall have adequate formal academic training and sufficient practical and technical experience needed to execute and record auditing and inspection activities conducted at the site and perform all required laboratory and field testing. This includes a demonstrated knowledge of the various aspects of the type of work being conducted.

b. As required, different CQA Inspectors, each with specialized knowledge and experience, shall be employed for different portions of the work.

c. CQA Earthwork Inspectors:

c1. The lead CQA field inspector for earthwork (Lead CQA Earthwork Inspector) shall have at least 5 years of experience as an earthwork inspector.

c2. All CQA Earthwork Inspectors shall be knowledgeable in:

c2.1 Field practices relating to construction techniques used for the type of earthwork being performed.

c2.2 Construction and compaction equipment.

c2.3 All codes and regulations concerning material installation.

c2.4 Observation procedures for earthwork construction.

c2.5 Sampling and earthwork testing procedures.

c2.6 Testing equipment.

c2.7 Documentation procedures.

c2.8 Site safety.

d. CQA Geosynthetics Inspectors:

d1. The lead CQA field inspector for geosynthetics (Lead CQA Geosynthetics Inspector) shall have at least 5 years of CQA experience as a field inspector on projects with a geomembrane lining system including two years as a CQA inspector.

d2. All CQA Geosynthetics Inspectors shall be knowledgeable in:

d2.1 Field practice relating to techniques used for the installation of geosynthetic clay liners (GCLs), high-density polyethylene (HDPE) geomembranes, pipes, HDPE geonets, and non-woven geotextiles.

d2.2 Correct procedures for seaming GCL.

d2.3 HDPE geomembrane welding equipment and the correct operating procedures for seaming HDPE geomembranes, including but not limited to:

d2.3.1 Non-destructive seam testing procedures and failure criteria.

d2.3.2 Sampling for destructive testing of samples of seams and laboratory testing procedures.

d2.3.3 Laboratory testing equipment.

d2.4 Geotextile seaming equipment and the correct procedures for splicing geotextiles and joining HDPE geonets.

d2.5 All codes and regulations concerning material installation.

d2.6 Documentation procedures for field and laboratory tests.

d2.7 Site safety.

106. <u>DEFINITIONS</u>

106.1 The term "Design Drawing" means the Design Engineer's drawings indicating the Work to be performed.

106.2 The term "Work" means the services furnished to complete the CQA activities specified herein.

106.3 The term "Owner-approved equal" means an acceptable equivalent to a specified material or equipment that has been accepted by the Owner.

107. <u>PROJECT MEETINGS</u>

107.1 Project meetings will be held on a periodic basis during the lifetime of the project. The meetings will include:

a. A preconstruction meeting.

b. Progress meetings.

c. Additional meetings as required to discuss problems or work deficiencies.

107.2 Preconstruction Meeting:

a. The preconstruction meeting will be organized by the Owner. In addition to the Owner, the Design Engineer, the GW Contractor (including representatives of the Earthwork Contractor and Geosynthetics Contractor), the CQA Officer (or CQA Officer-in-Absentia), the Lead CQA Inspectors, and any other interested party designated by the Owner shall attend the preconstruction meeting.

b. The preconstruction meeting shall be used to discuss:

b1. Site specific safety requirements.

b2. Requirements of the Design Drawings, GW Specification, and CQA Specification.

b3. The CQA Contractor’s CQA Plan and the responsibilities of each party.

b4. The lines of authority and communication.

b5. Procedure for submittal of manufacturer QA/QC documents for audit.

b6. Procedures for examination of materials delivered to the site.

b7. Location of material storage area(s).

b8. Field and laboratory test requirements and sample sizes.

b9. Procedures for observance of field tests.

b10. Coordination between each contractor and the CQA Inspector to obtain timely field samples and tests.

b11. Procedure for handling construction deficiencies, repairs, and retesting.

b12. Work area security and safety protocol.

b13. Work days and work hours.

b14. Coordination with other contractors or trades.

b15. Site visits.

107.3 Weekly Progress Meetings:

a. Weekly progress meetings will be scheduled by the Owner. In addition to the Owner, the meetings shall be attended by the Design Engineer, the GW Contractor (including representatives of the Earthwork Contractor and the Geosynthetics Contractor), the CQA Officer (or CQA Officer-in-Absentia), and the Lead CQA Inspectors.

b. If needed, daily meetings shall be held each day to review the work schedule, work completed, results of tests, and to discuss potential construction problems.

c. The Owner or its designee will document each meeting and distribute copies of meeting minutes to all responsible parties.

107.4 Additional Meetings:

a. Additional meetings between one or more contractors, the Lead CQA Inspector(s), and the CQA Officer (or the CQA Officer-in-Absentia) shall be held immediately after a work deficiency is identified or a problem arises. These meetings shall be used to define and resolve the problem.

b. Any supervisor/superintendent can request such a meeting through their line of authority.

c. Possible solutions to the problem shall be discussed, and an acceptable solution shall be selected. This solution shall be implemented provided it does not conflict with or require a change to the Design Drawings, in which case the solution shall be submitted to the Design Engineer for review.

d. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes from the permitted design shall require approval by the Owner and Design Engineer to ensure that the original design objectives are maintained. All changes shall meet the requirements of the Permitting Authority and may include regulations approved by the Permitting Authority.

e. The CQA Contractor shall document each special meeting and distribute copies of minutes to all responsible parties.

108. PERFORMANCE AUDITS AND CQA DOCUMENTATION

108.1 As a minimum, the CQA Officer shall conduct the following reviews and performance audits:

a. Full review and audit of results of preconstruction testing or GW Contractor's material certificates used to qualify earthwork materials for construction use.

b. Full review and audit of manufacturer certificates that qualify geosynthetic materials and ballast infill materials for use in the final cover system (including geomembrane and synthetic turf).

c. Weekly audit of reports and test data sheets during and after construction of the earthwork until completion of work.

d. Weekly audit of reports and test data sheets during and after installation of geosynthetic materials and cover materials until completion of the work.

108.2 CQA documentation shall be well-documented and include at least the following:

a. Daily records, which shall include:

a1. Inspection data sheets.

a2. Data sheets listing the number and types of construction equipment used by the GW Contractor, including applicable construction equipment data.

a3. Problem identification reports and corrective action reports. Problem identification reports and corrective action reports shall include detailed descriptions of materials and/or workmanship that do not meet a specified design and shall be cross-referenced to specific inspection data sheets where the problem was identified and corrected.

b. Testing records, which shall include:

b1. Material shipping and manufacturer QA/QC data sheets.

b2. Data sheets describing field samples taken.

b3. Laboratory data sheets.

b4. Field test data sheets.

b5. Notes, charts, drawings, or sketches identifying the location and elevation of field tests, location of failures and repairs or retests, and where samples were obtained.

b6. Non-destructive test reports including location of failures, records of repairs, and results of retests.

c. Photographic records, which shall include:

c1. Digital photographs, each with a unique identifying number.

c2. Figure indicating the location from which each photograph was taken.

c3. Summary list giving the date and time of each photograph.

108.3 All records shall, at a minimum, bear the following:

a. Unique identifying sheet number.

b. The date.

c. Project name, project number, and location.

d. Descriptive remarks.

e. Data sheets for tests.

f. Written text descriptions for visual observations

g. Signature of the preparer of designated authority.

END OF SECTION 011100

SECTION 014362

QUALITY ASSURANCE FOR FILL, LINER, AND LEACHATE COLLECTION MATERIALS

PART 1 – GENERAL

101. EXTENT

101.1 The intent of this section is to define the requirements for Construction Quality Assurance (CQA) activities to ensure that the quality of materials and installation procedures used to retrofit the Bypass Basin are in accordance with the General Work (GW) Specification P-1400, Design Drawings, permit requirements, and as specified herein.

101.2 The Work specified within this Specification is the responsibility of the CQA Contractor and shall include, but not be limited to, the following items:

a. Attend project meetings and site visits as scheduled by the GW Contractor for coordination between the Owner, GW Contractor, subcontractors, and CQA Contractor.

b. Perform pre-construction material certification activities to ensure materials meet or exceed GW Specification requirements that include but are not limited to:

b1. Testing for suitability of material prior to use.

b2. Perform pre-construction audits of material certifications prior to material use.

c. Perform CQA activities during construction to ensure materials meet or exceed GW Specification requirements that include but are not limited to:

c1. Audits of material certifications.

c2. Perform field observations, inspections, and tests.

c3. Perform laboratory tests and reviews of test results.

c4. Material sampling.

d. Documentation of all observations, findings, and testing, and of conformance of work to the GW Specification to be submitted by the Owner to the Permitting Authority.

e. Preparation of an Index Report, an Acceptance Report, Weekly Summary Reports, and a Retrofit Completion Report

f. Submit a draft version of the Retrofit Completion Report to the Owner and Design Engineer for their review and comment. Upon resolution of all comments, submit a final version of the Retrofit Completion Report, sealed and certified by the CQA Officer, to the Owner and Design Engineer.

101.3 Definitions:

a. The following definitions of terms shall apply throughout this section:

a1. GCL Manufacturer: The manufacturer who is, pursuant to Specification P-1400, responsible for manufacture of GCL materials and for transporting GCL materials to the site.

a2. GM/GC Manufacturer: The manufacturer who is, pursuant to Specification P-1400, responsible for manufacture of geomembrane and drainage geocomposite materials and for transporting geomembrane and drainage geocomposite materials to the site.

a3. Pipe Manufacturer: The manufacturer who is, pursuant to Specification P-1400, responsible for manufacture of LCRS pipe materials and fittings and for transporting these materials to the site.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

102.1 CQA Specification P-1401:

a. Section 011100 – Summary of Work.

102.2 GW Specification P-1400:

a. Section 319005 – Earthwork.

b. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

c. Section 319025 – Geosynthetic Clay Liner (GCL).

d. Section 319050 – Leachate Collection and Removal System.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D422 Standard Test Method for Particle-Size Analysis of Soils.

b. D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

c. D1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

d. D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique.

e. D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

f. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

g. D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

h. D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

i. D2434 Standard Test Method for Permeability of Granular Soils (Constant Head).

j. D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

k. D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).

l. D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

m. D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

n. D4643 Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating.

o. D4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

p. D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

q. D4959 Standard Test Method for Determination of Water Content of Soil By Direct Heating.

r. D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

s. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

t. D5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

u. D5887 Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.

v. D5890 Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

w. D5891 Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

x. D5993 Standard Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners.

y. D5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes.

z. D6243 Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.

aa. D6496 Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.

bb. D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

cc. D6768 Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

dd. D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

ee. D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

103.5 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

104. SUBMITTALS

104.1 Submittals with Bid Proposal:

a. Documentation to substantiate that the CQA Contractor's and its laboratory's Accreditation Certifications are current.

b. Detailed resumes on all CQA laboratory and field personnel proposed for the Work, including:

b1. A complete description of their qualifications and previous experience in the same type of work.

b2. Documentation of certification to perform required testing.

104.2 Submittals During the Course of the Work:

a. Certifications and submittals as specified herein.

b. An Index Report, an Acceptance Report, Weekly Summary Reports, and a Retrofit Completion Report as described below shall be prepared.

b1. Index Report:

b1.1 An Index Report shall be prepared listing all records and reports.

b1.2 The Index Report shall be assembled in chronological framework for recording and identifying all reports.

b2. Weekly Summary Reports:

b2.1 At the end of each week of construction, until construction is complete, a Weekly Summary Report must be prepared by either the CQA Officer or under the supervision of the CQA Officer and submitted to the Owner and the Design Engineer. The CQA Officer must review and approve each Weekly Summary Report.

b2.2 The Weekly Summary Report shall contain descriptions of the weather, locations where construction occurred during the previous week, materials used, results of testing, inspection reports, and procedures used to perform inspections.

b3. Retrofit Completion Report:

b3.1 After the GW Contractor completes retrofit construction activities, the CQA Officer shall prepare a Retrofit Completion Report that demonstrates the Bypass Basin was retrofitted in conformance with Project Specifications, the Design Drawings, and permit requirements. At a minimum, this report shall include:

b3.1.1 All data sheets, testing records, manufacturer data sheets, and reports concerning items that were installed and tested.

b3.1.2 Photographs of the liner system and leachate collection system and any other photographs relied upon to document construction activities. All photographs shall include time, date, and location information.

b3.1.3 Any designations of CQA officers-in-absentia in accordance with Section 011100, Paragraph 104.1f4.

b3.1.4 Certification that the GW Contractor’s work is in compliance with Project Specifications, the Design Drawings, and permit requirements.

b3.1.5 Certifications that:

b.3.1.5.1 Pipe bedding material contains no undesirable objects.

b.3.1.5.2 The anchor trench and backfill are constructed to prevent damage to a geosynthetic membrane.

b.3.1.5.3 All tears, rips, punctures, and other damage to geosynthetic materials are repaired.

b.3.1.5.4 All geomembrane seams are properly constructed and tested in accordance with the manufacturer’s specifications.

b.3.1.5.5 Proper filter material consisting of uniform granular fill, to avoid clogging, is used in construction.

b.3.1.5.6 The filter material, as placed, possesses structural strength adequate to support the maximum loads imposed by the overlying materials and equipment used at the facility.

b3.2 The first draft version of the Retrofit Completion Report shall be submitted within 1 week after completion of CQA Work to the Owner and Design Engineer for their review and comment.

b3.3 Within 1 week of resolving all comments, the final version of the Retrofit Completion Report shall be sealed and certified by the CQA Officer and submitted to the Owner and Design Engineer.

105. CONSTRUCTION QUALITY ASSURANCE REQUIREMENTS

105.1 Organizations Involved:

a. The organizations involved in the design, permitting, and construction activities associated with the Work are defined in Section 011100.

b. The responsibilities and authorities of the organizations and personnel associated with the Work are described in Section 011100.

105.2 Qualifications:

a. The qualifications of the CQA Contractor personnel are described in Section 011100.

105.3 Project Meetings:

a. The requirements for project meetings and audits are described in Section 011100.

105.4 Performance Audits, CQA Documentation, and CQA Reports:

a. The requirements for performance audits and CQA documentation are described in Section 011100.

b. The requirements for CQA reports are described in Paragraph 104.2 of this section.

PART 2 – PRODUCTS

201. PRODUCTS

201.1 The requirements for the various products used for retrofitting the Bypass Basin are specified in their respective technical specification sections in the GW Specification.

201.2 All permanent materials to be used in the Work are supplied by the GW Contractor. The GW Contractor and CQA Contractor shall coordinate obtaining materials for testing by the CQA Contractor.

PART 3 – EXECUTION

301. GENERAL CQA TESTING AND INSPECTION REQUIREMENTS

301.1 Record daily weather conditions.

301.2 Field tests shall document the elevation and coordinate location for each test. The locations may be determined by survey, taping, or pacing off distances unless otherwise noted.

301.3 Material Source Testing: Material source testing activities include visual observations and laboratory and field testing at the material source to control material quality and material preparation prior to transport of the material to the project site.

302. CQA TESTING AND INSPECTION REQUIREMENTS FOR EXISTING LINER DECONTAMINATION ACTIVITITES

302.1 Testing During Construction:

a. CQA activities during removal of material from and decontamination of the Bypass Basin's existing geomembrane liner shall include visual observations and field testing to verify the liner has been decontaminated in accordance with the Design Drawings.

b. Visual Observations:

b1. Observe and record method(s) of material removal and decontamination.

b2. Verify and document that the GW Contractor is taking necessary precautions to avoid damaging the geomembrane liner. Identify any locations where damage to the existing geomembrane liner has occurred and record the method(s) used to repair such damage.

b3. Verify and document that the GW Contractor has developed and is implementing fugitive dust controls in accordance with 35 Ill. Adm. Code 845.740(c)(2), which must include:

b3.1 A water spray or other commercial dust suppressant to suppress dust in CCR handling areas and haul roads.

b3.2 Handling of CCR to minimize airborne particulates and offsite particulate movement during any weather event or condition.

b4. Verify and document that the GW Contractor has developed and is implementing measures to prevent contamination of surface water, groundwater, soil, and sediments in accordance with 35 Ill. Adm. Code 845.740(c)(4).

b4.1 If CCR and CCR-impacted material removed from the Bypass Basin is temporarily stored, verify and document the material is stored in a lined landfill, CCR surface impoundment, enclosed structure, or CCR storage pile.

b4.2 If CCR and/or CCR-impacted material are temporarily stored in a CCR storage pile, verify and document the pile is:

b4.2.1 Tarped or constructed with wind barriers to suppress dust and to limit stormwater contact with the pile.

b4.2.2 Is periodically wetted and/or has periodic application of dust suppressants.

b4.2.3 Has a storage pad or a geomembrane liner that:

b.4.2.3.1 Has a hydraulic conductivity no greater than 1×10^{-7} cm/sec.

b.4.2.3.2 Is properly sloped to allow appropriate drainage.

b4.2.4 Is tarped over the edge of the storage pad where possible.

b4.2.5 Is constructed with fixed and/or mobile berms, where appropriate, to reduce run-on and run-off of stormwater to and from the storage pile, and minimize stormwater-CCR contact.

b4.2.6 Is located within the groundwater monitoring system in-place for the Ash Surge Basin and/or Bypass Basin.

b5. Verify and document that all material removal and decontamination work is performed in a systematic manner to remove all ash and ash residuals from the liner surface.

b6. Verify and document that the GW Contractor is providing adequate temporary ballasting on exposed liner areas to prevent uplift of the geomembrane by wind by the use of sandbags and/or other means which will not damage the geomembrane.

b7. For areas of geomembrane that are damaged, verify and document that the GW Contractor addresses and repairs the damaged areas as specified on the Design Drawings.

b8. Verify and document that the GW Contractor repairs all locations of the geomembrane from which samples are obtained for verification of decontamination.

c. Laboratory and Field Tests:

c1. Perform an electrical leak location survey over decontaminated liner areas as specified on the Design Drawings.

c2. Collect samples of the existing geomembrane liner for verification of decontamination by laboratory testing as specified on the Design Drawings.

c3. Perform laboratory testing of existing geomembrane liner samples as specified on the Design Drawings.

d. Test Acceptance Criteria:

d1. Laboratory and field test acceptance criteria shall be as specified on the Design Drawings.

d2. If the results from any of the laboratory and field tests do meet the respective pass/fail thresholds, then the CQA Officer shall reject all existing geomembrane liner areas corresponding to the failed test(s) as decontaminated.

303. CQA TESTING AND INSPECTION REQUIREMENTS FOR STRUCTURAL FILL MATERIAL

303.1 Initial Material Certification:

a. Prior to shipment of any Structural Fill material, the CQA Contractor shall assemble, document the receipt of, and audit the material supplier's test results and certifications that the properties of the material meet GW Specification requirements.

303.2 Inspections and Testing During Construction:

a. CQA activities during placement of Structural Fill shall include visual observations and laboratory and field testing to ensure that Structural Fill is installed in accordance with GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-1 and the following paragraphs.

b. Visual Observation of the Material Source for Structural Fill Material During Construction:

b1. Inspect materials to ensure that they are uniform.

b2. Visually inspect the material in accordance with ASTM D2488.

b3. Inspect to ensure that only suitable material is transported to the site, observe segregation operations if unsuitable materials are present, and observe (if necessary) the removal of organic soils, roots, stumps, and stones.

b4. Observe changes in color or texture that can be indicative of a change in material type or moisture content.

b5. Observe moisture conditioning activities to ensure that any required substantial changes in moisture content are made at the source.

c. Visual Observation of Fill Placement:

c1. Record the placement method(s) the GW Contractor is utilizing for installing the Structural Fill.

c2. In instances where the GW Contractor is transporting material into the basin, the CQA Contractor shall:

c2.1 Verify no equipment (wheeled or tracked) is traversing the Bypass Basin area when less than 10 inches of earthen material are above the basin's existing geomembrane liner.

c2.2 Verify Structural Fill has been installed above the existing geomembrane liner along the basin's ramp as detailed on the Design Drawings before the GW Contractor's equipment uses the ramp to transport fill material into the basin.

c2.3 Document the receipt of and audit the GW Contractor's demonstration(s) that equipment entering the basin will not exert a ground pressure greater than 8 psi.

c2.4 Verify equipment operating within the basin does not hard brake on the ramp, make sharp turns, nor make quick stops that could pinch or tear the Bypass Basin's existing geomembrane liner.

c3. Record type and size of compaction equipment in use:

c3.1 For rubber-tired rollers, record the tire inflation pressure, spacing of tires, and empty and ballasted wheel loads.

c3.2 For hand tampers, record make, model number, size and compactive effort.

c3.3 Observe and record compactive effort, uniformity of compaction and scarification and connection between compacted lifts. Record number of passes of a roller by type, size, and weight of roller.

c3.4 For proofrolling, record the type, size, and weight of compaction equipment or other vehicles used for proofrolling.

c4. Observe removal of roots, rocks, rubbish, or out-of-specification soil from the borrow material.

c5. Observe and record changes in soil characteristics necessitating a change in construction procedures.

c6. Observe fill placement and procedures for proper lift thickness.

c7. Observe procedures to be followed to adjust the soil moisture content to obtain uniform moisture content.

c8. Observe and record final finishing procedures.

c9. Observe and record that final grade is consistent with the design grade specified on the Design Drawings.

d. Laboratory and Field Tests:

d1. Laboratory and field testing shall be performed in accordance with the requirements specified in Table 014362-1.

e. Test Acceptance Criteria:

e1. Acceptance criteria shall be as specified in GW Specification Section 319005.

304. <u>CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOSYNTHETIC CLAY LINER COMPONENT OF COMPOSITE LINER SYSTEM</u>

304.1 Initial Material Certification:

a. Prior to shipment of any geosynthetic clay liner (GCL) materials, the CQA Contractor shall assemble, document the receipt of, and audit the GCL Manufacturer's submittals listed below for conformance with the GW Specification.

a1. Certificates describing the origin and identification of the raw materials.

a2. Copy of the GCL Manufacturer's QA/QC certificates on tests performed on the material and a summary of results of the tests.

a3. Certification and guarantee by the GCL Manufacturer that the properties of the manufactured material meet GW Specification requirements.

a4. Certification that the GCL was continuously inspected during the manufacturing process for, as a minimum, the following:

a4.1 Lack of uniformity.

a4.2 Damage.

a4.3 Imperfections.

a4.4 Holes.

a4.5 Tears.

a4.6 Thin spots.

a4.7 Foreign materials.

b. GCL Panel Layout:

b1. Document receipt of the GCL Manufacturer's proposed GCL panel layout.

304.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of GCL.

a2. Document that each roll is marked with the following information:

a2.1 Name of GCL Manufacturer.

a2.2 Product identification (brand name, product code).

a2.3 Date of manufacture.

a2.4 Roll identification number and weight.

a2.5 Panel number.

a2.6 GCL thickness.

a2.7 Physical dimensions (length, width).

a2.8 Manufacturing lot number.

a2.9 Order number.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

304.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GCL Manufacturer shall submit to the CQA Contractor representative samples of the GCL materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the GCL materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing of the received GCL samples in accordance with Table 014362-3. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-3.

b. Test acceptance criteria shall be as specified in GW Specification Section 319025. If the results from any of the tests in Table 014362-3 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all GCL material for which the failed test(s) represent(s) for use in the project.

304.4 Inspections During Construction:

a. CQA activities during placement of the GCL component of the Bypass Basin's new composite liner system shall include visual observations and field testing to ensure that the GCL is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-3 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (i.e., temperature, humidity, precipitation, and wind) to ensure that they are appropriate for GCL placement. The GW Specification describes acceptable weather conditions.

b2. If the weather becomes unacceptable for installation of GCL, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. GCL Placement:

c1. Supporting Surface:

c1.1 Prior to placement of the GCL, visually inspect the Structural Fill surface to ensure that it meets the requirements of the GW Specification. Confirm that it is compacted and is free from clods of soil, rocks larger than specified, roots, sudden or sharp changes in grade, and standing water. Field observations shall be performed in accordance with the requirements specified in Table 014362-4.

c1.2 Provide documentation of daily inspection of the Structural Fill surface for the area of GCL to be placed that day.

c2. Panel Deployment:

c2.1 As each panel is unrolled, visually inspect the GCL to ensure there are no flaws or damage. The CQA Inspector shall traverse the panels in such a way that the entire surface is inspected. Any defects shall be documented on a drawing and marked on the GCL for repair.

c3. Document that the location of the seams meet the general requirements for seaming contained in GW Specification Section 319025.

c4. At the time of placement, make measurements to confirm that required overlap of adjacent GCL panels has been achieved, that proper temporary anchorage is being used (e.g., sand bags or tires), and that the GCL is being placed in a relaxed (nonstressed) state.

c5. Document any liner damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Any damage shall be documented on a drawing and marked on the GCL for repair.

c6. Document improper GCL panel placement and, as a result, inadequate coverage with the available materials or an excess number of field seams.

c7. Document inadequate sheet overlap resulting in poor quality seams.

c8. Document unseamed or cut panels.

c9. Document repair of damage. Documentation shall include location, type, and method of repair.

305. <u>CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOMEMBRANE COMPONENT OF COMPOSITE LINER SYSTEM</u>

305.1 Initial Material Certification and Inspection of Installation Plans:

a. Prior to shipment of any geomembrane materials, the CQA Contractor shall assemble, document the receipt of, and audit the GM/GC Manufacturer submittals listed below for conformance with the GW Specification.

a1. Geomembrane Resin:

a1.1 Certificate that the resin meets GW Specification requirements.

a1.2 Certificate of the origin of the resin and that all resin is from the same supplier (including resin supplier's name, identification brand name, and number).

a1.3 Copies of the GM/GC Manufacturer's and resin supplier's QA/QC certificates. Certificates shall include a summary report of test results conducted to verify the quality of the resin used in each batch to manufacture geomembrane for this project. As a minimum, the report shall include tests on specific gravity, melt flow index, and percent carbon black.

a2. Geomembrane Sheeting:

a2.1 Certification that the properties of the manufactured sheeting meet GW Specification requirements and are guaranteed by the GM/GC Manufacturer.

a2.2 Statement certifying that no reclaimed polymer has been added to the resin. Note: Polymer recycled during the manufacturing process may be permitted provided that it does not exceed 2% by weight.

a2.3 Statement certifying that the manufactured sheeting is free of per- and polyfluoroalkyl substances (PFAS).

a2.4 Copies of all of the GM/GC Manufacturer's QA/QC certificates for the geomembrane sheeting. The certificates shall include test results.

a3. Extrudate Resins or Rod for Seaming Geomembrane:

a3.1 Certification from the GM/GC Manufacturer that all extrudate is the same resin type as the geomembrane and was obtained from the same resin supplier as the resin used to manufacture the geomembrane.

b. Review of GW Contractor's Installation Plans

b1. Geomembrane Field Installation Quality Assurance Plan:

b1.1 Document receipt of the GW Contractor's QA plan for installing geomembrane.

b1.2 Review the plan for compliance with the GW Specification and document where the plan is not in compliance.

b2. Geomembrane Panel Layout:

b2.1 Document receipt of the GW Contractor's panel layout for geomembrane.

305.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of geomembrane.

a2. Document that each roll is marked with the following information:

a2.1 Name of GM/GC Manufacturer.

a2.2 Product identification, which can be traced back to the origin of the base material (resin supplier's name, resin production plant, resin brand name type, and production date of the resin).

a2.3 Date of manufacture of the geomembrane.

a2.4 Roll identification number.

a2.5 Geomembrane thickness and type.

a2.6 Physical dimensions (length, width).

a2.7 Lot number.

a2.8 Panel number and weight.

a2.9 Order number.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

305.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the geomembrane materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the geomembrane materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing in accordance with Table 014362-6. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-6.

b. Test acceptance criteria shall be as specified in GW Specification Section 319020. If the results from any of the tests in Table 014362-6 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all geomembrane material from the resin batch corresponding to the failed test(s) for use in the project.

305.4 Inspections and Testing During Construction:

a. CQA activities during placement of the geomembrane component of the Bypass Basin's new composite liner system shall include visual observations and field testing to ensure that the geomembrane is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-6 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (i.e., temperature, humidity, precipitation, and wind) to ensure that they are acceptable for geomembrane placement and seaming. The GW Specification describes acceptable weather conditions.

b2. If the weather becomes unacceptable for installation of the geomembrane liner, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. Geomembrane Placement:

c1. Prior to placement of the geomembrane liner, the GCL component of the composite liner system in the area to be lined shall have been installed, seamed, and inspected and all necessary repairs made in accordance with GW Specification Section 319025.

c2. Observe and document that the GW Contractor's geomembrane placement plan is being followed. Note where the plan is not being followed and document the GW Contractor's reasons for not following the plan. As each panel is placed, visually inspect the geomembrane for tears, punctures, and thin spots. The CQA Inspector shall traverse the panels in such a way that the entire surface is inspected. Any defects shall be documented on a drawing and marked on the geomembrane for repair.

c3. Document that the location of the seams meet the general requirements for seaming specified in GW Specification Section 319020.

c4. At the time of placement, make measurements to confirm that required overlap of adjacent geomembrane sheets has been achieved, that proper temporary anchorage is being used (e.g., sand bags or tires), and that the geomembrane is being placed in a relaxed (nonstressed) state.

c5. Document any liner damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Mark the location of damage on the geomembrane for repair and on a drawing.

c6. Document improper liner placement (if the GW Contractor's geomembrane placement plan is not followed) and, as a result, inadequate coverage with the available materials or an excess number of field seams.

c7. Document inadequate sheet overlap resulting in poor quality seams.

c8. Document nonwelded or cut panels.

c9. Document repair of damage. Documentation shall include location, type, and method of repair.

d. Geomembrane Seaming and Seam Repair:

d1. Trial Welds Prior to Beginning Seaming:

d1.1 Observe that trial welds are being made at the frequency specified in GW Specification Section 319020.

d1.2 Observe fabrication of test strips and note that test strips are fabricated correctly.

d1.3 Specify where samples are to be cut from the test strips and witness all destructive tests.

d1.4 Observe documentation of results of the destructive tests by the GW Contractor.

d1.5 Audit documentation of each trial weld received from the GW Contractor.

d2. Seaming and Seam Repair – Activities that shall be documented during field seaming operations include:

d2.1 Observe that the geomembrane is free from dirt, dust, and moisture.

d2.2 Observe that the seaming materials and seam welding equipment are as specified.

d2.3 Observe that a firm surface is available for seaming.

d2.4 Observe that geomembrane overlap and panel adjustment are correct prior to seaming.

d2.5 For extrusion welding, observe that the geomembrane is pre-beveled and the geomembrane is properly abraded and that the panels are temporarily bonded.

d2.6 Observe that grind marks are covered with extrudite.

d2.7 Observe weather conditions (e.g., temperature, humidity, wind) to ensure that they are acceptable for seaming.

d2.8 Measurements of temperatures, pressures, and speed of seaming to ensure that they are as specified. Gages and dials on seaming equipment shall be checked and readings recorded.

d2.9 Observe that the geomembrane is not damaged by equipment or personnel during the seaming process.

d2.10 Observe that no solvents or adhesives are used.

e. Anchorage at Existing Penetrations and Concrete Structures:

e1. Where shown on the Design Drawings, CQA Inspectors shall ensure that the seals around existing penetrations and the anchorage to existing concrete structures are of sufficient strength and are impermeable.

e2. Specific inspections that shall be made on all seals and anchors include:

e2.1 Observations and tests to ensure that the sealing systems (i.e., pipe boots) have been installed as specified (are leak free) and in the proper location(s).

e2.2 Observations to ensure that all objects that are placed adjacent to the geomembrane (i.e., batten bars) are smooth and free of objects or conditions that may damage the geomembrane.

e2.3 Observations to ensure that all seals and anchors are complete:

e2.3.1 Batten bars of the specified material, width, and thickness and prepunched at the specified spacing.

e2.3.2 Anchor bolts of the specified size and material.

e2.3.3 Anchor bolts spaced as specified.

e2.4 Observations to confirm that all geomembrane liner penetrations and connections are installed as specified. Liner penetrations shall be verified for appropriate clamp and caulking use, for appropriate material, for good seaming, and for good housekeeping practices. No sharp bends on concrete surfaces shall be allowed.

f. Geomembrane Production Seam Testing:

f1. Non-Destructive: Activities to be observed and documented include the following:

f1.1 Observe that 100 percent of the seam lengths are tested using non-destructive procedures.

f1.2 Observe that testing is performed as seaming progresses.

f1.3 Observe that the correct procedures are used for testing each type of seam.

f1.4 Observe all non-destructive test procedures.

f1.5 For air pressure testing, observe that the equipment, procedures, and air pressure meet specified requirements. Observe that all testing is properly documented.

f1.6 For vacuum box testing, observe that testing is being performed correctly.

f1.7 For inaccessible seams, observe that a procedure acceptable to the Owner is used to test the seams.

f1.8 Observe that all leaks are marked, recorded as to location, and repaired.

f1.9 Observe that repairs are made in accordance with approved techniques.

f1.10 Observe that all repairs are re-tested and that no leakage is present.

f1.11 Review leakage data for possible patterns. Make suggestions to the GW Contractor if data shows a consistent pattern of failure of a particular machine or crew.

f1.12 Audit documentation of testing prepared by the GW Contractor to make sure that the location of leaks is identified on the drawings.

f2. Destructive:

f2.1 Destructive seam testing shall be performed at the frequencies specified in GW Specification Section 319020.

f2.2 The CQA Inspector shall specify the location where each sample shall be taken and record data for each sample.

f2.3 The CQA Inspector shall designate any additional test locations that may be necessary. These locations may be based on the suspicion of contamination by dirt or moisture, change in seaming materials, increase in failed nondestructive tests, and other causes that could result in unacceptable seams.

f2.4 Laboratory testing shall be performed in accordance with GW Specification Section 319020. Predetermined pass/fail values are specified in that section.

f2.5 Audit and document the results of laboratory testing on seam samples. Note any sample that does not pass and identify the location on the geomembrane liner for repair in the field and on the drawings.

f3. Repair of Failed Seams:

f3.1 For field seams that fail, the seam can either be reconstructed between the failed and any previous passed seam location, or the installer can go on either side of the failed seam location (10-foot minimum), take another sample, and test it. If that sample passes, reconstruct the seam between the two locations. If it fails, the process shall be continued. In all cases, acceptable seams must be bounded by two passed test locations. The CQA Geosynthetics Inspector shall document the procedure used and results of tests.

f3.2 Document that repairs are made. Documentation shall include location, type, and method of repair.

306. CQA TESTING AND INSPECTION REQUIREMENTS FOR DRAINAGE GEOCOMPOSITE OF LEACHATE COLLECTION AND REMOVAL SYSTEM

306.1 Initial Material Certification:

a. Prior to shipment of any drainage geocomposite materials, the CQA Contractor shall assemble, document the receipt of, and audit the GM/GC Manufacturer submittals listed below for conformance with the GW Specification.

a1. Copies of the raw material producers’ certificates describing the origin and identification of the raw materials.

a2. Copies of the raw material producers’ QC certificates.

a3. Statement certifying that the manufactured drainage geocomposite is free of per- and polyfluoroalkyl substances (PFAS).

a4. Copies of the GM/GC Manufacturer's QC certificates on tests performed on the geonet core, geotextile cap and carrier, and double-sided laminated geocomposite as specified in Specification P-1400 Section 319020 and a summary of the results of the tests.

a5. Certification that the properties of the manufactured drainage geocomposite material meets GW Specification requirements and are guaranteed by the GM/GC Manufacturer.

306.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of drainage geocomposite.

a2. Document that each roll is marked with the following information:

a2.1 Name of GM/GC Manufacturer.

a2.2 Product identification (brand name, product code).

a2.3 Date of manufacture of drainage geocomposite.

a2.4 Roll identification number.

a2.5 Drainage geocomposite thickness and type.

a2.6 Roll dimensions (length and width).

a2.7 Lot number.

a2.8 Panel number and weight.

a2.9 Order number.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

306.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the drainage geocomposite materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the drainage geocomposite materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing in accordance with Table 014362-7. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-7.

b. Test acceptance criteria shall be as specified in GW Specification Section 319020. If the results from any of the tests in Table 014362-7 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all drainage geocomposite materials for which the failed test(s) represent(s) for use in the project.

306.4 Inspections During Construction:

a. CQA activities during placement of the drainage geocomposite component of the Bypass Basin's new LCRS shall include visual observations and field testing to ensure that the drainage geocomposite is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-7 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (i.e., temperature, precipitation, and wind) to ensure they are acceptable for placement. The GW Specification describes correct weather conditions.

b2. If the weather becomes unacceptable for installation of the drainage geocomposite, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. Drainage Geocomposite Placement:

c1. Prior to placement of the drainage geocomposite, the HDPE geomembrane component of the composite liner system in the area to be lined shall have been installed, seamed, and inspected and all necessary repairs made in accordance with GW Specification Section 319020.

c2. Inspect all materials as they are unrolled to ensure that there are no flaws or damage.

c3. Observe and document that drainage geocomposite coverage is as specified on the Design Drawings, that joining of the geonet cores is as specified in GW Specification Section 319020, and sewing of the geotextile caps is as specified in GW Specification Section 319020.

c4. Make measurements to ensure that the specified material overlap is achieved.

c5. Observe and document that all materials are free from wrinkles and folds.

c6. Observe and document that the material is not damaged during the installation process.

c7. Document any material damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Mark the location of damage on the drainage geocomposite for repair and on a drawing.

c8. Document repair of damage. Documentation shall include location, type, and method of repair.

307. CQA TESTING AND INSPECTION REQUIREMENTS FOR COARSE AGGREGATE BEDDING, SAND FILTER LAYER, PROTECTIVE WARNING LAYER, RIPRAP BEDDING LAYER, AND RIPRAP MATERIALS

307.1 Initial Material Certification:

a. Prior to shipment of any Coarse Aggregate Bedding, Sand Filter Layer, Protective Warning Layer, Riprap Bedding Layer, or riprap materials, the CQA Contractor shall assemble, document the receipt of, and audit the material suppliers' test results and certifications that the properties of the materials meet GW Specification requirements.

307.2 Inspections and Testing During Construction:

a. CQA activities during the placement of Coarse Aggregate Bedding, Sand Filter Layer, Protective Warning Layer, Riprap Bedding Layer, and riprap materials shall include visual observations and laboratory and field testing to ensure that the materials are installed in accordance with GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-2 and the following paragraphs.

b. Visual Observations of Material Placement:

b1. Upon delivery of the material to the site, inspect the material to ensure that it has not been contaminated during transportation and handling. Observe and document rejection of contaminated materials and replacement of suitable materials.

b2. Record the placement method(s) the GW Contractor is utilizing for installing the material.

b3. In instances where the GW Contractor is transporting material into the basin, then the CQA Contractor shall:

b3.1 Verify no equipment (wheeled or tracked) is traversing the Bypass Basin area when less than 10 inches of earthen material are above geosynthetic materials (i.e., drainage geocomposite, geomembrane liner, GCL).

b3.2 Verify the Protective Warning and Sand Filter Layers have been installed along the basin's ramp as detailed on the Design Drawings before the GW Contractor's equipment uses the ramp to transport fill material into the basin.

b3.3 Document the receipt of and audit the GW Contractor's demonstration(s) that equipment entering the basin will not exert a ground pressure greater than 8 psi.

b3.4 Verify equipment operating within the basin does not hard brake on the ramp, make sharp turns, nor make quick stops that could pinch or tear geosynthetic materials.

b4. Observe placement procedures to provide proper thickness.

b5. Observe placement procedures to prevent segregation and degradation of material.

b6. Observe placement procedures to:

b6.1 Ensure pipes and underlying geosynthetic materials are not damaged during the installation process (Note: Side slope cover installation must be observed at all times to assure appropriate placement technique and equipment are used and to detect any damage to geosynthetic materials).

b6.2 Ensure that placement of the Coarse Aggregate Bedding material did not damage or displace the leachate collection pipe.

c. With the use of the GW Contractor's surveyor, make thickness measurements not more than 50 feet on a grid pattern to ensure that the thickness and coverage of each material is in compliance with the Design Drawings.

d. Audit surveys of each completed layer to ensure that specified slopes and elevations specified on the Design Drawings are obtained.

e. Laboratory and Field Tests:

e1. Laboratory and field testing shall be performed in accordance with the requirements specified in Table 014362-2.

f. Test Acceptance Criteria:

f1. Acceptance criteria shall be as specified in GW Specification Section 319050.

308. <u>CQA TESTING AND INSPECTION REQUIREMENTS FOR LEACHATE COLLECTION PIPING AND SIDESLOPE RISERS</u>

308.1 Initial Material Certification:

a. Prior to shipment of any HDPE piping, the CQA Contractor shall assemble, document the receipt of, and audit the Pipe Manufacturer's submittals listed below for conformance with the GW Specification:

a1. Certification that the manufactured pipe meets the requirements of the GW Specification.

a2. Statement that no reclaimed polymer has been added to the resin.

a3. Copies of the Pipe Manufacturer's QA/QC certificates on tests performed during fabrication.

308.2 Transportation, Handling, and Storage:

a. Documentation of Delivery and Inspection of HDPE Pipe:

a1. Document the arrival of pipe.

a2. Check the Quality Control certificates and marking on each pipe to verify that the pipe received meets the GW Specification requirements.

a3. Document that each length of pipe is marked with the following information:

a3.1 Name of Pipe Manufacturer.

a3.2 Pipe type (ASTM designation).

a3.3 Pipe size (diameter).

a3.4 Standard Dimension Ratio (SDR).

a4. Document that all fittings are fabricated and manufactured by the same manufacturer.

a5. Measure and document the spacing and diameter of perforations for perforated pipe and that perforations are predrilled prior to shipment.

a6. Recommended rejection of pipe that does not have the required documentation; that is of the incorrect size, type, or strength; or that is incorrectly fabricated. Ensure that this pipe is removed from the site.

b. Handling:

b1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

b2. Inspect the handling of materials by installing personnel to ensure that care is used.

c. Storage:

c1. Inspect the storage facility.

c2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

c3. Document unsafe or improper storage conditions, and report conditions to the Owner.

308.3 Preconstruction Testing:

a. Observe and document that the pipes are of the specified size and strength and are constructed of the specified material.

b. Observe and document that pipe perforations for perforated pipe are as specified.

c. Observe and document that the material is not damaged during the installation process and that underlying geosynthetic materials are not damaged.

308.4 Inspections and Testing During Construction:

a. Inspection activities that shall be performed during pipe placement and joining include:

a1. Location:

a1.1 Observations and measurements to ensure that the specified pipe sizes are placed at the specified locations.

a1.2 Observations to ensure that perforated pipe is placed correctly.

a1.3 Measurements to ensure that the horizontal and vertical position and slope are within tolerances required by the GW Specification.

a1.4 Document the as-built locations of all pipes.

a2. Pipe Joining:

a2.1 Observations to ensure that the pipe is joined by using the hot plate thermal butt fusion method as required by the GW Specification and that the equipment used for welding is as recommended by the Pipe Manufacturer.

a2.2 Observations to ensure that the joining method described in the GW Specification is followed.

a3. Joint Quality Control:

a3.1 Observations and documentation that the test joints required by the GW Specification are made.

a3.2 Observations and documentation that the quality of the test joints meet the GW Specification.

a4. Miscellaneous:

a4.1 Observations to ensure that cleanouts are installed as specified.

a4.2 Observations to ensure that the placement of the Coarse Aggregate Bedding material under, around, and over the pipe is as specified on the Design Drawings.

a4.3 Observations to ensure that the pipe network is not damaged during backfilling.

a5. Cleaning:

a5.1 Observe that all the pipes are cleaned by jet cleaning after installation is complete and document that all pipes are intact and not obstructed.

a5.2 Document the location of defective or clogged pipe.

a5.3 Document repair by the GW Contractor and re-cleaning.

a6. Testing:

a6.1 Observe and document that visual observations on pipe joints have been performed and the results of observations documented.

a6.2 Document the location of failed joints.

a6.3 Document the repair and retesting of failed joints by the GW Contractor and the results of testing.

309. <u>CQA TESTING AND INSPECTION REQUIREMENTS FOR CREST ANCHOR TRENCH</u>

309.1 Inspections and Testing During Construction:

a. CQA activities during excavation, formation, and backfilling of the crest anchor trench for the retrofitted Bypass Basin’s geosynthetic materials shall include visual observations and field testing to ensure that the crest anchor trench is constructed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-5 and the following paragraphs.

b. Measurements:

b1. Perform measurements of the crest anchor trench to ensure that the trench width, depth, and location is as specified on the Design Drawings.

c. Observations:

c1. Observe that the trench corners are rounded as specified.

c2. Observe that good housekeeping practices are followed in the trenching operation by not allowing soil to fall back into the trench or down the slope and not allowing water to pond in the trench.

c3. Observe that the trench is backfilled as soon as possible and compacted such that the geosynthetic materials are not damaged.

310. SAMPLING PATTERN

310.1 The CQA Officer shall establish a completely random sampling pattern for determining the choice of sampling points for field tests. Each block of work shall be subdivided into a sampling grid with at least 10 times as many grids as samples or tests to be taken or as directed by the Owner. The grid shall have a numeric identification system devised to distinguish each set of tests for a specific area from all other sets of tests. Each lift shall have a separate grid.

310.2 Sampling points shall be chosen by a random number generator or other acceptable method to obtain uniform coverage. Tests shall be numbered beginning with test number one (1) and no numbers shall be skipped. In areas where a test of any type fails to meet specification criteria and a retest is performed, the retest shall have the same test number as the original test except that an “R” shall follow the test designation.

311. VERIFICATION AND CALIBRATION

311.1 Verification of Selected Field Tests:

a. The following tests shall be verified at the following frequency:

Test Requiring Verification	Frequency of Verification Test
Nuclear In-Place Density and Nuclear In-Place Moisture Content, ASTM D6938	Note 1
“Quick” Moisture Content Test Using Microwave, (ASTM D4643) or Gas Stove, Frying Pan, or Infrared Oven, (ASTM D4959), etc.	One standard oven-dry moisture content (ASTM D2216) test per 20 quick tests.
Lift Thickness Measured Using a Shaft or Shovel	One lift thickness verified by measurement every two acre-lifts.

Notes:

1 – A standard block test as required by ASTM D6938 shall be performed at the start of each day on each Nuclear apparatus that will be used that day. At the start of earthwork construction, a series of five Nuclear tests and five sand cone or rubber balloon tests shall be performed in the borrow area, or area to be excavated, on a compacted test strip to calibrate the Nuclear apparatus. During construction, one of the last Nuclear readings performed at the end of each day shall be verified using a sand cone (ASTM D1556) or rubber balloon (ASTM D2167) density and moisture content test for each apparatus used

that day. The average wet density and moisture content for each apparatus shall be computed for every ten tests. If variations greater than those permitted by the ASTMs occur, corrections shall be applied to all future tests for the apparatus until the next set of 10 tests is performed.

311.2 Calibration:

a. Procedures for calibration of field and laboratory testing equipment shall be submitted by the CQA Contractor prior to the start of testing. These procedures shall meet ASTM requirements.

312. CORRECTIVE ACTION PROCEDURES

312.1 Failure of Material Quality Tests:

a. The GW Contractor and the Owner shall be notified immediately if gradation or Atterberg limits tests do not meet GW Specification acceptance criteria. Failure to meet acceptance criteria of one or more of these groups of tests may indicate problems with the quality of soil materials. The GW Contractor shall cease all construction activities until the source of the problem or "out-of-specification" materials is identified. Construction shall not begin again until materials and installation procedures meeting GW Specification acceptance criteria are identified for use.

312.2 Failure of Field Density or Moisture Content Tests:

a. If the results of field density or moisture content tests fail to meet GW Specification acceptance criteria, those tests shall be re-run after recompaction. Judgment shall be used to select re-test locations suspected of having lower than specified density or moisture content. If the results of the re-test meet GW Specification requirements, the compaction can be considered acceptable. If the results of the re-tests show out-of-specification densities or moisture contents, the CQA Officer shall immediately inform the Owner of the extent of the defective area. The defective area shall be removed and reconstructed or recompacted by the GW Contractor.

TABLE 014362-1

CQA FOR STRUCTURAL FILL MATERIAL

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	In-Situ Moisture Content	Laboratory Moisture Content	ASTM D2216	One per 500 cubic yards, and for each moisture density curve sample.
2	Moisture Density Curve	Proctor	ASTM D1557	One per 500 cubic yards, and for all changes in material.
3	Soil Index Properties	Atterberg Limits	ASTM D4318	One per 500 cubic yards, and for each moisture density curve sample.
4	Soil Index Properties	Grain Size	ASTM D422	One per 500 cubic yards, and for each moisture density curve sample.
5	Soil Classification	Unified Soil Classification System	ASTM D2487	One per 500 cubic yards, and for each moisture density curve sample.
6	Field Density / Soil Compaction	Nuclear Density Gauge, Sand Cone or Rubber Balloon Method	ASTM D6938(1), ASTM D2167, or ASTM D1556	Four per lift. One per 500 cubic yards.
7	Field Moisture Content	Nuclear Density Gauge or Direct Heat Method	ASTM D6938(1) or ASTM D4959	At each field density test location.
8	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per acre per lift.
9	Surface Lines and Grades	Surveying		One per 50-foot grid and at grade breaks (i.e., toe and top of slopes).

Notes:

(1) ASTM D6938 Procedure B (backscatter) shall be used to measure the as-compacted density of Structural Fill material.

TABLE 014362-2

CQA FOR COARSE AGGREGATE BEDDING, SAND FILTER LAYER, PROTECTIVE WARNING LAYER, RIPRAP BEDDING, AND RIPRAP MATERIALS

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
Coarse Aggregate Bedding, Protective Warning Layer, Road Surfacing, Riprap Bedding, and Riprap Materials				
1	Soil Index Properties	Grain Size	ITP 27	One per 500 cubic yards.
2	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per lift. One per 250 linear feet of road for material to be used as road surfacing.
3	Certification of Final Thickness and Grade	Surveying		One per 50-foot grid spacing.
Sand Filter Layer Material				
1	Hydraulic Conductivity	Hydraulic Conductivity	ASTM D2434	One per 500 cubic yards.
2	Soil Index Properties	Grain Size	ITP 27	One per 500 cubic yards.
3	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per lift. One per 250 linear feet of road for material to be used as road subgrade.
4	Certification of Final Thickness and Grade	Surveying		One per 50-foot grid spacing.

TABLE 014362-3

CQA FOR GEOSYNTHETIC CLAY LINER

No.	Characteristic to be Monitored	Test: Test Method Reference	Test: Minimum Test Frequency
1	Swell Potential	ASTM D5890	One test prior to material delivery for each type of material, and one test per material per 20,000 SF
2	Fluid Loss Properties	ASTM D5891	
3	Moisture Content	ASTM D4643	
4	Nonwoven Cap and Nonwoven Carrier Mass / Area	ASTM D5261	
5	Bentonite Mass / Area	ASTM D5993	
6	Hydraulic Conductivity	ASTM 5084	
7	Index Flux	ASTM D5887	
8	Tensile Strength	ASTM D6768	
9	Peel Strength	ASTM D6496	
10	Hydrated Internal Shear Strength	ASTM D6243	

TABLE 014362-4

CQA FOR AREAS TO RECEIVE GEOSYNTHETIC MATERIALS

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Certification of Surface Elevation Prior to Geomembrane	Surveying		One per 50-foot grid and at grade breaks (toe and top of slopes).
2	Subgrade Firm and Unyielding	Observe and Document Proofroll		Continuous on Structural Fill surface.
3	Subgrade Free of Deleterious Conditions	Observe and document exposed subgrade is free from • Irregularities • Protrusions • Loose soil or soft spots • Abrupt changes in grade • Debris • Clods • Stones • Roots • Organic material • Moisture seeps, puddling, or ponding • Frozen material		Continuous

TABLE 014362-5

CQA FOR ANCHOR TRENCHES

		Test		
No.	**Characteristic to be Monitored**	**Monitoring / Testing Method**	**Test Method Reference**	**Minimum Test Frequency**
1	Trench Geometry	Measurement		1 location per 100 ft of trench
2	Trench Condition	Observe and Document • Trench free of sloughed material • Trench free from ponded water • Absence of loose material below geosynthetics		Continuous
3	Trench Backfill	Observe and document prompt backfill of trenches		Continuous
4	Field Density / Soil Compaction	Nuclear Density Gauge, Sand Cone or Rubber Balloon Method	ASTM D6938, ASTM D2167, or ASTM D1556	One per 200 ft of trench per lift

TABLE 014362-6

CQA FOR HDPE GEOMEMBRANE

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Receipt of Delivery	Observe and document: • Name of GM/GC Manufacturer • Product identification • Date of manufacture of the geomembrane • Roll identification number • Geomembrane thickness and type • Physical dimensions (length, width) • Manufacturing lot number • Panel number and weight • Order number	Visual	Each Roll
2	Inspection of Rolls	Lack of uniformity	Visual	Each Roll
		Damage, Tears, Punctures	Visual	Each Roll
		Imperfections, Blisters, Excessive Folding	Visual	Each Roll
3	Geomembrane Properties	Thickness	ASTM D5994	5 per roll of geomembrane delivered at locations evenly distributed throughout roll
		Density	ASTM D1505 / D792	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Tensile properties (strength and elongation at yield and at break)	ASTM D6693	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Tear resistance	ASTM D1004	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Puncture resistance	ASTM D4833	Per resin batch, but not less than once per 20,000 SF of geomembrane

No.	Characteristic to be Monitored	Test: Monitoring / Testing Method	Test: Test Method Reference	Test: Minimum Test Frequency
		Carbon black content	ASTM D4218	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Carbon black dispersion	ASTM D5596	Per resin batch, but not less than once per 20,000 SF of geomembrane
4	Weather and Site Conditions at Time of HDPE Geomembrane Deployment and Seaming	Observe and document weather and site conditions		Continuous
5	Panel Deployment	Observe and document: • Relaxed deployment • Damage prevention • Wrinkles minimized • Temporary anchorage • Protected from damage • Proper overlap • Seam location	Visual	Continuous
6	Trial Welds	Observe and document Geosynthetics Contractor staff performing and testing trial welds		• Prior to each seaming period. • Every 4 hours of continuous seaming. • Whenever personnel or equipment are changed. • When climatic conditions result in wide changes in geomembrane temperature. • When requested by the CQA Geosynthetics Inspector(s) for any seaming crew or piece of welding equipment if problems are suspected.

No.	Characteristic to be Monitored	Test: Monitoring / Testing Method	Test: Test Method Reference	Test: Minimum Test Frequency
7	Preparation for Seaming	Observe and document: • HDPE geomembrane is clean • Minimum wrinkles and fish mouths • Fish mouths cut as necessary to lay flat • Film surface for seaming	Visual	Continuous
8	Seaming	Observe and document: • Materials • Equipment • Staff • Acceptable procedures • Weather • Pressure • Speed • Damage • Absence of solvents	Visual	Continuous
9	Non-Destructive Seam Tests	Observe and document: • Equipment • Methods • Pressures • Leaks marked • Repairs made • Repairs retested	Various as applicable to seam type	100 percent of seam lengths shall be tested.

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
10	Destructive Seam Samples and Testing	Observe and document • Removal of all destructive test samples • Repair of sampled areas • Testing of repairs Label all samples Ship all samples to CQA Contractor's testing laboratory	Shear strength and peel adhesion	• One test per every 500 linear feet of seam length if the seam is welded with a fusion weld. • One test per every 400 linear feet of seam length if the seam is welded with an extrusion weld. • One test for each seaming machine

TABLE 014362-7

CQA FOR DRAINAGE GEOCOMPOSITE

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Receipt of Delivery	Observe and document: • Name of GM/GC Manufacturer • Product identification • Roll identification number • Product thickness or composition • Manufacturing batch code or lot code • Date of manufacture • Order number • Roll dimensions (i.e., length, width, and total weight)	Visual	Each Roll
2	Inspection of Rolls	Lack of uniformity	Visual	Each Roll
		Damage, Tears, Punctures	Visual	Each Roll
		Imperfections,	Visual	Each Roll
3	Drainage Geocomposite Properties	Flow rate per width	ASTM D4716	Once per 20,000 SF of drainage geocomposite
		Ply Adhesion	ASTM D7005	Once per 20,000 SF of drainage geocomposite
4	Weather and Site Conditions at Time of Deployment and Seaming	Observe and document weather and site conditions.		Continuous

No.	Characteristic to be Monitored	Test: Monitoring / Testing Method	Test: Test Method Reference	Test: Minimum Test Frequency
5	Panel Deployment	Observe and document: • No debris or rocks below geotextile or geonet • Anchorage • Cutting • Damage prevention • Proper overlap and seaming	Visual	Continuous
6	Seaming	Observe and document: • Seam orientation • Seaming method • Thread material • Stitching type • Stitch length • Sweep for broken needles	Visual	Continuous
7	Repair Areas	Identify areas to be patched Document patching method and location	Visual	Continuous

END OF SECTION 014362

ATTACHMENT 1

SPECIFICATION P-1400 – BYPASS BASIN RETROFIT

Note: See Attachment 5-1 for Specification P-1400

ATTACHMENT 7-1
LOCATION RESTRICTIONS COMPLIANCE DEMONSTRATION

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PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTIONS
ASH SURGE BASIN AND BYPASS BASIN
POWERTON STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.60, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to placement above the uppermost aquifer for the existing Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Placement Above the Uppermost Aquifer Restriction Determination

The bases of Ash Surge Basin and Bypass Basin are separated from the upper limit of the uppermost aquifer by a minimum distance of five (5) feet (1.52 meters). Therefore, the locations of the Basins are in compliance with the requirements outlined in §257.60.

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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WETLANDS LOCATION RESTRICTIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.61, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to wetlands for the existing Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.61. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Wetlands Location Restriction Determination

The Ash Surge Basin and the Bypass Basin are not located in mapped wetlands included in the National Wetlands Inventory – Version 2 presented by the U.S. Fish and Wildlife Service (USFW) [USFW, 2018]. Therefore, the locations of the Basins are in compliance with the requirements outlined in §257.61(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

LICENSED PROFESSIONAL ENGINEER
JESSE PAUL VARSHO
062-059069
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3. References

USFS, 2018. "National Wetlands Inventory, Version 2," https://www.fws.gov/wetlands/data/Mapper.html, updated 1 May 2018, accessed 28 August 2018.

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FAULT AREAS LOCATION RESTRICTIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.62, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to fault areas for the existing Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.62. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Fault Areas Location Restriction Determination

The Ash Surge Basin and the Bypass Basin are not located within 200 feet (60 meters) of a mapped Holocene-aged fault, as mapped by the United States Geological Survey (USGS) Quaternary Fault Database [USGS, 2018]. Therefore, the locations of the Basins are in compliance with the requirements outlined in §257.62(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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3. References

USGS, 2018. "Quaternary Fault and Fold Database," https://earthquake.usgs.gov/hazards/qfaults/, accessed 28 August 2018.

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SEISMIC IMPACT ZONES LOCATION RESTRICTIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.63, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to seismic impact areas for the existing Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois.

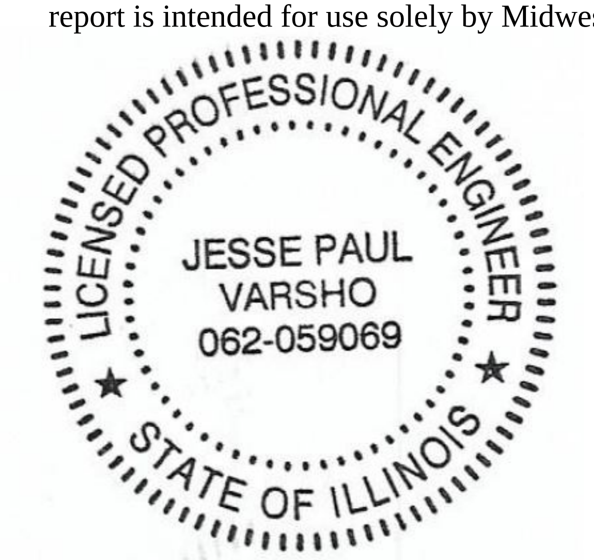
The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.63. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. *Seismic Impact Zones Restriction Determination*

The Ash Surge Basin and the Bypass Basin are not located within a seismic impact zone as defined in §257.53 and as mapped by the United States Geological Survey (USGS) [USGS, 2014]. Therefore, the locations of the Basins are in compliance with the requirements outlined in §257.63(a).

2. *Limitations and Certification*

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.



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3. References

USGS, 2014. "2014 U.S. Geological Survey National Seismic Hazard Maps, PGA 2% in 50 Years," https://earthquake.usgs.gov/hazards/hazmaps/conterminous/index.php#2014, accessed 28 August 2018.

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UNSTABLE AREAS LOCATION RESTRICTIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.64, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to unstable areas for the existing Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.64. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Unstable Areas Restriction Determination

The Ash Surge Basin and the Bypass Basin are not located in unstable areas [Geosyntec, 2016]. Therefore, the locations of the Basins are in compliance with the requirements outlined in §257.64(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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3. References

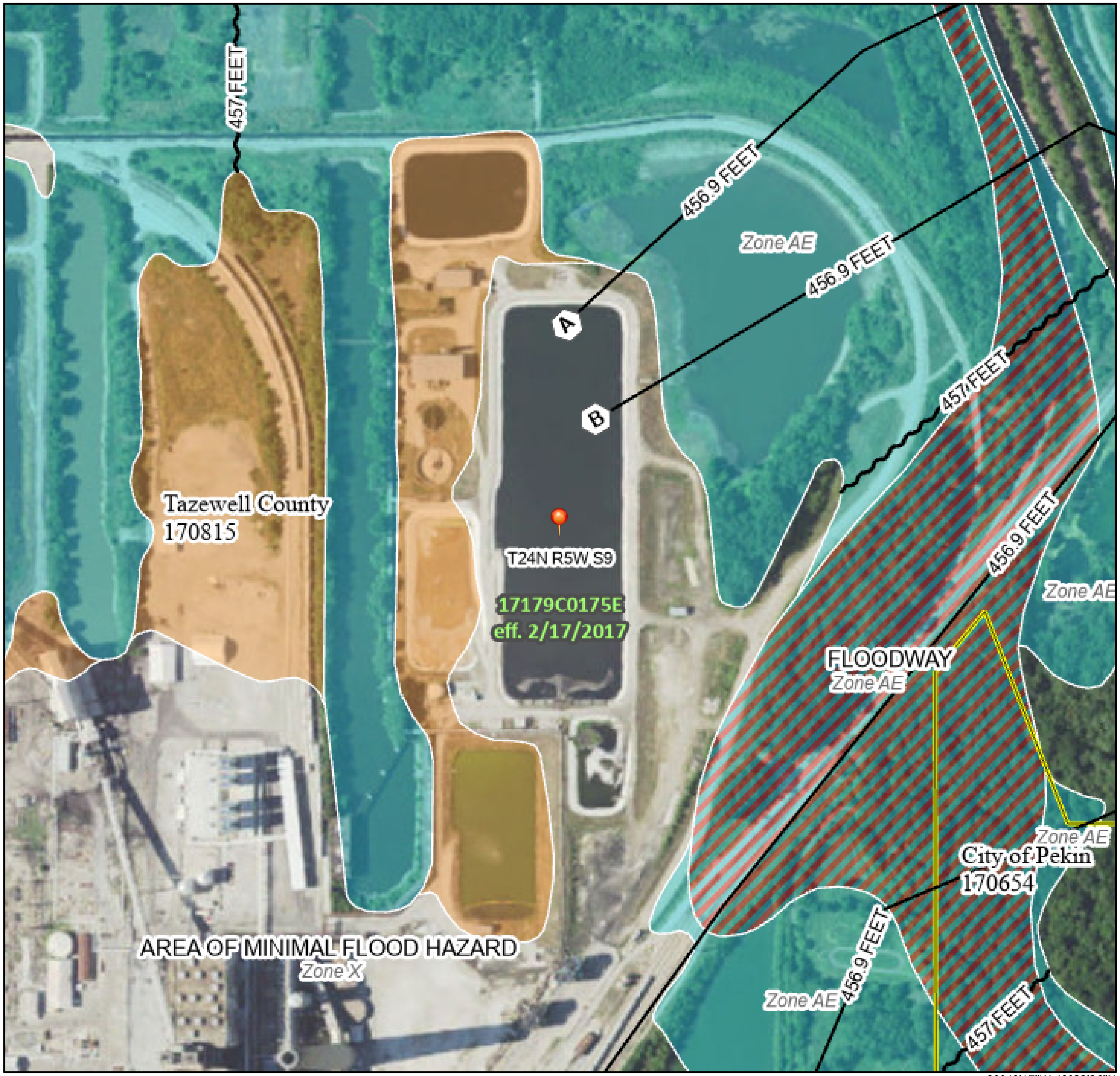
Geosyntec, 2016. Structural Stability and Factor of Safety Assessment, Ash Surge Basin and Bypass Basin, Powerton Station, October.

ATTACHMENT 7-2
FLOODPLAIN LOCATION DETERMINATION

National Flood Hazard Layer FIRMette

FEMA

89°40'55"W 40°32'53"N



89°40'17"W 40°32'26"N

Feet 0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/23/2021 at 12:14 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT 7-3
LINER DESIGN CERTIFICATION

MWG
Midwest Generation, LLC

Powerton Generating Station

Alternative Composite Liner Design Certification for Retrofitted Bypass Basin

Revision 0

July 15, 2022

Issue Purpose: Use

Project No.: 12661-130

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
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Sargent & Lundy

TABLE OF CONTENTS

1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(c)
Federal CCR Rule Reference: 40 CFR 257.72(c)

1.1 PURPOSE

The Bypass Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is being retrofitted with a new composite liner system and a new leachate collection and removal system (LCRS). As a CCR surface impoundment, the Bypass Basin is regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments," which is codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and is referred to herein as the "Illinois CCR Rule." The Bypass Basin is also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), which is referred to herein as the "Federal CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.410(c) and 40 CFR 257.72(c), this document demonstrates and provides certification that the design of the new composite liner system for the retrofitted Bypass Basin complies with the requirements of 35 Ill. Adm. Code 845.410 and 40 CFR 257.72 for an alternative composite liner.

1.2 SCOPE & APPLICABLE CCR REGULATIONS

Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the retrofitted Bypass Basin will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program. The Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval, and so this demonstration and certification has been prepared pursuant to both sets of regulations.

1.2.1 FEDERAL CCR RULE

The following excerpts from the Federal CCR Rule are applicable to the design of an alternative composite liner system for a retrofitted CCR surface impoundment:

- § 257.72(a): New CCR surface impoundments…must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of § 257.70(b) or (c).
- § 257.70(c): If the owner or operator elects to install an alternative composite liner, all of the following requirements must be met:

- An alternative composite liner must consist of two components: the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil.
- The hydraulic conductivity for the two feet of compacted soil used in comparison [to the alternative composite liner's lower component] shall be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods. The liquid flow rate comparison must be made using Equation 1 of [40 CFR 257.70(c)], which is derived from Darcy's Law for gravity flow through porous media.

1.2.2 ILLINOIS CCR RULE

The following excerpts from the Illinois CCR Rule are applicable to the design of an alternative composite liner system for a retrofitted CCR surface impoundment:

- § 845.410(a): New CCR surface impoundments…must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of Section 845.400(b) or (c).
- § 845.400(c)(1): An alternative composite liner must consist of two components: the upper component consisting of, at a minimum, a 30-mil geomembrane liner, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The geomembrane liner components consisting of high-density polyethylene (HDPE) must be at least 60 mil. If the lower component of the alternative liner is compacted soil, the geomembrane liner must be installed in direct and uniform contact with the compacted soil.
- § 845.400(c)(2): The liquid flow rate through the lower component of the alternative composite liner must be no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. The hydraulic conductivity for the two feet of compacted soil used in the comparison must be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods.
- § 845.400(c)(3): The liquid flow rate comparison must be made using the following equation, which is derived from Darcy's Law for gravity flow through porous media.

2.0 DEMONSTRATION

The alternative composite liner design for the retrofitted Bypass Basin at the Powerton Generating Station is compliant with the referenced regulations as demonstrated in the following sections.

2.1 UPPER COMPONENT

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.400(c)(1)
Federal CCR Rule Reference: 40 CFR 257.70(c)(1)

The upper component of the alternative composite liner design for the retrofitted Bypass Basin consists of a 60-mil HDPE geomembrane. This complies with 35 Ill. Adm. Code 845.400(c)(1) and 40 CFR 257.70(c)(1).

2.2 LOWER COMPONENT

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.400(c)(2) & 845.400(c)(3)
Federal CCR Rule Reference: 40 CFR 257.70(c)(2)

The lower component of the alternative composite liner design for the retrofitted Bypass Basin consists of a geosynthetic clay liner (GCL). To demonstrate the specified GCL complies with 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2), the maximum liquid flow rate allowed by the project construction specifications is compared to the liquid flow rate through two feet of soil with a hydraulic conductivity of 1×10^{-7} cm/sec. Table 1 presents this flow rate comparison. As shown in the table, the maximum allowable hydraulic conductivity specified for the GCL is 1×10^{-9} cm/sec. The GCL's hydraulic conductivity will be determined by ASTM D5887, which is a recognized and generally accepted method for determining the hydraulic conductivity of a GCL.

Per Table 1, the design liquid flow rate through the GCL specified for the lower component of the alternative composite liner for the retrofitted Bypass Basin is less than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. This complies with 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2).

Table 1 – Liquid Flow Rate Comparison Between Compacted Soil Liner & GCL for Retrofitted Bypass Basin

Parameter	Symbol	Compacted Soil Liner	GCL
Crest Elevation	EL_{crest}	469.50 feet	
Minimum Retrofitted Bypass Basin Floor Elevation	EL_{floor}	459.76 feet	
Hydraulic Head on Liner (Omitting Geomembrane Thickness)	$h = EL_{crest} - EL_{floor}$	9.74 feet	
Thickness of Liner Lower Component	t	2 feet	7 mm = 0.023 feet
Hydraulic Gradient Through Liner	$i = h / t$	4.87	423
Maximum Hydraulic Conductivity of Liner	k	1.0×10^{-7} cm/sec	1.0×10^{-9} cm/sec
Liquid Flow Rate Through Liner (per Unit Area)	$q = k \times (i + 1)$	5.87×10^{-7} cm^3/sec/cm^2	4.24×10^{-7} cm^3/sec/cm^2

3.0 CERTIFICATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(c)
Federal CCR Rule Reference: 40 CFR 257.72(c)

I hereby certify that:

- Per the preceding demonstration and pursuant to 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2), the design liquid flow rate through the lower component of the alternative composite liner for the retrofitted Bypass Basin is no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec.
- The design of the alternative composite liner for the retrofitted Bypass Basin complies with the requirements of 35 Ill. Adm. Code 845.410 and 40 CFR 257.72.
- This pre-construction composite liner design certification was prepared by me or under my direct supervision, and
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 15, 2022

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

Th. Dehlin
07/15/2022
Exp. 11/30/2023

4.0 REFERENCES

1. Illinois Pollution Control Board. “Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments.” 35 Ill. Adm. Code 845. Accessed April 15, 2022.

2. U.S. Environmental Protection Agency. “Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.” 40 CFR Part 257 Subpart D. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D. Accessed April 15, 2022.

ATTACHMENT 7-4
LEACHATE COLLECTION SYSTEM DESIGN CERTIFICATION

MWG
Midwest Generation, LLC

Powerton Generating Station

Leachate Collection System Design Certification for Retrofitted Bypass Basin

Revision 0

July 15, 2022

Issue Purpose: Permit

Project No.: 12661-130

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

Sargent & Lundy

TABLE OF CONTENTS

1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)

1.1 PURPOSE

The Bypass Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is being retrofitted with a new composite liner system and a new leachate collection and removal system (LCRS). As a CCR surface impoundment, the Bypass Basin is regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments," which is codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and is referred to herein as the "Illinois CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.420(b), this document demonstrates and provides certification that the design of the new leachate collection and removal system for the retrofitted Bypass Basin complies with the requirements of 35 Ill. Adm. Code 845.420.

1.2 APPLICABLE ILLINOIS CCR RULE REGULATIONS

The following excerpts from the Illinois CCR Rule are applicable to the design of an LCRS for a retrofitted CCR surface impoundment:

- § 845.420: A new CCR surface impoundment must be designed, constructed, operated and maintained with a leachate collection and removal system. The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the leachate collection system of the CCR surface impoundment during its active life and post-closure care period.
- § 845.420(a): The leachate collection and removal system must:
    1) Be placed above the liner required by Section 845.410;
    2) Have placed above it a filter layer that has a hydraulic conductivity of at least 1×10^{-5} cm/sec;
    3) Have a bottom slope of three percent or more towards the collections pipes;
    4) Be constructed of:
        A) Granular drainage materials with a hydraulic conductivity of 1×10^{-1} cm/sec or more and a thickness of 24 inches or more above the crown of the collection pipe; or
        B) Synthetic drainage materials with a transmissivity of 6×10^{-4} m^2/sec or more;
    5) Be constructed of materials that are chemically resistant to CCR and any non-CCR waste managed in the CCR surface impoundment and the leachate expected to be

generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste and any waste cover materials and equipment used at the CCR surface impoundment;

6) Be designed, constructed, and operated with collection pipes at the base of the granular material to prevent clogging with fines during the active life and post-closure care period:
7) Have collection pipes
   A) Designed such that leachate is collected at a sump and is pumped or flows out of the CCR surface impoundment;
   B) With slopes that allow flow from all points within the CCR surface impoundment to the sump or drain outlet; and
   C) Large enough to conduct periodic cleaning;
8) Have a protective layer or other means of deflecting the force of CCR pumped into the CCR surface impoundment;
9) Be designed and operated to minimize clogging during the active life and post-closure care period; and
10) At a minimum, the leachate collection and removal system must be operated to remove free liquids from the CCR surface impoundment at the time of closure and during post closure care.

2.0 DEMONSTRATION

The LCRS design for the retrofitted Bypass Basin at the Powerton Generating Station is compliant with the referenced regulations as demonstrated in the following sections.

2.1 LOCATION ABOVE NEW COMPOSITE LINER SYSTEM

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(1)

The LCRS will be placed above the retrofitted Bypass Basin's new composite liner system – a 60-mil high-density polyethylene (HDPE) geomembrane over a geosynthetic clay liner (GCL) – as required by 35 Ill. Adm. Code 845.420(a)(1).

2.2 FILTER LAYER

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(2)

A sand filter layer having a hydraulic conductivity of at least 1×10^{-5} cm/sec will be placed above the LCRS as required by 35 Ill. Adm. Code 845.420(a)(2).

2.3 BOTTOM SLOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(3)

Natural soil fill material will be placed along the floor of the Bypass Basin to establish three percent slopes down towards a leachate collection pipe located in the middle of the basin. The LCRS will also be installed along the inside faces of the Bypass Basin's existing dikes, which have interior sideslopes of approximately 3-horiztonal:1-vertical, or 33 percent. This complies with 35 Ill. Adm. Code 845.420(a)(3).

2.4 DRAINAGE MATERIAL

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(4)

The LCRS will be constructed of a drainage geocomposite with a transmissivity of at least 6×10^{-4} m^2/sec. The drainage geocomposite will consist of an HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet core. This complies with 35 Ill. Adm. Code 845.420(a)(4).

2.5 CHEMICAL RESISTANCE, STRENGTH, & THICKNESS

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(5)

The HDPE components (collection pipe, drainage geocomposite) and natural soil components (protective warning layer, sand filter layer, and coarse aggregate bedding layer) of the LCRS are chemically resistant to the CCR and non-CCR waste that will be managed in the retrofitted Bypass Basin. The LCRS components have also been designed to have sufficient strength and thickness to prevent collapse under the pressures exerted by the overlying waste, a potential final cover system for the waste, and Station equipment used to perform routine maintenance at the CCR surface impoundment. This complies with 35 Ill. Adm. Code 845.420(a)(5).

2.6 CLOGGING PREVENTION FOR COLLECTION PIPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(6)

The perforated leachate collection pipe will be surrounded by coarse aggregate bedding material. The perforations in the leachate collection pipe and the gradation of the coarse aggregate bedding material are designed to prevent fines from clogging the pipe during the active life and post-closure care period of the retrofitted Bypass Basin.

2.7 COLLECTION PIPE DESIGN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(7)

A 6-in.-diameter, perforated leachate collection pipe will be installed in a north-south spanning trench in the middle of the retrofitted Bypass Basin to collect leachate from the drainage geocomposite component of the LCRS. The leachate collection pipe will be sloped towards a sump with a submersible pump and riser pipe to convey leachate out of the basin. The slopes of the retrofitted Bypass Basin's LCRS will ensure flow from all points within the retrofitted Bypass Basin is directed to the leachate collection pipe and ultimately conveyed to the sump. Finally, the 6-in. diameter of the leachate collection pipe is large enough to conduct periodic cleaning. This complies with 35 Ill. Adm. Code 845.420(a)(7).

2.8 PROTECTIVE LAYER

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(8)

Along the retrofitted Bypass Basin's floor, a protective warning layer consisting of 6 inches of densely graded aggregate will be installed over the sand filter layer to deflect the force of CCR flowing into the CCR surface impoundment. This layer will also provide a working surface for operators removing CCR from the basin during routine cleanings and will also serve as a means of warning these operators that they have reached the basin floor and to stop excavating. Along the basin's sideslopes, the protective warning layer will consist of riprap on a gravel bedding layer to protect the sand filter layer from erosion. This complies with 35 Ill. Adm. Code 845.420(a)(8).

2.9 CLOGGING PREVENTION FOR DRAINAGE GEOCOMPOSITE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(9)

The upper non-woven geotextile component of the drainage geocomposite will prevent CCR and non-CCR sediments from intruding into, clogging, and impeding the flow of leachate through the HDPE geonet core during the active life and post-closure care period of the retrofitted Bypass Basin. Moreover, the sand filter layer installed above the LCRS will also preclude CCR and non-CCR sediments from clogging the LCRS. This complies with 35 Ill. Adm. Code 845.420(a)(9).

2.10 OPERATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(10)

At a minimum, the LCRS will be operated to remove free liquids from the retrofitted Bypass Basin when the basin is closed and during the basin's post-closure care period.

3.0 CERTIFICATION

<u>Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)</u>

I hereby certify that:

- The design of the leachate collection system for the retrofitted Bypass Basin complies with the requirements of 35 Ill. Adm. Code 845.420.
- This pre-construction leachate collection system design certification was prepared by me or under my direct supervision, and
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 15, 2022

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

Th. Dehlin
07/15/2022
Exp. 11/30/2023

4.0 REFERENCES

1. Illinois Pollution Control Board. "Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments." 35 Ill. Adm. Code 845. Accessed June 17, 2022.

ATTACHMENT 7-5
CCR FUGITIVE DUST CONTROL PLAN

CCR COMPLIANCE
FUGITIVE DUST CONTROL PLAN

Midwest Generation, LLC
Powerton Generating Station
13082 East Manito Road
Pekin, Illinois

PREPARED BY: KPRG and Associates, Inc.
14665 W. Lisbon Road, Suite 1A
Brookfield, WI 53005

October 19, 2021

TABLE OF CONTENTS

SECTION/DESCRIPTION **PAGE**

1.0 INTRODUCTION

On April 15, 2021, the Illinois Environmental Protection Agency adopted a new Part 845 of its waste disposal regulations creating statewide standards for the disposal of coal combustion residuals (CCR) in surface impoundments, created by the generation of electricity by coal-fired power plants. Part 845 specifically requires that "the owner or operator of a CCR surface impoundment, or any lateral expansion of a CCR surface impoundment, must adopt measures that will effectively minimize CCR from becoming airborne at the facility, including CCR fugitive dust originating from CCR surface impoundments, roads, and other CCR management and material handling activities". As a result, each regulated facility must develop a CCR fugitive dust control plan that complies with 35 Ill. Adm. Code 845.500(b).

This site specific Fugitive Dust Control Plan (Plan) has been developed to comply with the requirements specified in Section 845.500. In general, the Plan identifies the potential CCR fugitive dust sources and describes the control measures that will be implemented to minimize CCR fugitive dust emissions. The Plan also includes a procedure for the periodic assessment of the Plan's effectiveness, documentation of any Plan amendments deemed necessary to assure continued compliance, a record of any citizen complaints received pertaining to CCR fugitive dust emissions, and an outline of the required reporting and recordkeeping requirements in 35 Ill. Adm. Code 845.500.

2.0 SITE INFORMATION

2.1 Owner/Operator and Address:

Midwest Generation, LLC
Powerton Generating Station
13082 East Manito Road
Pekin, Illinois

2.2 Owner Representative/Responsible Person Contact Information:

Mr. Dale Green
Plant Manager
309-346-2165

2.3 Location and Description of Facility Operations

The Midwest Generation Powerton Generating Station is located at 13082 East Manito Road, Pekin, Tazewell County, Illinois. The facility is a coal-fired electric power generating station occupying approximately 1,710 acres. Units 5 and 6 began operating in 1972 and 1975, respectively. Electrical power is transmitted from the site to the area grid through overhead transmission power lines. In conjunction with the station is a man-made perched cooling pond which occupies approximately 1,440 acres and provides cooling water to the facility.

The general vicinity is a primarily mixed industrial and agricultural area with limited commercial and residential developments.

3.0 POTENTIAL FUGITIVE DUST SOURCES

Potential fugitive dust sources associated with the bottom ash and slag and fly ash systems have been identified at the facility; however, some of these are regulated by the facility's operating permit and are adequately addressed within the required fugitive dust operating program. The potential CCR fugitive dust sources generally include exterior ash distribution systems, temporary ash storage locations, ash bulk loading/unloading operations and ash truck transportation routes. Fugitive dust could potentially be generated from these sources as a result of equipment malfunctions, wind erosion, housekeeping issues and/or the nature of the operation. Specifically, these identified sources were further evaluated to determine the probability of CCR fugitive dust being generated and to determine the level of emission controls that are warranted to mitigate fugitive dust emissions. The findings of the evaluation are individually discussed in the following sections.

3.1 Bottom Ash and Slag Distribution System

Collected bottom ash and slag in the boilers is transported as a liquid mixture through an enclosed piping system to the dewatering bins. Some of this piping is located inside a building; however, a portion is situated above ground and in the outside environment. Although not an anticipated occurrence, a breach in the exterior piping could result in the accidental release of bottom ash and slag and potential fugitive dust emissions if the material were to accumulate and dry out.

3.2 Dewatering Bins

The dewatering bins are designed to remove water from the bottom ash and slag. Bottom ash and slag that is relatively wet is drop loaded through the bins into open top trucks for removal off-site for beneficial reuse purposes. The water removed from the dewatering bins is pumped to the Ash Surge Basin and the Ash Bypass Basin where settling occurs prior to discharge of the water from the facility. As of right now, the Metals Cleaning Basin has no water. The loading operation has the potential for fugitive dust emissions if bottom ash and slag is not properly loaded and is allowed to accumulate and dry out on the ground surface beneath the dewatering bins.

3.3 Ash Surge Basin, Bypass Basin, and Metal Cleaning Basin

Extracted water from the dewatering bins is pumped through enclosed pipes to the Ash Surge Basin or the Ash Bypass Basin. Occasionally, CCR material is placed in the Metal Cleaning Basin. After settling occurs, water from the Ash Surge Basin, Ash Bypass Basin, and the Metal Cleaning Basin is ultimately discharged through a final settling basin and then through a regulated NPDES outfall. These basins are normally filled with water; however, dredging occasionally may be required to remove the settled material from each basin. When this requirement occurs, the basins are dewatered and the dredged material is allowed to dry within each basin. When the material is suitable for transport, it is loaded into open top trucks, covered if necessary, and sent off site to a mine reclamation site. Potential fugitive dust emissions could occur if dry bottom ash and slag residual is exposed or loaded during excessive windy and dry weather conditions.

3.4 Former Ash Basin

This basin was formerly used for the routine disposal of bottom ash and slag; however, this procedure ceased in the 1970s. The bottom ash and slag is completely submerged within the basin. Water level fluctuations in the basin are attributable to precipitation and other weather-related conditions. In rare emergency operational situations, overflow from the Ash Surge Basin to the Former Ash Basin could occur by gravity through the spillway. This discharge is not expected to contain significant quantities of CCR and is allowed through the existing NPDES permit. It is noted that a new railroad spur was constructed through the middle of the Former Ash Basin.

3.5 Concrete Storage Pad

This partially below-grade concrete structure is used for the temporary storage of residual bottom ash and slag generated at the dewatering bins and as a result of other routine ash-related maintenance activities. The staged bottom ash and slag is allowed to partially dry within the structure until it is suitable for off-site removal. The material is placed in temporary storage, loaded into open top trucks, covered and sent off site to a mine reclamation site. Dry material that is exposed during excessively windy and dry weather conditions has the potential for becoming fugitive dust emissions.

3.6 Fly Ash Equipment

Collected fly ash in the precipitator hoppers is initially transported in a closed vacuum piping system to a cyclone and bag filter where it is mechanically separated from the air stream within an enclosed building. Fly ash is then sent within an enclosed building to the fly ash silos. At the silos, the fly ash is drop loaded into trucks through a telescopic pipe contained within a drop chute. The loading of fly ash occurs within a partially enclosed structure. After the trucks containing fly ash have been loaded and the truck’s rear gate is water sprayed to remove dust, they proceed to a nearby platform to allow the truck driver to secure the truck and to broom sweep or water spray any residual fly ash remaining on the truck. This entire process is covered by the fugitive dust operating program for the facility.

3.7 Ash Transport Roadways

Both gravel covered and asphalt paved roads within the facility are used by trucks hauling bottom ash, slag, and fly ash to the mine reclamation site as well as by other vehicles entering and exiting the facility. Fugitive CCR dust emissions could occur during transit if CCR material is not properly cleaned from the trucks or if there is a release of CCR material from the vehicle due to a malfunction or accident.

These potential fugitive dust sources are identified on the Site Diagram included in Appendix A.

4.0 DESCRIPTION OF CONTROL MEASURES

4.1 Purpose

The purpose of developing appropriate control measures is to minimize and reduce the emissions of CCR fugitive dust from the identified potential emission sources. The control measures and work practices implemented at the facility are described in the following sections.

4.2 Bottom Ash and Slag Distribution System

Bottom ash and slag is in a liquid mixture within a closed system until the point of discharge at the dewatering bins. A significant portion of the piping system is contained within a building, which eliminates dust emissions to the outside environment. An assessment of the exterior distribution system will be performed on a quarterly basis to verify the integrity of the system or when a breach in the system is detected. If a leak is noted, resulting in the release of bottom ash and slag, the affected area will be restored to original conditions and repair of the pipe will be performed as soon as feasible. The CCR will be sent off site to a mine reclamation site.

4.3 Dewatering Bins

The bottom ash and slag is drop loaded from the dewatering bins in a wet state and into trucks positioned beneath the bins. The bottom ash and slag has sufficient moisture to preclude this material from becoming airborne during loading. An assessment of the dewatering bin loading operation will be performed on a quarterly basis to verify if there has been an equipment malfunction resulting in an accumulation of released material. Should there be a malfunction in the dewatering equipment that results in a spill of the material, repair of any malfunctioning equipment and clean up and transfer of the material to the concrete storage pit will be performed as soon as feasible.

4.4 Ash Surge Basin, Ash Bypass Basin, and Metal Cleaning Basin

During normal operations, the Ash Surge Basin and Ash Bypass Basin are filled with water thereby suppressing any potential fugitive dust emissions. The Metal Cleaning Basin has recently been emptied and cleaned thereby suppressing any potential fugitive dust emissions. Infrequently, the basins will need to be dewatered and the sediment removed for proper off-site disposition. While the bottom ash and slag residue is drying, there is the potential for this material to become airborne especially during excessively dry and windy conditions. Loading of this material under these adverse conditions also has the potential for generating fugitive dust. Dewatered basins will be assessed on a quarterly basis or more frequently during excessively dry and windy conditions. To minimize fugitive dust emissions from exposed dry bottom ash and slag, the height of the staged material will be minimized and the material piles will be either sprayed with water or covered. Loading activities also will be limited during such occasions.

4.5 Former Ash Basin

The Former Ash Basin was used for the disposal of bottom ash and slag in the past; however, this procedure is no longer occurring. The previously deposited material is completely submerged within the basin with the typical water level at approximately 10-15 feet below grade, thereby, making the bottom ash and slag not readily susceptible to wind erosion and generation of potential fugitive dust emissions.

4.6 Concrete Storage Pad

The concrete pad only periodically contains bottom ash and slag and other CCR-related materials generated from routine plant maintenance activities. Typically these materials are in a wet state but are allowed to partially dry to facilitate removal. When sufficiently dry, the material is promptly removed off site. The concrete pad will be assessed on a quarterly basis or more frequently during excessively dry and windy conditions. To minimize fugitive dust emissions from exposed dry bottom ash and slag and other CCR-related materials, the height of the staged material will be minimized and the material piles will be either sprayed with water or covered.

4.7 Fly Ash Equipment

Fly ash from the mechanical separators is sent to the silos within an enclosed structure. The fly ash is drop loaded into an opening within the tarp covering the truck trailer through a telescopic pipe contained within a drop chute. This loading mechanism minimizes the potential for fly ash to become airborne during the loading process. The loading of trucks also occurs within a partial enclosure. At the completion of loading but prior to leaving the enclosure, the rear of each truck trailer is sprayed with water. The truck is then broom swept or water sprayed at the truck stand to remove any accumulated fly ash. Accumulated CCR is promptly transferred to the concrete storage pad.

This process is covered by the facility's fugitive dust operating program. Under the program, the facility must maintain control measures, including enclosures, covers and dust collection devices. Additionally, the facility is required to conduct weekly inspections of the process to confirm compliance. A record of the inspections is maintained at the facility.

4.8 Ash Transport Roadways

Truck drivers are instructed on the proper procedure for cleaning trucks and a vehicle speed limit is enforced at the facility. Ash material that may not have been adequately removed from the trucks has the potential to become airborne and ultimately be deposited on haul roads. To minimize fugitive dust emissions, these roads will be assessed on a quarterly basis and any observed accumulated ash material will be promptly cleaned up and collected for off-site removal.

5.0 PLAN ASSESSMENTS/AMENDMENTS

To assure that the work practices being implemented adequately control the dust from the identified potential fugitive dust emission sources at the facility, routine assessments and record keeping are performed. These procedures include the following:

5.1 Fugitive CCR Dust Assessments

Pursuant to 845.500(b)(3), assessments of the potential fugitive dust emission sources identified within this Plan will be conducted to assess the effectiveness of this Plan. The assessment will include observation of ash removal from basins, temporary storage and transport activities at the facility to confirm the adequacy of the control measures. The assessments will be conducted on a quarterly basis by an individual designated by the contact identified in Section 2.2 of this Plan. Observations made during each assessment are recorded on a form similar to the one included in Appendix B, however, the station may create their own form.

If the results of the assessment determine that ash-related equipment has malfunctioned or the integrity of the equipment has been compromised, the necessary repairs or replacement will be performed as soon as feasible. If the assessment finds that this Plan does not effectively minimize the CCR from becoming airborne, this Plan will be amended to include additional control measures.

5.2 Plan Amendments

This Fugitive Dust Plan will be reviewed whenever there is a change in conditions that would substantially affect the written Plan currently in place. A record of the reviews and any modifications or amendments made to the Plan currently in place will be kept on a form similar to the one included in Appendix C, however, the station may create their own form. The amended Plan will be reviewed by a Registered Professional Engineer and, if deemed acceptable, will be recertified.

5.3 Citizen Complaints

Any written or verbal complaints received from a citizen involving alleged CCR fugitive dust emission events at the facility will be recorded by an individual designated by the contact identified in Section 2.2 of this Plan. The complaints will be recorded on a form similar to the one included in Appendix D, however, the station may create their own form. Upon receipt of the complaint, an investigation of the alleged source of the fugitive dust emissions will be performed and the results of that investigation recorded on the form. If the fugitive dust emission event is confirmed, any necessary repairs or changes in operation required to mitigate the fugitive dust emissions will be implemented as soon as practicable. Quarterly reports will be submitted to the IEPA no later than 14 days from the end of the quarter of all complaints received during that quarter, including the information required by 845.500(b)(2)(A).

6.0 CCR FUGITIVE DUST PLAN REPORTING/RECORDKEEPING REQUIREMENTS

This section outlines the Plan reports that must be prepared, submitted, and records that must be maintained to meet the requirements specified in 35 Ill. Adm. Code Section 845.500. These requirements include the following:

- Place the Plan in the facility's operating record and publicly accessible internet site. If the Plan is amended, replace the initial Plan with the amended Plan. Only the most recent amended Plan will be maintained in the facility's operating record and internet site.

- Prepare an annual CCR Fugitive Dust Control Report and submit to the IEPA as part of the annual consolidated report required by 845.550. The annual report will include:
  - A description of the actions taken to control CCR fugitive dust,
  - A record of all citizen complaints, and
  - A summary of any corrective measures taken.
  - Placement of this report in the operating record and publicly accessible internet site.

- Provide notification to the IEPA and, if applicable, the Tribal authority when the Plan and reports are placed in the facility's operating record and publicly accessible internet site.

- Submit quarterly reports to IEPA within 14 days from the end of the quarter of all complaints received in that quarter. The quarterly reports will include:
  - The date of the complaint,
  - The date of the incident,
  - The name and contact information of the complainant, and
  - All actions taken to assess and resolve the complaint.

7.0 PROFESSIONAL ENGINEER CERTIFICATION

The undersigned Registered Professional Engineer is familiar with the requirements of 845.500 and has visited and examined the facility or has supervised examination of the facility by appropriately qualified personnel. The undersigned Registered Professional Engineer attests that this CCR Fugitive Dust Control Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and meets the requirements of 845.500, and that this Plan is adequate for the facility. This certification was prepared as required by 845.500(b)(7).

Engineer: Joshua D. Davenport

Signature: ______________________

Date: 10/19/21

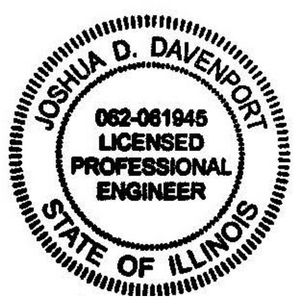
Company: KPRG and Associates, Inc.

Registration State: Wisconsin

Registration Number: 062.061945

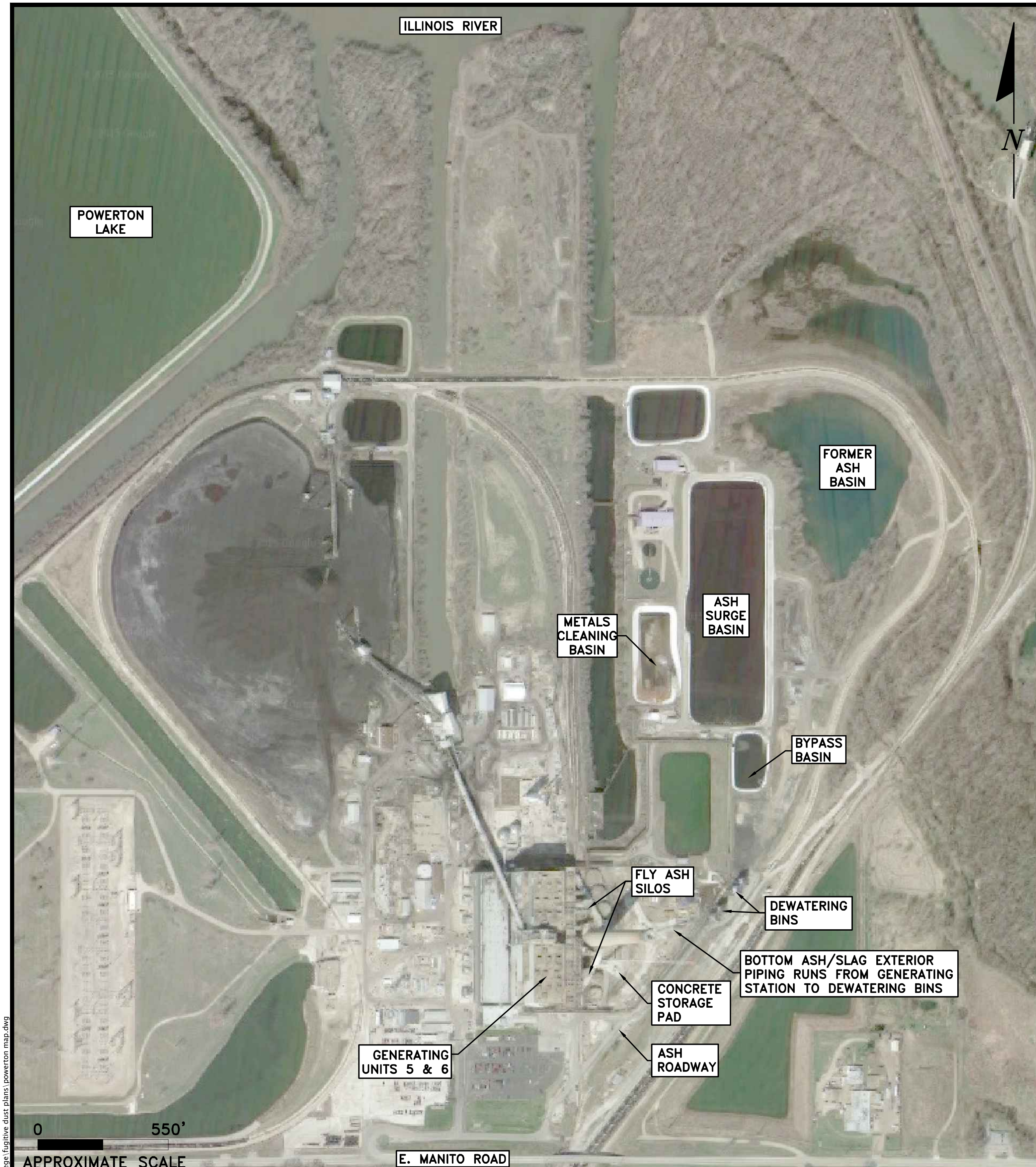
License Expiration Date: November 30, 2021

Professional Engineer Stamp:



APPENDIX A

SITE DIAGRAM
POTENTIAL FUGITIVE DUST SOURCES



E N V I R O N M E N T A L C O N S U L T A T I O N & R E M E D I A T I O N

SITE DIAGRAM/FUGITIVE DUST SOURCES

K P R G

KPRG and Associates, inc.

POWERTON GENERATING STATION
PEKIN, ILLINOIS

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

14665 West Lisbon Road, Suite 2B Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

Scale: 1" = 550'

Date: October 15, 2021

KPRG Project No. 15315

APPENDIX A

W:\projects\midwest generation\attorney-client privilege\fugitive dust plans\powerton map.dwg

APPENDIX B

EXAMPLE ASSESSMENT RECORD

APPENDIX B

POWERTON STATION

EXAMPLE ASSESSMENT RECORD

Date	Inspector	Unit Inspected (See Key Below)	Maintenance/Cleanup Required (yes/no)	Response Action Performed (completion date)	Inspector Signature

Unit Key:

1 - Exterior Bottom Ash/Slag Piping
2 - Dewatering Bins
3 - Concrete Storage Pad
4 - Ash Roadways
5 - Ash Surge Basin
6 - Bypass Basin

APPENDIX C

EXAMPLE PLAN REVIEW AND AMENDMENT RECORD

APPENDIX C

POWERTON STATION

EXAMPLE CCR PLAN REVIEW/AMENDMENT RECORD

Date of Review	Reason for Review	Section Amended	P.E. Certification (Name/Date)

APPENDIX D

EXAMPLE CITIZEN COMPLAINT LOG

APPENDIX D

POWERTON STATION

EXAMPLE CITIZEN COMPLAINT LOG

Date	Time	Citizen Information (Name, Address, Phone No., Email)	Summary of Complaint	Action Taken	Recorded By

ATTACHMENT 8-1
WRITTEN RETROFIT PLAN

MWG
Midwest Generation, LLC

Powerton Generating Station

Bypass Basin Retrofit Plan

Revision 0

April 15, 2022

Issue Purpose: Use

Project No.: 12661-130

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

Sargent & Lundy

LEGAL NOTICE

This report was prepared by Sargent & Lundy, L.L.C. (S&L) expressly for the sole use of Midwest Generation, LLC (Client) in accordance with the contract agreement between S&L and Client. This report was prepared using the degree of skill and care ordinarily exercised by engineers practicing under similar circumstances. Client acknowledges: (1) S&L prepared this report subject to the particular scope limitations, budgetary and time constraints, and business objectives of Client; (2) information and data provided by others, including Client, may not have been independently verified by S&L; and (3) the information and data contained in this report are time-sensitive and changes in the data, applicable codes, standards, and acceptable engineering practices may invalidate the findings of this report. Any use or reliance upon this report by third parties shall be at their sole risk.

TABLE OF CONTENTS

1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)

1.1 PURPOSE

Midwest Generation, LLC (MWG) plans to retrofit the Bypass Basin at the Powerton Generating Station ("Powerton" or "Station") in Pekin, Illinois with a new composite liner system and a new leachate collection and removal system. The Bypass Basin is an existing coal combustion residual (CCR) surface impoundment that was historically used by the Station as a settling pond for bottom ash transport water discharged from the Station's dewatering bins (which initially treat the Station's CCR sluice water) and for other process waste streams related to electric power-generating operations when the Station's Ash Surge Basin was being cleaned. However, the Bypass Basin has not been in service since early October 2020 when the Station started cleaning out the basin in accordance with historical cleaning practices. The Bypass Basin is lined with a 60-mil high-density polyethylene (HDPE) geomembrane liner, has a surface area of approximately 0.83 acre, and has a storage capacity of approximately 9,000 cubic yards.

As a CCR surface impoundment, the Bypass Basin is regulated by both the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments," which are codified in Title 35, Part 845 to the Illinois Administrative Code (35 Ill. Adm. Code 845), and the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," which are codified in 40 CFR Part 257 Subpart D. These state and federal CCR regulations are referred to herein as the Illinois CCR Rule and the Federal CCR Rule, respectively. Pursuant to 35 Ill. Adm. Code 845.770(c) and 40 CFR 257.102(k)(2), this document provides MWG's written retrofit plan for the Bypass Basin.

1.2 SCOPE

Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the Bypass Basin will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program. The Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval, and so this written retrofit plan has been prepared pursuant to both sets of regulations.

2.0 RETROFIT PLAN NARRATIVE DESCRIPTION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(A)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(i)(A)

MWG plans to retrofit the Bypass Basin by executing the following sequential steps:

1. Obtaining a construction permit from the Illinois EPA for retrofitting the Bypass Basin;
2. Removing the gravel warning and sand cushion layers over the existing geomembrane liner from the basin and transporting the soil materials to a permitted disposal facility;
3. Decontaminating the basin's existing geomembrane liner for re-use as a supplemental liner in the retrofitted basin, including submittal of visual inspection documentation and analytical testing results to demonstrate the existing liner is no longer contaminated with CCR constituents in accordance with 35 Ill. Adm. Code 845.770(a)(4);
4. Decontaminating the basin's appurtenant structures (*e.g.*, inlet and outlet structures, piping);
5. Placing structural fill within the basin floor to establish the slopes for the new leachate collection and removal system and to support the new composite liner (see Section 2.1);
6. Installing an alternative composite liner system in accordance with 35 Ill. Adm. Code 845.410 and 40 CFR 257.72 (see Section 2.2);
7. Installing a leachate collection and removal system in accordance with 35 Ill. Adm. Code 845.420 (see Section 2.3);
8. Submitting to the Illinois EPA:
    a. A retrofit completion report (see Section 8.0), and
    b. A certification from a qualified professional engineer licensed in the State of Illinois that the Bypass Basin has been retrofitted in accordance with the activities outlined in this retrofit plan (or subsequent amendment of this retrofit plan), the requirements stipulated in 35 Ill. Adm. Code Part 845, and the requirements of 40 CFR 257.102(k).

2.1 STRUCTURAL FILL

Pursuant to 35 Ill. Adm. Code 845.420(a)(3), the retrofitted Bypass Basin will have a new leachate collection and removal system that slopes towards a collection pipe at a minimum slope of three percent. Because the existing basin floor is approximately flat, MWG plans to place, compact, and grade structural fill along the basin floor to establish the lines and grades for the new leachate collection and removal system. The structural fill will be placed over the Bypass Basin's existing HDPE geomembrane liner, which MWG plans to leave in-place as a supplemental liner under the basin's new composite liner. All earthwork activities associated with placing, compacting, and grading structural fill along the basin floor will be done in a manner to prevent tearing, ripping, or otherwise damaging the Bypass Basin's existing HDPE geomembrane liner.

2.2 COMPOSITE LINER

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(a) & 845.400(c)
Federal CCR Rule Reference: 40 CFR 257.72(a) & 257.70(c)

MWG plans to retrofit the Bypass Basin with an alternative composite liner system that meets the requirements of 35 Ill. Adm. Code 845.400(c) and 40 CFR 257.70(c). The composite liner will consist of a 60-mil HDPE geomembrane over a geosynthetic clay liner (GCL). Pursuant to 35 Ill. Adm. Code 845.400(c)(2) and 40 CFR 257.70(c)(1), the GCL component will have a hydraulic conductivity of no more than 1×10^{-9} cm/sec to ensure that the liquid flow rate through the GCL is less than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

2.3 LEACHATE COLLECTION & REMOVAL SYSTEM

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)

In addition to installing a new composite liner in the basin, MWG plans to install a new leachate collection and removal system (LCRS) in the Bypass Basin pursuant to 35 Ill. Adm. Code 845.420. This LCRS will be placed over the new composite liner and will be constructed of drainage geocomposite with a transmissivity of at least 6×10^{-4} m^2/sec in accordance with 35 Ill. Adm. Code 845.420(a)(4). The drainage geocomposite will consist of an HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet core, and will be sloped towards a perforated collection pipe installed in a trench along the middle of the basin. As discussed in Section 2.1, the structural fill placed along the basin floor will ensure the drainage geocomposite slopes towards the collection pipe at a slope of at least three percent pursuant to 35 Ill. Adm. Code 845.420(a)(3). This collection pipe will then convey leachate to a sump pump at the southern end of the retrofitted Bypass Basin to ultimately be pumped out of the basin. This drainage geocomposite and collection pipe system will ensure leachate flows from all points within the basin to the sump, will be constructed in such a way as to prevent clogging of the LCRS during the active life and post-closure care period of the basin, and will be large enough to conduct periodic cleaning. The upper non-woven geotextile component of the drainage geocomposite will also prevent CCR and non-CCR sediments from intruding into, clogging, and impeding the flow of leachate through the HDPE geonet core.

In addition to the upper non-woven geotextile component of the drainage geocomposite, a sand filter layer will be installed above the retrofitted Bypass Basin's LCRS to prevent CCR and non-CCR sediments from clogging the LCRS. This sand filter layer will have a hydraulic conductivity of at least 1×10^{-5} cm/sec pursuant to 35 Ill. Adm. Code 845.420(a)(2). Meanwhile, the upper non-woven geotextile component of the drainage geocomposite will preclude the intrusion of sand particles from the filter layer into the HDPE geonet core's apertures, which would otherwise impede the flow of leachate through the geonet.

Finally, in accordance with 35 Ill. Adm. Code 845.420(a)(8), a protective warning layer will be installed over the sand filter layer to provide a means of deflecting the force of CCR pumped into the retrofitted Bypass Basin. Along the floor of the retrofitted Bypass Basin, this uppermost layer will be comprised of coarse aggregate materials to provide a working surface for operators removing CCR from the basin; it will also serve as a means of warning these operators that they have reached the basin floor and to stop excavating. Along the basin's side slopes, the protective warning layer will consist of riprap on a gravel bedding layer to protect the sand filter layer from erosion.

3.0 CCR REMOVAL & DECONTAMINATION PROCEDURES

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(B)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(i)(B)

In early October 2020, Powerton took the Bypass Basin out of service for routine cleaning and began drawing down the surface water in the basin to dewater the basin and the CCR material stored therein. The Station then began removing the ash stored above the granular protective layers covering the basin's existing geomembrane liner in accordance with the Station's historical cleaning and maintenance practices for the Bypass Basin whereby ash is periodically removed from the basin to recover storage capacity. As of late October 2021, no CCR remains in the Bypass Basin. With the CCR removed from the basin, the retrofit work described in Section 2.0 will be performed in accordance with this retrofit plan (or subsequent amendment of this retrofit plan) and the construction permit issued by the Illinois EPA.

After receiving a retrofit construction permit from the Illinois EPA, MWG will first remove the granular protective layers covering the Bypass Basin's existing geomembrane liner: a 6-in.-thick gravel warning layer and a 12-in.-thick sand cushion layer. These soil materials will be loaded onto trucks and transported to a permitted disposal facility. Because these soil materials are likely to contain CCR materials, the trucks transporting the material off-site will carry manifests pursuant to 35 Ill. Adm. Code 845.740(c)(1)(A) and as specified in 35 Ill. Adm. Code 809. In addition, a CCR transportation plan will be prepared in accordance with 35 Ill. Adm. Code 845.740(c)(1)(B) which will include:

- Identification of the transportation method selected;
- The frequency, time of day, and routes of CCR transportation;
- Any measures to minimize noise, traffic, and safety concerns caused by the transportation of the CCR;
- Measures to limit fugitive dust from any transportation of CCR;
- Installation and use of a vehicle washing station;
- A means of covering the CCR for any mode of CCR transportation;
- A requirement that the CCR is transported by a permitted special waste hauler under 35 Ill. Adm. Code 809.201.

On-site fugitive dust control measures will also be implemented as necessary to minimize airborne CCR particulates while CCR-impacted material is being handled. Pursuant to 35 Ill. Adm. Code 845.740(c)(2)(A), these dust control measures will include a water spray, commercial dust suppressant, or a combination of these.

Prior to the removal of the granular protective layers covering the Bypass Basin's existing geomembrane liner, signage will be posted at the Station's entrance warning of the hazards of CCR dust inhalation in accordance with 35 Ill. Adm. Code 845.740(c)(3)(A). Pursuant to 35 Ill. Adm. Code 845.740(c)(3)(B), a written notice will be issued to each of the local governments through which the CCR-impacted material will be transported. This written notice will include an explanation of the hazards of CCR dust inhalation, the aforementioned CCR transportation plan, and a tentative transportation schedule.

After the granular protective layers in the basin have been removed, MWG will begin decontaminating the Bypass Basin's existing geomembrane liner to be re-used as a supplemental liner under the new composite liner. The basin's inlet and outlet structures, associated piping, *etc.* will also be decontaminated. At a minimum, decontamination procedures will include pressure washing of the geomembrane liner and pond appurtenances in a systematic manner to remove all CCR and residuals of CCR. Following decontamination, the existing geomembrane liner will be visually inspected, and an electrical leak location survey will be conducted to ensure the liner is competent. Analytical tests will also be conducted in accordance with the construction permit issued by the Illinois EPA at the time of the retrofit work to demonstrate that the liner is no longer contaminated with CCR constituents. The results from the visual inspection and analytical tests will be submitted to the Illinois EPA for approval of re-using the existing geomembrane liner as a supplemental liner under the new composite liner in the retrofitted Bypass Basin.

4.0 ESTIMATED MAXIMUM INVENTORY OF CCR TO BE REMOVED

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(C)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(i)(C)

As previously stated, no appreciable volume of CCR remains in the Bypass Basin since Powerton cleaned the basin in accordance with the Station's ash pond maintenance practices. However, it is likely that CCR materials are present within the granular protective layers covering the Bypass Basin's existing geomembrane liner. For the purposes of this retrofit plan, the maximum amount of CCR that will be removed during the retrofit of the Bypass Basin is conservatively based on the volume of the granular protective layers that will be removed from the basin prior to the installation of the basin's new composite liner and new LCRS: approximately 1,000 cubic yards.

5.0 ESTIMATED LARGEST AREA TO BE RETROFITTED

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(D)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(i)(D)

The estimated largest area of the Bypass Basin to be retrofitted is anticipated to be the basin's full surface area: 0.83 acre.

6.0 RETROFIT SCHEDULE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(E)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(i)(E)

MWG expects to complete the retrofit work for the Bypass Basin in 2023. Table 1 lists the major milestones necessary for retrofitting the Bypass Basin and the expected duration for completing each milestone.

Table 1 – Planning Level Schedule for Retrofitting the Bypass Basin

Activity	Estimated Duration
Prepare Retrofit Construction Design Documents	Complete
Obtain Retrofit Construction Permit from Illinois EPA	13 Months
Hire Contractor to Complete Retrofit Activities in Accordance with Illinois EPA Permit	4 Months
Remove Protective Granular Layers Above Existing Liner	1 Week
Decontaminate Existing Liner and Basin Appurtenances (Including Laboratory Testing)	3 Weeks
Obtain Approval from Illinois EPA to Re-Use Existing Liner as Supplemental Liner	3 Months
Install Composite Liner System	1 Week
Install Leachate Collection and Removal System (Including Filter and Protective Layers)	1 Week
Submit Retrofit Completion Report and Certification to Illinois EPA	1 Week
Obtain Approval of Retrofit Completion Report and Certification from Illinois EPA	3 Months
Complete and Certify Retrofit of the Bypass Basin	--

7.0 AMENDMENTS TO CLOSURE PLAN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(3)
Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(iii)

This retrofit plan will be amended in accordance with 35 Ill. Adm. Code 845.770(c)(3) and 40 CFR 257.102(k)(2)(iii) if a change in the operation of the Bypass Basin would substantially affect this retrofit plan or if an unanticipated event necessitates a revision to this retrofit plan. Any and all amendments to this retrofit plan will be certified by a qualified professional engineer licensed in the State of Illinois in accordance with 35 Ill. Adm. Code 845.770(c)(4) and 40 CFR 257.102(k)(2)(iv).

8.0 COMPLETION OF RETROFIT ACTIVITIES

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(g)
Federal CCR Rule Reference: 40 CFR 257.102(k)(4)

Upon completion of all retrofit activities required by 35 Ill. Adm. Code Part 845 and 40 CFR 257.102(k) and approved by the Illinois EPA in a construction permit, a retrofit completion report and certification will be submitted to the Illinois EPA. The retrofit completion report will include (1) the engineering and hydrogeology reports containing monitoring well completion reports, boring logs, all construction quality assurance (CQA) reports, certifications, designations of CQA officers-in-absentia required by 35 Ill. Adm. Code 845.290; (2) photographs with time, date, and location information of the liner system and leachate collection system; (3) other photographs relied upon for documentation of construction activities; (4) a written summary of the retrofit requirements and completed activities as stated in the construction permit and 35 Ill. Adm. Code 845; and (5) any other information relied upon by the qualified professional engineer for the certification. Pursuant to 35 Ill. Adm. Code 845.770(g)(2) and 40 CFR 257.102(k)(4), the certification will be prepared by an independent, qualified professional engineer licensed in the State of Illinois and will verify that the Bypass Basin has been retrofitted in accordance with this retrofit plan (or subsequent amendment of this retrofit plan), the requirements of 35 Ill. Adm. Code Part 845, and the requirements of 40 CFR 257.102(k). Finally, within 30 days of the Illinois EPA approving the retrofit completion report and certification, a notification of completion of retrofit activities will be prepared in accordance with 35 Ill. Adm. Code 845.770(h).

9.0 CERTIFICATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(4)

Federal CCR Rule Reference: 40 CFR 257.102(k)(2)(iv)

I certify that:

- This written retrofit plan for the Bypass Basin was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code 845.770 and with the requirements of 40 CFR 257.102(k).
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin   Date: April 15, 2022

Seal:

Digitally signed by Thomas J. Dehlin
Date: 2022.04.15 09:04:38 -05'00'

ATTACHMENT 8-2
PRELIMINARY WRITTEN CLOSURE PLAN

MWG

Midwest Generation, LLC
Powerton Generating Station

Preliminary Written Closure Plan for Bypass Basin

Revision 1

October 29, 2021

Issue Purpose: Use

Project No.: 12661-122

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

Sargent & Lundy

TABLE OF CONTENTS

1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)
Federal CCR Rule Reference: 40 CFR 257.102(b)

1.1 PURPOSE

The Bypass Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments." These regulations are codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and are also referred to herein as the "Illinois CCR Rule." The Bypass Basin is also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), also referred to herein as the "Federal CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.720(a) and 40 CFR 257.102(b), this document provides the preliminary written closure plan for the Bypass Basin at Powerton. In accordance with both sets of regulations, this document describes the steps necessary to close the CCR unit at any point during its active life. MWG intends to first retrofit the Bypass Basin with a composite liner and a leachate collection and removal system (LCRS) in accordance with 35 Ill. Adm. Code 845.770(a) and 40 CFR 257.102(k) and then use the basin to manage CCR wastestreams and several non-CCR wastestreams from the Station. After Powerton ceases coal-fired power generating operations, the Station will initiate closure of the CCR surface impoundment. Therefore, this preliminary written closure plan describes the steps necessary to close the Bypass Basin after it has been retrofitted. In accordance with 40 CFR 257.102(k)(2)(ii)(A), MWG will prepare a corresponding retrofit plan for the Bypass Basin no later than 60 days prior to submitting a retrofit construction permit application to the Illinois EPA.

MWG intends to close the retrofitted Bypass Basin by removing CCR and CCR-mixed materials remaining in the basin at the time of closure and decontaminating affected areas pursuant to 35 Ill. Adm. Code 845.740(a) and 40 CFR 257.102(c). This plan describes the steps necessary to close the Bypass Basin in this manner.

1.2 SCOPE

Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the retrofitted Bypass Basin will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program. The Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval, and so this preliminary written closure plan has been prepared pursuant to both sets of regulations.

2.0 CLOSURE PLAN NARRATIVE DESCRIPTION

Illinois CCR Rule References: 35 Ill. Adm. Code 845.720(a)(1)(A) & 845.740(a)
Federal CCR Rule References: 40 CFR 257.102(b)(1)(i) & 257.102(c)

MWG plans to close the retrofitted Bypass Basin by removing CCR and CCR-mixed materials remaining in the basin at the time of closure and decontaminating affected areas pursuant to 35 Ill. Adm. Code 845.740(a) and 40 CFR 257.102(c). The Bypass Basin closure will be executed according to the following sequential steps:

1. Obtaining a construction permit from the Illinois EPA for closing the retrofitted basin;
2. Ceasing all CCR and non-CCR inflows to the basin;
3. Drawing down free surface water in the basin by draining water into the existing outlet structure in the southeast corner of the basin;
4. Once the water elevation is below the invert elevation of the basin's outlet structure, promoting additional drainage and dewatering by:
    a. Excavating sumps and trenches within the ash material,
    b. Using portable pumps as necessary to remove additional water by pumping water into the basin's outlet structure, and/or
    c. Utilizing earthmoving equipment to pile the ash within the basin to promote drainage;
5. Removing the CCR from the retrofitted basin, loading the material onto trucks, and transporting the material to a beneficial-use facility or a permitted disposal facility;
6. Removing the retrofitted basin's LCRS, filter layer installed over the LCRS, and any soil and geosynthetic materials installed over the filter layer and transporting the materials to a permitted disposal facility;
7. Removing the retrofitted basin's composite liner system;
8. Removing the original geomembrane liner (which MWG plans to use as a supplemental liner for the retrofitted basin pursuant to 35 Ill. Adm. Code 845.770(a)(4));
9. Inspecting the basin subgrade to verity it is not contaminated with CCR constituents;
10. Removing the retrofitted basin's appurtenant structures (*e.g.*, inlet troughs, outlet structures, piping);
11. Sampling the groundwater at the basin site to verify the groundwater monitoring concentrations do not exceed the groundwater protection standards established for constituents in accordance with the operating permit issued by the Illinois EPA for the basin; and
12. Certifying (via a qualified professional engineer licensed in the State of Illinois) that the CCR has been removed from the basin and the CCR surface impoundment has been decontaminated in accordance with the closure plan in effect at the time of closure and in accordance with the corresponding construction permit issued by the Illinois EPA.

3.0 CCR REMOVAL & DECONTAMINATION PROCEDURES

Illinois CCR Rule References: 35 Ill. Adm. Code 845.720(a)(1)(B) & 845.740(a)
Federal CCR Rule References: 40 CFR 257.102(b)(1)(ii) & 257.102(c)

The preliminary closure plan for the retrofitted Bypass Basin is to follow the sequential steps outlined in Section 2.0.

Upon receipt of the construction permit from the Illinois EPA for closing the retrofitted Bypass Basin and after permanent cessation of all flows into the impoundment, MWG will first draw down the free surface water remaining in the CCR surface impoundment and dewater the CCR stored therein. Initially, free water remaining in the retrofitted basin will be drawn down by allowing the water to drain to the outlet structure at the southeast corner of the basin. Once the water level falls below the outlet structure's invert elevation, additional drainage and dewatering may be facilitated by:

- Excavating sumps and trenches within the ash,
- Using portable pumps to pump water into the basin's outlet structure, and/or
- Utilizing earthmoving equipment to pile the CCR within the retrofitted basin to promote drainage.

Once the CCR within the impoundment is sufficiently dewatered to handle, construction equipment will then be used to load CCR materials onto trucks and transported to a beneficial-use facility or a permitted disposal facility. Trucks transporting the CCR materials off-site will carry manifests pursuant to 35 Ill. Adm. Code 845.740(c)(1)(A) and as specified in 35 Ill. Adm. Code 809. In addition, a CCR transportation plan will be prepared in accordance with 35 Ill. Adm. Code 845.740(c)(1)(B) which will include:

- Identification of the transportation method selected;
- The frequency, time of day, and routes of CCR transportation;
- Any measures to minimize noise, traffic, and safety concerns caused by the transportation of the CCR;
- Measures to limit fugitive dust from any transportation of CCR;
- Installation and use of a vehicle washing station;
- A means of covering the CCR for any mode of CCR transportation;
- A requirement that the CCR is transported by a permitted special waste hauler under 35 Ill. Adm. Code 809.201.

On-site fugitive dust control measures will also be implemented as necessary to minimize airborne CCR particulates while CCR materials are being handled. Pursuant to 35 Ill. Adm. Code 845.740(c)(2)(A), these dust control measures will include a water spray, commercial dust suppressant, or a combination of these.

Prior to the removal of CCR materials from the retrofitted Bypass Basin, signage will be posted at the Station's entrance warning of the hazards of CCR dust inhalation in accordance with 35 Ill. Adm. Code 845.740(c)(3)(A). Pursuant to 35 Ill. Adm. Code 845.740(c)(3)(B), a written notice will be issued to each of the local governments through which the CCR materials will be transported. This written notice will include an explanation of the hazards of CCR dust inhalation, the aforementioned CCR transportation plan, and a tentative transportation schedule.

The containment systems installed within the retrofitted Bypass Basin (*i.e.*, LCRS, composite liner, filter layer over the LCRS, *etc*.) will be removed from the impoundment. The original geomembrane liner and appurtenant structures (*i.e.*, inlet trough, outlet structure, piping, *etc*.) will also be removed. Materials removed from the impoundment site will be loaded onto trucks and transported to permitted disposal facilities in accordance with the aforementioned CCR transportation plan developed for the closure work. Finally, the basin subgrade will be visually inspected to verify the area is not contaminated with CCR constituents.

In accordance with 35 Ill. Adm. Code 845.740(e) and 40 CFR 257.102(c), CCR removal and decontamination will be complete when constituent concentrations throughout the retrofitted Bypass Basin and areas that may have been affected by releases from the basin have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standards established under 35 Ill. Adm. Code 845.600. After CCR removal and decontamination of the retrofitted Bypass Basin has been completed, MWG will submit a report documenting the completion of CCR removal and decontamination of the unit, which will include a certification from a qualified professional engineer licensed in the State of Illinois that CCR removal and decontamination was completed in accordance with 35 Ill. Adm. Code 845.740.

In accordance with 35 Ill. Adm. Code 845.740(b), MWG will continue groundwater monitoring in accordance with Subpart F of the Illinois CCR Rule ("Groundwater Monitoring and Corrective Action") for three years after the completion of CCR removal and decontamination. After groundwater monitoring has been completed, MWG will submit a report documenting the completion of groundwater monitoring, which will include a certification from a qualified professional engineer licensed in the State of Illinois that groundwater monitoring was completed in accordance with 35 Ill. Adm. Code 845.740.

4.0 ESTIMATED MAXIMUM INVENTORY OF CCR

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(1)(D)
Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(iv)

Detailed records of the maximum inventory of CCR ever stored in the Bypass Basin are not available. For the purposes of this preliminary written closure plan, the maximum inventory of CCR ever on-site over the active life of the Bypass Basin is conservatively based on the estimated maximum capacity of the basin prior to retrofit: 9,000 cubic yards.

5.0 CLOSURE SCHEDULE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(1)(F)
Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(vi)

Closure activities for the retrofitted Bypass Basin are expected to be completed by 2030. Table 1 lists the major milestones necessary for closing the basin and the expected duration for completing each milestone.

Table 1 – Planning Level Schedule for Closing the Retrofitted Bypass Basin

Activity	Estimated Duration
Prepare Closure Construction Design Documents	6 Months
Obtain Closure Construction Permit from Illinois EPA	13 Months
Hire Contractor to Complete Closure Activities in Accordance with Illinois EPA Permit	4 Months
Cease All Flows into Retrofitted Bypass Basin	--
Draw Down Water & Dewater Impounded Ash	5 Months
Remove Impounded Ash	1 Month
Remove Basin Containment Systems and Appurtenant Structures	2 Months
Submit Completion of CCR Removal and Decontamination Report and Certification to Illinois EPA	2 Weeks
Obtain Approval of Completion of CCR Removal and Decontamination Report from Illinois EPA	3 Months
Complete and Certify Closure of the Retrofitted Bypass Basin	--

6.0 AMENDMENTS TO CLOSURE PLAN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(3)
Federal CCR Rule Reference: 40 CFR 257.102(b)(3)

This closure plan will be amended in accordance with 35 Ill. Adm. Code 845.720(a)(3) and 40 CFR 257.102(b)(3) if a change in the operation of the Bypass Basin would substantially affect this closure plan or if an unanticipated event necessitates a revision to this closure plan. Any and all amendments to this closure plan will be certified by a qualified professional engineer registered in the State of Illinois in accordance with 35 Ill. Adm. Code 845.720(a)(4) and 40 CFR 257.102(b)(4).

7.0 COMPLETION OF CLOSURE ACTIVITIES

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.760
Federal CCR Rule Reference: 40 CFR 257.102(f)

Upon completion of all CCR removal and decontamination activities required by 35 Ill. Adm. Code Part 845 and 40 CFR 257.102(c) and approved by the Illinois EPA in a construction permit, a closure report and a closure certification for the retrofitted Bypass Basin will be submitted to the Illinois EPA in accordance with 35 Ill. Adm. Code 845.760(e). The closure report will include (1) the engineering and hydrogeology reports containing any monitoring well completion reports, boring logs, all construction quality assurance (CQA) reports, certifications, designations of CQA officers-in-absentia required by 35 Ill. Adm. Code 845.290; (2) photographs with time, date, and location information relied upon for documentation of construction activities; (3) a written summary of the closure requirements and completed activities as stated in the closure plan in effect and 35 Ill. Adm. Code Part 845; and (4) any other information relied upon by the qualified professional engineer for the certification. Pursuant to 35 Ill. Adm. Code 845.760(e)(2) and 40 CFR 257.102(f)(3), the certification will be prepared by an independent, qualified professional engineer licensed in the State of Illinois and will verify that the retrofitted Bypass Basin has been closed in accordance with the closure plan in effect at the time of the closure work, the requirements of 35 Ill. Adm. Code Part 845, and the requirements of 40 CFR 257.102. Finally, within 30 days of the Illinois EPA approving the closure report and closure certification, a notification of completion of closure will be prepared in accordance with 35 Ill. Adm. Code 845.760(f).

8.0 CERTIFICATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(4)
Federal CCR Rule Reference: 40 CFR 257.102(b)(4)

I certify that:

- This preliminary written closure plan for the Bypass Basin was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code Part 845 and with the requirements of 40 CFR 257.102.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: October 29, 2021

Seal:

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

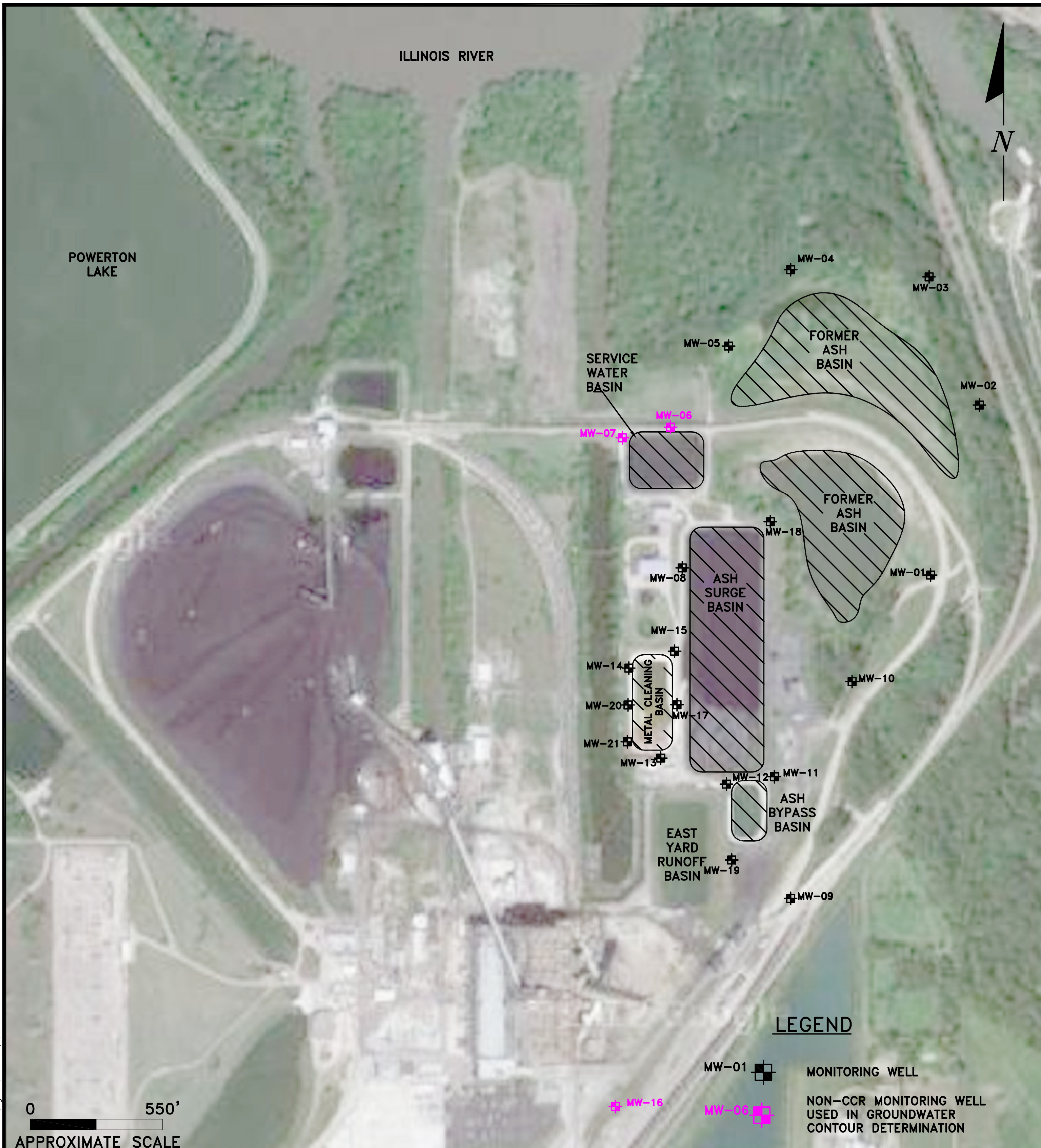
Th. Dehlin
10/29/2021
Exp. 11/30/2021

9.0 REFERENCES

1. Illinois Pollution Control Board. "Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments." 35 Ill. Adm. Code 845. Accessed October 19, 2021.

2. U.S. Environmental Protection Agency. "Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." 40 CFR Part 257 Subpart D. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D. Accessed October 19, 2021.

ATTACHMENT 9-0
GROUNDWATER MONITORING FIGURES & TABLES



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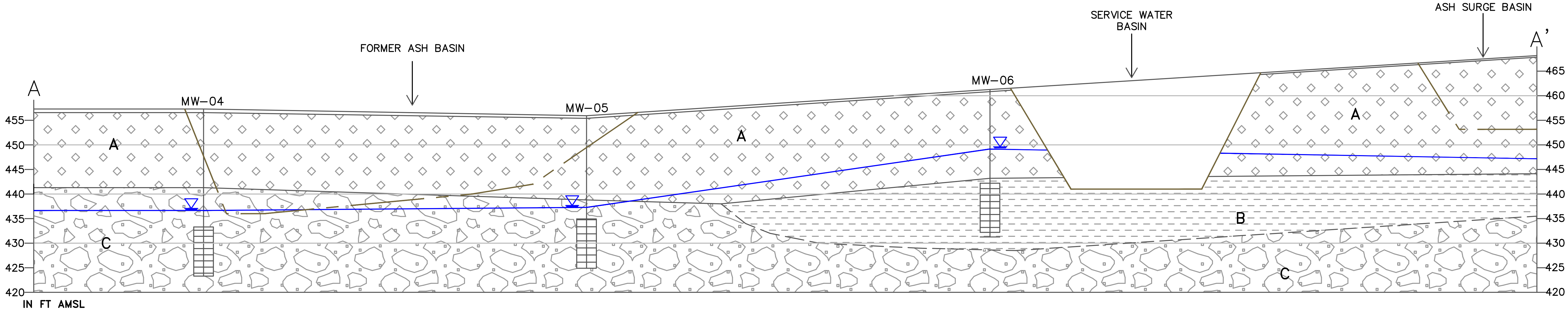
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

MONITORING WELL MAP

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-1

W:\Projects\Midwest Generation\12313 Ash Pond Groundwater\Figures\Powerton\2021



FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

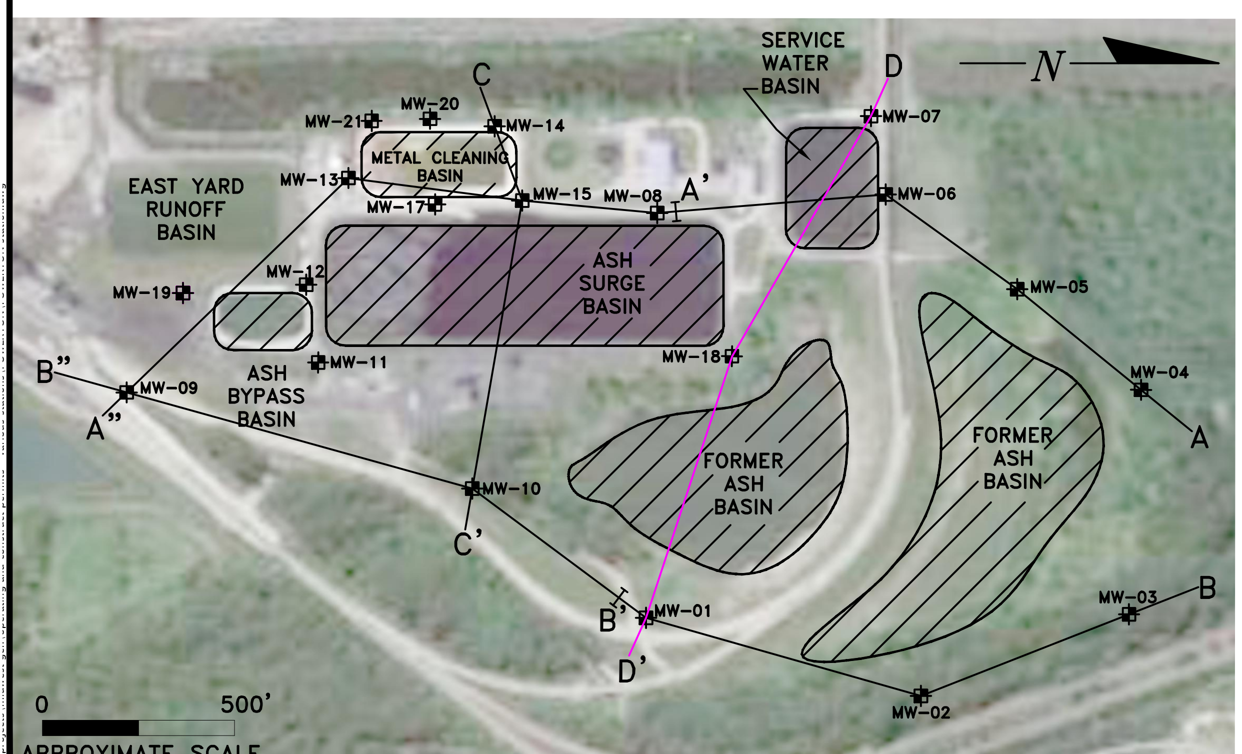
CLAY/SILTY CLAY: CONSISTING OF OLIVE, BROWN AND GRAY CLAYS, SILTS AND SILTY CLAYS WITH SOME MORE ORGANIC RICH LAYERS/PEAT. MAY LOCALLY CONTAIN FINE SILTY SAND AND/OR FINE SAND. THIS UNIT IS NOT MAPPABLE ACROSS THE SITE (I.E. DISCONTINUOUS).

SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS.

WATER LEVEL (5/21)

PROJECTED POND OUTLINE

POND OUTLINE



20'
0
100'
APPROXIMATE SCALE

ENVIRONMENTAL CONSULTATION & REMEDIATION

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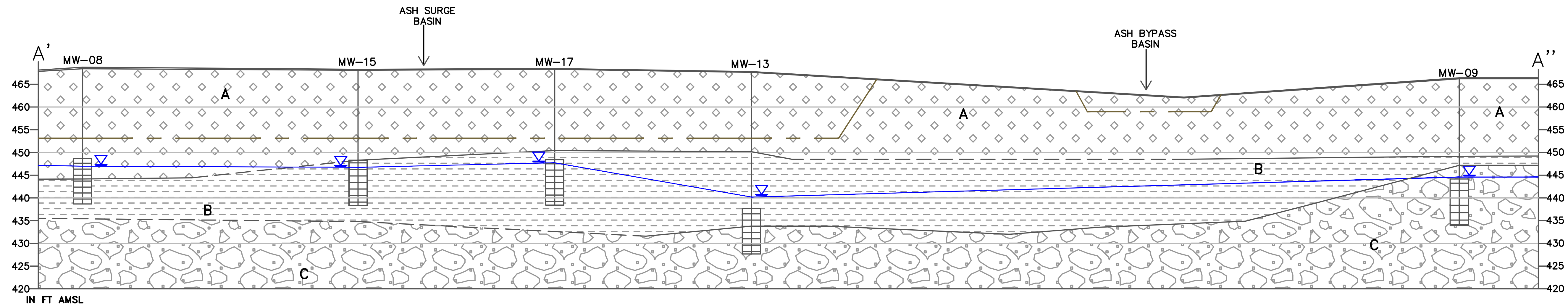
CROSS SECTION A–A'

POWERTON STATION
PEKIN, ILLINOIS

SEE SCALE | Date: October 4, 2021

KPRG Project No. 19520.1 | FIGURE 9–2



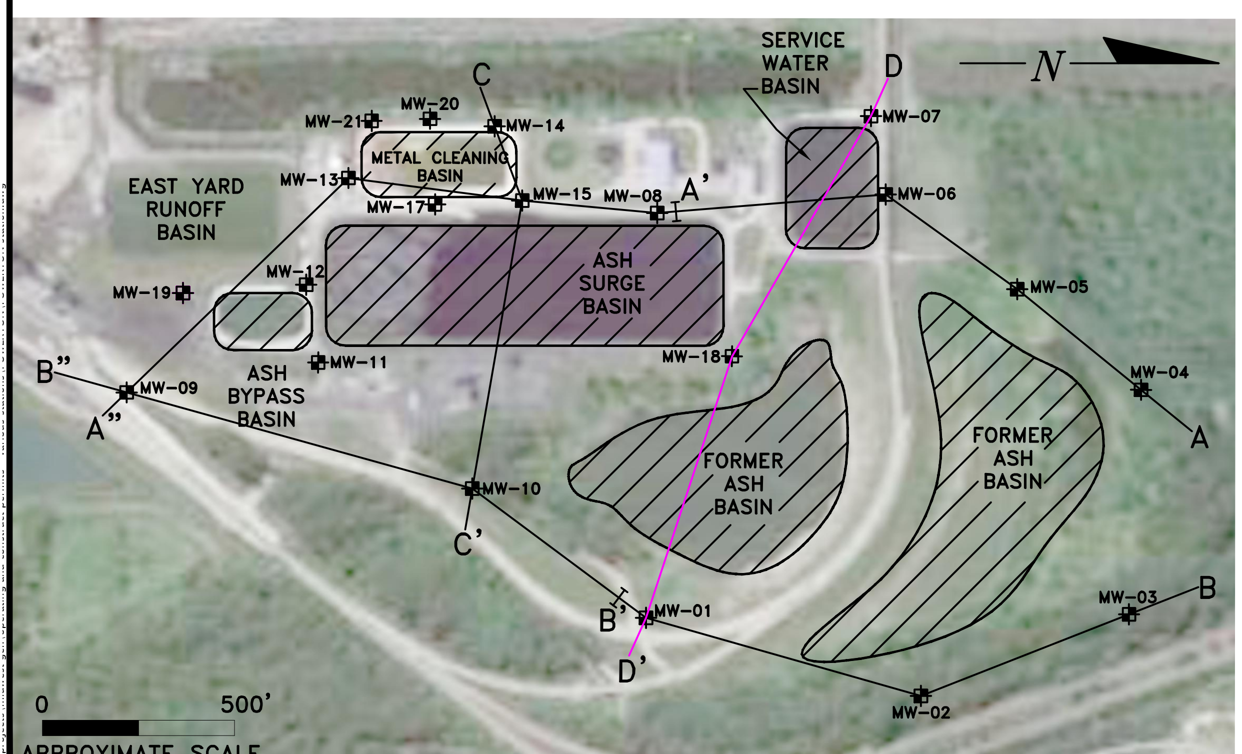
A — FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

B — CLAY/SILTY CLAY: CONSISTING OF OLIVE, BROWN AND GRAY CLAYS, SILTS AND SILTY CLAYS WITH SOME MORE ORGANIC RICH LAYERS/PEAT. MAY LOCALLY CONTAIN FINE SILTY SAND AND/OR FINE SAND. THIS UNIT IS NOT MAPPABLE ACROSS THE SITE (I.E. DISCONTINUOUS).

C — SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS.

WATER LEVEL (5/21)

PROJECTED POND OUTLINE



25'
125'
0
APPROXIMATE SCALE

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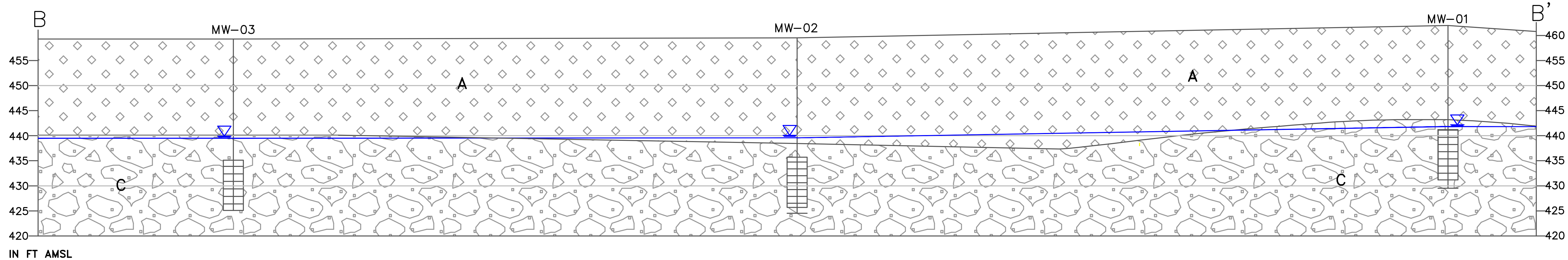
CROSS SECTION A'–A"	
POWERTON STATION PEKIN, ILLINOIS	
SEE SCALE	Date: October 4, 2021
KPRG Project No. 19520.1	FIGURE 9–3



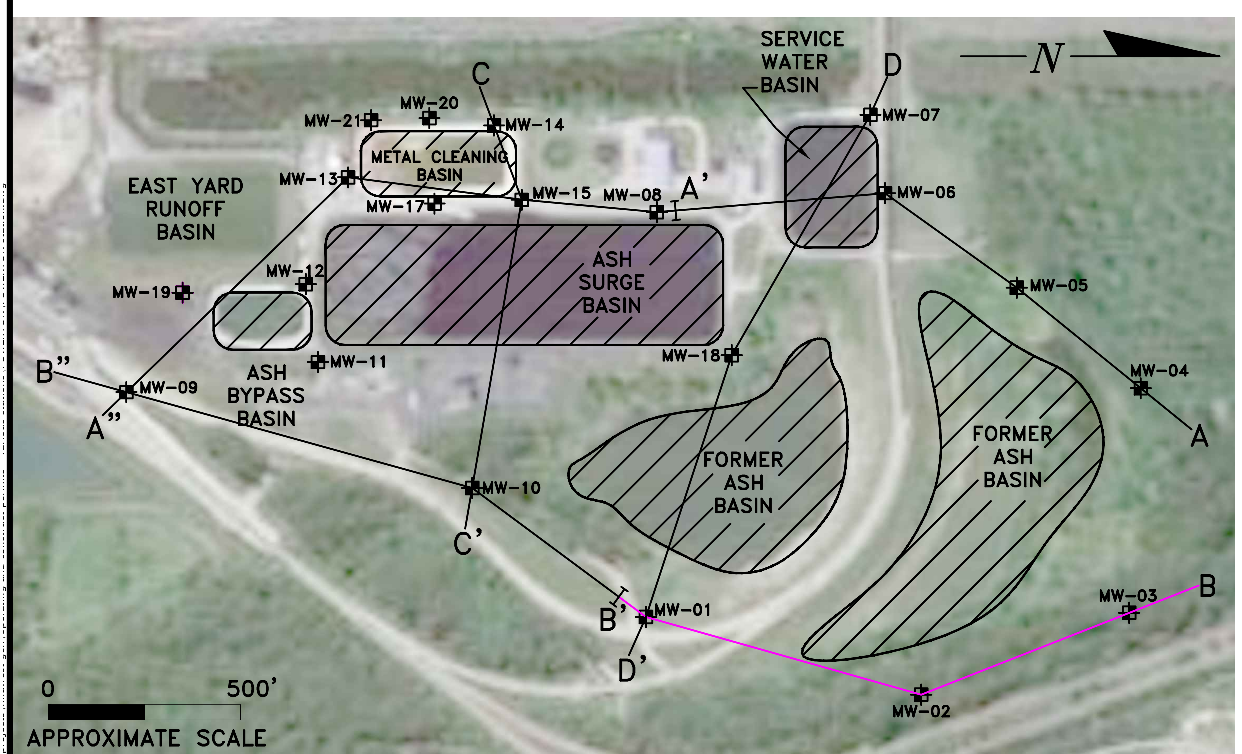
FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS. (A)

CLAY/SILTY CLAY: CONSISTING OF OLIVE, BROWN AND GRAY CLAYS, SILTS AND SILTY CLAYS WITH SOME MORE ORGANIC RICH LAYERS/PEAT. MAY LOCALLY CONTAIN FINE SILTY SAND AND/OR FINE SAND. THIS UNIT IS NOT MAPPABLE ACROSS THE SITE (I.E. DISCONTINUOUS). (B)

SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS. (C)

WATER LEVEL (5/21)

20'
100'
0
APPROXIMATE SCALE



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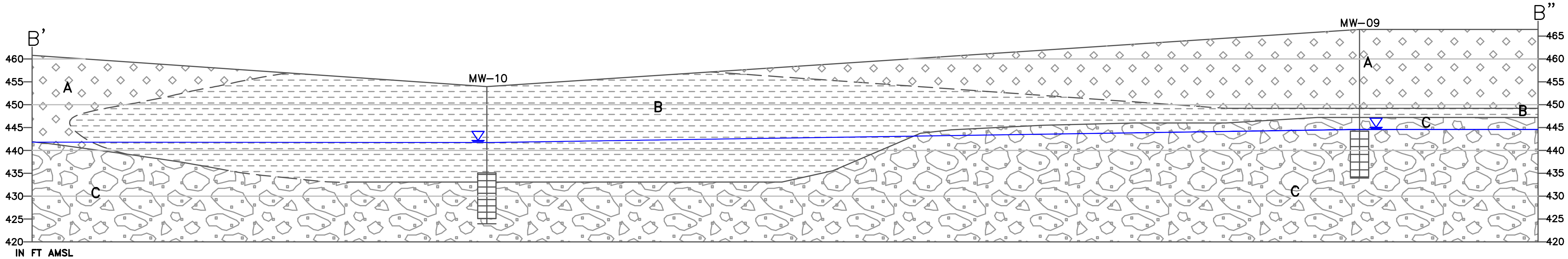
CROSS SECTION B-B'	
POWERTON STATION PEKIN, ILLINOIS	
SEE SCALE	Date: August 17, 2021
KPRG Project No. 19520.1	FIGURE 9-4



A — FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

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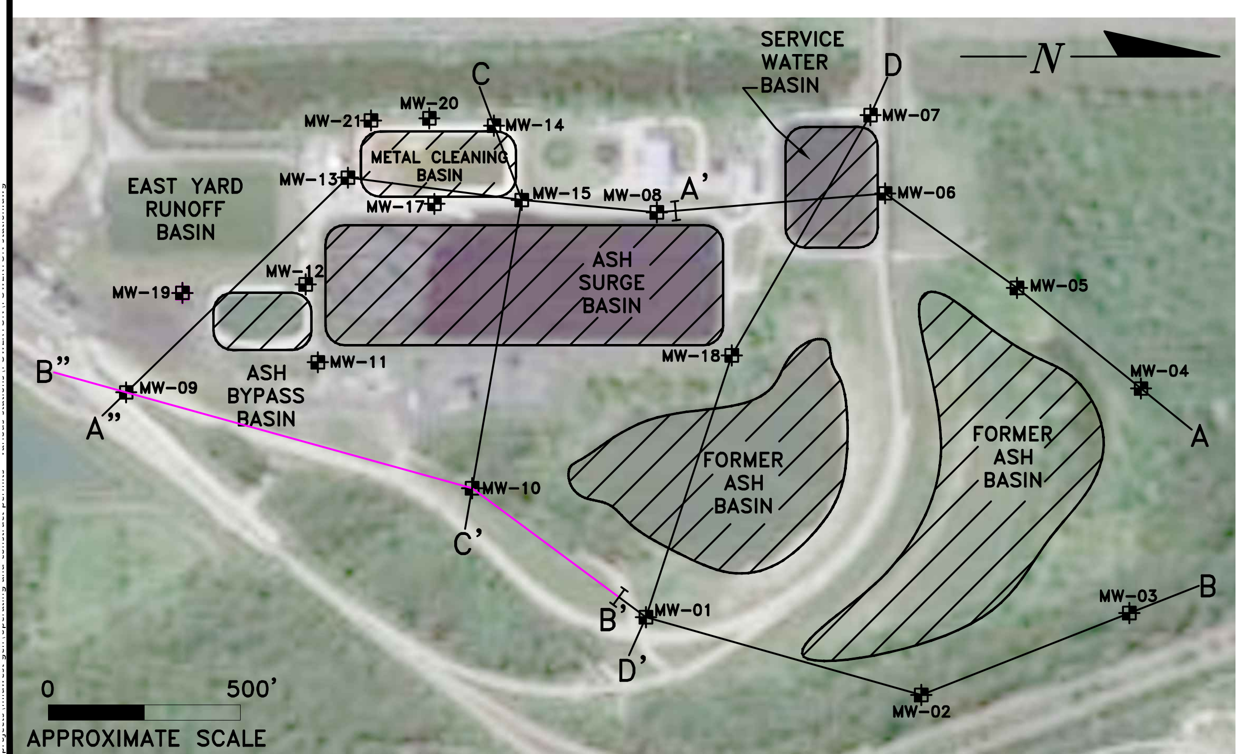
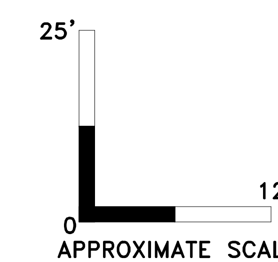
C — SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS.

WATER LEVEL (5/21)





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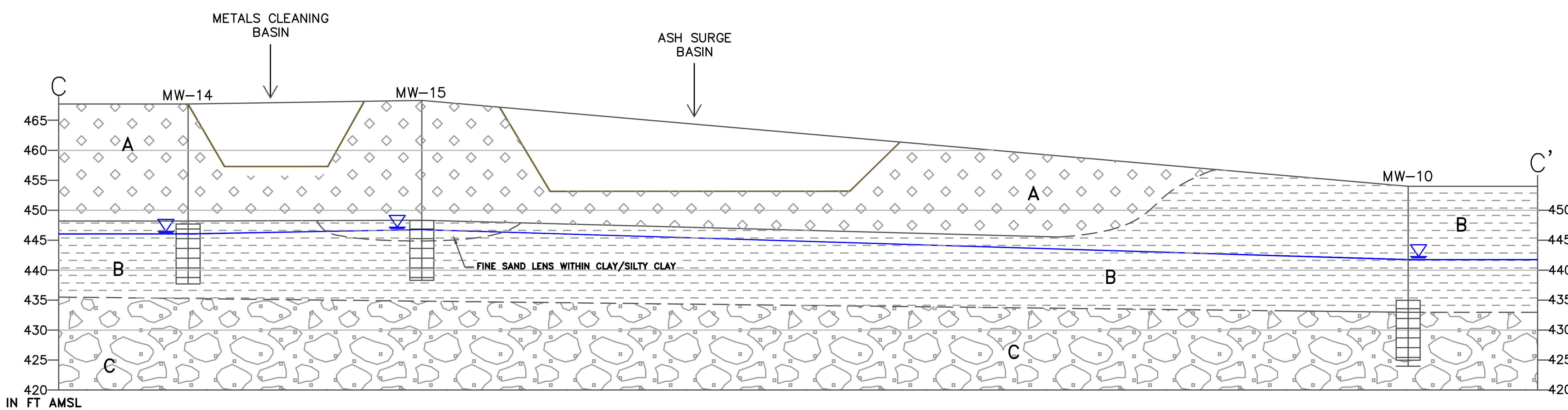
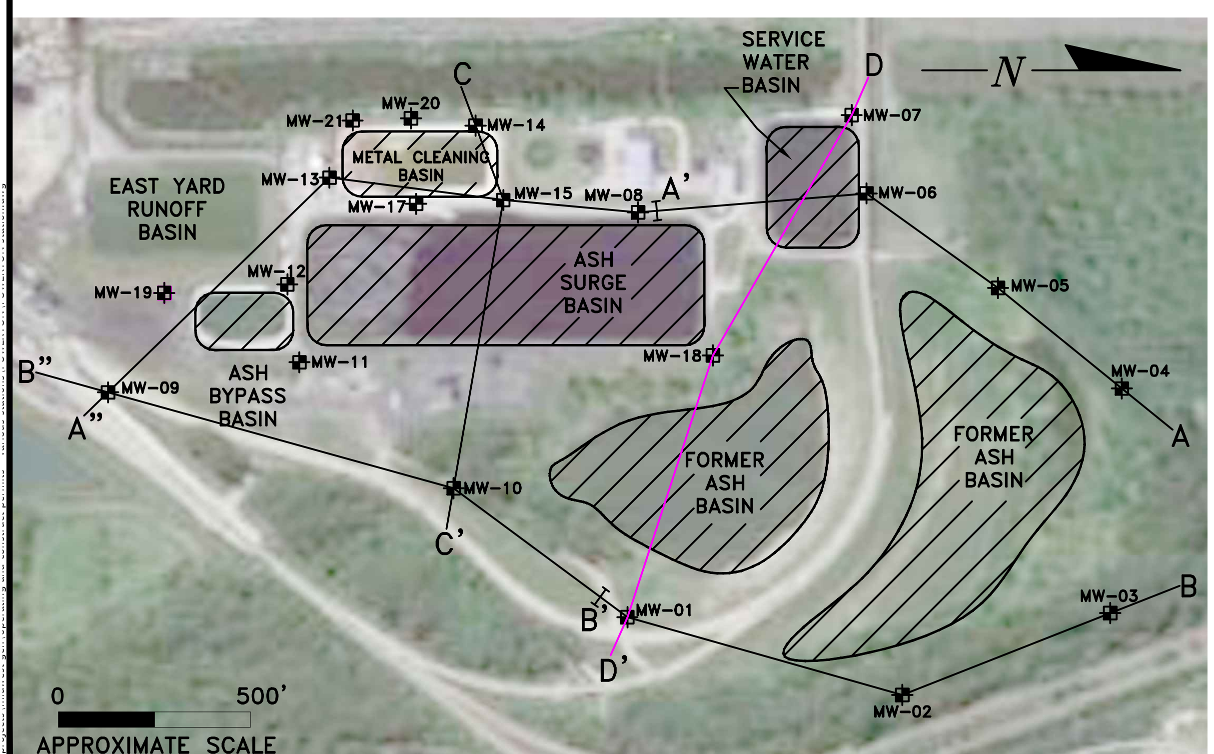
CROSS SECTION B'–B"	
POWERTON STATION PEKIN, ILLINOIS	
SEE SCALE	Date: August 17, 2021
KPRG Project No. 19520.1	FIGURE 9–5





A — FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

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C — SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS.

WATER LEVEL (5/21)

POND OUTLINE

20'
0
100'
APPROXIMATE SCALE

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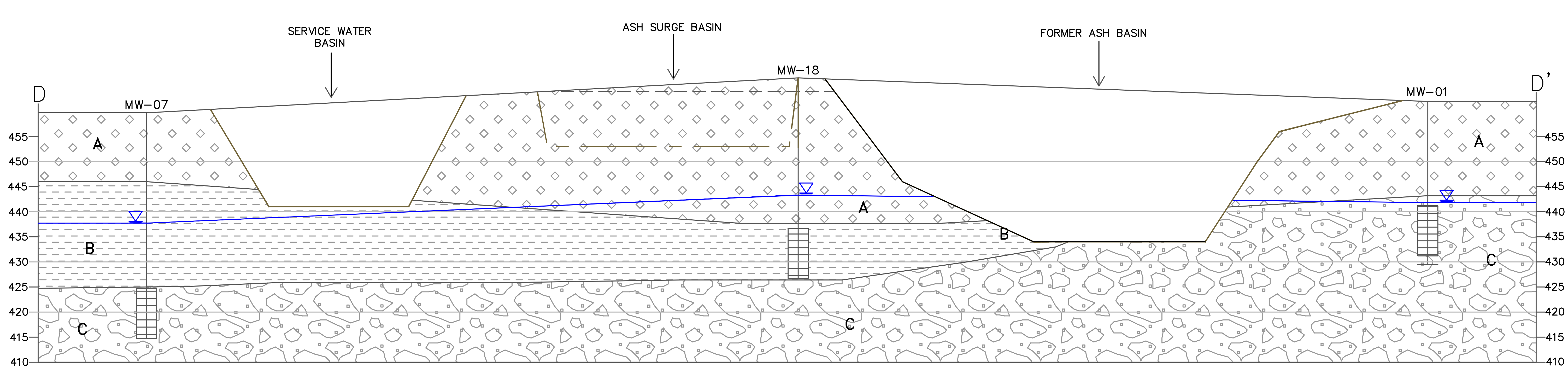
CROSS SECTION C–C'	
POWERTON STATION PEKIN, ILLINOIS	
SEE SCALE	Date: October 4, 2021
KPRG Project No. 19520.1	FIGURE 9–6



FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

CLAY/SILTY CLAY: CONSISTING OF OLIVE, BROWN AND GRAY CLAYS, SILTS AND SILTY CLAYS WITH SOME MORE ORGANIC RICH LAYERS/PEAT. MAY LOCALLY CONTAIN FINE SILTY SAND AND/OR FINE SAND. THIS UNIT IS NOT MAPPABLE ACROSS THE SITE (I.E. DISCONTINUOUS).

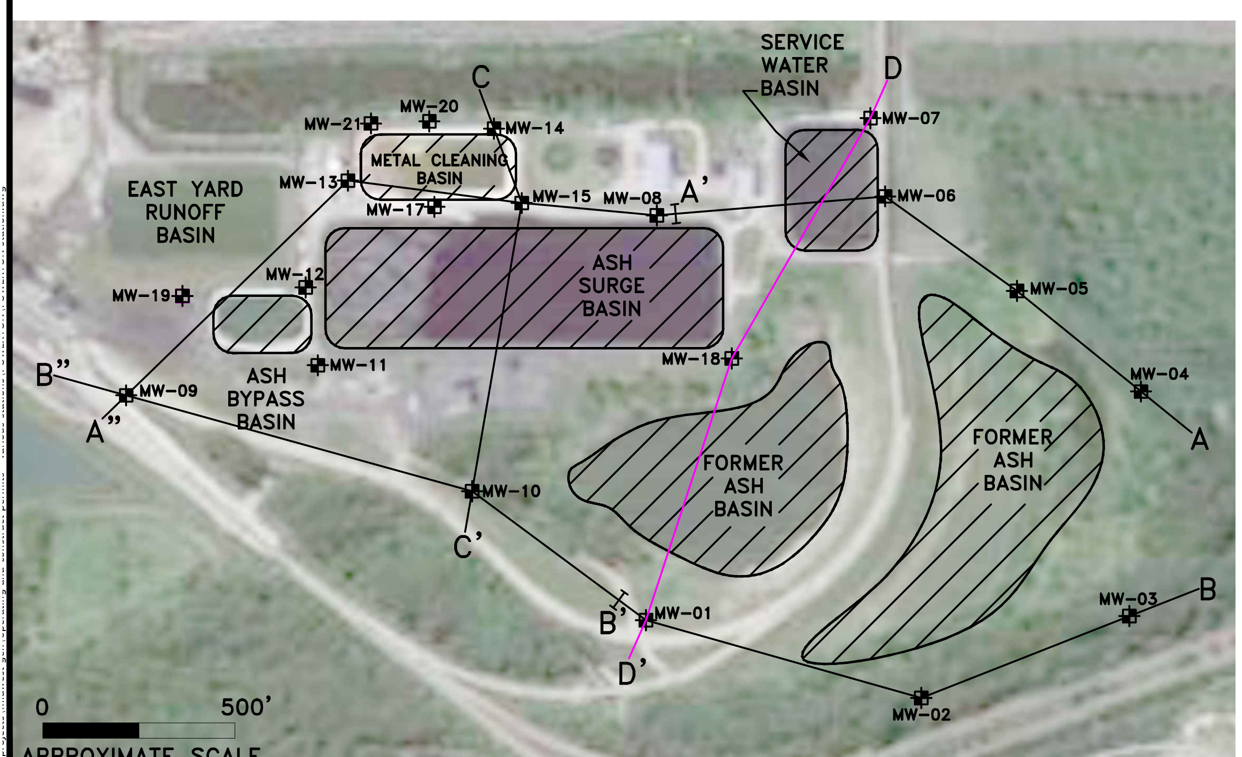
SAND AND GRAVEL: CONSISTING OF LIGHT BROWN, BROWN AND/OR GRAY MEDIUM TO COARSE SANDS AND GRAVELS.

WATER LEVEL (5/21)

PROJECTED POND OUTLINE

POND OUTLINE

20'
100'
0
APPROXIMATE SCALE



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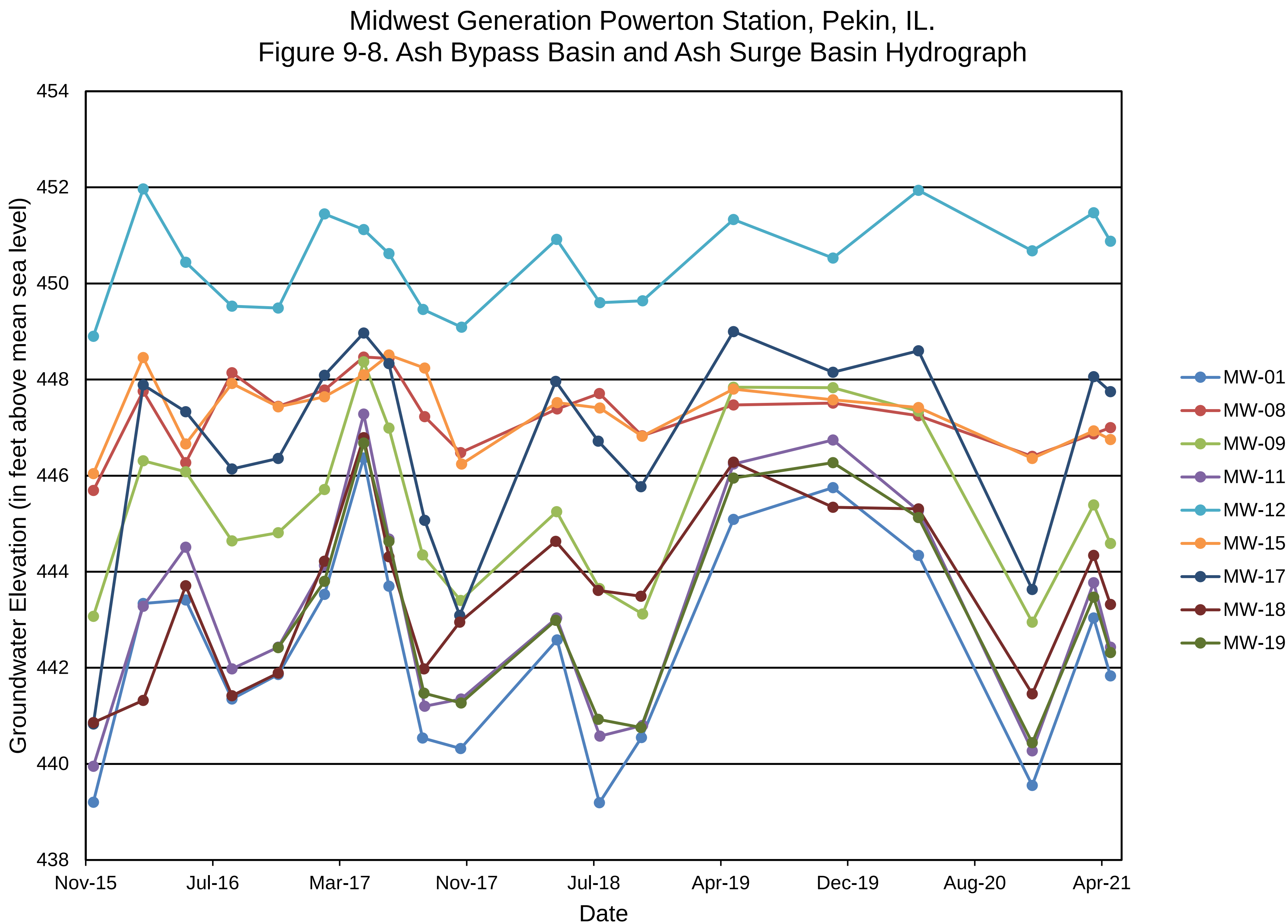
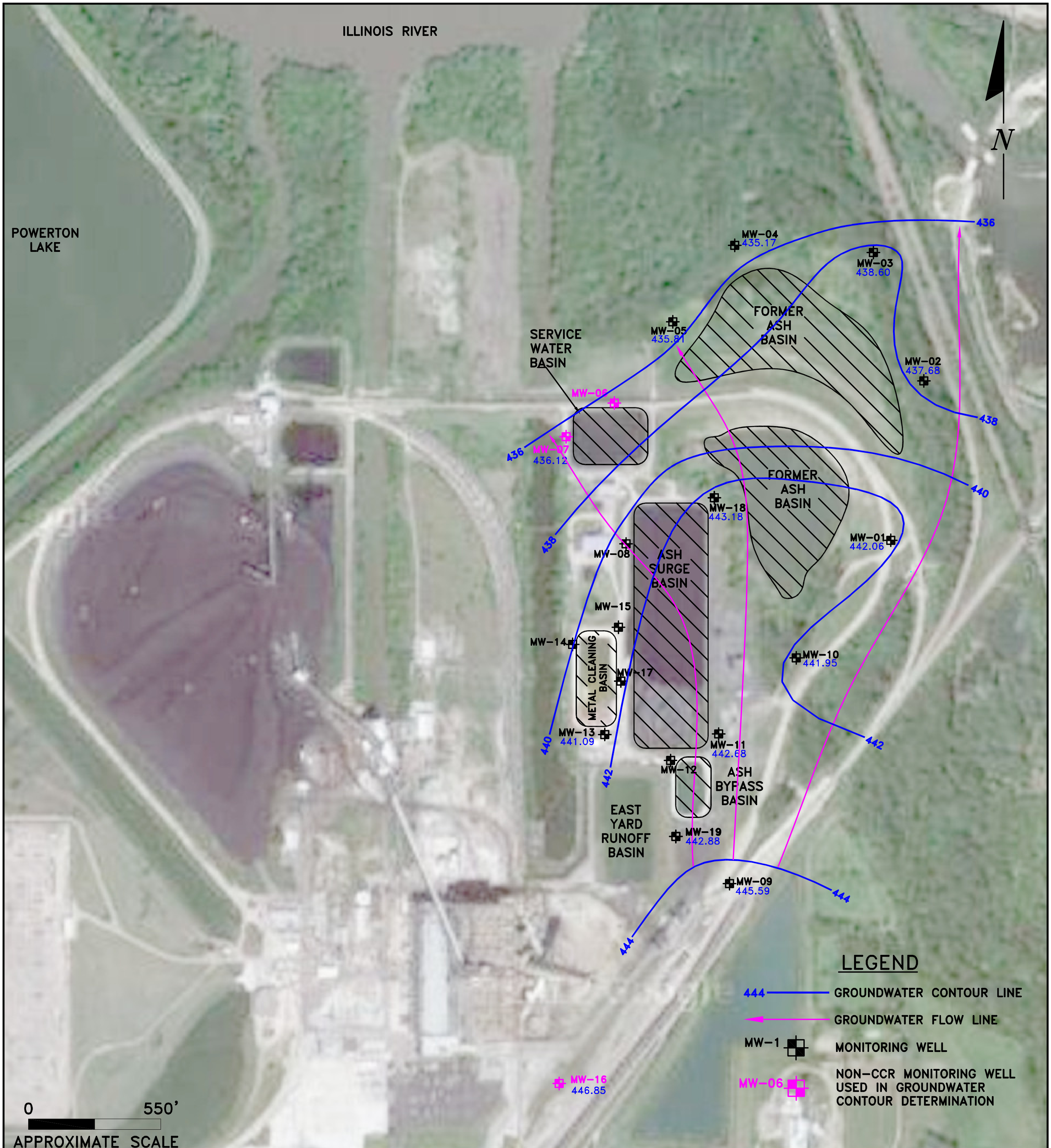
CROSS SECTION D-D'	
POWERTON STATION PEKIN, ILLINOIS	
SEE SCALE	Date: October 4, 2021
KPRG Project No. 19520.1	FIGURE 9-7


Midwest Generation Powerton Station, Pekin, IL.
Figure 9-8. Ash Bypass Basin and Ash Surge Basin Hydrograph
Groundwater Elevation (in feet above mean sea level)
454
452
450
448
446
444
442
440
438
Nov-15
Jul-16
Mar-17
Nov-17
Jul-18
Apr-19
Dec-19
Aug-20
Apr-21
Date
MW-01
MW-08
MW-09
MW-11
MW-12
MW-15
MW-17
MW-18
MW-19



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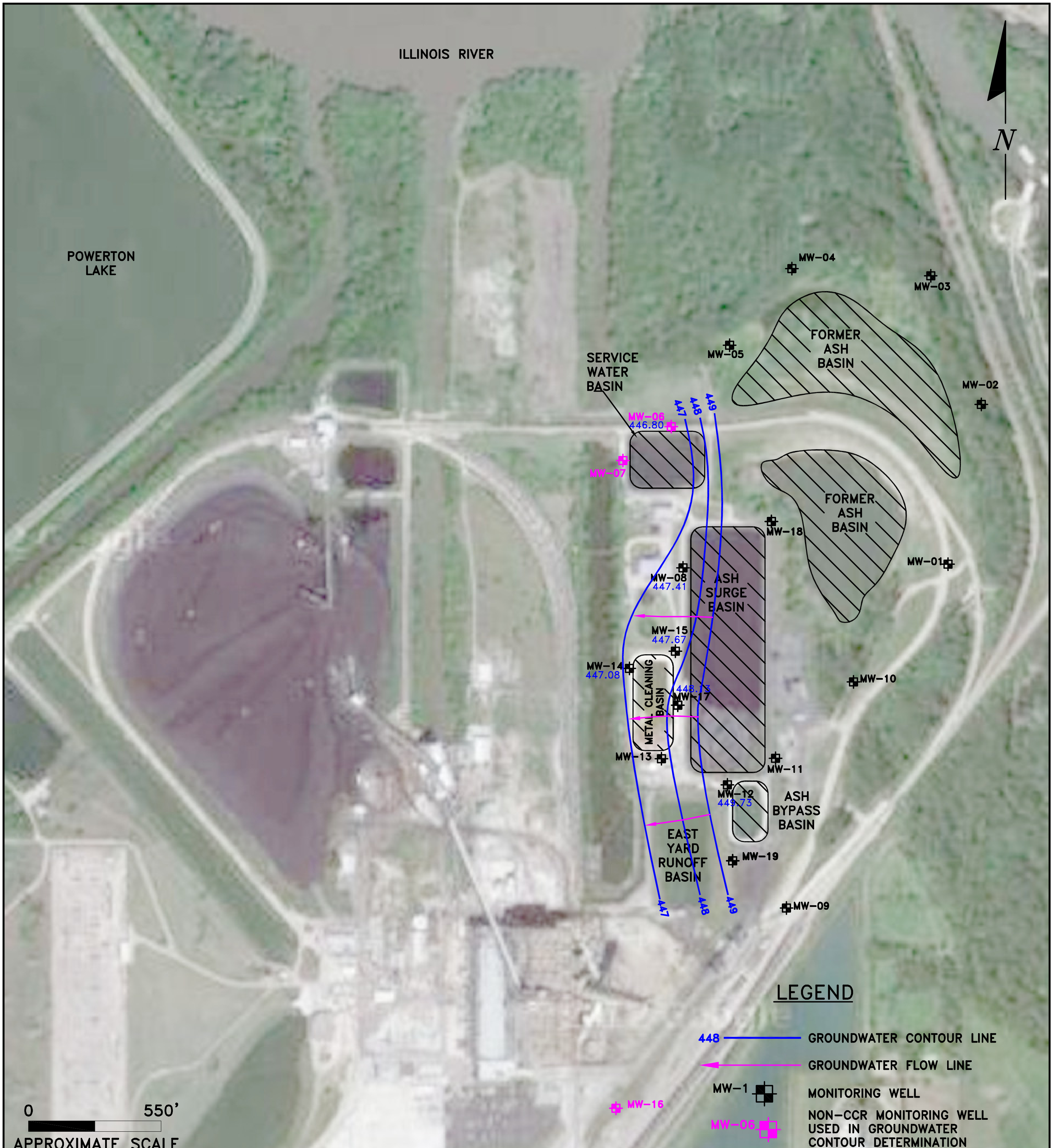
GROUNDWATER CONTOUR MAP FOR GRAVELLY SAND UNIT 08/2020

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-10



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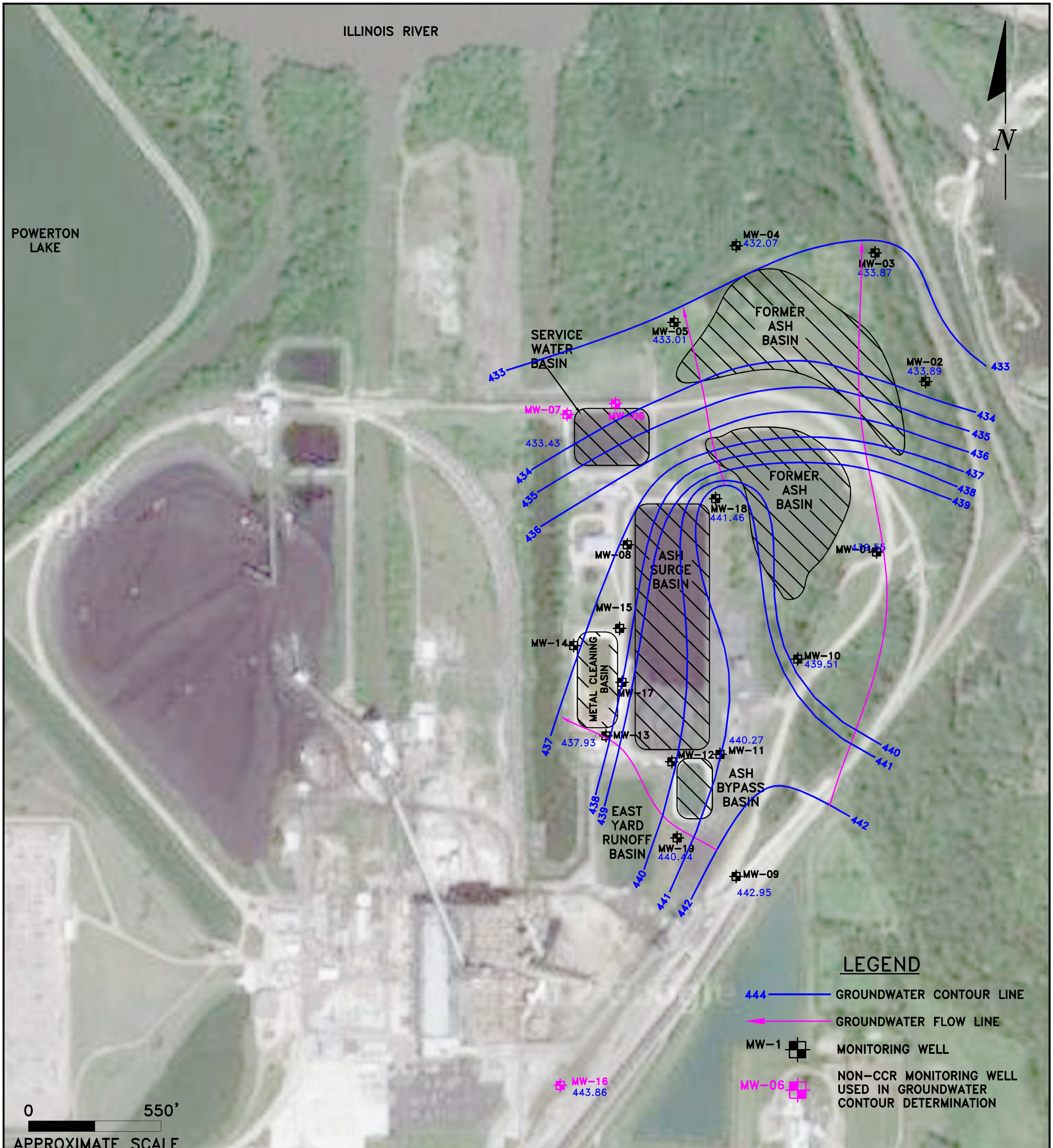
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

GROUNDWATER CONTOUR MAP FOR SILT/CLAY UNIT 08/2020

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-11



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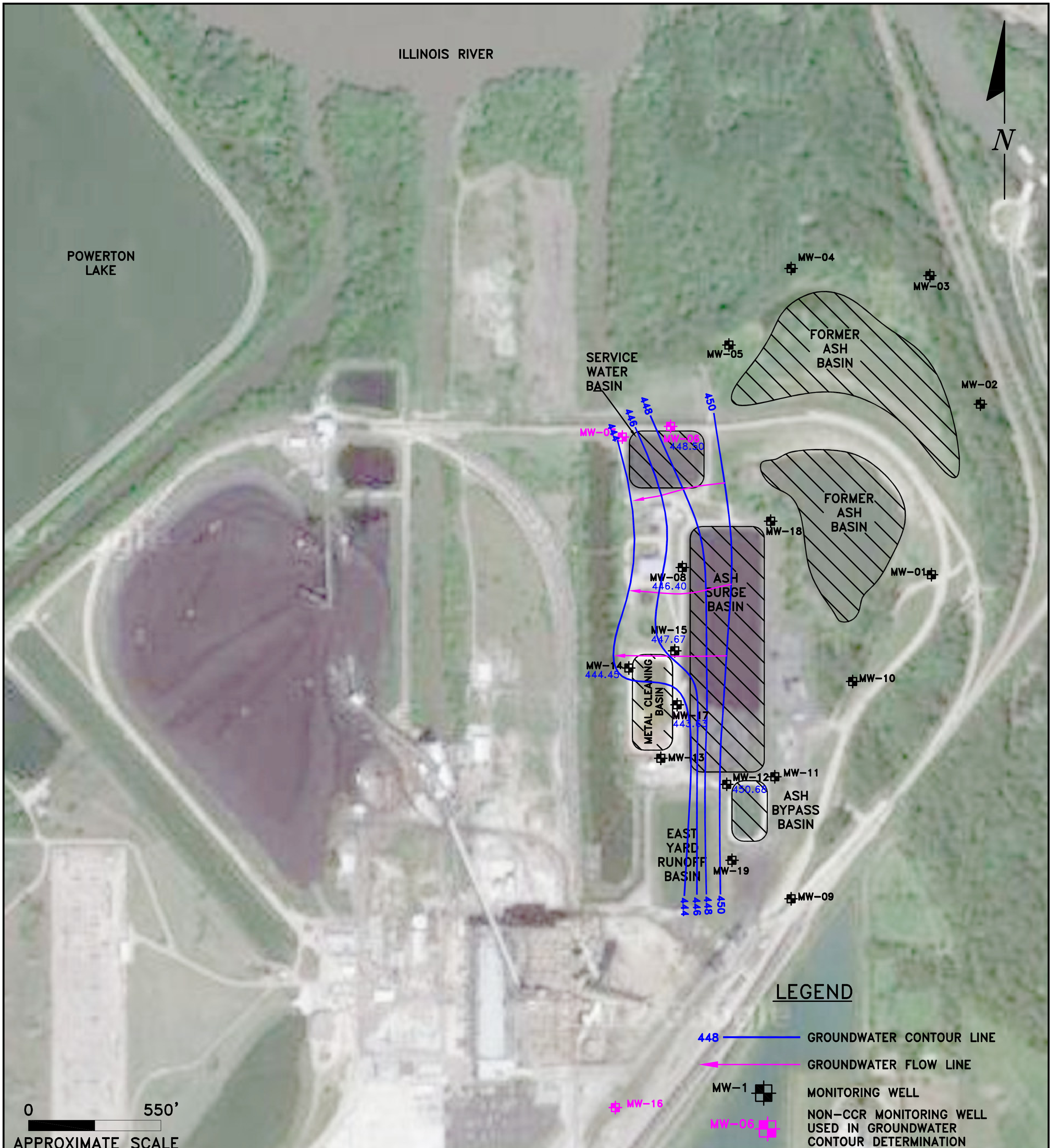
GROUNDWATER CONTOUR MAP FOR GRAVELLY SAND UNIT 12/2020

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-12



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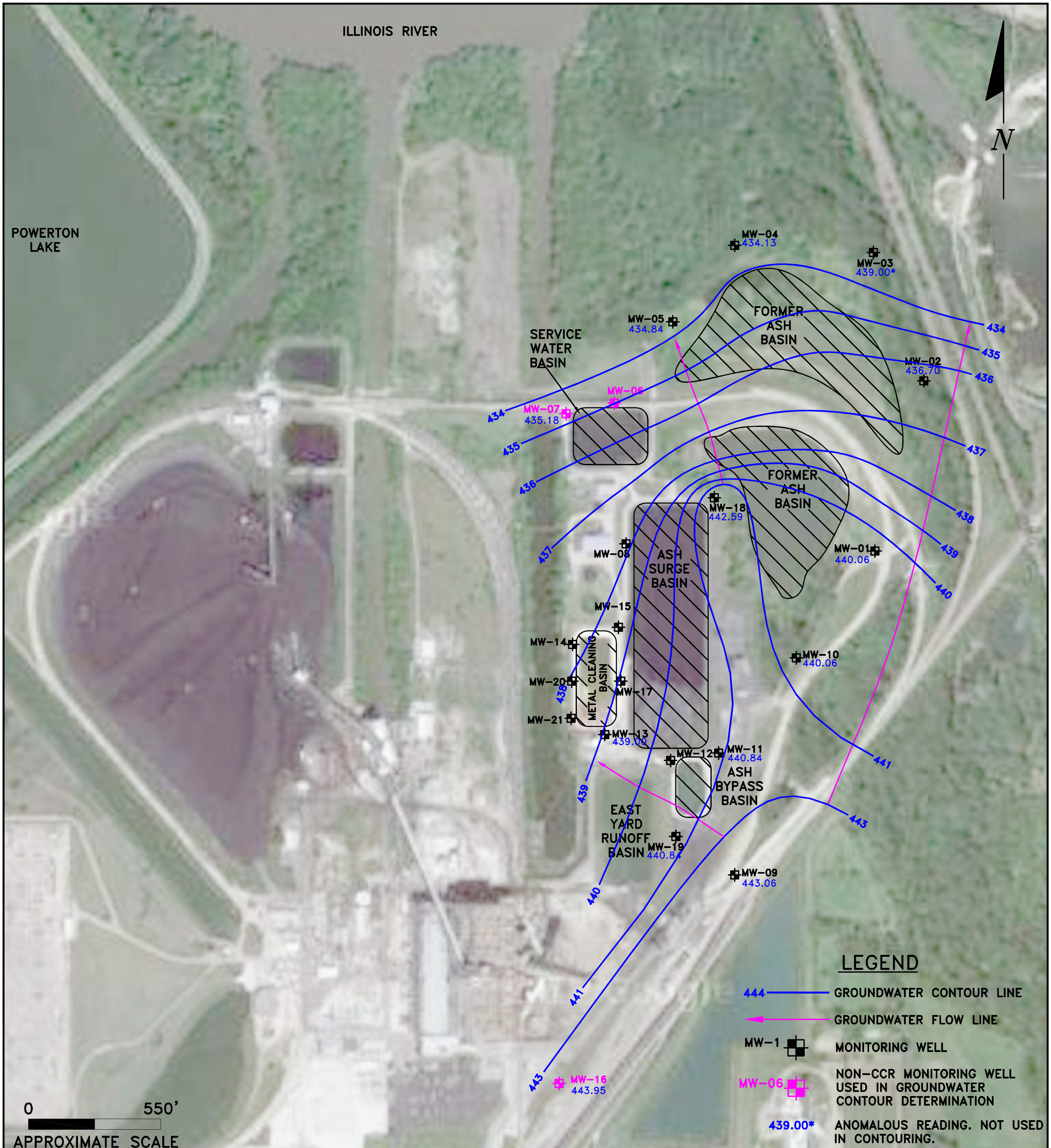
GROUNDWATER CONTOUR MAP FOR SILT/CLAY UNIT 12/2020

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-13



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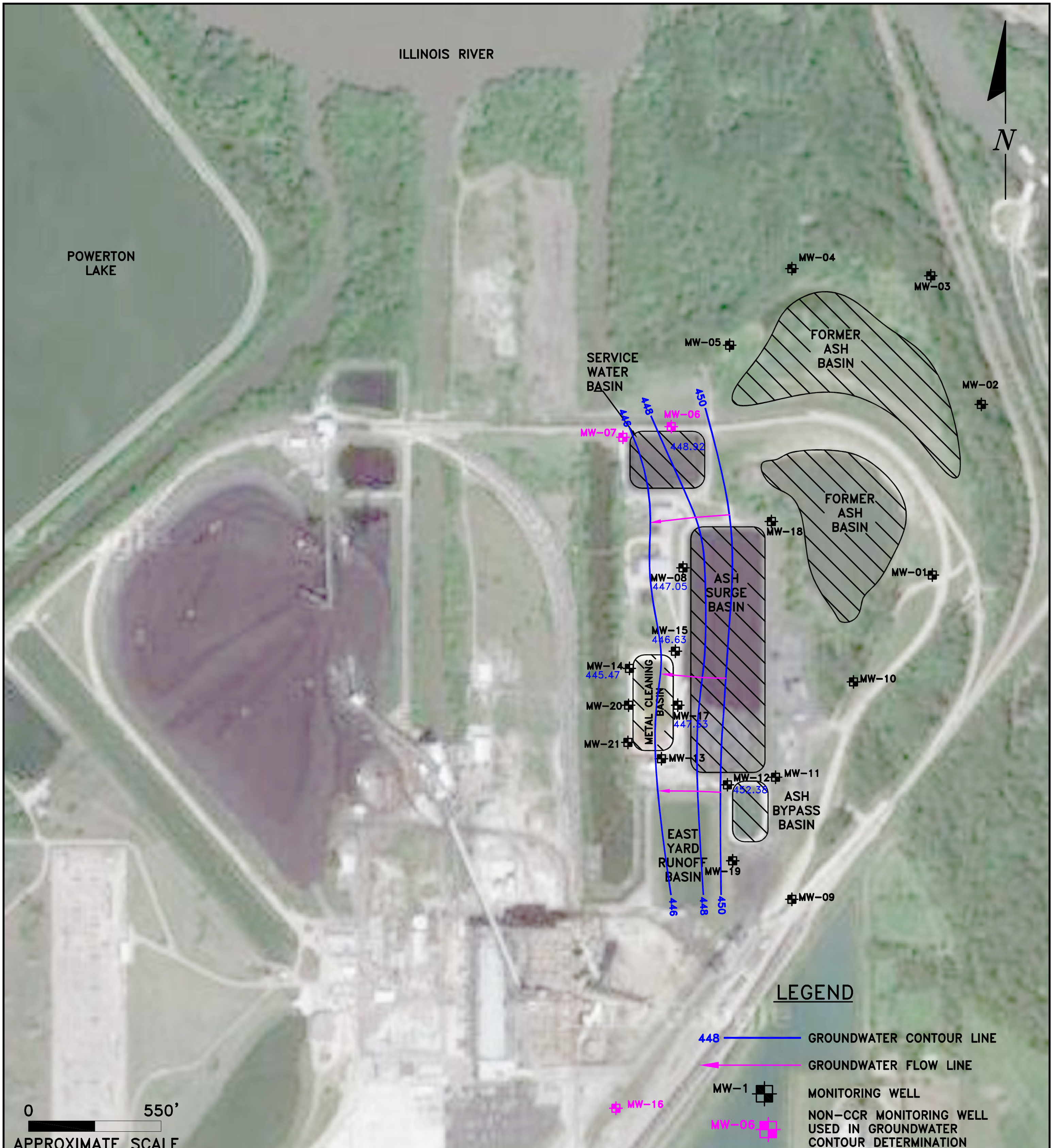
GROUNDWATER CONTOUR MAP FOR GRAVELLY SAND UNIT 02/2021

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-14



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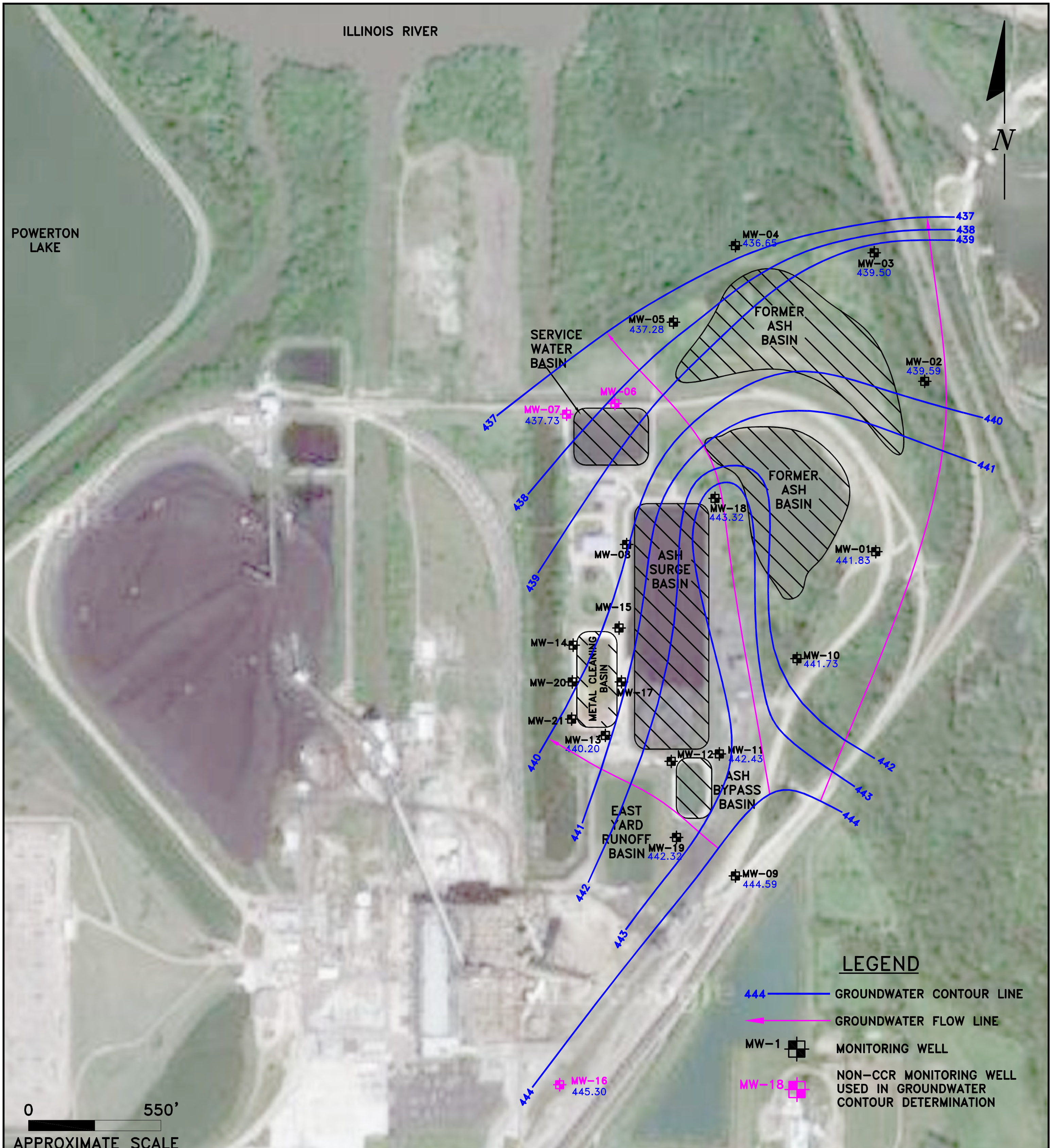
GROUNDWATER CONTOUR MAP FOR SILT/CLAY UNIT 02/2021

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-15



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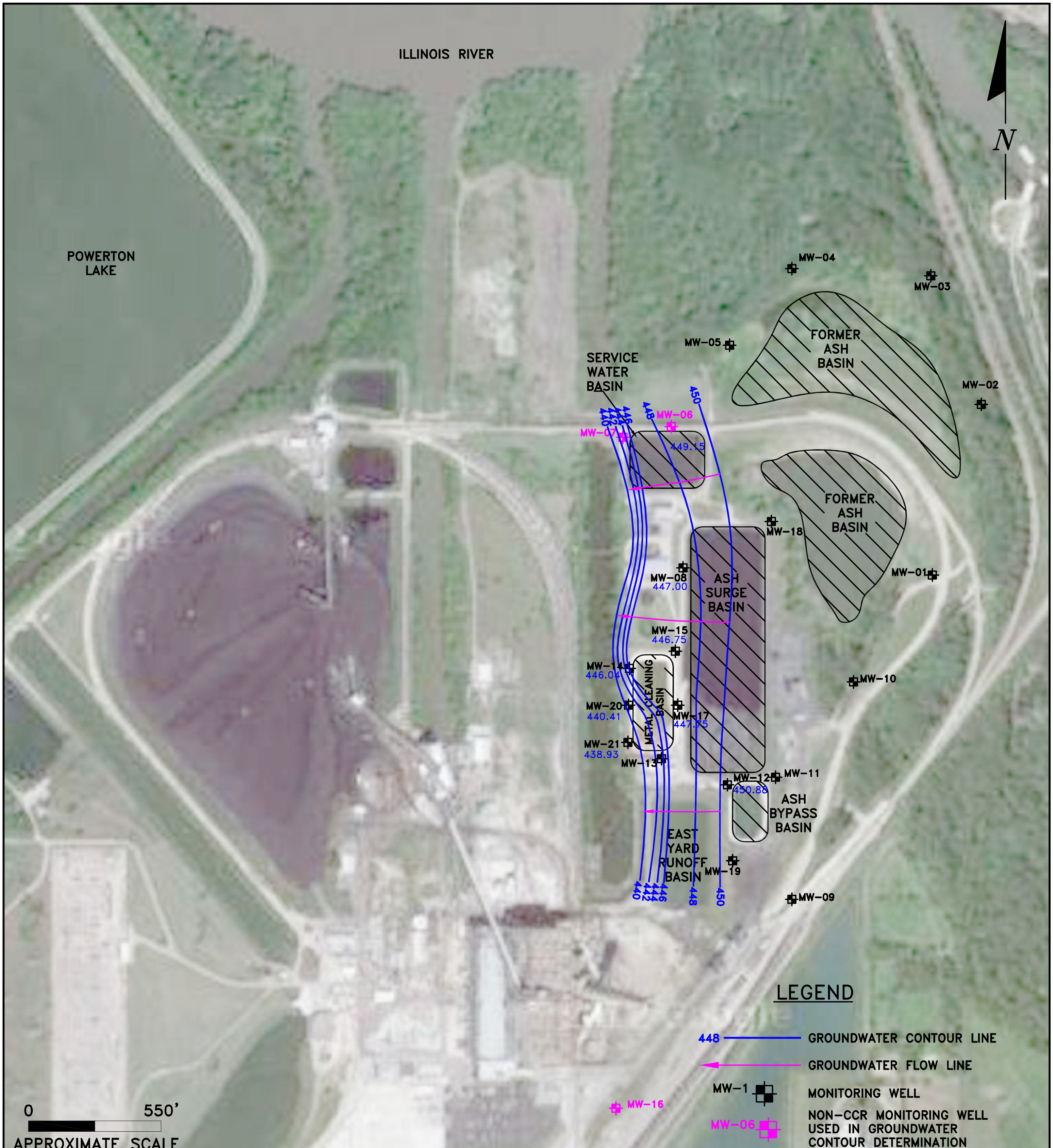
GROUNDWATER CONTOUR MAP FOR GRAVELLY SAND UNIT 05/2021

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-16



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GROUNDWATER CONTOUR MAP FOR SILT/CLAY UNIT 05/2021

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-17

W:\projects\midwest generation\ash pond issues\eluc & gmz\powerton station gmz--former ash basin.dwg(proposed gmz)

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GROUNDWATER MANAGEMENT ZONE FOR CCR SURFACE IMPOUNDMENTS

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550'	Date: September 17, 2021
KPRG Project No. 19520.1	Figure 9-18

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2500' RADIUS POTABLE WELL MAP

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 800'	Date: August 31, 2021
KPRG Project No. 19520.1	FIGURE 9-19

W:\projects\midwest gen\operating and construct permits - various stations\POWERTON\POWERTON station.dwg

ATTACHMENT 9-0
GROUNDWATER MONITORING FIGURES & TABLES

Table 9-1. Summary of Local Precipitation Data - Midwest Generation, LLC, Powerton Generating Station, Pekin, Illinois.

Powerton Station	
Month	**Average Monthly Precipitation* (inches)**
January	2.02
February	1.90
March	2.56
April	3.98
May	4.65
June	3.76
July	3.66
August	3.44
September	3.52
October	3.16
November	2.79
December	2.20

Notes:

* - Historical precipitation data was obtained from the National Oceanic and Atmospheric Administration. Precipitation data was averaged from thirteen stations located in and within close proximity to Pekin, Illinois. Dates of precipitation data range from 1991-2020.

Table 9-2. Ash Bypass Basin and Ash Surge Basin Groundwater Elevations - Midwest Generation, LLC, Powerton Station, Pekin, IL

Well ID	Date	Top of Casing Elevation (ft above MSL)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft above MSL)
MW-01	11/16/2015	465.24	26.04	439.20
	2/22/2016	465.24	21.90	443.34
	5/16/2016	465.24	21.83	443.41
	8/15/2016	465.24	23.89	441.35
	11/14/2016	465.24	23.38	441.86
	2/13/2017	465.24	21.71	443.53
	5/1/2017	465.24	18.87	446.37
	6/20/2017	465.24	21.54	443.70
	8/25/2017	465.24	24.70	440.54
	11/8/2017	465.24	24.92	440.32
	5/17/2018	465.24	22.66	442.58
	8/8/2018	465.24	26.05	439.19
	10/30/2018	465.24	24.69	440.55
	4/29/2019	465.24	20.15	445.09
	11/11/2019	465.24	19.49	445.75
	4/27/2020	465.24	20.90	444.34
	12/7/2020	465.24	25.69	439.55
	4/7/2021	465.24	22.20	443.04
	5/10/2021	465.24	23.41	441.83
MW-08	11/16/2015	471.75	26.06	445.69
	2/22/2016	471.75	23.99	447.76
	5/16/2016	471.75	25.48	446.27
	8/15/2016	471.75	23.61	448.14
	11/14/2016	471.75	24.31	447.44
	2/13/2017	471.75	23.97	447.78
	5/1/2017	471.75	23.28	448.47
	6/20/2017	471.75	23.31	448.44
	8/29/2017	471.75	24.52	447.23
	11/8/2017	471.75	25.27	446.48
	5/17/2018	471.75	24.36	447.39
	8/8/2018	471.75	24.04	447.71
	10/31/2018	471.75	24.92	446.83
	4/29/2019	471.75	24.28	447.47
	11/11/2019	471.75	24.24	447.51
	4/27/2020	471.75	24.50	447.25
	12/7/2020	471.75	25.35	446.40
	4/7/2021	471.75	24.88	446.87
	5/10/2021	471.75	24.75	447.00
MW-09	11/16/2015	469.14	26.07	443.07
	2/22/2016	469.14	22.83	446.31
	5/16/2016	469.14	23.06	446.08
	8/15/2016	469.14	24.50	444.64
	11/14/2016	469.14	24.33	444.81
	2/13/2017	469.14	23.43	445.71
	5/1/2017	469.14	20.77	448.37
	6/20/2017	469.14	22.15	446.99
	8/25/2017	469.14	24.79	444.35
	11/8/2017	469.14	25.74	443.40
	5/16/2018	469.14	23.89	445.25
	8/8/2018	469.14	25.49	443.65
	11/1/2018	469.14	26.02	443.12
	4/29/2019	469.14	21.30	447.84
	11/11/2019	469.14	21.31	447.83
	4/27/2020	469.14	21.80	447.34
	12/7/2020	469.14	26.19	442.95
	4/7/2021	469.14	23.75	445.39
	5/10/2021	469.14	24.55	444.59

Table 9-2. Ash Bypass Basin and Ash Surge Basin Groundwater Elevations - Midwest Generation, LLC, Powerton Station, Pekin, IL

Well ID	Date	Top of Casing Elevation (ft above MSL)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft above MSL)
MW-11	11/16/2015	471.62	31.67	439.95
	2/22/2016	471.62	28.34	443.28
	5/16/2016	471.62	27.11	444.51
	8/15/2016	471.62	29.64	441.98
	11/14/2016	471.62	29.19	442.43
	2/13/2017	471.62	27.49	444.13
	5/1/2017	471.62	24.34	447.28
	6/20/2017	471.62	26.94	444.68
	8/29/2017	471.62	30.42	441.20
	11/9/2017	471.62	30.27	441.35
	5/16/2018	471.62	28.58	443.04
	8/9/2018	471.62	31.04	440.58
	11/1/2018	471.62	30.82	440.80
	4/29/2019	471.62	25.38	446.24
	11/11/2019	471.62	24.88	446.74
	4/27/2020	471.62	26.35	445.27
	12/7/2020	471.62	31.35	440.27
	4/7/2021	471.62	27.85	443.77
	5/10/2021	471.62	29.19	442.43
MW-12	11/16/2015	473.38	24.48	448.90
	2/22/2016	473.38	21.41	451.97
	5/16/2016	473.38	22.94	450.44
	8/15/2016	473.38	23.85	449.53
	11/14/2016	473.38	23.89	449.49
	2/13/2017	473.38	21.93	451.45
	5/1/2017	473.38	22.26	451.12
	6/20/2017	473.38	22.76	450.62
	8/26/2017	473.38	23.92	449.46
	11/10/2017	473.38	24.29	449.09
	5/16/2018	473.38	22.46	450.92
	8/9/2018	473.38	23.78	449.60
	11/1/2018	473.38	23.74	449.64
	4/29/2019	473.38	22.05	451.33
	11/11/2019	473.38	22.85	450.53
	4/27/2020	473.38	21.44	451.94
	12/7/2020	473.38	22.70	450.68
	4/7/2021	473.38	21.91	451.47
	5/10/2021	473.38	22.50	450.88
MW-15	11/16/2015	471.37	25.33	446.04
	2/22/2016	471.37	22.91	448.46
	5/16/2016	471.37	24.71	446.66
	8/15/2016	471.37	23.45	447.92
	11/14/2016	471.37	23.94	447.43
	2/13/2017	471.37	23.73	447.64
	5/1/2017	471.37	23.27	448.10
	6/20/2017	471.37	22.86	448.51
	8/29/2017	471.37	23.13	448.24
	11/10/2017	471.37	25.13	446.24
	5/17/2018	471.37	23.85	447.52
	8/9/2018	471.37	23.96	447.41
	10/31/2018	471.37	24.55	446.82
	4/29/2019	471.37	23.57	447.80
	11/11/2019	471.37	23.79	447.58
	4/27/2020	471.37	23.95	447.42
	12/7/2020	471.37	25.01	446.36
	4/7/2021	471.37	24.44	446.93
	5/10/2021	471.37	24.62	446.75

Table 9-2. Ash Bypass Basin and Ash Surge Basin Groundwater Elevations - Midwest Generation, LLC, Powerton Station, Pekin, IL

Well ID	Date	Top of Casing Elevation (ft above MSL)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft above MSL)
MW-17	11/16/2015	467.75	26.92	440.83
	2/22/2016	467.75	19.86	447.89
	5/16/2016	467.75	20.42	447.33
	8/15/2016	467.75	21.61	446.14
	11/14/2016	467.75	21.39	446.36
	2/13/2017	467.75	19.66	448.09
	5/1/2017	467.75	18.78	448.97
	6/20/2017	467.75	19.42	448.33
	8/29/2017	467.75	22.68	445.07
	11/6/2017	467.75	24.66	443.09
	5/14/2018	467.75	19.79	447.96
	8/6/2018	467.75	21.03	446.72
	10/29/2018	467.75	21.98	445.77
	4/29/2019	467.75	18.75	449.00
	11/11/2019	467.75	19.60	448.15
	4/27/2020	467.75	19.15	448.60
	12/7/2020	467.75	24.12	443.63
	4/7/2021	467.75	19.69	448.06
	5/10/2021	467.75	20.00	447.75
MW-18	11/16/2015	469.28	28.42	440.86
	2/22/2016	469.28	27.96	441.32
	5/16/2016	469.28	25.57	443.71
	8/15/2016	469.28	27.86	441.42
	11/14/2016	469.28	27.39	441.89
	2/13/2017	469.28	25.06	444.22
	5/1/2017	469.28	22.49	446.79
	6/20/2017	469.28	24.97	444.31
	8/28/2017	469.28	27.30	441.98
	11/6/2017	469.28	26.33	442.95
	5/14/2018	469.28	24.65	444.63
	8/6/2018	469.28	25.67	443.61
	10/29/2018	469.28	25.79	443.49
	4/29/2019	469.28	23.00	446.28
	11/11/2019	469.28	23.94	445.34
	4/27/2020	469.28	23.97	445.31
	12/7/2020	469.28	27.82	441.46
	4/7/2021	469.28	24.94	444.34
	5/10/2021	469.28	25.96	443.32
MW-19	11/14/2016	465.07	22.65	442.42
	2/13/2017	465.07	21.27	443.80
	5/1/2017	465.07	18.39	446.68
	6/20/2017	465.07	20.44	444.63
	8/28/2017	465.07	23.60	441.47
	11/9/2017	465.07	23.80	441.27
	5/14/2018	465.07	22.08	442.99
	8/6/2018	465.07	24.14	440.93
	10/29/2018	465.07	24.31	440.76
	4/29/2019	465.07	19.12	445.95
	11/11/2019	465.07	18.80	446.27
	4/27/2020	465.07	19.94	445.13
	12/7/2020	465.07	24.63	440.44
	4/7/2021	465.07	21.60	443.47
	5/10/2021	465.07	22.75	442.32

MSL - Mean Sea Level
TOC - Top of Casing

Table 9-4. Hydraulic Gradient, Direction and Seepage Velocity. Midwest Generation, LLC, Powerton Station, Pekin, IL.

DATE	Screened Unit	Groundwater Flow Direction	Kavg (ft/sec)*	Average Hydraulic Gradient (ft/ft)	Porosity (unitless)**	Estimated Seepage Velocity (ft/day)
11/16/2015	Silt/clay	Westerly	6.380E-07	0.0093	0.4	0.001
11/16/2015	Sandy	North-Northwest	1.390E-03	0.0026	0.35	0.87
2/22/2016	Silt/clay	Westerly	6.380E-07	0.0098	0.4	0.001
2/22/2016	Sandy	North-Northwest	1.390E-03	0.0030	0.35	1.03
5/16/2016	Silt/clay	Westerly	6.380E-07	0.0124	0.4	0.002
5/16/2016	Sandy	North-Northwest	1.390E-03	0.0021	0.35	0.72
8/15/2016	Silt/clay	Westerly	6.380E-07	0.0093	0.4	0.001
8/15/2016	Sandy	North-Northwest	1.390E-03	0.0014	0.35	0.48
11/14/2016	Silt/clay	Westerly	6.380E-07	0.0083	0.4	0.001
11/14/2016	Sandy	North-Northwest	1.390E-03	0.0014	0.35	0.48
2/13/2017	Silt/clay	Westerly	6.380E-07	0.0091	0.4	0.001
2/13/2017	Sandy	Northeasterly - Northwesterly	1.390E-03	0.0049	0.35	1.68
5/1/2017	Silt/clay	Westerly	6.380E-07	0.0100	0.4	0.001
5/1/2017	Sandy	Northeasterly - Northwesterly	1.390E-03	0.0021	0.35	0.72
6/20/2017	Silt/clay	Westerly	6.380E-07	0.0088	0.4	0.001
6/20/2017	Sandy	Northeasterly - Northwesterly	1.390E-03	0.0057	0.35	1.96
8/25/2017	Silt/clay	Westerly	6.380E-07	0.0214	0.4	0.003
8/25/2017	Sandy	North-Northwest	1.390E-03	0.0174	0.35	5.97
11/8/2017	Silt/clay	Westerly	6.380E-07	0.0267	0.4	0.004
11/8/2017	Sandy	North-Northwest	1.390E-03	0.0157	0.35	5.39
5/17/2018	Silt/clay	Westerly	6.380E-07	0.0070	0.4	0.0010
5/17/2018	Sandy	North-Northwest	1.390E-03	0.0042	0.35	1.44
8/7/2018	Silt/clay	Westerly	6.380E-07	0.0263	0.4	0.004
8/7/2018	Sandy	North-Northwest	1.390E-03	0.0037	0.35	1.27
4/29/2019	Silt/clay	Westerly	6.380E-07	0.0129	0.4	0.0018
4/29/2019	Sandy	North-Northwest	1.390E-03	0.0022	0.35	0.75
11/11/2019	Silt/clay	Westerly	6.380E-07	0.0114	0.4	0.0016
11/11/2019	Sandy	North-Northwest	1.390E-03	0.0008	0.35	0.27
4/27/2020	Silt/clay	Westerly	6.380E-07	0.0114	0.4	0.0016
4/27/2020	Sandy	Northeasterly - Northwesterly	1.390E-03	0.0023	0.35	0.79
12/7/2020	Silt/clay	Westerly	6.380E-07	0.0137	0.4	0.0019
12/7/2020	Sandy	Northeasterly - Northwesterly	1.390E-03	0.0037	0.35	1.27
5/10/2021	Silt/clay	Westerly	6.380E-07	0.0208	0.4	0.0029
5/10/2021	Sandy	North-Northwest	1.390E-03	0.0041	0.35	1.41

* Kavg - See text discussion in Section 9.1.2 for average hydraulic conductivity values used (feet/second).
** - Porosity estimates from Applied Hydrogeology, Fetter, 1980.

Table 9-5. Groundwater Analytical Results - Midwest Generation, LLC, Powerton Station, Pekin, IL. Ash By-Pass Basin Ash Surge Basin.

Well	Date	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Radium 226 + 228	Selenium	Thallium
MW-01 (S) up-gradient	11/16/2015	1.0	98	44	0.17	7.07	93	530	< 0.003	< 0.001	0.057	^ < 0.001	< 0.0005	< 0.005	< 0.001	* < 0.0005	< 0.01	< 0.0002	< 0.0050	0.744	< 0.0025	* < 0.002
	2/25/2016	0.2	110	42	0.16	7.23	54	460	< 0.003	0.0025	0.053	< 0.001	< 0.0005	< 0.005	0.0014	0.0019	< 0.01	< 0.0002	< 0.005	< 0.722	0.0029	< 0.002
	5/20/2016	0.34	100	44	0.17	6.95	65	430	< 0.003	0.0081	0.062	< 0.001	< 0.0005	0.007	0.0053	0.011	< 0.01	< 0.0002	< 0.005	< 0.953	< 0.0025	< 0.002
	8/17/2016	0.27	78	39	0.25	7.16	50	530	< 0.003	0.0014	0.048	< 0.001	< 0.0005	< 0.005	< 0.001	0.0014	< 0.010	< 0.0002	0.0057	< 0.491	< 0.0025	< 0.002
	11/16/2016	0.18	97	39	0.21	7.22	32	500	< 0.003	0.0051	0.056	< 0.001	< 0.0005	< 0.005	0.0044	0.0082	< 0.01	< 0.0002	0.0059	< 0.618	< 0.0025	< 0.002
	2/14/2017	0.18	120	55	0.17	7.30	60	550	< 0.003	0.0041	0.056	< 0.001	< 0.0005	< 0.005	0.0045	0.0076	< 0.01	< 0.0002	0.0056	< 0.837	< 0.0025	< 0.002
	5/3/2017	0.19	86	66	0.16	7.41	45	460	< 0.003	0.0015	0.045	< 0.001	< 0.0005	< 0.005	0.0033	0.0067	< 0.01	< 0.0002	< 0.005	0.574	< 0.0025	< 0.002
	6/21/2017	0.18	85	58	0.18	7.60	47	540	< 0.003	< 0.001	0.04	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.0061	< 0.418	< 0.0025	< 0.002
	8/25/2017	0.56	86	41	0.18	7.41	63	490	< 0.003	< 0.001	0.049	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.0059	0.775	< 0.0025	< 0.002
	11/8/2017	0.57	130	38	0.12	6.69	61	640	< 0.003	< 0.001	0.083	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	< 0.005	0.343	< 0.0025	< 0.002
	5/17/2018	0.15	88	50	0.12	6.7	48	540	< 0.003	< 0.001	0.045	< 0.001	< 0.0005	< 0.005	< 0.001	0.00068	< 0.01	< 0.0002	< 0.005	< 0.396	< 0.0025	< 0.002
	8/8/2018	0.14	86	48	0.13	6.8	43	430	< 0.003	< 0.001	0.051	<^ 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	< 0.005	0.579	< 0.0025	< 0.002
	4/30/2019	0.07	78	54	0.17	7.2	27	450	< 0.003	0.0014	0.039	< 0.001	< 0.0005	< 0.005	< 0.001	0.0017	< 0.01	< 0.0002	< 0.005	< 0.656	< 0.0025	< 0.002
	11/13/2019	0.52	95	47	0.18	7.51	41	390	NA	0.029	0.091	NA	0.00085	NA	0.016	0.034	0.012	< 0.0002	0.0079	0.884	< 0.0025	< 0.002
	12/26/2019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0021	0.0041	NA	NA	NA	NA	NA	NA
	4/28/2020	0.33	110	46	0.19	7.17	41	470	NA	< 0.001	0.051	NA	< 0.0005	NA	< 0.001	< 0.0005	< 0.01	< 0.0002	< 0.005	0.628	< 0.0025	< 0.002
	12/7/2020	0.6	100	54	0.25	7.22	55	490	NA	< 0.001	0.058	NA	< 0.0005	NA	< 0.001	0.00055	< ^ 0.01	< 0.0002	0.0051	0.724	< 0.0025	< 0.002
	5/11/2021	0.23	84	53	0.2	7.52	38	450	< 0.003	< 0.001	0.043	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.01	< 0.523	< 0.0025	< 0.002
MW-09 (S) up-gradient	11/18/2015	2.0	63	H 31	H 0.19	7.15	H 110	H 440	< 0.003	< 0.001	0.027	^ < 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	H < 0.0002	0.043	< 0.655	< 0.0025	< 0.002
	2/25/2016	2.3	77	36	0.19	7.34	120	500	< 0.003	0.0042	0.036	< 0.001	< 0.0005	< 0.005	0.0011	< 0.0005	< 0.01	< 0.0002	0.053	< 0.361	< 0.0025	< 0.002
	5/19/2016	2.0	73	38	0.17	7.30	100	520	< 0.003	< 0.001	0.029	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.042	< 0.394	0.0032	< 0.002
	8/17/2016	2.7	74	39	0.15	7.32	120	750	< 0.003	< 0.001	0.031	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.036	< 0.498	< 0.0025	< 0.002
	11/17/2016	4.5	85	38	0.13	7.37	110	630	< 0.003	0.0038	0.039	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.036	0.646	0.0025	< 0.002
	2/15/2017	4.1	84	38	0.13	6.94	160	620	< 0.003	0.0032	0.043	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.035	< 0.377	0.0062	< 0.002
	5/3/2017	3.5	85	38	0.17	7.48	170	680	< 0.003	0.0012	0.034	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.034	< 0.445	0.011	< 0.002
	6/21/2017	3.3	82	38	0.14	7.63	180	760	< 0.003	< 0.001	0.037	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.033	< 0.380	0.0072	< 0.002
	8/25/2017	3.8	85	36	0.14	7.30	150	630	< 0.003	< 0.001	0.044	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.028	< 0.160	0.0043	< 0.002
	11/8/2017	4	89	37	0.13	6.92	190	650	< 0.003	0.0012	0.048	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.026	0.344	< 0.0025	< 0.002
	5/16/2018	4.1	89	36	0.15	7.83	180	550	< 0.003	< 0.001	0.038	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	0.00029	0.031	< 0.424	0.006	< 0.002
	8/8/2018	4.3	86	39	0.14	7.31	180	690	< 0.003	< 0.001	0.037	<^ 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.032	0.44	0.0078	< 0.002
	5/1/2019	4.6	79	37	0.17	7.11	170	640	< 0.003	< 0.001	0.038	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.031	< 0.66	0.0036	< 0.002
	11/14/2019	2.5	85	36	0.18	7.49	82	500	NA	0.0056	0.057	NA	< 0.0005	NA	0.0032	0.00076	< 0.010	< 0.0002	0.026	< 0.457	< 0.0025	< 0.002
	4/29/2020	2	71	34	0.2	7.19	140	510	NA	0.0012	0.031	NA	< 0.0005	NA	< 0.001	< 0.0005	< 0.010	< 0.0002	0.028	0.698	< 0.0025	< 0.002
	12/8/2020	2.6	65	34	0.22	7.29	63	400	NA	0.0013	0.042	NA	< 0.0005	NA	< 0.001	< 0.0005	< 0.010	< 0.0002	0.025	< 0.479	< 0.0025	< 0.002
	5/13/2021	2	74	33	0.2	7.33	120	410	< 0.003	< 0.001	0.035	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.010	< 0.0002	0.025	< 0.612	< 0.0025	< 0.002
MW-19^ (S) up-gradient	11/18/2016	3.8	89	38	0.13	7.34	120	670	< 0.003	< 0.001	0.084	< 0.001	< 0.0005	< 0.005	0.001	0.00068	< 0.01	< 0.0002	0.035	< 0.476	0.0043	< 0.002
	2/15/2017	4.7	88	37	0.13	7.50	180	630	< 0.003	< 0.001	0.088	< 0.001	< 0.0005	< 0.005	< 0.001	0.00061	< 0.01	< 0.0002	0.046	< 0.482	0.0063	< 0.002
	5/5/2017	3.3	88	38	0.14	7.51	160	640	< 0.003	< 0.001	0.076	< 0.001	< 0.0005	< 0.005	0.0013	0.0012	< 0.01	< 0.0002	0.035	0.923	0.0068	< 0.002
	6/21/2017	2.3	110	35	0.12	7.30	170	690	< 0.003	< 0.001	0.089	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.024	< 0.334	0.0028	< 0.002
	8/28/2017	3.5	97	36	0.16	7.20	160	700	< 0.003	< 0.001	0.073	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.041	0.370	0.0035	< 0.002
	11/6/2017	4.5	86	35	0.17	7.26	190	640	< 0.003	< 0.001	0.071	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.042	0.360	< 0.0025	< 0.002
	5/14/2018	4.1	96	35	0.16	7.92	180	820	< 0.003	< 0.001	0.079	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.043	0.562	0.0044	< 0.002
	8/6/2018	3.8	100	37	0.13	7.57	170	720	< 0.003	< 0.001	0.078	<^ 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.032	0.835	0.0052	< 0.002
	5/2/2019	3.7	100	39	0.13	6.86	160	700	< 0.003	< 0.001	0.076	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.03	< 0.431	0.0035	< 0.002
	11/13/2019	2.5	130	53	0.15	7.51	140	740	NA	0.0014	0.100	NA	< 0.0005	NA	< 0.001	0.00056	< 0.01	< 0.0002	0.04	< 0.447	< 0.0025	< 0.002
	4/27/2020	2.3	100	43	0.17	6.87	110	570	NA	< 0.001	0.077	NA	< 0.0005	NA	< 0.001	< 0.0005	< 0.01	< 0.0002	0.04	0.630	< 0.0025	< 0.002
	12/7/2020	3.3	74	34	0.19	7.30	F1 76	420	NA	< 0.001	0.062	NA	< 0.0005	NA	< 0.001	< 0.0005	< ^ 0.01	< 0.0002	0.05	< 0.509	< 0.0025	< 0.002
	5/10/2021	2.3	68	33	0.17	7.36	110	420	< 0.003	< 0.001	0.060	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.05	< 0.524	< 0.0025	< 0.002
MW-08 (CL) down-gradient	11/18/2015	1.5	160	H 170	H 0.44	7.61	H 470	H 1300	< 0.003	0.0029	0.15	^ < 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.028	H < 0.0002	0.01	< 0.559	< 0.0025	< 0.002
	2/25/2016	1.7	160	200	0.30	7.00	280	1100	< 0.003	0.0018	0.11	< 0.001	0.00052	< 0.005	< 0.001	0.00072	0.015	< 0.0002	0.02	0.535	< 0.0025	< 0.002
	5/18/2016	1.7	160	140	0.34	7.67	300	1200	< 0.003	0.0029	0.16	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.036	< 0.0002	0.0069	0.417	< 0.0025	< 0.002
	8/17/2016	1.0	150	230	0.35	7.33	360	1400	< 0.003	0.0032	0.15	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.023	< 0.0002	0.013	< 0.519	< 0.0025	< 0.002
	11/15/2016	1.2	140	290	0.33	6.90	230	1300	< 0.003	0.0012	0.076	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.016	0.583	< 0.0025	< 0.002
	2/16/2017	1.5	150	460	0.28	7.00	230	1500	< 0.003	0.003	0.086	< 0.001	< 0.0005	< 0.005	< 0.001	0.00087	< 0.01	< 0.0002	0.026	< 0.375	< 0.0025	< 0.002
	5/2/2017	0.55	140	300	0.33	7.30	320	1300	< 0.003	0.0029	0.13	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.022	< 0.0002	0.0083	< 0.480	< 0.0025	< 0.002
	6/21/2017	1.2	160	490	0.30	7.27	350	1700	< 0.003	0.0045	0.14	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.031	< 0.439	< 0.0025	< 0.002
	8/29/2017	1.2	150	360	0.47	7.29	300	1500	< 0.003	0.0011	0.062	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.034	0.699	< 0.0025	< 0.002
	11/8/2017	0.68	130	260	0.45	7.27	270	1200	< 0.003	0.0027	0.10	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.019	< 0.0002	0.014	0.806	< 0.0025	< 0.002
	5/17/2018	1.2	130	200	0.37	6.79	170	1000	< 0.003	0.003	0.07	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.024	0.655	< 0.0025	< 0.002
	8/8/2018	1.1	140	270	0.32	6.93	190	1200	< 0.003	0.0055	0.07	<^ 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.019	< 0.410	< 0.0025	< 0.002
	5/1/2019	0.54	95	73	0.35	7.60	85	600	< 0.003	0.0018	0.07	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.021	< 0.0002	0.0069	0.892	< 0.0025	< 0.002
	11/13/2019	0.98	110	92	0.33	7.66	110	640	NA	0.0025	0.087	NA	< 0.0005	NA	< 0.001	0.00094	0.022	< 0.0002	0.013	< 0.498	< 0.0025	< 0.002
	4/28/2020	0.74	110	120	0.38	7.58	58	660	NA	0.0026	0.095	NA	< 0.0005	NA	< 0.001	< 0.0005	0.026	< 0.0002	0.011	< 0.450	< 0.0025	< 0.002
	12/14/2020	0.73	120	150	0.38	7.40	92	530	NA	0.0024	0.110	NA	< 0.0005	NA	< 0.001	0.00093	0.03	< 0.0002	0.012	1.310	< 0.0025	< 0.002
	5/11/2021	0.54	97	120	0.39	7.64	110	680	< 0.003	0.002	0.092	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.021	< 0.0002	0.011	< 0.695	< 0.0025	< 0.002

Notes: All units are in mg/l except pH is in standard units.
F1 - MS and/or MSD Recovery outside of limits.
H - Sample was prepped or analyzed beyond the specified holding time.
V- Serial dilution exceeds control limits.
* - LCS or LCSD is outside acceptance limits.
^ - Denotes instrument related QC exceeds the control limits
(R) - Resample Event
NA - Not Analyzed

Table 9-5. Groundwater Analytical Results - Midwest Generation, LLC, Powerton Station, Pekin, IL. Ash By-Pass Basin Ash Surge Basin.

Well	Date	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Radium 226 + 228	Selenium	Thallium
MW-11 (S) down-gradient	11/18/2015	1.7	110	H 54	H 0.55	7.06	H 160	H 670	< 0.003	0.017	0.18	^ < 0.001	< 0.0005	< 0.005	0.002	< 0.0005	< 0.01	H < 0.0002	0.0120	0.788	< 0.0025	< 0.002
	2/26/2016	1.5	140	120	0.55	7.25	220	850	< 0.003	0.023	0.23	< 0.001	< 0.0005	< 0.005	0.0023	< 0.0005	< 0.01	< 0.0002	0.013	0.562	< 0.0025	< 0.002
	5/20/2016	1.6	140	120	0.56	7.10	210	920	< 0.003	0.027	0.26	< 0.001	< 0.0005	< 0.005	0.0024	0.00076	< 0.01	< 0.0002	0.014	0.524	< 0.0025	< 0.002
	8/17/2016	1.0	130	93	0.67	7.08	180	910	< 0.003	F1 0.29	1.4	< 0.001	< 0.0005	< 0.005	0.0034	0.001	< 0.010	< 0.0002	0.011	1.130	< 0.0025	< 0.002
	11/17/2016	1.2	140	130	0.44	7.21	240	1100	< 0.003	0.071	0.44	< 0.001	< 0.0005	< 0.005	0.0037	0.0013	< 0.01	< 0.0002	0.0088	0.734	< 0.0025	< 0.002
	2/16/2017	1.6	140	110	0.40	6.62	260	910	< 0.003	0.04	0.3	< 0.001	< 0.0005	< 0.005	0.003	0.00094	< 0.01	< 0.0002	0.013	0.341	< 0.0025	< 0.002
	5/3/2017	1.3	160	160	0.42	7.36	440	1300	< 0.003	0.039	0.26	< 0.001	< 0.0005	< 0.005	0.0035	0.00093	< 0.01	< 0.0002	0.015	0.662	< 0.0025	< 0.002
	6/22/2017	1.2	140	120	0.60	7.21	260	1000	< 0.003	0.07	0.36	< 0.001	< 0.0005	< 0.005	0.0025	< 0.0005	< 0.01	< 0.0002	0.014	< 0.418	< 0.0025	< 0.002
	8/29/2017	2.2	130	83	0.52	7.23	310	1100	< 0.003	0.017	0.21	< 0.001	< 0.0005	< 0.005	0.0026	< 0.0005	< 0.01	< 0.0002	0.016	< 0.313	< 0.0025	< 0.002
	11/9/2017	1.5	140	100	0.59	6.96	230	970	< 0.003	0.092	0.54	< 0.001	< 0.0005	< 0.005	0.0034	< 0.0005	< 0.01	< 0.0002	0.014	1.24	< 0.0025	< 0.002
	5/16/2018	2.0	140	88	0.61	7.89	270	1000	< 0.003	0.089	0.47	< 0.001	< 0.0005	< 0.005	0.0041	< 0.0005	< 0.01	< 0.0002	0.014	1.12	< 0.0025	< 0.002
	8/9/2018	1.4	160	120	0.65	7.24	220	1000	< 0.003	0.68	3.0	<^ 0.0010	0.0008	< 0.005	0.0053	0.0012	< 0.01	< 0.0002	0.013	1.48	< 0.0025	< 0.002
	5/1/2019	2.3	110	60	0.62	7.08	200	730	< 0.003	0.11	0.6	< 0.001	< 0.0005	< 0.005	0.0026	0.0011	< 0.01	< 0.0002	0.014	1.59	< 0.0025	< 0.002
	11/14/2019	1.8	120	83	0.55	7.43	150	890	NA	0.14	0.72	NA	< 0.0005	NA	0.0041	0.0021	< 0.01	< 0.0002	0.02	2.64	< 0.0025	< 0.002
	4/29/2020	1.2	100	110	0.62	7.08	320	950	NA	0.019	0.21	NA	< 0.0005	NA	0.0019	< 0.0005	< 0.01	< 0.0002	0.024	0.47	< 0.0025	< 0.002
	12/8/2020	0.7	86	94	0.67	7.26	200	650	NA	0.027	0.26	NA	< 0.0005	NA	0.0021	< 0.0005	< 0.01	< 0.0002	0.03	< 0.523	< 0.0025	< 0.002
	5/11/2021	1.0	99	130	0.72	7.26	230	820	< 0.003	0.024	0.25	< 0.001	< 0.0005	< 0.005	0.0019	< 0.0005	0.012	< 0.0002	0.032	1.59	< 0.0025	< 0.002
MW-12 (CL) down-gradient	11/19/2015	0.94	160	H 220	H 0.57	7.12	H 650	H 1400	< 0.003	0.10	0.180	^ < 0.001	0.00068	< 0.005	< 0.001	0.00063	0.023	H < 0.0002	0.0280	< 0.685	< 0.0025	< 0.002
	2/26/2016	0.42	130	200	0.40	7.96	530	1200	< 0.003	0.077	0.130	< 0.001	0.0016	< 0.005	< 0.001	0.0014	0.014	< 0.0002	0.0150	1.11	< 0.0025	< 0.002
	5/20/2016	0.65	150	200	0.49	7.28	550	1400	< 0.003	0.065	0.16	F1 < 0.001	0.00077	< 0.005	< 0.001	0.0016	0.013	< 0.0002	0.028	0.576	< 0.0025	< 0.002
	8/18/2016	0.69	170	200	0.49	7.06	620	1600	< 0.003	0.33	0.88	0.0013	0.007	< 0.005	0.001	0.0011	0.015	< 0.0002	0.011	3.68	< 0.0025	< 0.002
	11/18/2016	0.83	140	180	0.46	7.34	340	1300	< 0.003	0.23	0.67	< 0.001	0.0028	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	< 0.01	1.86	< 0.0025	< 0.002
	2/16/2017	0.48	140	190	0.37	7.54	630	1300	< 0.003	0.29	0.26	< 0.001	0.0057	< 0.005	0.0013	0.0042	0.010	< 0.0002	0.015	1.15	< 0.0025	< 0.002
	5/3/2017	0.49	120	190	0.37	7.47	500	1200	< 0.003	0.10	0.17	< 0.001	0.0022	< 0.005	< 0.001	0.0038	0.011	< 0.0002	0.017	0.518	< 0.0025	< 0.002
	6/22/2017	0.50	130	190	0.48	7.36	580	1400	< 0.003	0.025	0.11	< 0.001	< 0.0005	< 0.005	< 0.001	0.00096	< 0.010	< 0.0002	0.028	0.376	< 0.0025	< 0.002
	8/29/2017	0.78	140	180	0.52	7.34	520	1400	< 0.003	0.02	0.095	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.014	< 0.0002	0.024	0.529	< 0.0025	< 0.002
	11/10/2017	0.94	130	170	0.48	7.38	370	1200	< 0.003	0.50	0.45	< 0.001	0.0015	< 0.005	< 0.001	0.00097	0.018	< 0.0002	0.023	1.67	< 0.0025	< 0.002
	5/16/2018	0.46	100	180	0.47	8.12	720	1500	< 0.003	0.09	0.1	< 0.001	0.00052	< 0.005	< 0.001	0.00067	0.012	< 0.0002	0.021	0.741	< 0.0025	< 0.002
	8/9/2018	0.61	120	190	0.44	7.42	480	1300	< 0.003	0.12	0.15	<^ 0.001	0.00084	< 0.005	< 0.001	0.00072	< 0.010	< 0.0002	0.026	0.735	< 0.0025	< 0.002
	5/1/2019	0.4	100	170	0.38	7.68	330	1000	< 0.003	0.04	0.13	< 0.001	0.00054	< 0.005	< 0.001	0.0012	0.014	< 0.0002	0.011	0.666	< 0.0025	< 0.002
	11/14/2019	0.74	120	160	0.45	7.61	280	1100	NA	0.026	0.072	NA	< 0.0005	NA	< 0.001	< 0.0005	0.014	< 0.0002	0.027	0.568	< 0.0025	< 0.002
	4/29/2020	0.34	71	150	0.34	7.96	360	980	NA	0.003	0.034	NA	< 0.0005	NA	< 0.001	< 0.0005	0.012	< 0.0002	0.015	0.578	< 0.0025	< 0.002
	12/8/2020	0.61	92	160	0.56	7.36	320	990	NA	0.025	0.069	NA	< 0.0005	NA	< 0.001	< 0.0005	0.012	< 0.0002	0.027	< 0.476	< 0.0025	< 0.002
	5/13/2021	0.4	89	140	0.23	7.39	350	990	< 0.003	0.0025	0.058	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.016	0.563	< 0.0025	< 0.002
MW-15 (CL) down-gradient	11/18/2015	1.5	270	H 210	H 0.53	6.55	H 1400	H 2400	< 0.003	0.03	0.096	^ < 0.001	0.00061	< 0.005	< 0.001	< 0.0005	0.042	H < 0.0002	0.023	< 0.599	0.0065	< 0.002
	2/25/2016	2.0	240	110	0.61	6.84	640	1700	< 0.003	0.025	0.083	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.041	< 0.0002	0.035	0.870	0.045	< 0.002
	5/19/2016	2.7	320	240	0.53	6.83	1200	2800	< 0.003	0.04	0.097	< 0.001	0.00098	< 0.005	< 0.001	< 0.0005	0.044	< 0.0002	0.041	< 0.420	0.0067	< 0.002
	8/18/2016	1.5	200	F1 170	0.54	6.96	660	1900	< 0.003	0.13	0.11	< 0.001	0.0041	< 0.005	< 0.001	< 0.0005	0.028	< 0.0002	0.027	< 0.672	0.0061	< 0.002
	11/17/2016	1.3	120	180	0.47	6.91	560	1900	< 0.003	0.0033	0.031	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.016	< 0.0002	0.018	< 0.570	0.0078	< 0.002
	2/17/2017	1.9	200	190	0.43	7.24	670	1700	< 0.003	0.02	0.056	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.025	< 0.0002	0.027	< 0.392	0.0032	< 0.002
	5/4/2017	1.5	180	190	0.57	7.35	670	1700	< 0.003	0.011	0.049	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.023	< 0.0002	0.023	< 0.456	0.0034	< 0.002
	6/21/2017	1.6	180	200	0.56	7.30	530	1600	< 0.003	0.0093	0.054	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.027	< 0.0002	0.03	< 0.347	0.019	< 0.002
	8/29/2017	2.2	190	200	0.53	6.87	540	1800	< 0.003	0.0018	0.044	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.023	< 0.0002	0.032	0.377	0.0092	< 0.002
	11/10/2017	1.6	170	180	0.63	7.09	530	1500	< 0.003	0.0063	0.046	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.025	< 0.0002	0.02	< 0.313	0.016	< 0.002
	5/17/2018	2.3	200	160	0.5	6.75	680	1800	< 0.003	0.0081	0.05	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.029	< 0.0002	0.03	0.397	0.077	< 0.002
	8/9/2018	2.3	200	200	0.48	7.06	520	1700	< 0.003	0.0083	0.048	<^ 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.026	< 0.0002	0.033	0.566	0.06	< 0.002
	5/2/2019	1.5	180	200	0.52	6.89	420	1500	< 0.003	0.0045	0.052	< 0.001	< 0.0005	< 0.005	< 0.0010	< 0.0005	0.027	< 0.0002	0.023	< 0.424	< 0.0025	< 0.002
	11/14/2019	1.8	170	170	0.5	7.24	260	1300	NA	0.0044	0.053	NA	< 0.0005	NA	< 0.0010	< 0.0005	0.029	< 0.0002	0.025	< 0.475	< 0.0025	< 0.002
	4/29/2020	1.2	160	200	0.58	6.90	370	1300	NA	0.0036	0.06	NA	< 0.0005	NA	< 0.0010	< 0.0005	0.027	< 0.0002	0.023	0.578	< 0.0025	< 0.002
	12/8/2020	1.5	170	200	0.55	7.04	540	1400	NA	0.02	0.1	NA	0.00059	NA	0.0012	< 0.0005	0.035	< 0.0002	0.02	0.626	0.012	< 0.002
	5/12/2021	1.3	180	180	0.54	6.97	520	1500	< 0.003	0.0048	0.065	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.026	< 0.0002	0.014	< 0.648	0.0071	< 0.002
MW-17 (CL) down-gradient	11/19/2015	1.6	210	H 230	H 0.43	7.11	H 850	H 1800	< 0.003	0.0028	0.14	^ < 0.001	< 0.0005	< 0.005	0.0012	0.0012	0.019	H < 0.0002	0.035	< 0.790	< 0.0025	< 0.002
	2/22/2016	1.8	290	280	0.55	7.19	960	2100	< 0.003	0.021	0.051	< 0.001	< 0.0005	< 0.005	0.0012	< 0.0005	0.038	< 0.0002	0.093	1.07	< 0.0025	< 0.002
	5/18/2016	1.4	200	230	0.64	7.02	700	1800	< 0.003	0.32	0.12	< 0.001	0.0011	< 0.005	0.0015	< 0.0005	0.026	< 0.0002	0.12	8.27	< 0.0025	0.0028
	8/15/2016	1.1	220	220	0.60	7.08	860	2100	< 0.003	0.34	0.12	< 0.001	0.001	< 0.005	0.0016	< 0.0005	0.022	< 0.0002	0.1	0.606	< 0.0025	0.0031
	11/14/2016	1.5	200	210	0.56	7.26	560	2000	< 0.003	0.19	0.073	< 0.001	0.00051	< 0.005	0.0012	< 0.0005	0.022	< 0.0002	0.042	3.76	< 0.0025	0.0021
	2/13/2017	1.6	190	230	0.56	6.84	770	1600	< 0.003	0.35	0.16	< 0.001	0.00093	< 0.005	0.0014	0.00079	0.019	< 0.0002	0.088	2.08	< 0.0025	0.0025
	5/4/2017	1.2	170	210	0.61	7.29	720	1500	< 0.003	0.24	0.39	0.0013	0.0023	< 0.005	0.0023	0.00066	0.016	< 0.0002	0.036	1.91	< 0.0025	0.0065
	6/22/2017	0.95	150	230	0.72	7.38	580	1600	< 0.003	0.41	0.13	< 0.001	0.0007	< 0.005	0.0012	0.0011	0.022	< 0.0002	0.11	1.21	< 0.0025	0.0022
	8/29/2017	1.4	190	230	0.64	7.19	640	1900	< 0.003	0.24	0.092	< 0.001	< 0.0005	< 0.005	< 0.001	0.00058	0.021	< 0.0002	0.13	3.32	< 0.0025	0.0025
	11/6/2017	1.7	190	240	0.62	7.27	840	1800	< 0.003	0.17	0.38	< 0.001	0.0022	< 0.005	0.0015	< 0.0005	< 0.01	< 0.0002	0.019	2.54	< 0.0025	0.0075
	5/14/2018	1.6	170	220	0.6	7.79	800	1700	< 0.003	0.42	0.17	< 0.001	0.002	< 0.005	0.0029	0.0021	0.015	< 0.0002	0.13	2.03	< 0.0025	0.0068
	8/6/2018	1.3	170	230	0.6	7.12	620	1600	< 0.003	0.087	0.055	<^ 0.001	0.00094	< 0.005	0.0015	< 0.0005	0.019	< 0.0002	0.084	1.34	< 0.0025	0.0023
	4/29/2019	0.98	150	190	0.66	7.25	660	1500	< 0.003	0.042	0.04	< 0.001	0.00052	< 0.005	< 0.001	0.00069	0.015	< 0.0002	0.06	0.517	< 0.0025	< 0.002
	11/13/2019	1.9	230	600	0.55	7.16	730	2300	NA	0.088	0.1	NA	0.0015	NA	0.0011	0.00093	0.021	< 0.0002	0.058	0.643	< 0.0025	0.0029
	4/27/2020	1.2	150	170	0.79	7.27	520	1300	NA	0.026	0.036	NA	< 0.0005	NA	< 0.001	0.00081	0.021	< 0.0002	0.075	0.498	< 0.0025	< 0.002
	12/7/2020	1.3	140	160	0.8	7.22	430	1100	NA	0.08	0.05	NA	0.001	NA	< 0.001	0.0011	0.022	< 0.0002	0.056	< 0.438	< 0.0025	< 0.002
	5/12/2021	0.99	130	160	0.77	7.52	480	1200	< 0.003	0.0053	0.027	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.018	< 0.0002	0.049	< 0.478	< 0.0025	< 0.002
MW-18 (S) down-gradient	11/19/2015	0.80	140	H 220	H 0.66	7.62	H 310	H 1200	< 0.003	0.0014	0.14	^ < 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	H < 0.0002	0.0051	< 0.845	< 0.0025	< 0.002
	2/22/2016	0.76	150	220	0.68	7.06	310	1200	< 0.003	0.0012	0.15	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.022	< 0.0002	0.0055	1.88	< 0.0025	< 0.002
	5/18/2016	0.72	120	230	0.71	7.68	230	1200	< 0.003	< 0.001	0.13	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.014	< 0.0002	0.0052	< 0.493	< 0.0025	< 0.002
	8/15/2016	0.67	130	210	0.64	7.52	330	1300	< 0.003	< 0.001	0.14	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.012	< 0.0002	0.0059	0.836	< 0.0025	< 0.002
	11/18/2016	0.94	130	200	0.58	7.69	250	1300	< 0.003	< 0.001	0.14	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.013	< 0.0002	0.0053	0.488	< 0.0025	< 0.002
	2/15/2017	0.56	140	190	0.50	7.81	340	1200	< 0.003	< 0.001	0.14	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.014	< 0.0002	0.0058	< 0.347	< 0.0025	< 0.002
	5/5/2017	0.46	130	180	0.52	8.12	360	1100	< 0.003	0.0032	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	0.00057	0.01	< 0.0002	< 0.005	0.612	< 0.0025	< 0.002
	6/21/2017	0.53	120	190	0.51	8.10	320	1200	< 0.003	< 0.001	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.014	< 0.0002	0.0051	0.629	< 0.0025	< 0.002
	8/28/2017	0.65	120	200	0.53	7.81	310	1200	< 0.003	< 0.001	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.012	< 0.0002	0.005	0.498	< 0.0025	< 0.002
	11/6/2017	0.67	120	190	0.57	7.74	400	1200	< 0.003	< 0.001	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.011	< 0.0002	0.0057	0.755	< 0.0025	< 0.002
	5/14/2018	0.57	130	180	0.59	8.27	440	1200	< 0.003	< 0.001	0.13	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.013	< 0.0002	0.0052	0.641	< 0.0025	< 0.002
	8/6/2018	0.58	120	230	0.57	7.88	270	1100	< 0.003	< 0.001	0.12	<^ 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.013	< 0.0002	0.0052	1.02	< 0.0025	< 0.002
	4/29/2019	0.54	120	180	0.61	7.77	170	1000	< 0.003	< 0.001	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.013	< 0.0002	< 0.005	< 0.445	< 0.0025	< 0.002
	11/13/2019	0.79	130	180	0.56	8.26	210	1100	NA	0.0013	0.12	NA	< 0.0005	NA	< 0.001	< 0.0005	0.014	< 0.0002	< 0.005	< 0.49	< 0.0025	< 0.002
	4/27/2020	0.60	120	170	0.69	7.90	180	1000	NA	< 0.001	0.12	NA	< 0.0005	NA	< 0.001	< 0.0005	0.016	< 0.0002	< 0.005	< 0.526	< 0.0025	< 0.002
	12/7/2020	0.75	110	F1 150	0.70	7.70	160	910	NA	0.0032	0.11	NA	< 0.0005	NA	< 0.001	< 0.0005	0.014	< 0.0002	0.061	< 0.497	< 0.0025	< 0.002
	5/10/2021	0.66	130	140	0.66	8.02	350	880	< 0.003	< 0.001	0.12	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.013	< 0.0002	0.005	< 0.544	< 0.0025	< 0.002

Notes: All units are in mg/l except pH is in standard units.
F1 - MS and/or MSD Recovery outside of limits.
H - Sample was prepped or analyzed beyond the specified holding time.
V- Serial dilution exceeds control limits.
* - LCS or LCSD is outside acceptance limits.
^ - Denotes instrument related QC exceeds the control limits
(R) - Resample Event
NA - Not Analyzed

Table 9-7 Ash Bypass Basin and Ash Surge Basin Turbidity Measurement Data - Midwest Generation, LLC, Powerton Station.

Well	Date	Turbidity (NTU)
MW-01	2/23/2021	78.20
	4/9/2021	6.96
	5/11/2021	3.24
	6/2/2021	3.80
	6/28/2021	4.30
	7/19/2021	4.88
	8/24/2021	3.34
	9/30/2021	3.04
MW-09	2/24/2021	16.90
	4/9/2021	5.73
	5/13/2021	0.49
	6/2/2021	2.37
	6/29/2021	4.53
	7/19/2021	6.12
	8/25/2021	16.65
	9/30/2021	3.20
MW-19	2/22/2021	0.56
	4/9/2021	4.25
	5/10/2021	1.80
	6/2/2021	5.77
	6/29/2021	8.79
	7/19/2021	7.30
	8/26/2021	30.91
	9/30/2021	2.92
MW-08	2/23/2021	47.30
	4/9/2021	23.05
	5/11/2021	8.93
	6/3/2021	11.11
	6/29/2021	5.48
	7/19/2021	6.86
	8/25/2021	6.80
	9/30/2021	5.01
MW-11	2/25/2021	35.10
	4/9/2021	41.53
	5/13/2021	14.70
	6/3/2021	14.92
	6/29/2021	40.48
	7/19/2021	25.73
	8/25/2021	55.39
	9/30/2021	4.06
MW-12	2/25/2021	26.50
	4/9/2021	66.11
	5/13/2021	5.17
	6/3/2021	106.47
	6/29/2021	21.40
	7/19/2021	22.70
	8/25/2021	12.62
	9/30/2021	18.66
MW-15	2/24/2021	64.90
	4/9/2021	16.80
	5/12/2021	16.45
	6/3/2021	7.85
	6/29/2021	6.58
	7/20/2021	5.82
	8/23/2021	4.28
	10/1/2021	13.13
MW-17	2/24/2021	42.00
	4/8/2021	17.10
	5/12/2021	10.90
	6/3/2021	38.15
	6/28/2021	29.15
	7/20/2021	16.38
	8/23/2021	26.51
	10/1/2021	21.26
MW-18	2/22/2021	3.40
	4/9/2021	4.62
	5/10/2021	2.28
	6/3/2021	2.38
	6/29/2021	3.96
	7/19/2021	5.19
	8/26/2021	7.96
	9/30/2021	37.94

Table 9-9. Summary of Sample Bottles, Preservation Holding Time, and Analytical Methods. Midwest Generation, LLC, Powerton Station, Pekin, IL.

PARAMETER	ANALYTICAL METHOD	CONTAINER	PRESERVATION	HOLD TIME	METHOD DETECTION LIMIT (MG/L)	Section 845.600(a) Standards
Boron	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.0245	2
Calcium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.106	NS
Chloride	SM4500 Cl-E	1 L plastic	None, < 6 °C	28 days	1.22	200
Fluoride	SM4500 F-C	1 L plastic	None, < 6 °C	28 days	0.019	4
pH	SM4500 H^+ -B	1 L plastic	None, < 6 °C	immediate *	Field Parameter	6.5 - 9.0 (secondary standard)
Sulfate	SM4500 SO_4 -E	1 L plastic	None, < 6 °C	28 days	2	400
Total Dissolved Solids	SM2400 C	1 L plastic	None, < 6 °C	7 days	6.1	1200
Antimony	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.00101	0.006
Arsenic	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000439	0.01
Barium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000841	2
Beryllium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000237	0.004
Cadmium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.00019	0.005
Chromium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000608	0.1
Cobalt	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000189	0.006
Lead	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000141	0.0075
Lithium	6010 C	250 mL plastic	HNO_3, < 6 °C	6 months	0.00215	0.04
Mercury	7470 A	250 mL plastic	HNO_3, < 6 °C	28 days	0.0000611	0.002
Molybdenum	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.00162	0.1
Selenium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000834	0.05
Thallium	6020 A	250 mL plastic	HNO_3, < 6 °C	6 months	0.000591	0.002
Radium 226	903.0	1 L plastic	HNO_3	180 days	1 pCi/L	5 pCi/L **
Radium 228	904.0	2 L plastic	HNO_3	180 days	1 pCi/L	5 pCi/L **

Notes: It is noted that some parameters may be combined with others within the same container.
* - The result for pH is obtained in the field and is not submitted to the laboratory.
** - Combined Radium 226/228
mL - milliliters
L - liters
°C - degrees Celsius
HNO_3 - Nitric Acid
NS- No Standard

ATTACHMENT 9-1
LOCAL WELL STRATIGRAPHY INFORMATION

Attachment 9-1
Local Well Statrigraphy Information. Midwest Generation, LLC, Powerton Generating Station, Pekin, IL.

ID	Well_Count	Well_ID	From	To	Original Logged Description	Grouped As_ToUseToDefine_K_interval	Base of Model	Notes	Ignored
11	3	121790013000	70	70	shale at	shale	x		
30	5	121790012800	76	76	shale at	shale	x		
51	9	121790013200	59	61	shale	shale	x		
58	10	121790052800	49	49	blue shale at	shale	x		
68	12	121790048800	120	121	gray shale	shale	x		
97	14	121790012700	76	76	shale at	shale	x		
101	15	121790012600	36	36	shale at	shale	x		
103	16	121790012500	85	85	shale at	shale	x		
114	18	121792462600	99	103	dk gray shale & hd dk color limestone	shale	x		
128	22	121792453000	44	45	shale bedrock	shale	x		
133	23	121792323500	93	93	shale at	shale	x		
139	24	121792489200	63	63	shale below	shale	x		
178	31	121792478800	99	104	gray shale	shale	x		
194	35	121792481600	102	103	dark gray shale	shale	x		
214	39	121792534000	70	70	boulders or bedrock at	shale	x		
238	45	121792501800	73	73	shale at	shale	x		
258	49	121792492400	60	85	blue-green shale below 60'	shale	x		
334	65	121792379400	61	65.5	light gray, hard, shale	shale	x		
352	70	121792361700	39	40	shale gray	shale	x		
358	72	121792552000	141	141	shale below	shale	x		
421	87	121792438000	45.5	50.25	clayey shale, gray & rust brown-extremely dense	shale	x		
442	90	121792440300	60	70	clayey shale;medium dark gray	shale	x		
451	91	121792440000	35	48.1	clayey shale-gray weathered-very dense	shale	x		
500	99	121792515900	72	72	gray shale at	shale	x		
508	100	121792515800	93	100	soft and hard shale	shale	x		
525	104	121792519900	56	58	shale	shale	x		
536	106	121792312100	103	103	shale at	shale	x		
540	107	121792200900	47	47	shale at	shale	x		
558	111	121792311900	106	106	shale at	shale	x		
572	114	121792180200	104	104	rocks	shale	x	(Assumed to be bedrock)	
581	115	121792179800	78	79	shale	shale	x		
584	116	121792179700	48	67	rock	shale	x	(Assumed to be bedrock)	
599	121	121792180500	88	88	shale	shale	x		
616	123	121792090700	105	107	shale	shale	x		
629	125	121792088600	54	54	cap rock & gray shale at	shale	x		
641	130	121792238000	105	105	rocks at	shale	x	(Assumed to be bedrock)	
650	131	121792237900	95	100	firm gray shale	shale	x		
661	133	121792237700	81	85	firm gray shale	shale	x		
667	135	121792157500	42	42	shale	shale	x		
669	136	121792156800	105	108	black shale	shale	x		
681	138	121792219300	136	136	shale at	shale	x		
693	141	121792138000	80	108	rocks	shale	x	(Assumed to be bedrock)	x
701	142	121792237600	118	120	gray shale	shale	x		
715	146	121792285300	133	133	shale at	shale	x		
730	148	121792204800	96	100	dark gray shale	shale	x		
750	152	121790067100	100	100	hardpan at	shale	x	(Assumed to be bedrock)	

ATTACHMENT 9-2
MONITORING WELL BORING LOGS

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-1-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **461.7**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✱ (1 2 3 4 5)	NOTES & TEST RESULTS
461.7	0.0		Brown coarse to fine sand, dry FILL				
				SS-1 1.0-2.5 14"R	3 4 4		qu=NT
				SS-2 3.5-5.0 12"R	3 3 5		Bentonite seal 3.0'-18.0'. Stickup protective cover installed. qu=NT
				SS-3 6.0-7.5 12"R	2 6 8		qu=NT
				SS-4 8.5-10.0 10"R	2 5 8		qu=NT
			Trace coarse gravel	SS-5 11.0-12.5 8"R	5 9 10		qu=NT
				SS-6 13.5-15.0 12"R	3 6 6		qu=NT
				SS-7 16.0-17.5 16"R	4 6 7		qu=NT
443.2	18.5		Brown coarse to medium sand, trace fine gravel, medium dense, saturated SW	SS-8 18.5-20.0 14"R	4 5 6		Sand pack 18.0'-30.0' qu=NT

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/4/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **22.0**
∇
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-1-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **461.7**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □---○---△ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
441.7	20.0						Set screen (slot 0.010") 20.5'-30.5'
439.7	22.0		∇	SS-9 21.0-22.5 15"R	4 5 5		qu=NT
				SS-10 23.5-25.0 18"R	4 4 4		qu=NT
				SS-11 26.0-27.5 18"R	4 4 6		qu=NT
433.7	28.0		Coarse to fine gravel, some coarse sand, medium dense, saturated GP	SS-12 28.5-30.0 18"R	4 5 6		qu=NT
				SS-13 31.0-32.5 18"R	4 6 7		qu=NT
429.2	32.5		End of Boring at 32.5'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/4/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **22.0**
∇
∇

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-2-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL Water Content LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) * (1 2 3 4 5)	NOTES & TEST RESULTS
459.2	0.0		Dark brown topsoil, silty clay, dry FILL				
457.7	1.5			SS-1 1.0-2.5 10"R	4 4 4		qu=NT
			Light brown coarse to fine sand, loose, dry FILL				
				SS-2 3.5-5.0 10"R	2 3 2		Bentonite seal 3.0'-20.0'. Stickup protective cover installed. qu=NT
				SS-3 6.0-7.5 12"R	3 3 4		qu=NT
			Dry	SS-4 8.5-10.0 14"R	4 5 4		qu=NT
				SS-5 11.0-12.5 15"R	2 2 3		qu=NT
			Some fine gravel	SS-6 13.5-15.0 15"R	3 6 5		qu=NT
				SS-7 16.0-17.5 18"R	2 5 6		qu=NT
			Dry	SS-8 18.5-20.0 18"R	3 3 4		qu=NT
439.2	20.0						

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/5/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **24.0**

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-2-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ — ○ — △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
439.2	20.0		Light brown fine to medium sand, well graded, medium dense, dry FILL				Sand pack 20.0'-33.5'
				SS-9 21.0-22.5 18"R	4 10 11		qu=NT
435.7	23.5						
435.2	24.0		∇ Gray coarse to fine gravel, coarse sand, trace fine sand and silt, poorly graded, medium dense GP	SS-10 23.5-25.0 18"R	5 13 13		qu=NT Set screen (slot 0.010") 23.5'-33.5'
				SS-11 26.0-27.5 18"R	4 6 8		qu=NT
				SS-12 28.5-30.0 18"R	7 10 10		qu=NT
				SS-13 31.0-32.5 18"R	7 8 7		qu=NT
				SS-14 33.5-35.0 18"R	6 9 10		qu=NT
424.2	35.0		End of Boring at 35.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/5/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **24.0**
∇
∇

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-3-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.1**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✱ (1 2 3 4 5)	NOTES & TEST RESULTS
459.1 458.6	0.0 0.5		Dark brown silty clay topsoil				
			Light brown coarse to medium sand, trace fine gravel, trace fine sand, very loose to loose, dry FILL	SS-1 1.0-2.5 16"R	2 1 2		qu=NT
				SS-2 3.5-5.0 14"R	1 1 2		Bentonite seal 3.0'-20.0'. Stickup protective cover installed. qu=NT
				SS-3 6.0-7.5 16"R	2 2 3		qu=NT
			Some fine sand	SS-4 8.5-10.0 18"R	2 3 2		qu=NT
			Light brown medium to fine sand, loose, dry	SS-5 11.0-12.5 17"R	1 2 2		qu=NT
				SS-6 13.5-15.0 18"R	4 5 6		qu=NT
				SS-7 16.0-17.5 16"R	2 2 3		qu=NT
440.1	19.0		Brown coarse sand, trace fine gravel, well graded, very loose, wet	SS-8 18.5-20.0 16"R	3 4 3		qu=NT

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/5/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **23.0**
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-3-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.1**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - ○ - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
439.1	20.0		SW				Sand pack 20.0'-34.0'
				SS-9 21.0-22.5 18"R	1 1 1		qu=NT
436.1	23.0		▽ Saturated				
				SS-10 23.5-25.0 0"R	1 2 2		qu=NT Set screen (slot 0.010") 24.0'-34.0'
				SS-11 26.0-27.5 18"R	1 2 2		qu=NT
				SS-12 28.5-30.0 18"R	2 1 2		qu=NT
				SS-13 31.0-32.5 18"R	1 2 2		qu=NT
425.1	34.0		End of Boring at 34.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/5/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **23.0**
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-4-Po** SHEET **1** OF **2**

CLIENT **Midwest Generation**

PROJECT & NO. **21053.070**

LOCATION **Powerton**

LOGGED BY **MPG**

GROUND ELEVATION **457.3**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
457.3	0.0		Brown silty clay, roots, topsoil FILL				
456.5	0.8		Light brown sand, medium to fine brown silty clay, fine gravel, dry FILL	SS-1 1.0-2.5 10"R	6 3 4		
				SS-2 3.5-5.0 8"R	3 4 4		Bentonite seal 3.0'-20.0'. Stickup protective cover installed.
				SS-3 6.0-7.5 18"R	4 6 9		qu=4.0**tsf
			Brown clayey silt	SS-4 8.5-10.0 18"R	4 5 5		qu=4.0**tsf
				SS-5 11.0-12.5 17"R	3 3 4		qu=3.5**tsf
				SS-6 13.5-15.0 17"R	2 2 3		qu=3.5**tsf
			Black clayey silt to silty clay				
441.3	16.0		Light brown coarse to fine sand, fine gravel, loose, dry SP	SS-7 16.0-17.5 18"R	2 2 3		
				SS-8 18.5-20.0 18"R	2 3 5		
437.3	20.0						

DRILLING CONTRACTOR **Groff Testing**

DRILLING METHOD **4.25" I.D. HSA**

DRILLING EQUIPMENT **CME 550 ATV**

DRILLING STARTED **10/16/10** ENDED **10/16/10**

REMARKS

Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)

∇ **24.0**

∇

∇

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-4-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **457.3**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ 10 20 30 40 50 LL / Unconfined Compressive Strength (TSF) ✱ 1 2 3 4 5	NOTES & TEST RESULTS
437.3	20.0		Brown coarse to fine gravel, trace coarse to medium sand, loose to medium dense, poorly graded GP				Sand pack 20.0'-34.0'
				SS-9 21.0-22.5 12"R	4 8 6		qu=NT
433.3	24.0		⊽ Saturated	SS-10 23.5-25.0 18"R	6 5 7		qu=NT Set screen (slot 0.010") 24.0'-34.0'
				SS-11 26.0-27.5 14"R	2 3 3		qu=NT
				SS-12 28.5-30.0 18"R	5 6 10		qu=NT
			Coarse to fine gravel, trace silt	SS-13 31.0-32.5 10"R	4 4 8		qu=NT
423.3	34.0						
			End of Boring at 34.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/16/10** ENDED **10/16/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
⊽ **24.0**
⊽
⊽

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-5-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **455.8**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ - - ○ - - △ LL Water Content (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
455.8	0.0		Dark brown silty clay, black coal cinders, topsoil FILL				
				SS-1 1.0-2.5 12"R	2 2 3		qu=NT
			Dry				Bentonite seal 2.0'-19.0'. Stickup protective cover installed.
				SS-2 3.5-5.0 14"R	6 8 10		qu=NT
			Coarse gravel, red coal cinders				
			Gray silty clay with coarse sand and fine gravel, medium stiff, dry	SS-3 6.0-7.5 16"R	2 3 3		qu=1.25**tsf
				SS-4 8.5-10.0 18"R	1 2 2		qu=1.0**tsf
				SS-5 11.0-12.5 18"R	2 2 3		qu=0.5**tsf
			Trace black coal cinders Trace coarse sand, moist				
			Gray clayey silt	SS-6 13.5-15.0 18"R	WOH 2 2		
				SS-7 16.0-17.5 18"R	WOH 6 6		
438.8	17.0		Gray coarse to fine gravel, coarse to fine sand, poorly graded, medium dense, dry GP				
				SS-8 18.5-20.0 18"R	4 8 7		Sand pack 19.0'-31.0'
435.8	20.0						

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/5/10** ENDED **10/6/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **20.5**
▽
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-5-Po** SHEET **2** OF **2**

CLIENT **Midwest Generation**

PROJECT & NO. **21053.070**

LOCATION **Powerton**

LOGGED BY **MPG**

GROUND ELEVATION **455.8**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL 10 20 30 40 50 LL / Unconfined Compressive Strength (TSF) ✱ 1 2 3 4 5	NOTES & TEST RESULTS
435.8 435.3	20.0 20.5		▽ Coarse to fine gravel, trace coarse to fine sand, poorly graded, medium dense, saturated GP				
				SS-9 21.0-22.5 0"R	4 6 6		qu=NT Set screen (slot 0.010") 21.0'-31.0'
				SS-10 23.5-25.0 10"R	4 6 6		qu=NT
			Loose	SS-11 26.0-27.5 10"R	3 4 4		qu=NT
				SS-12 28.5-30.0 10"R	4 5 6		qu=NT
424.8	31.0		End of Boring at 31.0'				

DRILLING CONTRACTOR **Groff Testing**

DRILLING METHOD **4.25" I.D. HSA**

DRILLING EQUIPMENT **CME 550 ATV**

DRILLING STARTED **10/5/10** ENDED **10/6/10**

REMARKS

Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)

▽ **20.5**

▽

▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-6-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **461.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ 10 20 ○ 30 40 △ LL 50 / Unconfined Compressive Strength (TSF) ✳ 1 2 3 4 5	NOTES & TEST RESULTS
461.2	0.0		Gravel, clay, coal cinders FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
451.2	10.0		Dark gray clayey silt, organics, very soft, moist FILL				
				SS-5 11.0-12.5 17"R	WOH 1 1		qu=0.25**tsf
447.2	14.0		Black coal cinders, loose, wet FILL	SS-6 13.5-15.0 16"R	WOH 3 3		qu=0.25**tsf
				SS-7 16.0-17.5 14"R	2 3 3		
444.2	17.0		∇				
443.2	18.0		Olive gray and gray organic silt, trace clay, trace peat, low plasticity, wet OL	SS-8 18.5-20.0	2 2 1		Sand pack 18.0'-28.0' qu=NT Set screen (slot 0.010") 19.0'-29.0'

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/6/10** ENDED **10/6/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **17.0**
∇
∇

PATRICK ENGINEERING INC.	
BORING NUMBER	**B-MW-6-Po** SHEET **2** OF **2**
CLIENT	**Midwest Generation**
PROJECT & NO.	**21053.070**
LOCATION	**Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **461.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ ○ △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
441.2	20.0						
				SS-9 21.0-22.5 16"R	WOH 1 2		qu=0.25**tsf
			Trace fine sand, dark gray mottled black organic silt, trace fine sand, wet	SS-10 23.5-25.0 18"R	1 2 3		qu=0.50**tsf
				SS-11 26.0-27.5 18"R	3 3 3		qu=0.75**tsf
433.7	27.5		Dark gray organic clay, trace fine sand, medium stiff, moist OL				
				SS-12 28.5-30.0 18"R	2 2 3		qu=1.25**tsf
431.2	30.0		End of Boring at 30.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/6/10** ENDED **10/6/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **17.0**
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-7-Po** SHEET **1** OF **3**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.6**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
459.6	0.0		Sand, gravel, black cinders, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-32.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
449.6	10.0		Sand, gravel, clay, black coal cinders FILL				
				SS-5 11.0-12.5 6"R	5 3 3		
446.1	13.5		Dark gray organic clay, soft, moist OH	SS-6 13.5-15.0 10"R	2 2 2		qu=0.5**tsf
			Moist	SS-7 16.0-17.5 18"R	2 1 2		qu=0.5**tsf
			Trace fine sand, organic silt, moist	SS-8 18.5-20.0 18"R	WOH 2 2		qu=0.75**tsf
439.6	20.0						

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **36.0**
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-7-Po** SHEET **2** OF **3**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **459.6**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content (PL, LL: 10, 20, 30, 40, 50) / Unconfined Compressive Strength (TSF) (1, 2, 3, 4, 5)	NOTES & TEST RESULTS
439.6	20.0		Dark gray organic clay, mottled black, medium stiff, dry OH				
				SS-9 21.0-22.5 18"R	3 2 4		qu=1.0**tsf
				SS-10 23.5-25.0 18"R	2 3 4		qu=1.25**tsf
433.6	26.0		Gray organic silt, trace shells, fibers, very soft, moist OL	SS-11 26.0-27.5 18"R	2 2 2		qu=0.25**tsf
			Dry	SS-12 28.5-30.0 18"R	2 3 3		qu=1.75**tsf
428.6	31.0		Dark gray organic clay, trace fine gravel, moist OH	SS-13 31.0-32.5 18"R	2 4 3		qu=1.25**tsf Sand pack 32.0'-45.0'
426.1	33.5		Gray clayey gravel, coarse sand, clay, silt, moist GC	SS-14 33.5-35.0 18"R	WOH 2 2		qu=NT Set screen (slot 0.010") 35.0'-45.0'
423.6	36.0		▽ Medium dense, saturated	SS-15 36.0-37.5 18"R	2 7 6		qu=NT
				SS-16 38.5-40.0 10"R	2 4 7		
419.6	40.0						

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/5/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **36.0**
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-8-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **468.7**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ 10 20 30 40 50 LL; Unconfined Compressive Strength (TSF) ✳ 1 2 3 4 5	NOTES & TEST RESULTS
468.7	0.0		Fine gravel, sand, silt, clay, black cinders, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
458.7	10.0		Black cinders FILL				
				SS-5 11.0-12.5 14"R	15 28 15/3"		
				SS-6 13.5-15.0 18"R	11 15 12		
			Silty clay seam 15.5'-16.5'	SS-7 16.0-17.5 17"R	15 15 14		
				SS-8 18.5-20.0 18"R	7 11 11		Sand pack 18.0'-30.0'
449.2	19.5		⊻				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/30/10** ENDED **9/30/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **21.0**
⊻ **19.5**
⊻

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-8-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **468.7**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □---○---△ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) * (1 2 3 4 5)	NOTES & TEST RESULTS
448.7	20.0		Black cinders FILL				Set screen (slot 0.010") 20.0'-30.0'
447.7	21.0		▽ Saturated	SS-9 21.0-22.5 18"R	5 5 3		
				SS-10 23.5-25.0 18"R	1 1 2		
444.2	24.5		Dark gray organic clay, soft, moist OH				qu=0.75**tsf
				SS-11 26.0-27.5 18"R	1 2 2		qu=1.0**tsf
441.2	27.5		Dark gray organic silt, medium stiff to soft, low plasticity, moist OL	SS-12 28.5-30.0 18"R	2 4 4		qu=1.25**tsf
438.7	30.0		End of Boring at 30.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/30/10** ENDED **9/30/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **21.0**
▽ **19.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-9-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **466.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
466.2	0.0		Black cinders, fine gravel, crushed rock, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-20.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
456.2	10.0		Black cinders, coarse to fine sand, brick, fine gravel, dry FILL				
				SS-5 11.0-12.5 14"R	6 12 15		qu=NT
				SS-6 13.5-15.0 18"R	5 6 7		qu=NT
				SS-7 16.0-17.5 18"R	6 9 10		qu=NT
449.2	17.0		Moist				
			Brown clayey silt, trace fine sand, moist CL				
447.2	19.0			SS-8 18.5-20.0 18"R	3 6 11		qu=NT
			Light brown fine to medium sand, loose, well graded				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/28/10** ENDED **9/28/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **23.5**
▼ **21.6**
▼

PATRICK ENGINEERING INC.	BORING NUMBER B-MW-9-Po	SHEET 2 OF 2
	CLIENT Midwest Generation	
	PROJECT & NO. 21053.070	
	LOCATION Powerton	

LOGGED BY **MPG**
GROUND ELEVATION **466.2**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL 10 20 30 40 50 LL / Unconfined Compressive Strength (TSF) 1 2 3 4 5	NOTES & TEST RESULTS
446.2	20.0		SW				Sand pack 20.0'-32.0'
444.6	21.6		▼	SS-9 21.0-22.5 18"R	3 3 4		Set screen (slot 0.010") 22.0'-32.0'
442.7	23.5		▽ Saturated	SS-10 23.5-25.0 18"R	1 3 6		
				SS-11 26.0-27.5 18"R	0 2 2		
			Medium dense	SS-12 28.5-30.0 18"R	2 6 13		
			Trace fine gravel	SS-13 31.0-32.5 18"R	2 5 10		
433.7	32.5		End of Boring at 32.5'				

DRILLING CONTRACTOR **Groff Testing**	REMARKS	WATER LEVEL (ft.)
DRILLING METHOD **4.25" I.D. HSA**	**Installed 2" diameter PVC monitoring well.**	▽ **23.5**
DRILLING EQUIPMENT **CME 550 ATV**		▼ **21.6**
DRILLING STARTED **9/28/10** ENDED **9/28/10**		▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-10-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **454.1**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✱ (1 2 3 4 5)	NOTES & TEST RESULTS
454.1	0.0		Black and brown silty clay topsoil CL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-17.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
444.1	10.0		Brown organic silt, some clay, trace peat, soft, moist OL				
				SS-5 11.0-12.5 16"R	1 2 2		qu=0.5**tsf
440.6	13.5		Black organic clay, medium plasticity, medium stiff, dry OL	SS-6 13.5-15.0 18"R	2 3 4		qu=1.5**tsf
438.1	16.0		Brown and gray silty clay, trace to little coarse to fine sand, medium stiff, dry CL	SS-7 16.0-17.5 18"R	4 4 4		qu=2.0**tsf Sand pack 17.0'-29.0'
				SS-8 18.5-20.0			Set screen (slot 0.010") 19.0'-29.0'

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/4/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ 21.0'
▼
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-10-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **454.1**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL Water Content LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) * (1 2 3 4 5)	NOTES & TEST RESULTS
434.1	20.0						
433.1	21.0						
			Gray coarse to fine sand, trace fine gravel, silt, poorly graded, loose, saturated SP	SS-9 21.0-22.5 18"R	2 2 1		qu=NT
				SS-10 23.5-25.0 10"R	2 4 3		qu=NT
429.6	24.5		Brown and gray coarse to fine gravel, poorly graded, loose, saturated GP				
				SS-11 26.0-27.5 10"R	2 4 7		qu=NT
				SS-12 28.5-30.0 14"R	5 7 8		qu=NT
424.1	30.0		End of Boring at 30.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **10/4/10** ENDED **10/4/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **21.0'**
∇
▼

PATRICK ENGINEERING INC.

BORING NUMBER B-MW-11-Po SHEET 1 OF 2
CLIENT Midwest Generation
PROJECT & NO. 21053.070
LOCATION Powerton

LOGGED BY MPG
GROUND ELEVATION 468.1

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
468.1	0.0		Cinders, gravel, sand, silt FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-28.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
458.1	10.0		Black and brown clay, fine gravel, cinders, bricks, silt, coarse sand, dry FILL				
				SS-5 11.0-12.5 16"R	8 10 10		qu=NT
				SS-6 13.5-15.0 17"R	2 2 3		qu=2.5**tsf
452.1	16.0		Brown and gray silty clay, trace fine gravel, trace fine sand, stiff, dry CL	SS-7 16.0-17.5 18"R	1 3 4		qu=1.5**tsf
449.6	18.5		Gray clayey silt, organics, very soft, moist ML	SS-8 18.5-20.0 18"R	WOH 2 2		qu=0.5**tsf

DRILLING CONTRACTOR Groff Testing
DRILLING METHOD 4.25" I.D. HSA
DRILLING EQUIPMENT CME 550 ATV
DRILLING STARTED 9/28/10 ENDED 9/29/10

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ 32.5 while drilling
▼ 26.5 after 12 hours
▼ 26.5 after 48 hours

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-11-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **468.1**

ELEV.	DEPTH (FT)	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content (PL □ 10 20 30 40 50 LL) / Unconfined Compressive Strength (TSF) ✱ (1 2 3 4 5)	NOTES & TEST RESULTS
448.1	20.0					
			SS-9 21.0-22.5 0"R	1 2 3		qu=NT
			SS-10 23.5-25.0 18"R	WOH WOH 1		qu=0.5**tsf
442.1	26.0					
441.6	26.5	▼ Dark gray silty clay, some organics, medium stiff, dry CL	SS-11 26.0-27.5 18"R	1 3 4		qu=1.5**tsf
			SS-12 28.5-30.0 18"R	3 4 6		Sand pack 28.0'-40.0' qu=2.5**tsf
			SS-13 31.0-32.5 18"R	3 4 6		Set screen (slot 0.010") 30.0'-40.0' qu=2.5**tsf
435.6	32.5	▽ Brown and gray coarse to fine gravel, coarse to fine sand, loose, saturated GP				
			SS-14 33.5-35.0 18"R	1 2 1		qu=NT
431.6	36.5	Light brown fine sand, well graded, very loose, saturated SW	SS-15 36.0-37.5 18"R	1 0 0		qu=NT
			SS-16 38.5-40.0 18"R	2 3 4		qu=NT
428.1	40.0	End of Boring at 40.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/28/10** ENDED **9/29/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **32.5** while drilling
▼ **26.5** after 12 hours
▼ **26.5** after 48 hours

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-12-Po** SHEET 1 OF 2

CLIENT **Midwest Generation**

PROJECT & NO. **21053.070**

LOCATION **Powerton**

LOGGED BY **MPG**

GROUND ELEVATION **470.0**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □- - -○- - -△ LL Water Content (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
470.0	0.0		Black cinders, fine gravel, silty clay, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
460.0	10.0		Black cinders FILL				
				SS-5 11.0-12.5 18"R	17 18 11		qu=NT
				SS-6 13.5-15.0 18"R	12 20 17		qu=NT
			Seam of l ight brown coarse sand	SS-7 16.0-17.5 18"R	6 7 6		qu=NT
451.5	18.5		Gray silt, little to some coarse to fine sand, trace clay, very soft, ⊻ saturated	SS-8 18.5-20.0 18"R	1 5 2		Sand pack 18.0'-35.0' qu=NT Set screen (slot 0.010") 19.0'-29.0'
450.5	19.5						

DRILLING CONTRACTOR **Groff Testing**

DRILLING METHOD **4.25" I.D. HSA**

DRILLING EQUIPMENT **CME 550 ATV**

DRILLING STARTED **9/29/10** ENDED **9/29/10**

REMARKS

Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)

⊻ **20.5**

⊻ **19.5**

⊻

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-12-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **470.0**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10, 20, 30, 40, 50) / Unconfined Compressive Strength (TSF) ✱ (1, 2, 3, 4, 5)	NOTES & TEST RESULTS
450.0 449.5	20.0 20.5		▽ ML				
				SS-9 21.0-22.5 18"R	1 2 1		qu=0.25**tsf
			Trace peat	SS-10 23.5-25.0 18"R	WOH 2 1		qu=0.5**tsf
444.0	26.0		Gray mottled black clayey silt, with some organics, trace peat, very soft, medium stiff, moist OH	SS-11 26.0-27.5 18"R	WOH WOH 2		qu=0.5**tsf
				SS-12 28.5-30.0 18"R	1 3 4		qu=1.75**tsf
				SS-13 31.0-32.5 18"R	2 3 3		qu=2.0**tsf
437.5	32.5		Dark brown and gray silty clay, trace coarse sand, trace organics, stiff to very stiff, dry CL	SS-14 33.5-35.0 18"R	4 6 6		qu=2.5**tsf
435.0	35.0		End of Boring at 35.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/29/10** ENDED **9/29/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **20.5**
▼ **19.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-13-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **467.7**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL 10 20 30 40 50 LL / Unconfined Compressive Strength (TSF) 1 2 3 4 5	NOTES & TEST RESULTS
467.7	0.0		Black cinders, sand, rock, dry FILL				
				SS-1 1.0-2.5			
				SS-2 2.5-4.0			Bentonite seal 3.0'-28.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
457.7	10.0		Black cinders, medium sand FILL				
				SS-5 11.0-12.5 14"R	5 9 7		qu=NT
				SS-6 13.5-15.0 15"R	3 3 2		qu=NT
			Some organic silt, moist	SS-7 16.0-17.5 18"R	WOH 1 1		qu=NT
450.2	17.5		Gray/olive gray organic silt, very soft OL				
				SS-8 18.5-20.0 18"R	1 0 0		qu=0.0**tsf
447.7	20.0						

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/29/10** ENDED **9/29/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **31.5**
▼ **29.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-13-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **467.7**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
447.7	20.0		Dark gray and black organic clay, very soft, moist OH	SS-9 21.0-22.5 18"R	WOH WOH 2		qu=0.25**tsf
445.2	22.5		Dark gray and black organic silt, very soft, moist OL	SS-10 23.5-25.0 18"R	WOH 1 1		qu=0.25**tsf
441.7	26.0		Dark gray and black organic clay, soft, dry OH	SS-11 26.0-27.5 18"R	WOH 1 2		qu=1.0**tsf
			Medium stiff	SS-12 28.5-30.0 18"R	0 2 3		Sand pack 28.0'-40.0' qu=1.5**tsf
438.2	29.5	▼					
437.2	30.5		Gray silty clay, some coarse to fine sand, trace fine gravel, wet CL				Set screen (slot 0.010") 30.0'-40.0'
436.2	31.5	∇		SS-13 31.0-32.5 18"R	2 4 5		qu=2.0**tsf
433.7	34.0		Stiff	SS-14 33.5-35.0 6"R	2 3 2		qu=2.0**tsf
			Brown coarse to fine gravel, trace coarse to medium sand, silt, medium dense, saturated GP	SS-15 36.0-37.5 8"R	4 6 6		qu=NT
				SS-16 38.5-40.0 8"R	5 8 8		qu=NT
427.7	40.0		End of Boring at 40.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/29/10** ENDED **9/29/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **31.5**
▼ **29.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-14-Po** SHEET **1** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **467.7**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content: PL □ – – ○ – – △ LL (10, 20, 30, 40, 50); Unconfined Compressive Strength (TSF) ✻ (1, 2, 3, 4, 5)	NOTES & TEST RESULTS
467.7	0.0		Cinders, gravel, sand, silt, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
457.7	10.0		Brown fine gravel, some silty clay and coarse sand, dry FILL				
				SS-5 11.0-12.5 18"R	4 4 4		
				SS-6 13.5-15.0 16"R	4 3 4		
			Black cinders	SS-7 16.0-17.5 16"R	2 3 3		
				SS-8 18.5-20.0 18"R	3 3 1		Sand pack 18.0'-30.0'
448.2	19.5	∇	Gray organic silt, some fine sand,				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/30/10** ENDED **9/30/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
∇ **19.5**
▼ **20.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER **B-MW-14-Po** SHEET **2** OF **2**
CLIENT **Midwest Generation**
PROJECT & NO. **21053.070**
LOCATION **Powerton**

LOGGED BY **MPG**
GROUND ELEVATION **467.7**

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
447.7 / 447.2	20.0 / 20.5		▼ very loose, low plasticity, saturated OL				Set screen (slot 0.010") 20.0'-30.0'
				SS-9 21.0-22.5 18"R	1 0 0		qu=NT
				SS-10 23.5-25.0 18"R	1 1 2		qu=0.25**tsf
442.7	25.0		Gray and mottled black organic silt, trace fine sand, soft, low plasticity, moist OL				
				SS-11 26.0-27.5 18"R	0 0 1		qu=0.25**tsf
438.7	29.0		Gray and black organic clay, medium stiff, moist OH	SS-12 28.5-30.0 18"R	2 3 4		qu=1.25**tsf
437.7	30.0		End of Boring at 30.0'				

DRILLING CONTRACTOR **Groff Testing**
DRILLING METHOD **4.25" I.D. HSA**
DRILLING EQUIPMENT **CME 550 ATV**
DRILLING STARTED **9/30/10** ENDED **9/30/10**

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ **19.5**
▼ **20.5**
▼

PATRICK ENGINEERING INC.

BORING NUMBER B-MW-15-Po SHEET 2 OF 2
CLIENT Midwest Generation
PROJECT & NO. 21053.070
LOCATION Powerton

LOGGED BY MPG
GROUND ELEVATION 468.3

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL □ Water Content ○ LL △ (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
448.3	20.0		Gray fine sand, trace medium sand, loose, saturated SM				Set screen (slot 0.010") 20.0'-30.0'
				SS-9 21.0-22.5 18"R	1 1 1		qu=NT
444.8	23.5		Gray silt, mottled black, some organics, soft, moist to wet OL	SS-10 23.5-25.0 18"R	1 2 2		qu=0.75**tsf
				SS-11 26.0-27.5 18"R	1 2 2		qu=1.0**tsf
440.3	28.0		Gray silty clay, some organics, soft, medium stiff, dry CL	SS-12 28.5-30.0 18"R	1 3 2		qu=1.0**tsf
438.3	30.0		End of Boring at 30.0'				

DRILLING CONTRACTOR Groff Testing
DRILLING METHOD 4.25" I.D. HSA
DRILLING EQUIPMENT CME 550 ATV
DRILLING STARTED 9/30/10 ENDED 9/30/10

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ 20.0'
▼ 19.5
▼

PATRICK ENGINEERING INC.	BORING NUMBER B-MW-15-Po SHEET 1 OF 2 CLIENT Midwest Generation PROJECT & NO. 21053.070 LOCATION Powerton

LOGGED BY MPG
GROUND ELEVATION 468.3

ELEV.	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	PL — Water Content — LL (10 20 30 40 50); Unconfined Compressive Strength (TSF) (1 2 3 4 5)	NOTES & TEST RESULTS
468.3	0.0		Black cinders, fine gravel, sand, silt, dry FILL				
				SS-1 1.0-2.5			
				SS-2 3.5-5.0			Bentonite seal 3.0'-17.0'. Stickup protective cover installed.
				SS-3 6.0-7.5			
				SS-4 8.5-10.0			
458.3	10.0		Black cinders, fine gravel, coarse sand, silt, dry FILL				
				SS-5 11.0-12.5 14"R	6 13 12		
				SS-6 13.5-15.0 0"R	50/1"		
				SS-7 16.0-17.5 14"R	7 7 5		Sand pack 17.0'-30.0'
				SS-8 18.5-20.0 18"R	2 1 1		
448.8	19.5		▽				
448.3	20.0						

DRILLING CONTRACTOR Groff Testing
DRILLING METHOD 4.25" I.D. HSA
DRILLING EQUIPMENT CME 550 ATV
DRILLING STARTED 9/30/10 ENDED 9/30/10

REMARKS
Installed 2" diameter PVC monitoring well.

WATER LEVEL (ft.)
▽ 20.0'
▼ 19.5
▼

KPRG
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

KPRG Project No. 18311.21

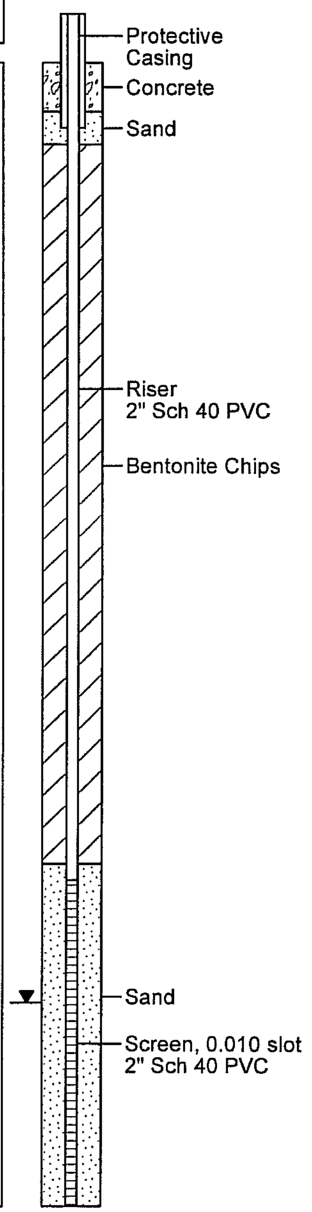
GEOLOGIC LOG OF MW-16

Date Started	: 11/27/2012
Date Well Set	: 11/27/2012
Rock Coring Tools	: Not cored
Drilling Tools	: 4.25 ID HSA
Drill Rig	: Geoprobe
Driller Name/Co	: S. Keehma/Cabeno

Total Boring Depth	: 35 feet
Well Bottom Depth	: 35 feet
Surface Elev.	: 468.957 feet above MSL
TOC Elev.	: 471.564 feet above MSL
Groundwater Elev.	: 439.81
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	: 40 32' 22.9" N
Coordinate E	: 89 40' 41.1" W
Logged By	: M. Wilson

Depth in Feet	Surf. Elev. 468.957	DESCRIPTION	PID	% Recovery
0	469			
		FILL: Black to brown silty clay with sand and gravel (Hydrovac from 0-10')		
2	467			
4	465			
6	463			
8	461	Approximate extent of fill		
10	459	Tan medium to fine grained SAND with some gravel		
			0	60
12	457			
14	455		0	
16	453		0	70
18	451			
			0	
20	449	- Gravel layer approximately 2" thick		
			0	100
22	447			
24	445		0	
		- Thin layer of fine grained sand		
26	443		0	100
28	441			
			0	
30	439	- Wet		
			0	60
32	437			
34	435		0	
36	433	End of boring at 35'		
38	431			
40				

Well Diagram: MW-16



12-13-2012 N:\Projects\18311 - Midwest Generation Ash Storage Issues\18311.2 - Powerton\Well Install\MW 16.bor

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ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

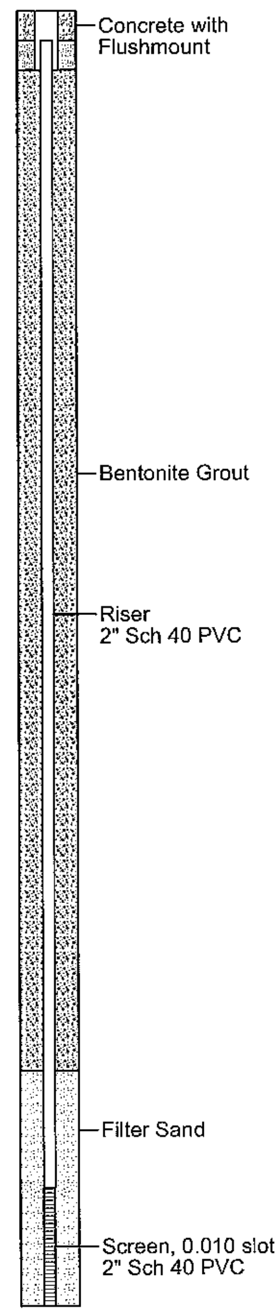
GEOLOGIC LOG OF MW-17

Date Started	: 09/21/15
Date Well Set	: 09/21/15
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 30.0 feet
Well Bottom Depth	: 30.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
0	575	Asphalt Roadway over sand, silt, gravel mix, brown, dry.		
1	574			
2	573	SILTY SAND, fine to coarse, black, slightly moist, occ silty layers.		
3	572			
4	571			
5	570			
6	569			
7	568			
8	567			
9	566			
10	565			
11	564			
12	563	- begin black with orange brown		
13	562			
14	561			
15	560			
16	559	- some gray silt laminates		
17	558			
18	557			
19	556	SILT, gray, laminated with SILTY SAND, moist		
20	555	- increase to very moist then wet		
21	554			
22		SILT, gray, laminated with light brown silt, trace organics, wet.		

Well Diagram:



ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

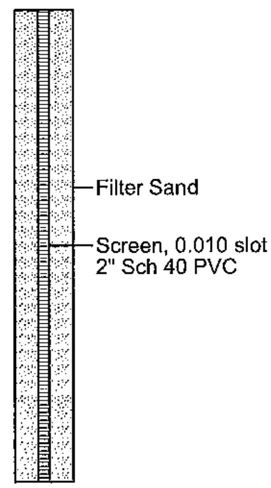
GEOLOGIC LOG OF MW-17

Date Started	: 09/21/15
Date Well Set	: 09/21/15
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 30.0 feet
Well Bottom Depth	: 30.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
22	553			
23	552			
24	551			
25	550	SILTY SAND, black and dark gray, fine to meduim, wet.		
26	549			
27	548	SILT and SAND, gray and black, wet.		
28	547			
29	546			
30	545	End of Boring at 30 feet.		
31	544			
32	543			
33	542			
34	541			
35	540			
36	539			
37	538			
38	537			
39	536			
40	535			
41	534			
42	533			
43	532			
44				

Well Diagram:



ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

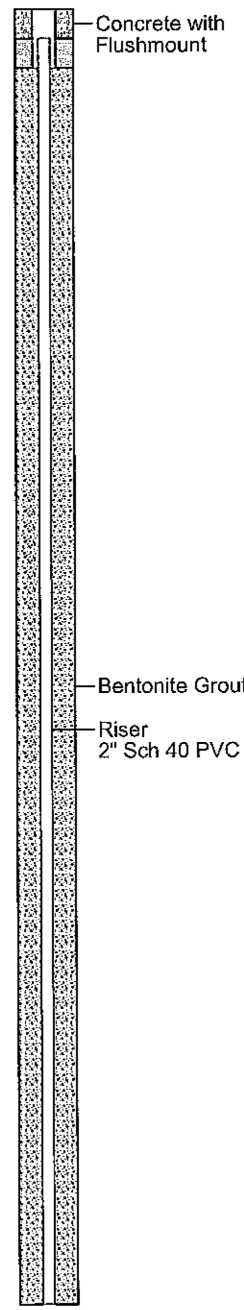
GEOLOGIC LOG OF MW-18

Date Started	: 09/21/15
Date Well Set	: 09/21/15
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 30.0 feet
Well Bottom Depth	: 30.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
0	575	SILTY CLAY, brown, trace gravel, slightly moist.		
1	574			
2	573			
3	572	SILTY SAND, fine to coarse, black, brown and dark gray, dry to slightly moist.		
4	571			
5	570			
6	569			
7	568	- clayey from 7-8, followed by occasional clayey layers		
8	567			
9	566			
10	565			
11	564			
12	563			
13	562			
14	561			
15	560			
16	559	- begin all black		
17	558			
18	557			
19	556	- very moist		
20	555			
21	554			
22				

Well Diagram:



ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

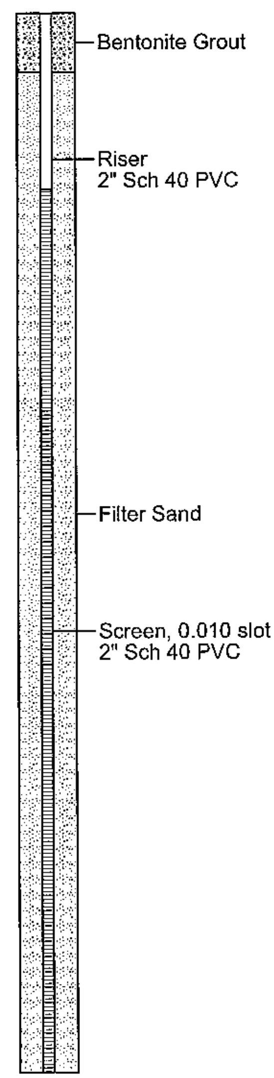
GEOLOGIC LOG OF MW-18

Date Started	: 09/21/15
Date Well Set	: 09/21/15
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 30.0 feet
Well Bottom Depth	: 30.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
22	553			
23	552			
24	551			
25	550			
26	549			
27	548			
28	547			
29	546	CLAY, gray, some black, moist.		
30	545			
31	544			
32	543	CLAY, dark gray, trace organics, moist.		
33	542			
34	541			
35	540			
36	539	CLAY, greenish gray, trace organics, moist.		
37	538			
38	537			
39	536	SILTY SAND, tan, some gravel, very moist.		
40	535	End of Boring at 40 feet.		
41	534			
42	533			
43	532			
44				

Well Diagram:



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ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

GEOLOGIC LOG OF MW-19

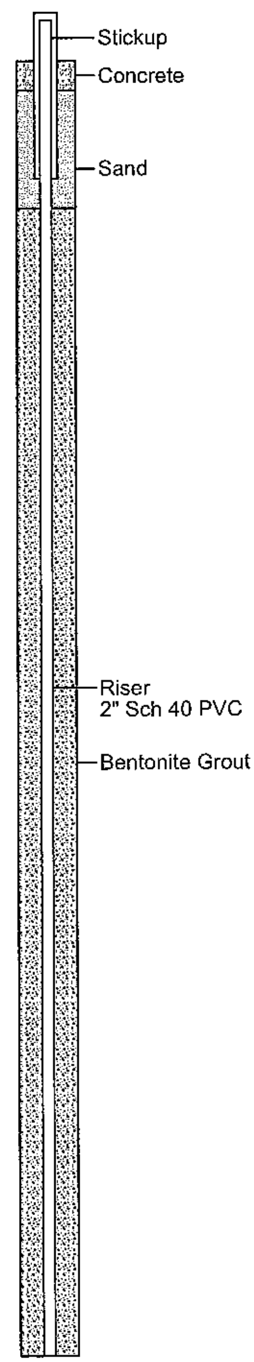
Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Date Started	: 10/05/16
Date Well Set	: 10/05/16
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 41.0 feet
Well Bottom Depth	: 41.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
0	575			
1	574	SILTY SAND, black, fine to coarse, occasional clayey layers slightly moist.		
2	573			
3	572			
4	571			
5	570	- very moist to wet		
6	569			
7	568	- slightly moist		
8	567			
9	566			
10	565			
11	564			
12	563			
13	562			
14	561	- 6" white and brown gravel		
15	560			
16	559			
17	558			
18	557	- moist		
19	556			
20	555			
21	554			
22				

Well Diagram:



KPRG
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

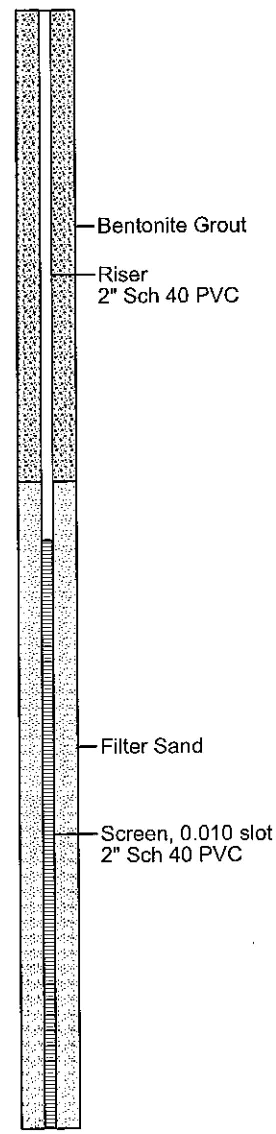
GEOLOGIC LOG OF MW-19

Date Started	: 10/05/16
Date Well Set	: 10/05/16
Drilling Tools	: 8 1/4 HSA
Reaming Tools	: None
Drill Rig	: Geoprobe
Driller Name/Co	: Nick / Cabeno Env. Serv.

Total Boring Depth	: 41.0 feet
Well Bottom Depth	: 41.0 feet
Surface Elev.	: xxx feet above MSL
TOC Elev.	: xxx feet above MSL
Groundwater Elev.	: xxx feet above MSL
Riser Material	: 2" Sch 40 PVC
Screen Material	: 2" Sch 40 PVC, 0.010 slot
Coordinate N	:
Coordinate E	:
Logged By	: P. Allenstein

Depth in Feet	Surf. Elev. 575	DESCRIPTION	% RQD	% Recovery
22	553			
23	552			
24	551			
25	550			
26	549			
27	548			
28	547	SAND, fine to medium, gray, trace gravel, moist.		
29	546	SAND, fine to medium, brown, very moist.		
30	545			
31	544			
32	543			
33	542			
34	541			
35	540			
36	539			
37	538			
38	537			
39	536			
40	535			
41	534	End of Boring at 41 feet.		
42	533			
43	532			
44				

Well Diagram:



ATTACHMENT 9-3
HISTORICAL CCA GROUNDWATER DATA

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-01	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013		7/29/2013		10/21/2013		3/6/2014		5/27/2014		8/28/2014		10/29/2014		2/23/2015		5/11/2015		8/18/2015		11/16/2015	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	0.0048	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.001	0.001	ND	0.0050	ND	0.001	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Barium	2.0	NP	0.044	0.001	0.026	0.001	0.034	0.001	0.056	0.001	0.044	0.001	0.038	0.001	0.06	0.001	0.074	0.20	ND	0.001	0.08	0.0025	0.078	0.0025	0.081	0.0025	0.070	0.0025	0.064	0.0025	0.041	0.0025	0.046	0.0025	0.049	0.0025	0.037	0.0025	0.038	0.0025	0.065	0.0025	0.054
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.45	0.01	0.26	0.01	0.33	0.01	1.0	0.01	0.48	0.01	0.29	0.01	0.46	0.01	1.8	2.0	ND	0.01	1.7	0.050	0.47	0.050	0.48	0.050	0.62	0.050	0.53	0.050	0.26	0.050	0.16	0.050	0.075	0.050	0.059	0.050	0.087	0.050	0.30	0.050	0.94
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	46	10	37	10	40	10	41	10	26	10	53	10	42	10	43	10	41	10	38	10	160	10	140	2.0	46	2.0	48	2.0	73	2.0	58	2.0	42	2.0	37	2.0	67	2.0	58	2.0	44
Chromium	0.1	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.0030	0.014	0.004	0.0076	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	0.0057	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	0.0077	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	0.011	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.28	0.25	0.32	0.25	0.38	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.10	0.12	0.10	0.16	0.10	0.11	0.10	0.10	0.10	0.13	0.10	0.15	0.10	0.18	0.10	0.17	0.10	0.23	0.10	0.16	0.10	0.18
Iron	5.0	NP	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.17	0.01	ND	0.10	0.43	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	0.00080	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0027	0.0020	0.018	0.001	ND	0.0025	0.027	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0043	0.0025	ND	0.0025	ND	0.0025	ND
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.01	0.005	0.008	0.005	ND	0.005	0.0069	0.005	0.0095	0.005	ND	0.005	0.0066	0.005	0.01	0.010	ND	0.005	0.0062	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NP	7.2	0.20	4.3	0.20	5.7	0.20	11	0.20	4.1	0.20	7.3	0.20	6.5	0.20	5.4	0.20	7.2	0.2	7.4	0.10	0.23	0.10	0.42	0.10	4.5	0.10	4.7	0.10	2.2	0.10	1.5	0.10	4.4	0.10	4.1	0.10	2.6	0.10	0.27	0.10	4.3
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	0.23	0.10	0.42	0.50	4.5	0.50	4.7	0.50	2.2	0.10	1.5	0.50	4.4	0.50	4.1	0.20	2.6	0.10	0.27	0.50	4.3
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0016	0.001	0.0022	0.001	0.0016	0.001	0.0036	0.001	0.0027	0.001	0.0025	0.001	0.0042	0.001	0.005	0.0050	ND	0.001	0.0045	0.0025	ND	0.0025	ND	0.0025	0.0042	0.0025	0.0040	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	50	10	30	10	39	10	83	10	31	10	61	10	68	25	72	10	91	10	77	100	330	50	270	20	85	20	99	20	51	10	36	20	54	10	43	10	50	20	55	20	66
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	490	17	340	17	410	17	510	17	440	17	470	17	580	17	710	26	640	26	640	10	840	10	870	10	660	10	590	10	440	10	350	10	410	10	470	10	450	10	650	10	510
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0016
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0053
pH	6.5 - 9.0	NA	7.46	NA	7.43	NA	7.58	NA	7.37	NA	6.39	NA	7.59	NA	7.45	NA	7.06	NA	6.98	NA	9.53	NA	7.00	NA	6.75	NA	7.12	NA	7.65	NA	7.15	NA	7.25	NA	7.25	NA	6.93	NA	7.39	NA	6.89	NA	7.07
Temperature	NA	NA	10.47	NA	3.77	NA	9.71	NA	18.42	NA	10.85	NA	7.33	NA	17.97	NA	15.74	NA	13.58	NA	11.00	NA	10.71	NA	15.64	NA	15.06	NA	9.08	NA	18.25 *	NA	21.57	NA	17.15	NA	1.92	NA	14.01	NA	22.91	NA	13.85
Conductivity	NA	NA	0.92	NA	0.64	NA	0.69	NA	0.74	NA	0.56	NA	0.53	NA	0.79	NA	0.92	NA	0.85	NA	0.88	NA	0.94	NA	1.06	NA	0.88	NA	0.55	NA	0.73	NA	0.71	NA	0.92	NA	0.44	NA	0.65	NA	1.01	NA	0.68
Dissolved Oxygen	NA	NA	NM	NA	7.76	NA	4.61	NA	4.57	NA	5.21	NA	8.46	NA	0.66	NA	3.34	NA	3.04	NA	3.03	NA	3.10	NA	2.03	NA	1.33	NA	3.25	NA	5.05	NA	0.94	NA	1.63	NA	9.99	NA	4.82	NA	2.51	NA	1.62
ORP	NA	NA	NM	NA	140.1	NA	209.8	NA	-98	NA	13	NA	242	NA	43	NA	165	NA	130	NA	94	NA	30.4	NA	58.8	NA	-127	NA	-37.2	NA	-14.1	NA	21.5	NA	-3.6	NA	150.7	NA	53.6	NA	-15.3	NA	118.2

Sample: MW-01	Date	2/25/2016		5/20/2016		8/17/2016		11/16/2016		2/14/2017		5/3/2017		8/25/2017		11/8/2017		3/6/2018		5/17/2018		8/8/2018		10/30/2018		2/25/2019		4/30/2019		8/27/2019		11/13/2019		2/24/2020		5/19/2020		8/10/2020		12/7/2020		2/23/2021		5/11/2021	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	0.0036	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	0.0086	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.010	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	0.0042	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	2.0	0.0025	0.049	0.0025	0.052	0.0025	0.046	0.0025	0.044	0.0025	0.036	0.0025	0.032	0.0025	0.048	0.0025	0.075	0.0025	0.047	0.0025	0.045	0.0025	0.053	0.0025	0.066	0.0025	0.045	0.0025	0.036	0.0025	0.056	0.0025	0.05	0.0025	0.042	0.0025	0.059	0.0025	0.057	0.0025	0.058	0.0025	0.046	0.0025	0.045
Beryllium	0.004	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	2.0	0.050	0.26	0.050	0.31	0.050	0.27	0.050	0.17	0.050	0.14	0.050	0.17	0.05	0.55	0.05	0.44	0.05	0.37	0.05	0.13	0.05	0.13	0.05	0.17	0.05	0.057	0.05	0.061	0.05	0.53	0.05	0.53	0.05	0.24	0.5	2	0.25	0.82	0.05	0.53	0.05	0.34	0.05	0.17
Cadmium	0.005	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	200.0	2.0	42	2.0	44	2.0	40	2.0	39	2.0	55	2.0	58	2	41	2	39	2	63	2	50	2	46	2	42	2	67	2	55	2	38	2	46	2	54	10	36	2	39	2	53	4	61	2	49
Chromium	0.1	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	1.0	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.65	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.2	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	0.0064 *	0.005	ND	0.005	ND
Fluoride	4.0	0.10	0.16	0.10	0.17	0.10	0.24	0.10	0.23	0.10	0.42	0.10	0.16	0.1	0.18	0.1	0.12	0.1	0.1	0.1	0.11	0.1	0.13	0.1	0.12	0.1	0.15	0.1	0.16	0.1	0.13	0.1	0.2	0.1	0.24	0.1	0.17	0.1	0.17	0.1	0.26	0.1	0.18	0.1	0.18 H
Iron	5.0	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.35	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.0075	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.15	0.0025	0.0028	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0054	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0059	0.0025	ND	0.0025	ND	0.0025	0.013	0.0025	0.0029	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.008	0.0025	ND
Mercury	0.002	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND F2	0.00020	ND	0.0002	ND	0.0002	0.00081	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.1	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	10.0	0.10	3.6	0.10	4.9	0.10	5.7	0.10	5.2	0.10	6.4	0.10	4.6	0.1	6.6	0.1	4.4	0.1	5	0.1	3.8	0.1	5.2	0.1	3.4	0.1	4.6	0.1	3.8	0.1	5.1	0.1	5.7	0.1	4.5	0.1	2.4	0.1	1.3	0.1	8.4	0.1	5.5	0.1	3.3
Nitrogen/Nitrate, Nitr	NA	0.20	3.6	0.50	4.9	0.50	5.7	0.50	5.2	0.50	6.4	0.50	4.6	0.5	6.6	0.5	4.4	0.5	5	0.5	3.8	0.5	5.2	0.2	3.4	0.5	4.6	0.5	3.8	0.5	5.1	0.5	5.7 ^	0.5	4.5	0.5	2.4	0.1	1.3	0.5	8.4	0.5	5.5	0.5	3.3 F1
Nitrogen/Nitrite	NA	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.0049	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.05	0.0025	0.0037	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0054	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	400.0	10	57	10	59	10	51	10	55	10	58	10	40	20	69	20	57	20	42	20	58	20	33	10	39	25	33	5	28	5	89	5	46	5	32	25	98 H	25	64	15	57 F1	10	41	10	38
Thallium	0.002	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	1,200	10	460	10	500	10	620	10	480	10	500	10	470	10	440	10	660	10	500	10	530	10	370	10	530	10	470	10	410	10	580	10	380	10	410	10	500	30	440	10	420	10	430	10	380
Vanadium	0.049	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	5.0	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.005	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00079	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	11.705	0.0025	ND	0.0025	0.0038	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0011	0.0025	0.0014	0.0025	ND	0.0025	0.01089	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.23	NA	6.95	NA	7.16	NA	7.22	NA	7.30	NA	7.41	NA	7.41	NA	6.69	NA	7.09	NA	6.70	NA	6.80	NA	7.59	NA	7.32	NA	7.20	NA	7.15	NA	7.51	NA	7.19	NA	7.10	NA	6.86	NA	7.22	NA	7.52	NA	7.52
Temperature	NA	NA	7.82	NA	14.70	NA	24.92	NA	18.68	NA	10.70	NA	9.68	NA	18.50	NA	13.54	NA	7.93	NA	15.57	NA	22.04	NA	17.91	NA	5.80	NA	6.10	NA	12.10	NA	16.07	NA	9.90	NA	10.00	NA	13.90	NA	11.90	NA	5.70	NA	8.00
Conductivity	NA	NA	0.57	NA	0.62	NA	0.74	NA	0.62	NA	0.59	NA	0.54	NA	0.67	NA	0.81	NA	0.48	NA	0.56	NA	0.62	NA	0.68	NA	0.85	NA	0.47	NA	0.14	NA	0.69	NA	0.28	NA	0.76	NA	0.82	NA	0.86	NA	0.55	NA	0.77
Dissolved Oxygen	NA	NA	3.74	NA	5.69	NA	1.53	NA	3.11	NA	6.64	NA	7.36	NA	0.86	NA	5.83	NA	9.54	NA	10.50	NA	5.17	NA	6.29	NA	9.35	NA	7.43	NA	3.51	NA	2.88	NA	4.50	NA	3.28	NA	5.33	NA	4.36	NA	8.66	NA	3.41
ORP	NA	NA	47.3	NA	38.8	NA	10.1	NA	10.7	NA	21.7	NA	-46.6	NA	102.4	NA	83.2	NA	-4.8	NA	11.8	NA	64.2	NA	15.5	NA	66.1	NA	119.1	NA	110.7	NA	-48	NA	52.7	NA	73.9	NA	139.9	NA	-4.8	NA	37.3	NA	116

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-02	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013		7/29/2013		10/21/2013		3/5/2014		5/27/2014		8/25/2014		10/27/2014		2/25/2015		5/13/2015		8/17/2015		11/17/2015	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	0.015	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.0018	0.001	0.0015	0.001	0.0017	0.001	ND	0.001	ND	0.001	ND	0.001	0.0011	0.001	0.0012	0.0050	ND	0.001	0.0011	0.0010	0.0010	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0015	0.0010	0.0016	0.0010	0.0017	0.0010	ND
Barium	2.0	NP	0.042	0.001	0.025	0.001	0.053	0.001	0.059	0.001	0.066	0.001	0.049	0.001	0.064	0.001	0.06	0.040	0.075	0.001	0.035	0.0025	0.053	0.0025	0.078	0.0025	0.088	0.0025	0.046	0.0025	0.069	0.0025	0.071	0.0025	0.067	0.0025	0.051	0.0025	0.055	0.0025	0.072	0.0025	0.066
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.38	0.01	0.23	0.01	0.35	0.01	0.83	0.01	0.69	0.01	0.27	0.01	0.74	0.01	0.65	0.40	0.8	0.01	0.29	0.050	0.21	0.050	1.4	0.050	2.7	0.050	0.28	0.050	0.38	0.050	1.1	0.050	0.078	0.050	0.082	0.050	0.11	0.050	0.41	0.050	0.50
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	45	10	43	10	44	10	46	10	40	10	53	10	51	10	45	10	48	10	52	2.0	53	2.0	48	10	90	10	88	10	91	2.0	58 ^	2.0	44	2.0	54	10	92	2.0	51	2.0	45
Chromium	0.1	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.0030	0.0096	0.004	0.0042	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	0.0021	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.024	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	ND	0.25	0.30	0.25	0.35	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	0.28	0.25	ND	0.10	0.32	0.10	0.19	0.10	0.17	0.10	0.19	0.10	0.18	0.10	0.19	0.10	0.22	0.10	0.17	0.10	0.22	0.10	0.22	0.10	0.18
Iron	5.0	NP	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.046	0.01	0.026	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0013	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	ND	0.001	0.0012	0.001	0.0022	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0019	0.0020	0.0063	0.001	ND	0.0025	ND	0.0025	0.0060	0.0025	0.0060	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.015	0.0025	0.0027
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.0086	0.005	0.0096	0.005	0.0053	0.005	0.01	0.005	0.0073	0.005	ND	0.005	0.0065	0.005	0.0066	0.010	ND	0.005	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NP	7.5	0.20	4.5	0.20	4.7	0.20	4.3	0.20	6.9	0.20	5.1	0.20	4.4	0.20	2.9	0.20	2.4	0.2	5.7	0.10	0.44	0.10	0.59	0.10	1.1	0.10	2.4	0.10	4.0	0.10	0.28	0.10	4.3	0.10	5.9	0.10	1.2	0.10	ND	0.10	3.2
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	0.48	0.10	0.59	0.10	1.1	0.50	2.4	0.50	4.0	0.10	0.28	0.50	4.3	0.50	5.9	0.10	1.2	0.10	ND ^	0.20	3.2
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	0.041	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0017	0.001	0.0032	0.001	0.0014	0.001	0.0032	0.001	0.0037	0.001	ND	0.001	0.0039	0.001	0.0016	0.0050	ND	0.001	0.0032	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	52	10	42	10	53	10	70	10	69	10	55	10	73	10	69	10	95	10	53	20	96	25	140	50	190	10	53	20	63	20	76	20	49	10	57	10	41	10	53	20	77
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	480	17	420	17	470	17	460	17	490	17	440	17	500	17	510	26	520	26	440	10	340	10	560	10	770	10	430	10	440	10	460	10	440	10	510	10	490	10	540	10	480
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.013	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.001
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00055	0.0025	0.0042
pH	6.5 - 9.0	NA	7.91	NA	7.78	NA	7.20	NA	7.52	NA	6.41	NA	7.92	NA	7.35	NA	7.32	NA	7.38	NA	7.53	NA	7.39	NA	7.03	NA	7.20	NA	8.21	NA	7.19	NA	7.01	NA	7.37	NA	8.13	NA	7.86	NA	7.28	NA	7.12
Temperature	NA	NA	14.01	NA	3.26	NA	13.14	NA	14.75	NA	9.58	NA	9.56	NA	14.90	NA	17.12	NA	12.33	NA	13.30	NA	20.87	NA	17.02	NA	12.34	NA	6.67	NA	15.72 *	NA	20.87	NA	17.43	NA	2.61	NA	12.12	NA	24.86	NA	13.93
Conductivity	NA	NA	0.96	NA	0.74	NA	0.75	NA	0.64	NA	0.59	NA	0.56	NA	0.66	NA	0.68	NA	0.68	NA	0.54	NA	0.56	NA	0.74	NA	0.80	NA	0.40	NA	0.69	NA	0.76	NA	0.78	NA	0.49	NA	0.66	NA	0.86	NA	0.64
Dissolved Oxygen	NA	NA	NM	NA	7.73	NA	0.58	NA	0.28	NA	3.34	NA	3.91	NA	0.78	NA	0.53	NA	2.03	NA	10.89	NA	0.65	NA	0.47	NA	0.32	NA	7.92	NA	0.55	NA	0.46	NA	2.96	NA	11.55	NA	1.99	NA	1.52	NA	8.66
ORP	NA	NA	NM	NA	124.5	NA	226.3	NA	-196	NA	63	NA	272	NA	168	NA	157	NA	200	NA	185.2	NA	-34.5	NA	33.9	NA	-180.3	NA	-53	NA	72.5	NA	35.9	NA	60.1	NA	113.1	NA	87.3	NA	-37.7	NA	112.9

Sample: MW-02	Date	2/23/2016		5/17/2016		8/16/2016		11/15/2016		2/14/2017		5/1/2017		8/23/2017		11/7/2017		3/6/2018		5/15/2018		8/7/2018		10/30/2018		2/26/2019		4/30/2019		8/27/2019		11/12/2019		2/24/2020		5/19/2020		8/10/2020		12/9/2020		2/22/2021		5/11/2021	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	0.0036	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.010	0.0010	0.0013	0.0010	0.0010	0.0010	ND	0.0010	0.0015	0.0010	0.0013	0.0010	0.0012	0.001	0.0038	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0012	0.001	0.0017	0.001	ND	0.001	0.0011	0.001	ND	0.001	0.0012	0.001	ND	0.001	ND	0.001	ND	0.001	0.001
Barium	2.0	0.0025	0.058	0.0025	0.061	0.0025	0.050	0.0025	0.057	0.0025	0.046	0.0025	0.050	0.0025	0.062	0.0025	0.088	0.0025	0.058	0.0025	0.065	0.0025	0.066	0.0025	0.068	0.0025	0.038	0.0025	0.046	0.0025	0.066	0.0025	0.066	0.0025	0.061	0.0025	0.057	0.0025	0.078	0.0025	0.071	0.0025	0.054	0.0025	0.057
Beryllium	0.004	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	2.0	0.050	0.24	0.050	0.30	0.050	0.32	0.050	0.15	0.050	0.16	0.050	0.21	0.25	1.3	0.05	2.8	0.25	0.39	0.05	0.18	0.25	1.5	0.05	0.092	0.05	0.064	0.05	0.13	0.05	0.49	0.05	0.43	0.05	0.3	0.05	0.33	0.25	1.1	0.05	0.56	0.05	0.25	0.05	0.19
Cadmium	0.005	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	200.0	2.0	45	2.0	47	2.0	39	2.0	39	2.0	50	2.0	56	2	48	2	47	2	62	2	47	2	55	2	42	2	51	2	51	2	49	2	46	2	55	10	47	2	42	2	43	4	44	2	50
Chromium	0.1	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	1.0	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.65	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.2	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	4.0	0.10	0.16	0.10	0.23	0.10	0.24	0.10	0.19	0.10	0.22	0.10	0.15	0.1	0.18	0.1	0.16	0.1	0.15	0.1	0.23	0.1	0.14	0.1	0.17	0.1	0.16	0.1	0.18	0.1	0.17	0.1	0.19	0.1	0.23	0.1	0.2	0.1	0.22	0.1	0.15	0.1	0.15	0.1	0.18 H
Iron	5.0	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.0075	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND F1	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.15	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Mercury	0.002	0.00020	ND F2	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.1	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	10.0	0.10	2.9	0.10	4.1	0.10	2.7	0.10	4.5	0.10	4.1	0.10	0.78	0.1	1.6	0.1	1.8	0.1	4.1	0.1	3.6	0.1	1.7	0.1	3.4	0.1	3.7	0.1	1.2	0.1	0.71	0.1	2.4	0.1	2.1	0.1	4.1	0.1	6.3	0.1	9.5	0.1	7.9	0.1	3.4
Nitrogen/Nitrate, Nitr	NA	0.20	2.9	0.50	4.1	0.50	2.7	0.50	4.5	0.50	4.1	0.10	0.78	0.1	1.6	0.1	1.8	0.5	4.1	0.2	3.6	0.1	1.7	0.2	3.4	0.5	3.7	0.1	1.2	0.1	0.71	0.5	2.4	0.5	2.1	0.5	4.1	1	6.3	0.5	9.5	0.5	7.9	0.5	3.4
Nitrogen/Nitrite	NA	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.0049	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND	0.004	ND F1	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.05	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND F2	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	400.0	20	73	10	54	10	39	10	53	10	50	25	60	20	57	25	83	20	45	20	57	20	66	10	33	1	24	5	30	5	38	5	43	5	39	5	37 H	25	68	15	65	15	51	10	39
Thallium	0.002	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND F1	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	1,200	10	440	10	470	10	370	10	470	10	510	10	500	10	420	10	530	10	490	10	500	10	560	10	480	10	400	10	440	10	420	10	420	10	380	10	390	30	450	10	340	10	540	10	300
Vanadium	0.049	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	5.0	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.005	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	11.705	0.0025	ND	0.0025	0.00077	0.0025	0.00068	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00066	0.0025	0.0015	0.0025	0.0007	0.0025	0.00062	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.28	NA	7.33	NA	7.29	NA	7.50	NA	6.18	NA	7.99	NA	7.40	NA	7.10	NA	7.10	NA	7.71	NA	7.09	NA	7.83	NA	7.82	NA	7.60	NA	7.13	NA	7.66	NA	7.43	NA	7.33	NA	6.96	NA	7.78	NA	7.65	NA	7.70
Temperature	NA	NA	5.47	NA	11.12	NA	10.65	NA	11.20	NA	5.17	NA	10.37	NA	15.30	NA	12.19	NA	5.33	NA	14.74	NA	19.91	NA	12.91	NA	1.60	NA	4.90	NA	15.20	NA	13.75	NA	6.80	NA	10.10	NA	17.90	NA	9.50	NA	2.40	NA	12.30
Conductivity	NA	NA	0.47	NA	0.55	NA	0.56	NA	0.53	NA	0.50	NA	0.56	NA	0.64	NA	0.57	NA	0.45	NA	0.51	NA	0.63	NA	0.57	NA	0.70	NA	0.48	NA	0.13	NA	0.71	NA	0.33	NA	0.64	NA	0.84	NA	0.84	NA	0.50	NA	0.76
Dissolved Oxygen	NA	NA	4.93	NA	2.58	NA	1.89	NA	6.05	NA	5.00	NA	3.26	NA	0.79	NA	6.57	NA	10.49	NA	5.03	NA	5.17	NA	8.30	NA	8.28	NA	4.19	NA	0.45	NA	0.61	NA	1.11	NA	0.55	NA	1.03	NA	5.30	NA	11.49	NA	0.68
ORP	NA	NA	36.9	NA	27.6	NA	-32.8	NA	13.2	NA	235.1	NA	-51.6	NA	45.5	NA	2.6	NA	19.4	NA	-6.7	NA	39.7	NA	16.6	NA	91.4	NA	116.0	NA	108.7	NA	-65.1	NA	44.5	NA	60.2	NA	135.3	NA	168.3	NA	140.7	NA	132.7

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-03	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013		7/31/2013		10/21/2013		3/5/2014		5/27/2014		8/25/2014		10/27/2014		2/25/2015		5/13/2015		8/17/2015		11/17/2015	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	0.0057	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.0017	0.001	ND	0.001	0.0011	0.001	0.0012	0.001	0.0012	0.001	0.0012	0.001	ND	0.001	0.0015	0.0050	ND	0.001	0.0013	0.0010	0.0012	0.0010	0.0013	0.0010	0.0011	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0010	0.0010	0.0017	0.0010	ND
Barium	2.0	NP	0.038	0.001	0.03	0.001	0.063	0.001	0.081	0.001	0.076	0.001	0.052	0.001	0.059	0.001	0.1	0.040	0.11	0.001	0.056	0.0025	0.061	0.0025	0.064	0.0025	0.099	0.0025	0.056	0.0025	0.052	0.0025	0.070	0.0025	0.063	0.0025	0.048	0.0025	0.045	0.0025	0.054	0.0025	0.061
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.75	0.01	0.18	0.01	0.24	0.01	0.64	0.01	0.7	0.01	0.56	0.01	0.63	0.01	0.64	0.40	0.63	0.01	0.65	0.050	0.21	0.050	0.47	0.050	0.46	0.050	0.14	0.050	0.15	0.050	0.37	0.050	0.14	0.050	0.32	0.050	0.086	0.050	0.34	0.050	0.30
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	39	10	52	10	59	10	62	10	39	10	54	10	57	10	54	10	58	10	53	2.0	55	2.0	60	2.0	57	10	120	10	100	10	79	2.0	47	2.0	47	2.0	48	2.0	45	2.0	43
Chromium	0.1	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.0030	0.0086	0.004	0.005	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	0.012	0.003	0.0042	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	0.0057	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.011	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.3	0.25	0.35	0.25	0.41	0.25	0.35	0.25	ND	0.25	ND	0.25	ND	0.25	0.29	0.25	0.35	0.25	ND	0.10	0.31	0.10	0.28	0.10	0.26	0.10	0.24	0.10	0.23	0.10	0.25	0.10	0.25	0.10	0.23	0.10	0.22	0.10	0.30	0.10	0.29
Iron	5.0	NP	ND	0.010	ND	0.010	ND	0.010	0.042	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.036	0.01	0.019	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00097	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	0.0047	0.001	0.0023	0.001	ND	0.001	0.0037	0.001	0.0014	0.001	ND	0.001	0.0033	0.001	0.002	0.0020	0.034	0.001	0.011	0.0025	ND	0.0025	ND	0.0025	0.0039	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.016	0.0025	0.0031
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.011	0.005	0.0095	0.005	ND	0.005	0.008	0.005	0.0078	0.005	ND	0.005	0.005	0.005	0.0067	0.010	ND	0.005	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0036	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NP	9.4	0.20	5.2	0.20	5.4	0.02	0.20	0.02	0.20	0.20	2.1	0.02	0.37	0.02	0.08	0.02	0.13	0.2	2.00	0.10	0.15	0.10	ND	0.10	ND	0.10	2.6	0.10	5.3	0.10	ND	0.10	2.4	0.10	2.0	0.10	2.7	0.10	ND	0.10	0.19
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	0.15	0.10	ND	0.10	ND	0.50	2.6	0.50	5.3	0.10	ND	0.50	2.4	0.10	2.0	0.20	2.7	0.10	ND ^	0.10	0.19
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	ND	0.001	0.0036	0.001	0.0015	0.001	0.0036	0.001	0.0021	0.001	0.0067	0.001	0.0018	0.001	0.0033	0.0050	ND	0.001	0.0048	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0046	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	64	10	42	10	47	10	66	10	45	10	72	10	84	10	74	10	74	10	64	20	82	20	99	20	96	20	65	20	65	25	100	10	40	10	46	10	39	10	48	20	50
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	480	17	430	17	440	17	460	17	480	17	450	17	520	17	520	26	460	26	500	10	310	10	460	10	430	10	490	10	440	10	490	10	440	10	400	10	380	10	420	10	380
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.012	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	0.14	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.002	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0012	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0054
pH	6.5 - 9.0	NA	7.43	NA	7.55	NA	7.33	NA	7.30	NA	6.58	NA	7.38	NA	7.36	NA	7.46	NA	7.41	NA	7.46	NA	7.31	NA	7.22	NA	7.25	NA	8.34	NA	7.27	NA	6.97	NA	7.43	NA	7.75	NA	7.63	NA	7.63	NA	7.12
Temperature	NA	NA	17.07	NA	5.24	NA	15.72	NA	21.59	NA	18.58	NA	15.50	NA	15.26	NA	15.10	NA	14.28	NA	13.60	NA	21.93	NA	24.89	NA	20.22	NA	7.08	NA	16.70	NA	19.57	NA	19.36	NA	8.51	NA	10.39	NA	25.85	NA	19.09
Conductivity	NA	NA	0.90	NA	0.74	NA	0.73	NA	0.76	NA	0.72	NA	0.65	NA	0.67	NA	0.68	NA	0.66	NA	0.73	NA	0.56	NA	0.76	NA	0.70	NA	0.43	NA	0.66	NA	0.83	NA	0.79	NA	0.49	NA	0.53	NA	0.74	NA	0.60
Dissolved Oxygen	NA	NA	NM	NA	7.20	NA	0.40	NA	0.32	NA	0.99	NA	4.95	NA	3.02	NA	5.22	NA	2.50	NA	6.10	NA	0.40	NA	0.24	NA	0.35	NA	5.08	NA	4.83	NA	0.48	NA	2.33	NA	3.65	NA	6.34	NA	3.10	NA	1.01
ORP	NA	NA	NM	NA	135.1	NA	220.5	NA	-218	NA	29	NA	157	NA	125	NA	180	NA	90	NA	140.31	NA	-101.8	NA	-44.7	NA	-160.1	NA	-60.3	NA	117.3	NA	45	NA	52	NA	102.3	NA	107.9	NA	-35.7	NA	92.5

Sample: MW-03	Date	2/23/2016		5/17/2016		8/16/2016		11/15/2016		2/14/2017		5/1/2017		8/23/2017		11/7/2017		3/6/2018		5/15/2018		8/7/2018		10/30/2018		2/26/2019		4/30/2019		8/26/2019		11/12/2019		2/24/2020		5/19/2020		8/10/2020		12/9/2020		2/22/2021		5/11/2021	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	0.003	0.003	ND	0.003	ND	0.0030	ND	0.003	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	0.0010	0.0014	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	0.0039	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0011	0.001	ND	0.001	0.0012	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	2.0	0.0025	0.042	0.0025	0.051	0.0025	0.058	0.0025	0.054	0.0025	0.059	0.0025	0.057	0.0025	0.059	0.0025	0.067	0.0025	0.052	0.0025	0.056	0.0025	0.072	0.0025	0.054	0.0025	0.049	0.0025	0.058	0.0025	0.071	0.0025	0.075	0.0025	0.063	0.0025	0.053	0.0025	0.056	0.0025	0.081	0.0025	0.088	0.0025	0.076
Beryllium	0.004	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	2.0	0.050	0.42	0.050	0.28	0.050	0.30	0.050	0.31	0.050	0.19	0.050	0.24	0.05	0.38	0.05	0.3	0.05	0.085	0.05	0.33	0.05	0.34	0.05	0.18	0.05	ND	0.05	0.27	0.05	0.28	0.05	0.3	0.05	0.3	0.05	0.15	0.05	0.49	0.05	0.76	0.05	0.6	0.05	0.18
Cadmium	0.005	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	200.0	2.0	46	2.0	46	2.0	44	2.0	39	2.0	47	2.0	55	2	52	2	63	2	55	2	68	2	67	2	44	2	56	2	48	2	51	2	50	2	53	10	49	2	47	2	44	4	53	4	49
Chromium	0.1	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	1.0	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.65	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.2	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	4.0	0.10	0.23	0.10	0.20	0.10	0.22	0.10	0.24	0.10	0.24	0.10	0.21	0.1	0.29	0.1	0.26	0.1	0.24	0.1	0.23	0.1	0.23	0.1	0.26	0.1	0.25	0.1	0.23	0.1	0.25	0.1	0.27	0.1	0.25	0.1	0.3	0.1	0.26	0.1	0.29	0.1	0.24	0.1	0.19 H
Iron	5.0	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.0075	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.15	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.014	0.0025	0.0036	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Mercury	0.002	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.1	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	10.0	0.10	0.95	0.10	0.70	0.10	0.98	0.10	3.7	0.10	4.6	0.10	1.2	0.1	ND	0.1	2.3	0.1	4	0.1	0.41	0.1	0.22	0.1	1	0.1	3.7	0.1	0.22	0.1	ND	0.1	0.46	0.1	ND	0.1	4.6	0.1	0.39	0.1	4.3	0.1	6.1	0.1	4.1
Nitrogen/Nitrate, Nitr	NA	0.10	0.95	0.10	0.70	0.10	0.98	0.20	3.7	0.50	4.6	0.10	1.2	0.1	ND	0.2	2.3	0.5	4	0.1	0.41	0.1	0.22	0.1	1	0.5	3.7	0.1	0.22	0.1	ND	0.1	0.46	0.1	ND	0.5	4.6	0.1	0.39	0.5	4.3	0.5	6.1	0.5	4.1
Nitrogen/Nitrite	NA	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^1+	0.02	ND
Perchlorate	0.0049	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.05	0.0025	0.0025	0.0025	ND	0.0025	0.0044	0.0025	ND	0.0025	0.0036	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0032	0.0025	ND
Silver	0.05	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	400.0	20	77	20	78	20	74	10	46	10	50	20	54	20	42	20	56	10	64	25	55	20	53	5	29	25	27	5	39	5	15	5	32	5	71	5	34	5	43	25	59	25	54	5	40
Thallium	0.002	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	1,200	10	400	10	450	10	530	10	450	10	460	10	510	10	410	10	460	10	400	10	510	10	530	10	410	10	400	10	420	10	420	10	390	10	410	10	340	30	350	10	410	10	520	10	370
Vanadium	0.049	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	5.0	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.005	0.00050	ND	0.00050	0.002	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.0011	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	11.705	0.0025	ND	0.0025	0.00074	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0019	0.0025	ND	0.0025	0.01403	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.41	NA	6.99	NA	7.23	NA	7.33	NA	7.49	NA	7.54	NA	7.44	NA	7.04	NA	7.05	NA	7.53	NA	6.60	NA	7.84	NA	7.49	NA	7.17	NA	7.17	NA	7.55	NA	7.10	NA	7.09	NA	7.00	NA	7.46	NA	7.34	NA	7.33
Temperature	NA	NA	6.10	NA	8.82	NA	15.65	NA	14.93	NA	11.71	NA	11.66	NA	19.50	NA	13.80	NA	5.20	NA	12.94	NA	18.21	NA	14.63	NA	2.80	NA	10.50	NA	25.0	NA	19.0	NA	10.0	NA	12.0	NA	21.5	NA	17.8	NA	13.9	NA	7.2
Conductivity	NA	NA	0.44	NA	0.49	NA	0.59	NA	0.53	NA	0.55	NA	0.55	NA	0.65	NA	0.54	NA	0.40	NA	0.49	NA	0.64	NA	0.51	NA	0.72	NA	0.44	NA	0.73	NA	0.72	NA	0.71	NA	0.19	NA	0.42	NA	0.25	NA	0.68	NA	0.73
Dissolved Oxygen	NA	NA	9.60	NA	3.67	NA	2.52	NA	3.56	NA	2.04	NA	5.97	NA	0.37	NA	4.39	NA	7.28	NA	5.43	NA	5.89	NA	4.20	NA	8.66	NA	4.53	NA	0.24	NA	0.43	NA	0.30	NA	3.61	NA	0.28	NA	1.15	NA	1.12	NA	5.90
ORP	NA	NA	36.1	NA	70.1	NA	2.8	NA	22.1	NA	118.3	NA	-1.0	NA	180.9	NA	-15.5	NA	15.7	NA	21.1	NA	60.7	NA	9.6	NA	116.4	NA	117.8	NA	30.3	NA	-50.3	NA	147.8	NA	53.2	NA	77.8	NA	148.9	NA	148.2	NA	143.3

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-04	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND
Arsenic	0.010	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0012	0.0050	ND	0.001	ND	0.0010	ND
Barium	2.0	NP	0.055	0.001	0.052	0.001	0.058	0.001	0.041	0.001	0.048	0.001	0.043	0.001	0.04	0.001	0.07	0.040	0.09	0.001	0.054	0.0025	0.030
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^
Boron	2.0	NP	0.77	0.01	0.83	0.01	0.33	0.01	0.84	0.01	0.79	0.01	0.78	0.01	0.83	0.01	0.76	0.40	0.74	0.01	0.97	0.050	0.23
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND
Chloride	200.0	NP	150	10	77	10	43	25	86	1.0	8.1	10	58	10	75	25	110	25	130	10	90	2.0	54
Chromium	0.1	NP	0.0045	0.004	ND	0.004	ND	0.004	0.0044	0.004	ND	0.004	ND	0.004	ND	0.004	0.0045	0.0030	0.01	0.004	0.0052	0.0050	ND
Cobalt	1.0	NP	ND	0.002	0.0026	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	0.0033	0.003	0.01	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND
Fluoride	4.0	NP	0.3	0.25	0.39	0.25	0.43	0.25	0.31	0.25	ND	0.25	ND	0.25	ND	0.25	0.26	0.25	0.29	0.25	ND	0.10	0.39
Iron	5.0	NP	ND	0.010	0.017	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	0.14	0.01	0.059	0.10	ND
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND
Manganese	0.15	NP	0.77	0.001	0.68	0.001	0.41	0.001	0.69	0.001	0.35	0.001	0.089	0.001	0.26	0.001	0.50	0.0020	0.027	0.001	0.007	0.0025	ND
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND
Nickel	0.1	NP	0.012	0.005	0.012	0.005	0.0067	0.005	0.011	0.005	0.01	0.005	0.0055	0.005	0.0074	0.005	0.0095	0.010	ND	0.005	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NP	0.34	0.02	0.73	0.20	2.7	0.02	0.06	0.02	0.07	0.02	0.65	0.02	1.1	0.02	0.46	0.02	1.0	0.02	1.8	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND
Selenium	0.05	NP	0.0022	0.001	0.0037	0.001	0.0022	0.001	0.0039	0.001	0.002	0.001	0.0085	0.001	0.0035	0.001	0.0032	0.0050	ND	0.001	0.013	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND
Sulfate	400.0	NP	110	25	140	10	48	25	61	1.0	6.7	50	160	10	94	25	170	25	150	50	130	20	92
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	680	17	620	17	470	17	580	17	520	17	660	17	600	17	800	26	720	26	640	10	350
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.27	NA	7.48	NA	7.26	NA	7.22	NA	6.37	NA	7.24	NA	7.04	NA	7.13	NA	7.14	NA	7.37	NA	7.30
Temperature	NA	NA	16.30	NA	13.33	NA	17.54	NA	19.07	NA	16.35	NA	12.99	NA	18.12	NA	16.51	NA	14.11	NA	13.20	NA	21.84
Conductivity	NA	NA	1.29	NA	1.06	NA	0.75	NA	0.91	NA	0.76	NA	0.76	NA	0.83	NA	1.05	NA	0.98	NA	0.92	NA	0.58
Dissolved Oxygen	NA	NA	NM	NA	3.93	NA	0.26	NA	0.18	NA	0.20	NA	1.43	NA	0.33	NA	0.46	NA	4.01	NA	5.93	NA	0.47
ORP	NA	NA	NM	NA	116.5	NA	202.6	NA	-228	NA	51	NA	212	NA	124	NA	119	NA	130	NA	170.3	NA	-90.1

Sample: MW-04	7/31/2013		10/21/2013		3/5/2014		5/27/2014		8/25/2014		10/27/2014		2/25/2015		5/13/2015		8/17/2015		11/17/2015		2/23/2016		5/17/2016		8/16/2016		11/15/2016		2/14/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^
Barium	0.0025	0.048	0.0025	0.062	0.0025	0.039	0.0025	0.054	0.0025	0.055	0.0025	0.070	0.0025	0.025	0.0025	0.025	0.0025	0.027	0.0025	0.030	0.0025	0.028	0.0025	0.037	0.0025	0.035	0.0025	0.026	0.0025	0.022
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^
Boron	0.050	0.67	0.050	0.81	0.050	0.81	0.050	0.94	0.050	1.0	0.050	0.77	0.050	0.94	0.050	0.80	0.050	0.44	0.050	0.51	0.050	0.43	0.050	0.60	0.050	0.90	0.10	0.79	0.050	0.48
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	2.0	70	10	150	10	130	10	92	10	95	10	96	10	74	2.0	65	2.0	47	2.0	74	2.0	47	2.0	60	2.0	59	2.0	53	2.0	56
Chromium	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.0020	0.0024	0.0020	0.0025	0.0020	ND^	0.0020	ND	0.0020	0.0021	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0021	0.0020	ND	0.0020	ND	0.0020	0.0020	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.31	0.10	0.21	0.10	0.29	0.10	0.23	0.10	0.25	0.10	0.21	0.10	0.32	0.10	0.26	0.10	0.30	0.10	0.26	0.10	0.22	0.10	0.25	0.10	0.28	0.10	0.27	0.10	0.25
Iron	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0025	0.13	0.0025	0.27	0.0025	0.026	0.0025	0.029	0.0025	0.24	0.0025	0.075	0.0025	0.018	0.0025	ND	0.0025	0.015	0.0025	0.14	0.0025	ND	0.0025	0.0041	0.0025	0.025	0.0025	0.22	0.0025	0.19
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	0.0023	0.0020	0.0039	0.0020	ND	0.0020	ND	0.0020	0.0024	0.0020	0.0020	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0021	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	0.10	ND	0.10	0.50	0.10	ND	0.10	ND	0.10	ND	0.10	0.14	0.10	0.30	0.10	ND	0.10	ND	0.10	0.85	0.10	0.45	0.10	ND	0.10	1.3	0.10	ND	0.10	0.64
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	0.50	0.10	ND	0.10	ND	0.10	ND	0.10	0.14	0.10	0.30	0.10	ND	0.10	ND ^	0.10	0.85	0.10	0.45	0.10	ND	0.10	1.3	0.10	ND	0.10	0.64
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0033	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	0.0049
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	50	190	100	260	50	200	100	320	50	260	100	390	25	100	20	120	10	47	25	75	20	74	20	65	20	61	10	30	20	68
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	670	10	980	10	780	10	980	10	880	10	1100	10	580	10	540	10	470	10	550	10	420	10	480	10	590	10	510	10	510
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0017	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0056	0.0025	0.00069	0.0025	0.0013	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.02	NA	7.00	NA	8.00	NA	7.04	NA	7.06	NA	7.20	NA	7.63	NA	7.30	NA	7.37	NA	6.72	NA	7.28	NA	7.09	NA	7.07	NA	7.12	NA	7.21
Temperature	NA	26.31	NA	16.83	NA	11.96	NA	17.48 *	NA	24.18	NA	20.48	NA	8.95	NA	13.52	NA	24.79	NA	16.54	NA	6.06	NA	14.14	NA	21.42	NA	17.30	NA	12.11
Conductivity	NA	1.08	NA	1.15	NA	0.81	NA	1.20	NA	1.36	NA	1.62	NA	0.72	NA	0.73	NA	0.79	NA	0.77	NA	0.48	NA	0.67	NA	0.77	NA	0.68	NA	0.64
Dissolved Oxygen	NA	0.24	NA	0.53	NA	1.63	NA	2.01	NA	1.23	NA	0.83	NA	1.97	NA	3.05	NA	1.31	NA	6.90	NA	9.71	NA	0.94	NA	2.20	NA	2.26	NA	2.91
ORP	NA	4.1	NA	-169.7	NA	-57	NA	13.7	NA	53.5	NA	22.9	NA	22.5	NA	72.4	NA	-32.1	NA	88.4	NA	43.8	NA	43.3	NA	-95.2	NA	-43.9	NA	57.7

Sample: MW-04	5/1/2017		8/28/2017		11/7/2017		3/6/2018		5/15/2018		8/7/2018		10/30/2018		2/26/2019		4/30/2019		8/26/2019		11/12/2019		2/24/2020		4/28/2020		8/10/2020		12/9/2020		2/22/2021		5/11/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.029	0.0025	0.026	0.0025	0.046	0.0025	0.057	0.0025	0.033	0.0025	0.03	0.0025	0.048	0.0025	0.025	0.0025	0.024	0.0025	0.034	0.0025	0.028	0.0025	0.024	0.0025	0.024	0.0025	0.03	0.0025	0.033	0.0025	0.032	0.0025	0.024
Beryllium	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.050	0.55	0.05	0.69	0.05	0.51	0.05	0.099	0.05	0.63	0.05	0.74	0.05	0.53	0.05	0.35	0.05	0.37	0.05	0.58	0.05	0.25	0.05	0.32	0.05	0.52	0.05	0.69	0.05	0.5	0.05	0.47	0.05	0.56
Cadmium	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2.0	58	10	77	10	93	10	81	2	68	2	69	10	86	2	55	2	47	2	58	2	53	2	51	2	50	2	56	10	88	6	62	4	44
Chromium	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.0020	ND	0.002	ND	0.002	ND	0.002	0.0023	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.010	ND	0.01	ND H	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	0.10	0.19	0.1	0.29	0.1	0.21	0.1	0.26	0.1	0.27	0.1	0.33	0.1	0.24	0.1	0.26	0.1	0.25	0.1	0.24	0.1	0.27	0.1	0.22	0.1	0.25	0.1	0.25	0.1	0.32	0.1	0.31	0.1	0.30 H
Iron	0.10	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	ND	0.0025	0.46	0.0025	0.025	0.0025	ND	0.0025	ND	0.0025	0.054	0.0025	0.013	0.0025	0.033	0.0025	ND	0.0025	0.086	0.0025	0.1	0.0025	0.041	0.0025	0.0098	0.0025	0.024	0.0025	0.22	0.0025	0.059	0.0025	0.0036
Mercury	0.00020	ND	0.0002	0.0002	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	ND	0.002	0.0029	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.0022	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	0.38	0.1	ND	0.1	1.5	0.1	4.2	0.1	ND	0.1	ND	0.1	0.44	0.1	0.18	0.1	ND	0.1	ND	0.1	ND	0.1	0.1	0.1	ND	0.1	ND	0.1	0.23	0.1	0.36	0.1	ND
Nitrogen/Nitrate, Nitr	0.10	0.38	0.1	ND	0.1	1.5	0.5	4.2	0.1	ND	0.1	ND	0.1	0.44	0.1	0.18	0.1	ND	0.1	ND	0.1	ND	0.1	0.1	0.1	ND	0.1	ND	0.1	0.23	0.1	0.36	0.1	ND
Nitrogen/Nitrite	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^1+	0.02	ND
Perchlorate	0.0040	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	0.0026	0.0025	ND	0.0025	0.0071	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	25	67	25	80	50	120	10	50	25	100	20	50	50	100	50	59	5	36	5	15	5	66	5	71	5	54 ^	5	23	15	97	15	86	15	80
Thallium	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	540	10	640	10	700	10	410	10	650	10	460	10	710	10	450	10	380	10	520	10	440	10	390	10	380	30	420	10	530	10	560	10	430
Vanadium	0.0050	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	0.035	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.00722	0.0025	0.0015	0.0025	0.00097	0.0025	0.004	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.34	NA	7.13	NA	6.80	NA	7.19	NA	7.63	NA	6.72	NA	7.55	NA	7.18	NA	7.08	NA	7.08	NA	7.78	NA	7.05	NA	7.03	NA	6.92	NA	7.10	NA	7.23	NA	7.22
Temperature	NA	12.10	NA	20.80	NA	13.71	NA	7.31	NA	15.20	NA	21.89	NA	17.42	NA	8.90	NA	11.70	NA	25.10	NA	18.93	NA	6.70	NA	12.50	NA	23.60	NA	16.60	NA	13.20	NA	13.50
Conductivity	NA	0.61	NA	0.80	NA	0.71	NA	0.43	NA	0.56	NA	0.75	NA	0.85	NA	0.83	NA	0.44	NA	0.91	NA	0.72	NA	0.65	NA	0.23	NA	0.77	NA	0.19	NA	0.73	NA	0.72
Dissolved Oxygen	NA	5.49	NA	0.42	NA	5.10	NA	2.30	NA	8.73	NA	2.47	NA	1.28	NA	1.00	NA	2.32	NA	3.98	NA	6.90	NA	2.92	NA	2.51	NA	5.96	NA	1.92	NA	4.10	NA	3.07
ORP	NA	-4.5	NA	196.4	NA	-5.5	NA	-10.1	NA	5.0	NA	51.2	NA	-7.4	NA	107.7	NA	117.8	NA	15.9	NA	-56.0	NA	138.9	NA	62.1	NA	111.5	NA	60.5	NA	143.4	NA	136.2

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-05	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND
Arsenic	0.010	NP	0.0011	0.001	ND	0.001	ND	0.001	ND	0.001	0.001	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.0010	ND
Barium	2.0	NP	0.053	0.001	0.048	0.001	0.046	0.001	0.071	0.001	0.065	0.001	0.054	0.001	0.058	0.001	0.066	0.040	0.077	0.001	0.061	0.0025	0.089
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^
Boron	2.0	NP	0.95	0.01	0.93	0.01	0.79	0.01	0.79	0.01	0.77	0.01	0.82	0.01	0.74	0.01	0.65	0.40	0.66	0.01	0.66	0.050	0.70
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND
Chloride	200.0	NP	150	25	120	10	89	25	160	25	140	10	82	50	100	50	150	25	170	50	110	10	92
Chromium	0.1	NP	0.0044	0.004	0.0042	0.004	ND	0.004	0.0066	0.004	ND	0.004	ND	0.004	ND	0.004	0.0058	0.0030	0.0049	0.004	0.0053	0.0050	ND
Cobalt	1.0	NP	0.0025	0.002	0.0023	0.002	ND	0.002	0.0027	0.002	0.0022	0.002	ND	0.002	ND	0.002	0.002	0.0030	ND	0.002	ND	0.0010	0.0022
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	0.0036	0.003	0.0061	0.003	ND	0.003	0.0031	0.003	ND	0.010	ND	0.003	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND
Fluoride	4.0	NP	0.27	0.25	0.36	0.25	0.43	0.25	0.25	0.25	ND	0.25	ND	0.25	ND	0.25	0.32	0.25	0.32	0.25	ND	0.10	0.23
Iron	5.0	NP	0.13	0.010	0.050	0.010	0.046	0.010	0.082	0.010	0.036	0.010	ND	0.010	ND	0.010	ND	0.010	0.43	0.01	0.052	0.10	0.20
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND
Manganese	0.15	NP	0.51	0.001	0.49	0.001	0.48	0.001	0.64	0.001	0.50	0.001	0.26	0.001	0.41	0.001	1.00	0.040	0.59	0.001	0.21	0.0025	0.67
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND
Nickel	0.1	NP	0.014	0.005	0.013	0.005	0.0077	0.005	0.014	0.005	0.014	0.005	0.008	0.005	0.0095	0.005	0.013	0.010	ND	0.005	0.009	0.0020	0.0055
Nitrogen/Nitrate	10.0	NP	ND	0.02	ND	0.02	0.08	0.02	ND	0.02	ND	0.02	1.6	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.19	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND
Selenium	0.05	NP	0.0019	0.001	0.003	0.001	ND	0.001	0.0045	0.001	0.0023	0.001	0.0028	0.001	0.0033	0.001	0.0031	0.0050	ND	0.001	0.0029	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND
Sulfate	400.0	NP	160	25	170	25	110	25	250	25	170	25	120	50	130	50	200	25	200	50	180	100	310
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	740	17	680	17	640	17	890	17	820	17	590	17	700	17	890	26	840	26	790	10	990
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.24	NA	7.36	NA	7.29	NA	7.05	NA	6.34	NA	7.14	NA	7.00	NA	6.94	NA	6.94	NA	8.01	NA	6.87
Temperature	NA	NA	14.80	NA	14.35	NA	15.83	NA	15.80	NA	15.64	NA	17.03	NA	16.99	NA	16.03	NA	14.38	NA	14.50	NA	16.36
Conductivity	NA	NA	1.33	NA	1.16	NA	1.00	NA	1.21	NA	1.10	NA	0.85	NA	0.94	NA	1.19	NA	1.17	NA	1.17	NA	1.14
Dissolved Oxygen	NA	NA	NM	NA	3.95	NA	0.07	NA	0.06	NA	0.06	NA	0.05	NA	0.07	NA	0.01	NA	0.46	NA	0.40	NA	0.28
ORP	NA	NA	NM	NA	110.1	NA	70.5	NA	-274	NA	-26	NA	237	NA	128	NA	152	NA	30	NA	99.2	NA	-50.9

Sample: MW-05	7/31/2013		10/21/2013		3/5/2014		5/27/2014		8/25/2014		10/27/2014		2/25/2015		5/13/2015		8/17/2015		11/17/2015		2/23/2016		5/17/2016		8/16/2016		11/15/2016		2/14/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^
Barium	0.0025	0.092	0.0025	0.088	0.0025	0.059	0.0025	0.052	0.0025	0.069	0.0025	ND	0.0025	0.041	0.0025	0.055	0.0025	0.073	0.0025	0.060	0.0025	0.043	0.0025	0.051	0.0025	0.055	0.0025	0.051	0.0025	0.052
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^
Boron	0.050	0.64	0.050	0.83	0.050	0.70	0.050	0.76	0.050	0.71	0.050	ND	0.050	1.1	0.050	0.72	0.050	1.3	0.050	0.74	0.050	0.59	0.050	0.63	0.050	0.66	0.10	0.83	0.050	0.59
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00050	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	10	150	10	170	10	120	10	80	10	140	10	120	10	79	10	120	2.0	60	10	110	2.0	54	10	88	10	100	2.0	66	10	98
Chromium	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	0.0015	0.0010	0.0015	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.0020	ND	0.0020	0.0027	0.0020	ND^	0.0020	ND	0.0020	0.0023	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.24	0.10	0.24	0.10	0.35	0.10	0.29	0.10	0.32	0.10	0.28	0.10	0.38	0.10	0.37	0.10	0.26	0.10	0.27	0.10	0.27	0.10	0.35	0.10	0.30	0.10	0.25	0.10	0.27
Iron	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0025	0.29	0.0025	0.62	0.0025	0.077	0.0025	0.043	0.0025	0.016	0.0025	ND	0.0025	0.058	0.0025	0.0078	0.0025	0.13	0.0025	0.084	0.0025	0.044	0.0025	0.039	0.0025	0.015	0.0025	0.0040	0.0025	0.0068
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	0.0059	0.0020	0.0068	0.0020	0.0038	0.0020	0.0036	0.0020	0.0041	0.0020	ND	0.0020	0.0025	0.0020	0.0023	0.0020	0.0051	0.0020	0.0027	0.0020	0.0032	0.0020	0.0027	0.0020	0.0020	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	0.10	ND	0.10	0.34	0.10	0.74	0.10	2.2	0.10	0.11	0.10	0.20	0.10	0.74	0.10	ND	0.10	ND	0.10	ND	0.10	0.27	0.10	ND	0.10	ND	0.10	0.12	0.10	ND
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	0.34	0.10	0.77	0.50	2.2	0.10	0.11	0.10	0.20	0.10	0.74	0.10	ND	0.10	ND ^	0.10	ND	0.10	0.27	0.10	ND	0.10	ND	0.10	0.12	0.10	ND
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	0.033	0.020	0.026	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0028	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	100	290	100	260	50	180	50	150	50	200	50	310	20	110	50	150	50	250	50	180	25	130	25	140	50	160	25	94	50	130
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	1000	10	1100	10	840	10	640	10	870	10	910	10	570	10	730	10	860	10	810	10	550	10	690	10	800	10	630	10	720
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00068	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00278	0.0025	ND	0.0025	0.0011	0.0025	0.0006	0.0025	ND	0.0025	ND
pH	NA	6.82	NA	6.89	NA	7.69	NA	7.01	NA	6.86	NA	7.30	NA	7.52	NA	7.26	NA	7.35	NA	6.65	NA	7.18	NA	7.08	NA	6.85	NA	6.96	NA	7.25
Temperature	NA	17.75	NA	14.79	NA	12.62	NA	20.54	NA	21.14	NA	21.18	NA	5.51	NA	17.46	NA	25.42	NA	15.07	NA	11.30	NA	13.85	NA	19.41	NA	15.32	NA	13.93
Conductivity	NA	1.25	NA	1.33	NA	0.28	NA	1.01	NA	1.28	NA	1.38	NA	0.69	NA	1.06	NA	1.32	NA	1.06	NA	0.75	NA	0.83	NA	1.02	NA	0.77	NA	0.87
Dissolved Oxygen	NA	0.36	NA	0.32	NA	1.17	NA	0.53	NA	1.01	NA	2.20	NA	2.50	NA	1.54	NA	2.24	NA	1.32	NA	1.99	NA	2.58	NA	2.88	NA	1.33	NA	1.93
ORP	NA	55.5	NA	-197	NA	-51	NA	-59.6	NA	64.8	NA	6.8	NA	9.8	NA	23.5	NA	-27.7	NA	-4.8	NA	-103.8	NA	-65.0	NA	-99.8	NA	-34.7	NA	-18.4

Sample: MW-05	5/1/2017		8/28/2017		11/7/2017		3/6/2018		5/15/2018		8/7/2018		10/30/2018		2/26/2019		4/30/2019		8/26/2019		11/12/2019		2/24/2020		4/28/2020		8/10/2020		12/9/2020		2/22/2021		5/11/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.055	0.0025	0.063	0.0025	0.057	0.0025	0.072	0.0025	0.057	0.0025	0.051	0.0025	0.07	0.0025	0.054	0.0025	0.041	0.0025	0.053	0.0025	0.049	0.0025	0.055	0.0025	0.05	0.0025	0.059	0.0025	0.048	0.0025	0.045	0.0025	0.039
Beryllium	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.050	0.68	0.05	0.57	0.05	0.45	0.05	0.34	0.05	0.56	0.05	0.45	0.05	0.5	0.05	0.56	0.05	0.6	0.05	0.47	0.05	0.56	0.05	0.52	0.05	0.48	0.05	0.68	0.05	0.46	0.05	0.53	0.05	0.48
Cadmium	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	0.00053	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	92	10	120	10	110	10	110	10	90	10	120	10	120	10	87	2	74	10	78	2	72	2	80	2	56	2	70	10	80	6	70	4	53
Chromium	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.0020	ND	0.002	ND	0.002	ND	0.002	0.0022	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.0039	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.010	ND	0.01	ND H	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	0.0069	0.005	ND
Fluoride	0.10	0.27	0.1	0.33	0.1	0.32	0.1	0.21	0.1	0.29	0.1	0.33	0.1	0.29	0.1	0.34	0.1	0.37	0.1	0.29	0.1	0.35	0.1	0.39	0.1	0.37	0.1	0.26	0.1	0.31	0.1	0.33	0.1	0.34 H
Iron	0.10	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.024	0.0025	0.032	0.0025	ND	0.0025	0.77	0.0025	0.015	0.0025	0.12	0.0025	ND	0.0025	0.0076	0.0025	0.039	0.0025	0.037	0.0025	0.053	0.0025	0.028	0.0025	0.03	0.0025	0.042	0.0025	0.04	0.0025	0.0084	0.0025	0.018
Mercury	0.00020	ND	0.0002	0.00021	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	0.00047	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	0.0022	0.002	0.0027	0.002	ND	0.002	0.0039	0.002	ND	0.002	0.003	0.002	ND	0.002	ND	0.002	ND	0.002	0.0025	0.002	0.0022	0.002	0.0026	0.002	0.0022	0.002	0.0023	0.002	0.0022	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	ND	0.1	ND	0.1	0.22	0.1	3.7	0.1	ND	0.1	0.13	0.1	0.28	0.1	0.48	0.1	0.24	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.33	0.1	0.92
Nitrogen/Nitrate, Nitr	0.10	ND	0.1	ND	0.1	0.22	0.2	3.7	0.1	ND	0.1	0.13	0.1	0.28	0.1	0.48	0.1	0.24	0.1	ND	0.1	ND	0.1	0.1	0.1	ND	0.1	ND	0.1	ND	0.1	0.33	0.1	0.92
Nitrogen/Nitrite	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^1+	0.02	ND
Perchlorate	0.0040	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0031	0.0025	ND	0.0025	ND	0.0025	0.0032	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	180	50	230	50	140	20	64	50	230	50	160	50	130	130	140	5	130	5	140	5	120	5	140	5	130 ^	25	92	15	110	25	110	15	100
Thallium	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	720	10	880	10	690	10	570	10	1000	10	790	10	890	10	660	10	590	10	660	10	590	10	660	10	600	30	650	10	580	10	650	10	540
Vanadium	0.0050	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00056	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.0021	0.0025	0.00092	0.0025	0.00073	0.0025	0.00896	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.60	NA	7.05	NA	6.87	NA	7.10	NA	7.70	NA	6.56	NA	7.57	NA	6.99	NA	6.96	NA	7.01	NA	7.85	NA	6.90	NA	6.87	NA	6.79	NA	6.91	NA	7.14	NA	7.20
Temperature	NA	12.43	NA	16.90	NA	13.03	NA	10.12	NA	16.71	NA	17.48	NA	15.77	NA	14.50	NA	14.40	NA	17.70	NA	15.40	NA	14.20	NA	13.50	NA	16.70	NA	15.00	NA	15.60	NA	14.60
Conductivity	NA	0.82	NA	1.06	NA	0.82	NA	0.63	NA	0.83	NA	1.04	NA	1.01	NA	1.13	NA	0.62	NA	0.15	NA	0.96	NA	0.34	NA	0.26	NA	1.12	NA	0.19	NA	0.86	NA	0.89
Dissolved Oxygen	NA	3.43	NA	0.49	NA	4.09	NA	1.68	NA	4.33	NA	2.17	NA	8.36	NA	0.10	NA	0.21	NA	0.35	NA	0.51	NA	0.21	NA	0.23	NA	0.20	NA	0.21	NA	1.12	NA	0.21
ORP	NA	-142.5	NA	232.2	NA	-9.6	NA	-43.3	NA	-9.7	NA	41.1	NA	17.8	NA	109.7	NA	116.4	NA	139.4	NA	-58.1	NA	40.3	NA	17.0	NA	-0.9	NA	56.3	NA	146.2	NA	116.7

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-06	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND
Arsenic	0.010	NP	0.0042	0.001	0.0024	0.001	0.0029	0.001	0.0031	0.001	0.0036	0.001	0.002	0.001	0.0021	0.001	0.0022	0.0050	ND	0.001	0.0017	0.0010	0.0027
Barium	2.0	NP	0.11	0.001	0.092	0.001	0.1	0.001	0.1	0.001	0.12	0.001	0.097	0.001	0.12	0.001	0.11	0.040	0.12	0.001	0.088	0.0025	0.12
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^
Boron	2.0	NP	0.5	0.01	0.35	0.01	0.43	0.01	0.61	0.01	0.63	0.01	0.39	0.01	0.46	0.01	0.57	0.40	0.45	0.01	0.39	0.050	1.0
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND
Chloride	200.0	NP	180	50	200	50	160	50	210	50	150	50	150	50	200	50	190	50	240	50	200	10	99
Chromium	0.1	NP	0.006	0.004	0.0083	0.004	0.0045	0.004	0.0085	0.004	0.0056	0.004	ND	0.004	0.0054	0.004	0.0072	0.0030	0.0077	0.004	ND	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	0.0032	0.003	0.0042	0.003	ND	0.003	0.16	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND
Fluoride	4.0	NP	0.65	0.25	0.61	0.25	0.63	0.25	0.64	0.25	0.50	0.25	0.47	0.25	0.37	0.25	0.48	0.25	0.42	0.25	ND	0.10	0.36
Iron	5.0	NP	1.6	0.010	1.6	0.010	1.7	0.010	1.8	0.010	1.9	0.010	1.7	0.010	1.9	0.010	1.9	0.010	1.6	0.01	1.1	0.10	1.8
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND
Manganese	0.15	NP	0.68	0.001	0.68	0.001	0.63	0.001	0.66	0.001	0.63	0.001	0.61	0.001	0.71	0.001	0.64	0.040	0.61	0.001	0.50	0.0025	1.3
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND
Nickel	0.1	NP	0.0091	0.005	0.014	0.005	0.0078	0.005	0.0099	0.005	0.0089	0.005	ND	0.005	0.0095	0.005	0.011	0.010	ND	0.005	0.0062	0.0020	ND
Nitrogen/Nitrate	10.0	NP	0.037	0.02	ND	0.02	ND	0.02	0.04	0.02	0.06	0.02	ND	0.02	ND	0.02	0.04	0.02	0.06	0.02	0.02	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND
Selenium	0.05	NP	0.0034	0.001	ND	0.001	ND	0.001	0.0025	0.001	0.0033	0.001	ND	0.001	0.0013	0.001	0.0023	0.0050	ND	0.001	0.001	0.0025	0.0030
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND
Sulfate	400.0	NP	210	50	250	50	280	50	260	50	170	50	250	50	450	50	340	50	440	50	320	130	560
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	950	17	990	17	1100	17	970	17	1000	17	1100	17	1300	17	1200	26	1200	26	1100	10	1400
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND
Zinc	5.0	NP	0.0064	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.049	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.67	NA	7.97	NA	7.62	NA	7.61	NA	7.35	NA	7.68	NA	7.59	NA	7.73	NA	7.68	NA	9.30	NA	7.23
Temperature	NA	NA	24.53	NA	16.38	NA	18.99	NA	22.40	NA	22.76	NA	20.99	NA	19.83	NA	20.30	NA	20.07	NA	14.40	NA	16.14
Conductivity	NA	NA	1.65	NA	1.63	NA	1.68	NA	1.56	NA	1.61	NA	1.54	NA	1.65	NA	1.69	NA	1.75	NA	1.49	NA	1.47
Dissolved Oxygen	NA	NA	NM	NA	0.24	NA	0.08	NA	0.10	NA	0.08	NA	0.03	NA	0.23	NA	0.02	NA	0.41	NA	0.18	NA	0.45
ORP	NA	NA	NM	NA	-137.5	NA	-161.9	NA	-236	NA	-196	NA	-176	NA	-169	NA	-183	NA	-160	NA	-85.8	NA	-97.1

Sample: MW-06	7/31/2013		10/23/2013		3/6/2014		5/29/2014		8/27/2014		10/29/2014		2/23/2015		5/11/2015		8/18/2015		11/17/2015		2/23/2016		5/17/2016		8/16/2016		11/16/2016		2/16/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND F1	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	0.0037	0.0010	0.0039	0.0010	0.0010	0.0010	0.20	0.0010	0.0024	0.0010	0.0016	0.0010	0.0011	0.0010	ND	0.0010	0.0025	0.0010	0.0016	0.0010	0.0019 F1	0.0010	ND	0.0010	ND	0.0010	0.0022	0.0010	ND
Barium	0.0025	0.12	0.0025	0.11	0.0025	0.10	0.0025	0.54	0.0025	0.11	0.0025	0.10	0.0025	0.099	0.0025	0.094	0.0025	0.12	0.0025	0.11	0.0025	0.082 F1	0.0025	0.098	0.0025	0.090	0.0025	0.090	0.0025	0.079
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^
Boron	0.050	0.62	0.050	0.51	0.050	0.34	0.050	0.35	0.050	0.52	0.050	0.34	0.050	0.34	0.050	0.35	0.050	0.75	0.050	0.51	0.050	0.40 F1	0.050	0.34	0.050	0.41	0.050	0.36	0.050	0.29
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND F1	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	10	200	10	210	10	230	10	230	10	230 ^	10	240	10	110	10	230	10	170	10	210	10	200	10	200 F1	10	210	10	180 F1	10	190
Chromium	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND F1	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0068	0.0010	ND	0.0010	ND	0.0010	0.0013	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND F1	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND F1	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.56	0.10	0.64	0.10	0.42	0.10	0.53	0.10	0.74	0.10	0.79	0.10	0.48	0.10	0.52	0.10	0.56	0.10	0.64	0.10	0.58	0.10	0.48	0.10	0.60	0.10	0.50	0.10	0.26
Iron	0.10	2.2	0.10	1.8	0.10	1.5	0.10	22	0.10	1.0	0.10	0.81	0.10	1.0	0.10	0.29	0.10	1.8	0.10	1.4	0.10	1.6 F1	0.10	0.15	0.10	ND	0.10	1.1	0.10	1.4
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00082	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND F1	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0025	0.70	0.0025	0.58	0.0025	0.68	0.013	8.0	0.0025	0.71	0.0025	0.57	0.0025	0.86	0.0025	0.90	0.0025	1.2	0.0025	0.98	0.0025	0.87 F1	0.0025	0.85	0.0025	0.57	0.0025	0.79	0.0025	1.0
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	ND	0.0020	0.0020	0.0020	ND	0.0020	0.0061	0.0020	ND	0.0020	ND	0.0020	0.0024	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0020	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	0.10	ND	0.10	0.16	0.10	ND	0.10	ND	0.10	ND	0.10	0.11	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	0.16	0.10	ND	0.10	ND	0.10	ND	0.10	0.11	0.10	ND	0.10	ND	0.10	ND ^	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	0.0065	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND F1	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND F1	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	100	440	100	310	100	410	100	530	100	300	100	380	100	360	100	350	100	400	100	490	100	390	250	500	100	380	100	470	100	390
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND F1	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	1200	10	1100	10	1100	10	1400	10	1300	10	1100	10	1100	10	1300	10	1400	10	1100	10	1100	10	1400	10	1200	10	1100	10	1000
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND F1	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0013	0.0025	0.00061	0.0025	0.00053	0.0025	0.00099	0.0025	ND	0.0025	ND
pH	NA	7.37	NA	7.55	NA	8.21	NA	7.45	NA	7.73	NA	7.60	NA	8.05	NA	7.76	NA	7.94	NA	7.46	NA	7.68	NA	7.47	NA	7.31	NA	7.66	NA	7.66
Temperature	NA	24.20	NA	23.30	NA	10.06	NA	19.41 *	NA	26.15	NA	19.31	NA	7.20	NA	17.91	NA	21.94	NA	18.66	NA	13.60	NA	15.26	NA	28.74	NA	19.81	NA	12.94
Conductivity	NA	1.71	NA	1.74	NA	1.01	NA	1.84	NA	1.91	NA	2.36	NA	1.17	NA	1.67	NA	1.99	NA	1.58	NA	1.31	NA	1.56	NA	1.94	NA	1.43	NA	1.24
Dissolved Oxygen	NA	0.14	NA	0.26	NA	1.24	NA	0.80	NA	0.39	NA	0.32	NA	0.96	NA	1.57	NA	1.60	NA	1.20	NA	0.64	NA	0.83	NA	1.32	NA	1.42	NA	1.06
ORP	NA	-180.4	NA	-233.2	NA	-168.8	NA	-25.3	NA	-143.4	NA	-126.7	NA	-147.7	NA	-73.6	NA	-142.7	NA	-90.4	NA	-96.8	NA	-58.8	NA	-166.3	NA	-154.6	NA	-102.5

Sample: MW-06	5/2/2017		8/24/2017		11/8/2017		3/6/2018		5/18/2018		8/10/2018		10/29/2018		2/25/2019		5/1/2019		8/27/2019		11/12/2019		2/25/2020		4/27/2020		8/11/2020		12/9/2020		2/23/2021		5/10/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.003	0.0033	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	ND	0.001	0.0016	0.001	0.0015	0.001	ND	0.001	ND	0.001	0.0014	0.001	ND	0.001	ND	0.001	0.0017	0.001	0.0023	0.001	0.0022	0.001	ND	0.001	ND ^	0.001	0.0016	0.001	0.0017	0.001	0.0011	0.001	ND
Barium	0.0025	0.077	0.0025	0.097	0.0025	0.098	0.0025	0.071	0.0025	0.072	0.0025	0.1	0.0025	0.083	0.0025	0.071	0.0025	0.073	0.0025	0.081	0.0025	0.07	0.0025	0.055	0.0025	0.063	0.0025	0.062	0.0025	0.052	0.0025	0.049	0.0025	0.047
Beryllium	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.050	0.36	0.05	0.36	0.05	0.3	0.05	0.3	0.05	0.39	0.05	0.36	0.05	0.31	0.05	0.24	0.05	0.33	0.05	0.35	0.05	0.26	0.05	0.22	0.05	0.31	0.05	0.49	0.05	0.23	0.05	0.25	0.05	0.32
Cadmium	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	180	10	180	10	180	10	180	10	170	10	190	10	170	10	170	10	180	10	160	10	150	10	150	10	140	10	140	10	140	10	130	10	130
Chromium	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.002	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.010	ND F1 F2	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	0.10	0.31	0.1	0.62	0.1	0.6	0.1	0.36	0.1	0.37	0.1	0.55	0.1	0.6	0.1	0.43	0.1	0.42	0.1	0.49	0.1	0.51	0.1	0.46	0.1	0.42	0.1	0.47	0.1	0.57	0.1	0.41	0.1	0.44 H F1
Iron	0.10	ND	0.1	1.2	0.1	1.5	0.1	0.94	0.1	ND	0.1	1	0.1	0.47	0.1	1.2	0.1	1.8	0.1	1.1	0.1	0.87	0.1	1.4	0.1	1.1	0.1	0.65	0.1	1.2	0.1	1	0.1	0.45
Lead	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.086	0.0025	0.73	0.0025	0.95	0.0025	1.1	0.0025	0.48	0.0025	1	0.0025	0.75	0.0025	0.78	0.0025	1.1	0.0025	0.77	0.0025	0.73	0.0025	0.7	0.0025	0.7	0.0025	0.57	0.0025	0.57	0.0025	0.66	0.0025	0.47
Mercury	0.00020	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	0.19	0.1	ND	0.1	ND	0.1	0.11	0.1	0.22	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.13 H
Nitrogen/Nitrate, Nitr	0.10	0.19	0.1	ND	0.1	ND	0.1	0.11	0.1	0.22	0.1	ND	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.13
Nitrogen/Nitrite	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	0.037	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.0040	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0036	0.0025	ND	0.0025	ND	0.0025	0.0063	0.0025	ND	0.0025	0.012	0.0025	0.0025	0.0025	ND	0.0025	0.0069	0.0025	ND
Silver	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	100	420	100	340	100	410	100	350	100	460	100	320	100	410	20	350	20	390	20	360 F1	20	280	20	280	50	400	100	280	50	220	50	240	50	400
Thallium	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	1200	10	1100	10	1100	10	1000	10	1300	10	1100	10	1100	10	1000	10	1100	10	970	10	920	10	830	10	1200	30	790	10	640	10	790	10	680
Vanadium	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.00067	0.0025	0.0014	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.58	NA	7.38	NA	7.24	NA	7.42	NA	6.97	NA	6.96	NA	7.75	NA	7.55	NA	7.36	NA	7.52	NA	8.03	NA	7.76	NA	7.52	NA	7.50	NA	7.65	NA	7.90	NA	7.74
Temperature	NA	14.71	NA	22.90	NA	18.78	NA	8.80	NA	15.39	NA	24.22	NA	21.39	NA	12.10	NA	12.40	NA	22.80	NA	18.25	NA	10.50	NA	11.90	NA	18.90	NA	16.00	NA	10.70	NA	12.40
Conductivity	NA	1.26	NA	1.53	NA	1.43	NA	0.99	NA	1.18	NA	1.49	NA	1.37	NA	1.60	NA	1.02	NA	1.50	NA	1.35	NA	1.21	NA	0.34	NA	0.66	NA	1.21	NA	0.94	NA	1.49
Dissolved Oxygen	NA	2.84	NA	0.21	NA	1.56	NA	2.82	NA	8.16	NA	7.57	NA	7.50	NA	0.75	NA	0.19	NA	0.23	NA	0.22	NA	0.22	NA	0.24	NA	0.36	NA	0.11	NA	0.34	NA	0.20
ORP	NA	-79.2	NA	-102.3	NA	-141.4	NA	-83.1	NA	-33.8	NA	-42.8	NA	-63.3	NA	-125.9	NA	-49.2	NA	-159.0	NA	-132.2	NA	-193.2	NA	-173.0	NA	-102.4	NA	-217.5	NA	-171.7	NA	37.5

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-07	Date	12/6/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/31/2013		7/31/2013		10/23/2013		3/5/2014		5/29/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.026	0.001	0.085	0.001	0.12	0.001	0.18	0.001	0.23	0.001	0.23	0.001	0.15	0.001	0.18	0.0050	0.26	0.001	0.17	0.0010	0.12	0.0010	0.22	0.0010	0.20	0.0010	0.15	0.0010	ND
Barium	2.0	NP	0.55	0.001	0.52	0.001	0.57	0.001	0.57	0.001	0.59	0.001	0.57	0.001	0.44	0.001	0.46	0.040	0.47	0.001	0.44	0.0025	0.42	0.0025	0.46	0.0025	0.49	0.0025	0.56	0.0025	0.13
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.61	0.01	0.44	0.012	0.43	0.01	0.38	0.01	0.34	0.01	0.35	0.01	0.41	0.01	0.36	0.40	0.41	0.01	0.47	0.050	0.52	0.050	0.41	0.050	0.46	0.050	0.37	0.25	1.0
Cadmium	0.005	NP	0.0026	0.001	ND	0.001	0.0015	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	170	50	200	25	140	25	130	10	81	25	99	25	130	25	130	25	150	50	160	10	180	10	150	10	160	10	170	10	150
Chromium	0.1	NP	0.0088	0.004	0.0075	0.004	0.0061	0.004	0.011	0.004	ND	0.004	ND	0.004	0.0043	0.004	0.0051	0.0030	0.028	0.004	0.017	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND
Cobalt	1.0	NP	0.017	0.002	0.0056	0.002	0.007	0.002	0.0055	0.002	0.006	0.002	0.0067	0.002	0.011	0.002	0.009	0.0030	0.0056	0.002	0.0075	0.0010	0.0059	0.0010	0.0045	0.0010	0.0071	0.0010	0.0085	0.0010	ND
Copper	0.65	NP	0.14	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	0.0055	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.47	0.25	0.42	0.25	0.58	0.25	0.94	0.25	0.47	0.25	0.54	0.25	0.38	0.25	0.35	0.25	0.35	0.25	ND	0.10	0.47	0.10	0.46	0.10	0.43	0.10	0.41	0.10	0.41
Iron	5.0	NP	8.0	0.010	7.5	0.010	10	0.010	22	0.010	26	0.010	31	0.010	10	0.010	21	0.010	18	0.01	27	0.10	15	0.10	30	0.10	20	0.10	17	0.10	0.15
Lead	0.0075	NP	0.039	0.001	ND	0.001	0.0014	0.001	ND	0.001	ND	0.001	ND	0.001	0.0013	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0011	0.00050	ND
Manganese	0.15	NP	3.5	0.001	5.9	0.001	6.4	0.001	12	0.001	12	0.001	11	0.001	9.3	0.001	8	0.040	6.7	0.001	9.5	0.025	5.7	0.0025	11	0.0025	5.9	0.0025	5.8 E	0.0025	0.33
Mercury	0.002	NP	ND	0.0002	ND	0.0002	0.00025	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.045	0.005	0.021	0.005	0.022	0.005	0.026	0.005	0.022	0.005	0.018	0.005	0.026	0.005	0.028	0.010	ND	0.005	0.014	0.0020	0.0063	0.0020	0.0055	0.0020	0.0081	0.0020	0.0099	0.0020	ND
Nitrogen/Nitrate	10.0	NP	0.043	0.02	0.08	0.02	ND	0.20	0.31	0.02	0.03	0.02	ND	0.02	0.02	0.02	ND	0.02	0.03	0.02	0.06	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0043	0.001	0.0026	0.001	0.0025	0.001	0.0073	0.001	0.0054	0.001	0.0013	0.001	0.006	0.001	0.0047	0.0050	ND	0.001	0.0031	0.0025	0.0028	0.0025	ND	0.0025	0.0056	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	120	10	49	10	25	1.0	9.1	1.0	3.3	1.0	3.0	10	18	10	25	10	43	10	36	25	120	10	42	20	80	20	95	10	52
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	860	17	1100	17	1300	17	1300	17	1300	17	1400	17	1300	17	1300	26	1100	26	1200	10	1000	10	1300	10	1200	10	1200	10	1200
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	0.012	0.005	0.0051	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	0.076	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.011	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	NM	NA	7.04	NA	6.78	NA	6.83	NA	6.45	NA	6.79	NA	6.91	NA	6.93	NA	6.97	NA	6.87	NA	6.69	NA	6.68	NA	6.82	NA	7.20	NA	6.67
Temperature	NA	NA	NM	NA	16.49	NA	18.51	NA	19.33	NA	16.43	NA	21.06	NA	19.19	NA	17.25	NA	16.64	NA	16.30	NA	17.12	NA	17.95	NA	16.36	NA	14.02	NA	17.66 *
Conductivity	NA	NA	NM	NA	1.98	NA	2.02	NA	2.02	NA	1.90	NA	2.04	NA	1.84	NA	1.78	NA	1.63	NA	1.87	NA	1.42	NA	1.77	NA	1.66	NA	1.36	NA	1.78
Dissolved Oxygen	NA	NA	NM	NA	0.61	NA	0.12	NA	0.34	NA	0.17	NA	0.13	NA	-0.02	NA	5.53	NA	2.86	NA	2.31	NA	0.50	NA	0.29	NA	0.44	NA	1.01	NA	0.65
ORP	NA	NA	NM	NA	-81.6	NA	-95.7	NA	-171	NA	-148	NA	-141	NA	-119	NA	-100	NA	-100	NA	-116.9	NA	-145.5	NA	-140.7	NA	-134.7	NA	-116.9	NA	-94.6

Sample: MW-07	8/27/2014		10/29/2014		2/23/2015		5/11/2015		8/18/2015		11/16/2015		2/24/2016		5/18/2016		8/19/2016		11/16/2016		2/16/2017		5/2/2017		8/24/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	0.0032
Arsenic	0.0010	0.19	0.0010	0.31	0.0010	0.18	0.0010	0.18	0.0010	0.23	0.0010	0.13	0.0010	0.21	0.0010	0.13	0.0010	0.14	0.0010	0.18	0.0010	0.19	0.0010	0.12	0.001	0.15
Barium	0.0025	0.52	0.0025	0.55	0.0025	0.61	0.0025	0.50	0.0025	0.49	0.0025	0.43	0.0025	0.50	0.0025	0.46	0.0025	0.44	0.0025	0.51	0.0025	0.50	0.0025	0.41	0.0025	0.44
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND
Boron	0.050	0.33	0.050	0.27	0.050	0.39	0.050	0.34	0.050	0.38	0.050	0.36	0.050	0.39	0.050	0.36	0.050	0.36	0.050	0.35	0.050	0.30	0.050	0.50	0.05	0.35
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Chloride	10	160 ^	10	150	10	130	10	170	10	140	10	160	10	150	10	180	10	160	10	150	10	170	10	170	10	160
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND
Cobalt	0.0010	0.0070	0.0010	0.0046	0.0010	0.012	0.0010	0.0070	0.0010	0.0026	0.0010	0.0062	0.0010	0.0038	0.0010	0.0062	0.0010	0.0064	0.0010	0.0058	0.0010	0.0054	0.0010	0.0044	0.001	0.0052
Copper	0.0020	ND ^	0.0020	ND	0.0020	0.0091	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND
Fluoride	0.10	0.43	0.10	0.46	0.10	0.42	0.10	0.42	0.10	0.44	0.10	0.43	0.10	0.47	0.10	0.41	0.10	0.43	0.10	0.39	0.10	0.37	0.10	0.38	0.1	0.43
Iron	0.10	14	0.10	35	0.10	23	0.10	9.5	0.10	38	0.10	12	0.10	33	0.10	9.2	0.10	14	0.10	22	0.10	20	0.10	13	0.1	15
Lead	0.00050	ND	0.00050	ND	0.00050	0.0066	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Manganese	0.013	6.6	0.013	13	0.013	7.0	0.050	5.9	0.13	15	0.025	6.2	0.025	13	0.025	3.0	0.013	7.1	0.025	7.8	0.050	8.6	0.013	5.5	0.013	6.9
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	ND
Nickel	0.0020	0.0072	0.0020	0.0045	0.0020	0.020	0.0020	0.0077	0.0020	0.0024	0.0020	0.0064	0.0020	0.0052	0.0020	0.0069	0.0020	0.0066	0.0020	0.0055	0.0020	0.0054	0.0020	0.0050	0.002	0.0055
Nitrogen/Nitrate	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND ^	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Sulfate	20	71	5.0	16	10	50	10	55	10	59	20	68	10	41	20	69	10	54	10	27	10	49	25	95	20	58
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Total Dissolved Soli	10	1300	10	1300	10	1100	10	1100	10	1300	10	1100	10	1300	10	1000	10	1400	10	1200	10	1200	10	1100	10	1100
Vanadium	0.0050	ND	0.0050	ND	0.0050	0.0084	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND
Zinc	0.020	ND	0.020	ND	0.020	0.027	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00078	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00238	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.00	NA	6.94	NA	6.90	NA	6.88	NA	7.03	NA	6.60	NA	6.80	NA	6.77	NA	6.62	NA	6.64	NA	6.83	NA	7.08	NA	6.75
Temperature	NA	22.30	NA	14.31	NA	8.40	NA	17.66	NA	22.21	NA	13.34	NA	10.72	NA	16.18	NA	21.90	NA	18.24	NA	16.29	NA	15.35	NA	17.40
Conductivity	NA	1.87	NA	2.62	NA	1.37	NA	1.67	NA	2.18	NA	1.47	NA	1.55	NA	1.47	NA	1.75	NA	1.61	NA	1.66	NA	1.43	NA	1.72
Dissolved Oxygen	NA	0.47	NA	1.50	NA	2.66	NA	1.19	NA	0.75	NA	1.47	NA	1.61	NA	2.26	NA	2.66	NA	2.07	NA	1.26	NA	3.06	NA	0.58
ORP	NA	-118.1	NA	-109.2	NA	-93.7	NA	-109.8	NA	-149.0	NA	-40.8	NA	-87.7	NA	-78.3	NA	-68.0	NA	-78.6	NA	-72.3	NA	-92.4	NA	-88.1

Sample: MW-07	11/8/2017		3/6/2018		5/18/2018		8/10/2018		10/29/2018		2/25/2019		5/1/2019		8/27/2019		11/12/2019		2/25/2020		4/27/2020		8/11/2020		12/9/2020		2/23/2021		5/10/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.17	0.001	0.073	0.001	0.16 V	0.001	0.17 V	0.001	0.2	0.001	0.14	0.001	0.21	0.001	0.17	0.001	0.16	0.001	0.11	0.001	0.2	0.001	0.15	0.001	0.13	0.001	0.12	0.001	0.14
Barium	0.0025	0.49	0.0025	0.33	0.0025	0.5	0.0025	0.48	0.0025	0.5	0.0025	0.51	0.0025	0.45	0.0025	0.48	0.0025	0.44	0.0025	0.47	0.0025	0.49	0.0025	0.52	0.0025	0.49	0.0025	0.46	0.0025	0.47
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.05	0.29	0.05	0.56	0.1	0.37	0.05	0.33	0.05	0.31	0.05	0.33	0.1	0.58	0.05	0.38	0.05	0.58	0.05	0.53	0.05	0.44	0.05	0.59	0.05	0.46	0.05	0.47	0.05	0.34
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	160	10	170	10	150	10	170	10	160	10	170	10	170	10	170	10	150	10	170	10	170	10	170	10	170	10	150	10	130
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	0.0056	0.001	0.0038	0.001	0.0061	0.001	0.006	0.001	0.0056	0.001	0.0058	0.001	0.0044	0.001	0.005	0.001	0.0043	0.001	0.0052	0.001	0.0052	0.001	0.0044	0.001	0.0056	0.001	0.0051	0.001	0.0054
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND F1	0.005	0.0053
Fluoride	0.1	0.41	0.1	0.46	0.1	0.41	0.1	0.39	0.1	0.42	0.1	0.41	0.1	0.45	0.1	0.37	0.1	0.44	0.1	0.44	0.1	0.44	0.1	0.31	0.1	0.5	0.1	0.48	0.1	0.46 H
Iron	0.1	16	0.1	5.5	0.1	15	0.1	15	0.1	19	0.1	11	0.1	13	0.1	19	0.1	10	0.1	14	0.1	11	0.1	20	0.1	15	0.1	12	0.1	11
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.0012	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00054	0.0005	ND
Manganese	0.013	8.5	0.0025	3.9	0.005	6.6	0.013	7.7	0.013	8.6	0.0025	4.9	0.005	5.9	0.013	7.5	0.013	5.3	0.013	11	0.013	5.1	0.013	7.3	0.013	5.2	0.0025	4.9	0.013	5.5
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	0.0058	0.002	0.0047	0.002	0.006	0.002	0.0059	0.002	0.0053	0.002	0.0073	0.002	0.0055	0.002	0.0053	0.002	0.0054	0.002	0.0068	0.002	0.0064	0.002	0.005	0.002	0.0064	0.002	0.0061	0.002	0.0055
Nitrogen/Nitrate	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND H
Nitrogen/Nitrate, Nitr	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	0.0026	0.0025	0.0029	0.0025	ND	0.0025	ND	0.0025	0.0041	0.0025	0.0077	0.0025	ND	0.0025	0.0094	0.0025	ND	0.0025	0.011	0.0025	0.0063	0.0025	ND	0.0025	0.0035	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	5	32	50	120	20	62	10	26	10	34	2	49	5	48	5	18	5	87	5	64	5	30	25	57	15	52	10	82	10	59
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	1200	10	1100	10	1300	10	1200	10	1300	10	1100	10	1100	10	1100	10	1100	10	1100	10	1100	60	1100	10	1000	10	1000	10	970
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	0.0015	0.0025	0.002	0.0025	0.00077	0.0025	0.0011	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	6.63	NA	7.01	NA	6.74	NA	6.83	NA	7.13	NA	6.61	NA	6.58	NA	6.68	NA	7.32	NA	6.64	NA	6.58	NA	6.55	NA	6.51	NA	6.76	NA	6.76
Temperature	NA	15.76	NA	9.19	NA	17.83	NA	21.77	NA	17.67	NA	16.20	NA	16.50	NA	18.80	NA	15.85	NA	15.50	NA	15.90	NA	16.20	NA	15.20	NA	14.80	NA	15.50
Conductivity	NA	1.59	NA	1.13	NA	1.52	NA	1.70	NA	1.67	NA	1.96	NA	1.26	NA	2.05	NA	1.77	NA	0.42	NA	1.69	NA	0.82	NA	0.23	NA	1.64	NA	1.91
Dissolved Oxygen	NA	4.41	NA	5.01	NA	7.09	NA	7.47	NA	3.48	NA	0.00	NA	0.25	NA	0.67	NA	0.55	NA	0.20	NA	0.31	NA	5.14	NA	0.29	NA	0.41	NA	0.23
ORP	NA	-69.3	NA	-33.4	NA	-61.4	NA	-45.4	NA	-41.0	NA	-103.7	NA	-127.6	NA	-102.7	NA	-113.0	NA	-162.0	NA	-153.6	NA	127.3	NA	-119.8	NA	-126.9	NA	-97.5

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm[c] millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-08	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/30/2013		7/31/2013		10/23/2013		3/3/2014		5/28/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.0052	0.001	0.0039	0.001	0.0044	0.001	0.0036	0.001	0.0052	0.001	0.0038	0.001	0.004	0.001	0.0041	0.0050	0.0062	0.001	0.005	0.0010	0.0036	0.0010	0.0041	0.0010	0.0037	0.0010	0.0030	0.0010	ND
Barium	2.0	NP	0.11	0.001	0.12	0.001	0.11	0.001	0.11	0.001	0.13	0.001	0.14	0.001	0.14	0.001	0.14	0.040	0.16	0.001	0.14	0.0025	0.14	0.0025	0.13	0.0025	0.13	0.0025	0.11	0.0025	0.11
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.93	0.01	0.72	0.012	0.64	0.01	0.82	0.01	0.82	0.01	0.57	0.01	0.57	0.01	1	0.40	0.93	0.01	1.1	0.050	0.91	0.050	1.2	0.050	0.93	0.050	0.83	0.050	0.44
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	180	50	210	50	140	50	210	50	190	50	170	50	200	50	210	50	220	50	200	10	230	10	220	10	260	10	230	10	340
Chromium	0.1	NP	0.0059	0.004	0.0081	0.004	0.0059	0.004	0.0084	0.004	0.0053	0.004	ND	0.004	0.0056	0.004	0.0066	0.0030	0.012	0.004	0.0046	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	0.0036	0.003	0.0037	0.003	0.01	0.003	ND	0.003	ND	0.003	0.0032	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.77	0.25	0.76	0.25	0.81	0.25	0.84	0.25	0.75	0.25	0.70	0.25	0.63	0.25	0.53	0.25	0.63	0.25	0.28	0.10	0.74	0.10	0.68	0.10	0.74	0.10	0.67	0.10	0.65
Iron	5.0	NP	0.56	0.010	2.1	0.010	1.7	0.010	0.97	0.010	0.94	0.010	2.3	0.010	1.2	0.010	1.3	0.010	2.1	0.01	6.5	0.10	2.3	0.10	6.6	0.10	1.3	0.10	0.89	0.10	0.24
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	0.15	0.001	0.27	0.001	0.29	0.001	0.18	0.001	0.2	0.001	0.27	0.001	0.2	0.001	0.2	0.0020	0.23	0.001	0.43	0.0025	0.25	0.0025	0.48	0.0025	0.16	0.0025	0.20	0.0025	0.70
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.011	0.005	0.013	0.005	0.0076	0.005	0.007	0.005	0.009	0.005	0.0054	0.005	0.0075	0.005	0.009	0.010	ND	0.005	0.0057	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NP	ND	0.02	ND	0.02	0.10	1.0	1.6	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0036	0.001	0.0013	0.001	ND	0.001	0.0031	0.001	0.0036	0.001	0.0018	0.001	0.0018	0.001	ND	0.0050	ND	0.001	0.002	0.0025	0.0029	0.0025	ND	0.0025	0.0048	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	160	50	240	50	140	50	200	50	200	50	300	50	440	50	330	50	360	50	330	100	460	100	380	100	350	100	320	100	300
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	890	17	990	17	970	17	940	17	990	17	1200	17	1200	17	1200	26	1200	26	1100	10	1300	10	1300	10	1300	10	1200	10	1400
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	8.24	NA	8.17	NA	7.66	NA	8.24	NA	7.87	NA	7.97	NA	8.20	NA	8.23	NA	8.09	NA	7.72	NA	7.81	NA	7.39	NA	8.16	NA	8.46	NA	7.72
Temperature	NA	NA	19.95	NA	18.15	NA	18.82	NA	17.95	NA	19.20	NA	19.73	NA	18.28	NA	19.15	NA	18.34	NA	17.10	NA	18.11	NA	17.58	NA	15.62	NA	11.74	NA	19.53
Conductivity	NA	NA	1.62	NA	1.67	NA	1.61	NA	1.40	NA	1.47	NA	1.57	NA	1.65	NA	1.79	NA	1.82	NA	1.78	NA	1.55	NA	1.60	NA	1.62	NA	1.29	NA	1.94
Dissolved Oxygen	NA	NA	NM	NA	0.25	NA	0.08	NA	0.05	NA	0.03	NA	0.03	NA	0.06	NA	0.09	NA	0.64	NA	0.33	NA	0.32	NA	0.16	NA	0.25	NA	1.19	NA	0.59
ORP	NA	NA	NM	NA	-190.8	NA	-181.5	NA	-271	NA	-238	NA	-222	NA	-228	NA	-231	NA	-210	NA	-183.8	NA	-225.9	NA	-182	NA	-225	NA	140.2	NA	-65.2

Sample: MW-08	8/27/2014		10/28/2014		2/26/2015		5/11/2015		8/18/2015		11/18/2015		2/25/2016		5/18/2016		8/17/2016		11/15/2016		2/16/2017		5/2/2017		8/29/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	ND
Arsenic	0.0010	0.0025	0.0010	0.0022	0.0010	0.0026	0.0010	0.0024	0.0010	0.0024	0.0010	0.0021	0.0010	0.0015	0.0010	0.0028	0.0010	0.0016	0.0010	ND	0.0010	ND ^	0.0010	0.0025	0.001	ND
Barium	0.0025	0.13	0.0025	0.13	0.0025	0.12	0.0025	0.10	0.0025	0.092	0.0025	0.14	0.0025	0.093	0.0025	0.17	0.0025	0.12	0.0025	0.068	0.0025	0.071	0.0025	0.12	0.0025	0.062
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND
Boron	0.050	0.80	0.050	0.72	0.050	0.81	0.050	0.74	0.050	1.5	0.050	1.4	0.25	1.8	0.050	1.4	0.050	0.86	0.25	1.2	0.050	0.87	0.050	0.68	0.25	1.4
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Chloride	50	380 ^	10	340	10	260	10	270	10	250	10	160	10	190	10	130	10	260	10	300	10	360	10	300	50	380
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.001	ND
Copper	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND
Fluoride	0.10	0.73	0.10	0.71	0.10	0.63	0.10	0.66	0.10	0.34	0.10	0.44	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.36	0.10	0.32	0.10	0.34	0.1	0.48
Iron	0.10	0.62	0.10	0.53	0.10	0.17	0.10	0.12	0.10	0.85	0.10	0.89	0.10	0.23	0.10	1.7	0.10	1.5	0.10	ND	0.10	0.26	0.10	2.4	0.1	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Manganese	0.0025	0.17	0.0025	0.13	0.0025	0.11	0.0025	0.11	0.0025	0.78	0.0025	0.21	0.0025	0.23	0.0025	0.23	0.0025	0.28	0.0025	0.38	0.0025	0.43	0.0025	0.58	0.0025	0.3
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	0.00025
Nickel	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0040	0.0020	ND	0.0020	0.0038	0.0020	ND	0.0020	ND	0.0020	0.0024	0.0020	0.0026	0.0020	ND	0.002	0.0032
Nitrogen/Nitrate	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.19	0.10	ND	0.10	ND	0.10	0.44	0.10	ND	0.10	ND	0.1	1.3
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.19	0.10	ND	0.10	ND	0.10	0.44	0.10	ND	0.10	ND	0.1	1.3
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	0.034
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Sulfate	50	240	50	290	50	160	50	160	50	310	100	530	50	250	100	290	100	360	50	290	50	300	100	350	50	310
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Total Dissolved Soli	10	1400	10	1200	10	1100	10	1100	10	1200	10	1200	10	1100	10	1200	10	1400	10	1300	10	1400	10	1300	10	1500
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND ^
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00081	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	0.0040	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00281	0.0025	0.00068	0.0025	0.0015	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	8.12	NA	7.89	NA	8.62	NA	7.90	NA	7.36	NA	7.61	NA	7.00	NA	7.67	NA	7.33	NA	6.90	NA	7.00	NA	7.30	NA	7.29
Temperature	NA	19.84	NA	16.22	NA	6.86	NA	15.81	NA	19.60	NA	14.72	NA	10.91	NA	19.30	NA	22.16	NA	16.05	NA	14.27	NA	14.28	NA	15.50
Conductivity	NA	1.95	NA	1.99	NA	1.19	NA	1.55	NA	1.86	NA	1.56	NA	1.32	NA	1.55	NA	1.80	NA	2.01	NA	1.89	NA	1.63	NA	1.81
Dissolved Oxygen	NA	0.51	NA	0.66	NA	1.22	NA	2.97	NA	1.03	NA	0.72	NA	1.09	NA	0.41	NA	2.22	NA	1.36	NA	2.26	NA	1.71	NA	1.89
ORP	NA	-148.4	NA	-62.6	NA	-154.2	NA	-97.9	NA	-81.8	NA	-30.2	NA	-46.8	NA	-139.2	NA	-96.6	NA	-24.8	NA	-41.8	NA	-110.0	NA	37.2

Sample: MW-08	11/8/2017		3/7/2018		5/17/2018		8/8/2018		10/31/2018		2/25/2019		5/1/2019		8/27/2019		11/13/2019		2/25/2020		5/19/2020		8/11/2020		12/9/2020		2/23/2021		5/11/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.0016	0.001	0.0038	0.001	ND	0.001	ND	0.001	ND	0.001	0.0014	0.001	0.0023	0.001	ND	0.001	0.0017	0.001	0.0011	0.001	0.0027	0.001	ND	0.001	0.0016	0.001	0.0015	0.001	0.0014
Barium	0.0025	0.11	0.0025	0.088	0.0025	0.055	0.0025	0.062	0.0025	0.06	0.0025	0.064	0.0025	0.066	0.0025	0.11	0.0025	0.072	0.0025	0.08	0.0025	0.096	0.0025	0.1	0.0025	0.12	0.0025	0.1	0.0025	0.09
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.05	0.52	0.1	0.63	0.05	0.84	0.05	0.89	0.05	0.69	0.05	0.67	0.05	0.6	0.25	1.2	0.5	0.99	0.5	0.82	0.05	0.62	0.25	0.96	0.05	0.72	0.05	0.58	0.05	0.5
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	280	10	250	10	180	10	250	10	220	10	100	2	73	10	100	10	80	10	78	10	130	10	220	10	200	10	130	10	100
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	0.1	0.43	0.1	0.46	0.1	0.39	0.1	0.32	0.1	0.36	0.1	0.36	0.1	0.35	0.1	0.22	0.1	0.34	0.1	0.35	0.1	0.37	0.1	0.26	0.1	0.38	0.1	0.36	0.1	0.36 H
Iron	0.1	0.7	0.1	0.71	0.1	0.2	0.1	0.33	0.1	0.2	0.1	0.44	0.1	1.4	0.1	0.61	0.1	1.6	0.1	2.5	0.1	3.5 ^	0.1	2.5	0.1	4	0.1	4.6	0.1	3.3
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.33	0.0025	0.35	0.0025	0.16	0.0025	0.3	0.0025	0.43	0.0025	0.32	0.0025	0.35	0.0025	0.5	0.0025	0.73	0.0025	0.77	0.0025	0.65	0.0025	0.65	0.0025	0.68	0.0025	0.74	0.0025	0.52
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	ND	0.002	ND	0.002	ND	0.002	0.0022	0.002	ND	0.002	ND	0.002	ND	0.002	0.0026	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.1	ND	0.1	0.14	0.1	0.17	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.12	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nitr	0.1	ND	0.1	0.14	0.1	0.17	0.1	ND	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.12	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0053	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	240	50	250	50	230	50	140	50	130	130	130	5	88	20	280	5	110	5	59	25	86 H	25	110	15	88	25	69	15	110
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	1100	10	1100	10	1100	10	1100	10	1000	10	780	10	640	10	950	10	700	10	610	10	680	60	880	10	740	10	630	10	660
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.0021	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	0.0013	0.0025	0.0017	0.0025	0.0013	0.0025	0.016	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.27	NA	7.17	NA	6.79	NA	6.93	NA	7.38	NA	7.13	NA	7.60	NA	6.92	NA	7.66	NA	7.43	NA	7.40	NA	7.09	NA	7.40	NA	7.70	NA	7.64
Temperature	NA	14.04	NA	8.99	NA	18.33	NA	18.22	NA	12.40	NA	13.30	NA	14.30	NA	15.00	NA	13.04	NA	14.10	NA	13.80	NA	14.40	NA	14.60	NA	14.30	NA	14.10
Conductivity	NA	1.47	NA	1.22	NA	1.36	NA	1.59	NA	1.22	NA	1.42	NA	0.70	NA	1.57	NA	1.14	NA	0.34	NA	0.23	NA	0.72	NA	1.37	NA	0.98	NA	1.15
Dissolved Oxygen	NA	1.83	NA	1.28	NA	3.53	NA	4.71	NA	2.59	NA	0.06	NA	0.13	NA	0.31	NA	0.45	NA	0.16	NA	0.24	NA	2.16	NA	0.12	NA	0.56	NA	0.12
ORP	NA	-81.1	NA	-92.1	NA	-36.6	NA	-103.2	NA	-35.5	NA	-38.6	NA	-176.8	NA	-19.3	NA	-90.5	NA	-191.8	NA	-231.6	NA	-57.9	NA	-194.7	NA	-178.0	NA	-174.6

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm[c] millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-09	Date	12/16/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/30/2013		7/30/2013		10/22/2013		3/3/2014		5/29/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	ND	0.001	0.0018	0.001	0.0017	0.001	ND	0.001	0.0012	0.001	ND	0.001	0.0017	0.001	ND	0.0050	ND	0.001	0.0013	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0021	0.0010	ND
Barium	2.0	NP	0.038	0.001	0.042	0.001	0.038	0.001	0.03	0.001	0.038	0.001	0.035	0.001	0.038	0.001	0.038	0.040	0.062	0.001	0.049	0.0025	0.042	0.0025	0.050	0.0025	0.048	0.0025	0.064	0.0025	0.044
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	2.1	0.01	1.9	0.012	1.9	0.01	2.5	0.01	2.7	0.01	2.6	0.01	2.6	0.01	2.9	1.0	3.2	0.01	4.3	0.050	3.2	0.050	2.5	0.050	1.6	0.050	1.7	0.25	2.5
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	25	10	28	10	28	10	30	25	30	10	30	10	27	10	28	10	31	10	27	2.0	29	2.0	33	2.0	42	2.0	25	2.0	34
Chromium	0.1	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.0030	0.01	0.004	0.0046	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND
Cobalt	1.0	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0032	0.0010	ND
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	ND	0.25	0.31	0.25	0.34	0.25	0.25	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	0.3	0.25	ND	0.10	0.21	0.10	0.18	0.10	0.17	0.10	0.16	0.10	0.20
Iron	5.0	NP	ND	0.010	0.066	0.010	ND	0.010	ND	0.010	ND	0.010	0.014	0.010	ND	0.010	ND	0.010	ND	0.01	0.024	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00051	0.00050	ND
Manganese	0.15	NP	0.23	0.001	0.45	0.001	0.48	0.001	0.14	0.001	0.28	0.001	0.22	0.001	0.34	0.001	0.11	0.0020	0.1	0.001	0.19	0.0025	0.053	0.0025	0.038	0.0025	0.019	0.0025	0.84	0.0025	0.36
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.01	0.005	0.0093	0.005	0.0063	0.005	0.0065	0.005	0.0088	0.005	ND	0.005	ND	0.005	0.0067	0.010	ND	0.005	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0045	0.0020	ND
Nitrogen/Nitrate	10.0	NP	2.9	0.20	5.6	0.20	5.6	0.20	3.7	0.50	2.6	0.20	5.0	0.20	2.8	0.20	6.3	0.20	10	0.2	12	0.10	11	0.10	7.9	0.10	4.6	0.10	3.2	0.10	11
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1.0	11	0.50	7.9	0.50	4.6	0.50	3.2	2.5	11
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0024	0.001	0.0072	0.001	0.0017	0.001	0.0043	0.001	0.0041	0.001	0.0072	0.001	0.0047	0.001	0.0044	0.0050	0.009	0.001	0.015	0.0025	0.016	0.0025	0.014	0.0025	0.0047	0.0025	0.0030	0.0025	0.0074
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	110	25	110	25	110	25	130	25	110	25	120	50	130	25	120	25	130	50	140	50	140	25	130	25	90	25	110	50	110
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	500	17	510	17	540	17	500	17	520	17	530	17	520	17	580	26	560	26	520	10	600	10	610	10	430	10	560	10	540
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.22	NA	7.34	NA	7.10	NA	7.32	NA	6.31	NA	7.28	NA	7.30	NA	7.18	NA	7.10	NA	8.00	NA	7.21	NA	6.63	NA	7.19	NA	7.53	NA	6.99
Temperature	NA	NA	14.61	NA	13.19	NA	14.51	NA	14.08	NA	14.56	NA	18.11	NA	15.72	NA	16.55	NA	13.91	NA	16.40	NA	17.38	NA	14.49	NA	14.68	NA	11.20	NA	19.42
Conductivity	NA	NA	0.91	NA	0.85	NA	0.84	NA	0.66	NA	0.66	NA	0.73	NA	0.67	NA	0.72	NA	0.77	NA	0.82	NA	0.72	NA	0.76	NA	0.66	NA	0.66	NA	0.78
Dissolved Oxygen	NA	NA	NM	NA	0.27	NA	0.49	NA	0.16	NA	0.08	NA	0.07	NA	0.11	NA	0.56	NA	1.10	NA	0.87	NA	0.64	NA	0.29	NA	1.01	NA	1.27	NA	2.11
ORP	NA	NA	NM	NA	21.2	NA	148.2	NA	-268	NA	20	NA	68	NA	47	NA	168	NA	210	NA	77.2	NA	-68.3	NA	117.2	NA	-159.8	NA	316.1	NA	41.5

Sample: MW-09	8/26/2014		10/30/2014		2/24/2015		5/12/2015		8/19/2015		11/18/2015		2/25/2016		5/19/2016		8/17/2016		11/17/2016		2/15/2017		5/3/2017		8/25/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.003	0.0037
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	0.0043
Barium	0.0025	0.039	0.0025	0.047	0.0025	0.043	0.0025	0.026	0.0025	0.034	0.0025	0.023	0.0025	0.034	0.0025	0.030	0.0025	0.036	0.0025	0.037	0.0025	0.038	0.0025	0.035	0.0025	0.046
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0050	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND	0.001	ND
Boron	0.050	2.4	0.050	1.6	0.050	3.0	0.050	3.2	0.25	3.3	0.050	2.2	0.25	2.3	0.050	1.5	0.050	2.7	0.50	3.8	0.050	3.0	0.050	3.4	0.5	3.8
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Chloride	2.0	33	2.0	32	2.0	34	2.0	37	2.0	36	2.0	30	2.0	35	2.0	36	2.0	41	2.0	38	2.0	38	2.0	37	2	37
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.001	ND
Copper	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.01	ND
Fluoride	0.10	0.19	0.10	0.15	0.10	0.18	0.10	0.16	0.10	0.14	0.10	0.19	0.10	0.20	0.10	0.16	0.10	0.15	0.10	0.15	0.10	0.14	0.10	0.13	0.1	0.14
Iron	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.1	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Manganese	0.0025	0.031	0.0025	0.022	0.0025	0.024	0.0025	0.086	0.0025	0.020	0.0025	0.076	0.0025	0.084	0.0025	0.079	0.0025	0.11	0.0025	0.10	0.0025	0.088	0.0025	0.12	0.0025	0.21
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	ND
Nickel	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Nitrogen/Nitrate	0.10	1.6	0.10	5.9	0.10	13	0.10	9.3	0.10	11	0.10	0.74	0.10	1.0	0.10	5.9	0.10	5.7	0.10	4.4	0.10	5.2	0.10	9.9	0.1	5.7
Nitrogen/Nitrate, Nitr	0.10	1.6	0.50	5.9	1.0	13	1.0	9.3	2.0	11	0.10	0.74	0.10	1.0	0.50	5.9	0.50	5.7	0.50	4.4	0.50	5.2	1.0	9.9	0.5	5.7
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.02	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.004	ND
Selenium	0.0025	0.0061	0.0025	0.0084	0.0025	0.0091	0.0025	0.014	0.0025	0.010	0.0025	0.0028	0.0025	ND	0.0025	0.0047	0.0025	0.0034	0.0025	0.0035	0.0025	0.0063	0.0025	0.011	0.0025	0.0053
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
Sulfate	25	100	50	160	25	130	50	140	50	160	25	130	25	140	25	100	50	130	50	140	50	120	50	180	50	160
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.002	ND
Total Dissolved Soli	10	490	10	630	10	570	10	620	10	670	10	410	10	480	10	490	10	760	10	600	10	590	10	690	10	600
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00089	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00379	0.0025	0.00063	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.09	NA	7.29	NA	7.53	NA	7.44	NA	7.35	NA	7.15	NA	7.34	NA	7.30	NA	7.32	NA	7.37	NA	6.94	NA	7.48	NA	7.30
Temperature	NA	20.80	NA	12.73	NA	11.65	NA	14.26	NA	18.58	NA	16.51	NA	10.02	NA	20.82	NA	22.91	NA	17.20	NA	9.91	NA	13.52	NA	14.20
Conductivity	NA	0.79	NA	1.05	NA	0.67	NA	0.79	NA	0.88	NA	0.67	NA	0.55	NA	0.76	NA	0.85	NA	0.70	NA	0.65	NA	0.70	NA	0.76
Dissolved Oxygen	NA	0.80	NA	1.52	NA	1.37	NA	2.20	NA	0.68	NA	1.42	NA	1.47	NA	4.29	NA	2.87	NA	4.07	NA	2.52	NA	3.10	NA	0.17
ORP	NA	22.3	NA	16.3	NA	25.0	NA	35.5	NA	-22.6	NA	72.9	NA	-37.1	NA	-54.3	NA	-76.3	NA	-40.5	NA	69.1	NA	-74.4	NA	127.0

Sample: MW-09	11/8/2017		3/7/2018		5/16/2018		8/8/2018		11/1/2018		2/27/2019		5/1/2019		8/28/2019		11/14/2019		2/25/2020		4/29/2020		8/12/2020		12/8/2020		2/24/2021		5/13/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.047	0.0025	0.055	0.0025	0.04	0.0025	0.038	0.0025	0.042	0.0025	0.051	0.0025	0.039	0.0025	0.04	0.0025	0.044	0.0025	0.03	0.0025	0.033	0.0025	0.034	0.0025	0.037	0.0025	0.032	0.0025	0.03
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND
Boron	0.05	3.4	1	4.1	1	4.1	1	4.4	0.5	5.2	0.05	4.5	1	4.8	0.5	3.8	0.5	2.4	0.5	2.4	0.05	2.1	0.5	1.8	0.25	2.2	0.25	2.2	0.25	1.9
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2	38	2	37	2	37	2	36	2	39	2	37	2	39	2	36	2	32	2	38	2	35	2	34	2	33	2	32	2	32
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND *	0.005	ND	0.005	ND
Fluoride	0.1	0.13	0.1	0.16	0.1	0.15	0.1	0.14	0.1	0.16	0.1	0.16	0.1	0.17	0.1	0.14	0.1	0.18	0.1	0.2	0.1	0.19	0.1	0.17	0.1	0.23	0.1	0.2	0.1	0.18
Iron	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.16	0.0025	0.084	0.0025	0.085	0.0025	0.075	0.0025	0.077	0.0025	0.19	0.0025	0.077	0.0025	0.077	0.0025	0.1	0.0025	0.1	0.0025	0.11	0.0025	0.08	0.0025	0.069	0.0025	0.096	0.0025	0.083
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.1	2.1	0.1	6.6	0.1	10	0.1	10	0.1	2.9	0.1	2.4	0.1	6.2	0.1	4.2	0.1	2.1	0.1	ND	0.1	1.7	0.1	5.9	0.1	0.83	0.1	1	0.1	2.1
Nitrogen/Nitrate, Nitr	0.2	2.1	0.5	6.6	1	10	1	10	0.2	2.9	0.5	2.4	0.5	6.2	0.5	4.2	0.5	2.1	0.5	ND	0.1	1.7	1	5.9	0.5	0.83	0.1	1	0.2	2.1
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	0.0035	0.0025	0.0069	0.0025	0.0086	0.0025	0.0026	0.0025	0.0028	0.0025	0.005	0.0025	0.0027	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	170	50	200	50	210	50	150	50	130	10	180	10	190	5	150	5	88	5	87	5	130 ^	25	120	15	64	25	80	25	120
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	620	10	690	10	780	10	640	10	700	10	630	10	630	10	610	10	500	10	400	10	520	30	480	10	220	10	360	10	370
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00069	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	0.0012	0.0025	ND	0.0025	0.01689	0.0025	0.00329	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	6.92	NA	6.95	NA	7.83	NA	7.31	NA	7.09	NA	7.13	NA	7.11	NA	7.34	NA	7.49	NA	7.23	NA	7.19	NA	7.22	NA	7.29	NA	7.35	NA	7.33
Temperature	NA	14.50	NA	10.71	NA	16.88	NA	19.90	NA	13.00	NA	14.80	NA	14.80	NA	13.70	NA	14.87	NA	15.10	NA	13.20	NA	12.50	NA	15.60	NA	14.50	NA	13.20
Conductivity	NA	0.77	NA	0.65	NA	0.74	NA	0.83	NA	0.75	NA	1.03	NA	0.64	NA	0.96	NA	0.79	NA	0.67	NA	0.72	NA	0.47	NA	0.24	NA	0.62	NA	0.79
Dissolved Oxygen	NA	2.43	NA	1.91	NA	2.48	NA	5.67	NA	2.21	NA	0.05	NA	0.23	NA	0.34	NA	5.80	NA	0.35	NA	0.24	NA	3.26	NA	0.53	NA	0.42	NA	0.10
ORP	NA	-51.7	NA	-43.0	NA	-20.5	NA	-73.1	NA	16.0	NA	22.5	NA	10.6	NA	38.5	NA	-36.5	NA	0.2	NA	-12.6	NA	112.4	NA	88.3	NA	4.7	NA	61.9

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm[c] millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-10	Date	12/15/2010		3/25/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/29/2013		7/31/2013		10/23/2013		3/6/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	ND	0.001	ND	0.001	0.0015	0.001	ND	0.001	ND	0.001	ND	0.001	0.0015	0.001	0.0014	0.0050	ND	0.001	0.001	0.0010	0.0012	0.0010	ND	0.0010	ND	0.0010	ND
Barium	2.0	NP	0.24	0.001	0.28	0.001	0.36	0.001	0.25	0.001	0.26	0.001	0.26	0.001	0.27	0.001	0.23	0.040	0.24	0.001	0.22	0.0025	0.30	0.0025	0.18	0.0025	0.23	0.0025	0.31
Beryllium	0.004	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	0.48	0.01	0.48	0.012	0.52	0.01	0.42	0.01	0.57	0.01	0.54	0.01	0.54	0.01	0.42	0.40	0.46	0.01	0.64	0.050	0.98	0.050	1.9	0.050	0.61	0.050	2.1
Cadmium	0.005	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	40	10	43	10	43	10	49	10	42	10	45	10	46	10	45	10	45	10	37	2.0	41	2.0	40	2.0	54	2.0	40
Chromium	0.1	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.0030	0.0048	0.004	0.0064	0.0050	0.0061	0.0050	ND	0.0050	ND	0.0050	ND^
Cobalt	1.0	NP	0.0026	0.002	0.0027	0.002	0.0039	0.002	0.0025	0.002	0.0026	0.002	0.0024	0.002	0.0029	0.002	0.0029	0.0030	ND	0.002	0.0021	0.0010	0.012	0.0010	0.0019	0.0010	0.0025	0.0010	0.0037
Copper	0.65	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	0.0041	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	0.028	0.0020	ND	0.0020	ND	0.0020	0.0020^
Cyanide	0.2	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	ND	0.25	0.30	0.25	0.36	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	ND	0.25	0.28	0.25	ND	0.10	0.18	0.10	0.18	0.10	0.17	0.10	0.20
Iron	5.0	NP	ND	0.010	ND	0.010	0.044	0.010	ND	0.010	ND	0.010	ND	0.010	0.015	0.010	0.012	0.010	0.016	0.01	ND	0.10	2.7	0.10	ND	0.10	0.18	0.10	0.19
Lead	0.0075	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	0.012	0.00050	ND	0.00050	ND	0.00050	0.00080
Manganese	0.15	NP	2.1	0.001	2.8	0.001	3.8	0.001	2.3	0.001	2.3	0.001	2.3	0.001	2.6	0.001	2.5	0.040	2.2	0.001	1.9	0.0025	3.2	0.0025	1.5	0.0025	2.0	0.0025	3.1
Mercury	0.002	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.015	0.005	0.016	0.005	0.015	0.005	0.01	0.005	0.013	0.005	0.0091	0.005	0.0093	0.005	0.014	0.010	ND	0.005	0.0079	0.0020	0.023	0.0020	0.0037	0.0020	0.0051	0.0020	0.0073
Nitrogen/Nitrate	10.0	NP	3.0	0.20	4.0	0.20	2.1	0.20	4.5	0.20	4.9	0.20	6.0	0.20	2.9	0.20	5.2	0.20	4.8	0.2	3.3	0.10	1.9	0.10	1.5	0.10	1.2	0.10	2.0
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	1.9	0.10	1.6	0.10	1.2	0.50	2.0
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	0.056	0.020	0.034	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0042	0.001	0.0064	0.001	0.0043	0.001	0.0057	0.001	0.0065	0.001	0.0056	0.001	0.0056	0.001	0.0058	0.0050	0.0074	0.001	0.0083	0.0025	0.0043	0.0025	0.0087	0.0025	0.0080	0.0025	ND
Silver	0.05	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	62	10	64	10	67	10	64	10	72	10	76	10	63	10	58	10	59	10	69	25	92	25	150	25	90	50	160
Thallium	0.002	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	530	17	520	17	650	17	470	17	540	17	530	17	550	17	580	26	420	26	440	10	580	10	550	10	620	10	670
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	0.012	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.04	NA	7.01	NA	6.88	NA	7.04	NA	6.03	NA	7.03	NA	6.95	NA	6.96	NA	7.03	NA	8.39	NA	6.87	NA	6.85	NA	7.02	NA	7.90
Temperature	NA	NA	11.72	NA	11.98	NA	14.25	NA	11.76	NA	11.05	NA	14.51	NA	13.49	NA	12.84	NA	11.87	NA	11.60	NA	14.99	NA	13.28	NA	11.61	NA	10.63
Conductivity	NA	NA	0.99	NA	0.92	NA	1.04	NA	0.62	NA	0.65	NA	0.71	NA	0.67	NA	0.67	NA	0.60	NA	0.70	NA	0.69	NA	0.71	NA	0.70	NA	0.63
Dissolved Oxygen	NA	NA	NM	NA	0.29	NA	0.08	NA	0.02	NA	0.04	NA	0.02	NA	0.04	NA	0.10	NA	2.07	NA	0.49	NA	0.39	NA	0.19	NA	0.50	NA	1.00
ORP	NA	NA	NM	NA	106.4	NA	132.3	NA	-297	NA	23	NA	118	NA	67	NA	107	NA	60	NA	33.2	NA	63.9	NA	20.8	NA	-138.7	NA	-65.7

Sample: MW-10	5/30/2014		8/28/2014		10/30/2014		2/23/2015		5/14/2015		8/18/2015		11/18/2015		2/24/2016		5/18/2016		8/19/2016		11/16/2016		2/15/2017		5/2/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0011	0.0010	ND	0.0010	ND	0.0010	0.0012	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Barium	0.0025	0.25	0.0025	0.28	0.0025	0.13	0.0025	0.17	0.0025	0.23	0.0025	0.14	0.0025	0.17	0.0025	0.18	0.0025	0.25	0.0025	0.17	0.0025	0.17	0.0025	0.19	0.0025	0.28
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Boron	0.25	3.2	0.050	1.9	0.050	0.84	0.050	0.83	0.050	0.64	0.050	0.42	0.050	0.30	0.050	0.40	0.050	0.38	0.050	0.35	0.050	0.37	0.050	0.48	0.050	0.49
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	2.0	37	2.0	57	2.0	62	2.0	22	2.0	52	2.0	55	2.0	53	2.0	48	2.0	44	2.0	44	2.0	44	2.0	44	2.0	44
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	0.0012	0.0010	0.0034	0.0010	0.0015	0.0010	0.0019	0.0010	0.0019	0.0010	0.0013	0.0010	0.0017	0.0010	0.0020	0.0010	0.0020	0.0010	0.0018	0.0010	0.0016	0.0010	0.0018	0.0010	0.0029
Copper	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0021	0.0020	0.0022
Cyanide	0.010	ND	0.010	0.024	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.18	0.10	0.20	0.10	0.18	0.10	0.17	0.10	0.21	0.10	0.17	0.10	0.17	0.10	0.17	0.10	0.18	0.10	0.18	0.10	0.17	0.10	0.16	0.10	0.18
Iron	0.10	0.11	0.10	0.34	0.10	ND	0.10	0.22	0.10	0.34	0.10	ND	0.10	0.13	0.10	0.20	0.10	ND	0.10	0.15	0.10	ND	0.10	0.22	0.10	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00058	0.00050	ND
Manganese	0.0025	1.6	0.0025	2.1	0.0025	1.1	0.0025	1.3	0.0025	1.7	0.0025	0.94	0.0025	1.4	0.0025	1.6	0.0025	2.3	0.0025	1.4	0.0025	1.3	0.0025	1.1	0.0025	3.3
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	0.0038	0.0020	0.0046	0.0020	0.0028	0.0020	0.0045	0.0020	0.0049	0.0020	0.0024	0.0020	0.0030	0.0020	0.0046	0.0020	0.0045	0.0020	0.0034	0.0020	0.0027	0.0020	0.0043	0.0020	0.0065
Nitrogen/Nitrate	0.10	2.1	0.10	0.41	0.10	0.67	0.10	0.90	0.10	1.2	0.10	2.8	0.10	1.3	0.10	3.1	0.10	2.2	0.10	1.7	0.10	0.54	0.10	0.20	0.10	0.22
Nitrogen/Nitrate, Nitr	0.50	2.1	0.10	0.43	0.10	0.71	0.10	0.94	0.10	1.2	0.20	2.9	0.10	1.3	0.20	3.2	0.50	2.2	0.20	1.8	0.10	0.58	0.10	0.20	0.10	0.22
Nitrogen/Nitrite	0.020	0.028	0.020	0.022	0.020	0.039	0.020	0.038	0.020	0.032	0.020	0.077	0.020	ND	0.020	0.056	0.020	0.025	0.020	0.051	0.020	0.043	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	0.0073	0.0025	0.0057	0.0025	0.0048	0.0025	0.0028	0.0025	0.0050	0.0025	0.0054	0.0025	0.0033	0.0025	0.0043	0.0025	0.0048	0.0025	0.0041	0.0025	0.0032	0.0025	ND ^	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	50	140	25	110	25	95	10	46	10	50	20	64	20	110	20	88	20	67	20	59	10	62	10	43	20	44
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	630	10	590	10	550	10	530	10	530	10	550	10	500	10	540	10	580	10	600	10	480	10	470	10	640
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00055	0.0025	0.00066	0.0025	0.0011	0.0025	ND	0.0025	0.0027	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.09	NA	6.74	NA	7.16	NA	7.36	NA	7.13	NA	7.46	NA	6.74	NA	6.71	NA	6.72	NA	6.69	NA	7.02	NA	6.88	NA	6.93
Temperature	NA	18.61 *	NA	15.79	NA	11.11	NA	5.22	NA	13.91	NA	23.06	NA	13.70	NA	7.22	NA	13.24	NA	17.04	NA	18.18	NA	9.67	NA	12.94
Conductivity	NA	0.93	NA	0.83	NA	1.04	NA	0.56	NA	0.70	NA	0.86	NA	0.67	NA	0.59	NA	0.70	NA	0.68	NA	0.64	NA	0.57	NA	0.72
Dissolved Oxygen	NA	3.29	NA	0.77	NA	0.64	NA	3.45	NA	0.88	NA	2.21	NA	2.01	NA	0.99	NA	1.62	NA	2.38	NA	2.51	NA	3.56	NA	2.40
ORP	NA	-39.0	NA	-0.5	NA	-86.1	NA	20.3	NA	-4.0	NA	-56.8	NA	70.3	NA	4.2	NA	30.6	NA	-76.5	NA	-20.3	NA	-34.4	NA	-73.9

Sample: MW-10	8/24/2017		11/9/2017		3/7/2018		5/16/2018		8/8/2018		10/30/2018		2/26/2019		5/1/2019		8/27/2019		11/12/2019		2/25/2020		4/28/2020		8/11/2020		12/8/2020		2/23/2021		5/11/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	0.0035	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.0041	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0013	0.001	ND	0.001	ND	0.001	0.0011	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.19	0.0025	0.2	0.0025	0.2	0.0025	0.17	0.0025	0.19	0.0025	0.2	0.0025	0.25	0.0025	0.19	0.0025	0.16	0.0025	0.24	0.0025	0.21	0.0025	0.21	0.0025	0.2	0.0025	0.22	0.0025	0.18	0.0025	0.2
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.05	0.33	0.05	0.34	0.05	0.45	0.05	0.41	0.05	0.37	0.05	0.32	0.05	0.35	0.05	0.41	0.05	0.26	0.05	0.31	0.05	1.3	0.05	0.94	0.25	1	0.5	2.3	0.05	0.97	0.05	0.59
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2	50	2	49	2	42	2	45	2	57	2	54	2	49	2	48	2	50	2	44	2	47	2	40	2	42	2	45	4	42	10	56
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	0.0019	0.001	0.0021	0.001	0.0015	0.001	0.0015	0.001	0.0024	0.001	0.0058	0.001	0.0028	0.001	0.0017	0.001	0.0015	0.001	0.0027	0.001	0.0023	0.001	0.0018	0.001	0.0021	0.001	0.002	0.001	0.0016	0.001	0.0019
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.0061	0.002	0.0027	0.002	ND	0.002	ND	0.002	0.0026	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND *	0.005	ND	0.005	ND
Fluoride	0.1	0.18	0.1	0.17	0.1	0.21	0.1	0.19	0.1	0.19	0.1	0.2	0.1	0.22	0.1	0.22	0.1	0.19	0.1	0.24	0.1	0.21	0.1	0.23	0.1	0.19	0.1	0.26	0.1	0.25	0.1	0.21 H
Iron	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.88	0.1	1.5	0.1	0.1	0.1	ND	0.1	0.13	0.1	0.26	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.11
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.0027	0.0005	0.0015	0.0005	ND	0.0005	ND	0.0005	0.00068	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	1.5	0.0025	1.7	0.0025	2	0.0025	1.4	0.0025	1.7	0.0025	1.9	0.0025	2.6	0.0025	1.9	0.0025	1.3	0.0025	2.7	0.0025	1.9	0.0025	2	0.0025	1.9	0.0025	1.9	0.0025	1.3	0.0025	1.7
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	0.0035	0.002	0.004	0.002	0.0044	0.002	0.0031	0.002	0.0037	0.002	0.0065	0.002	0.0079	0.002	0.0042	0.002	0.0031	0.002	0.0055	0.002	0.0048	0.002	0.0041	0.002	0.0033	0.002	0.0039	0.002	0.0032	0.002	0.0031
Nitrogen/Nitrate	0.1	1.9	0.1	2.9	0.1	2.3	0.1	1.1	0.1	2	0.1	0.64	0.1	ND	0.1	1.2	0.1	2.2	0.1	1.6	0.1	4	0.1	3.6	0.1	1.5	0.1	2.6	0.1	4.2	0.1	4.7
Nitrogen/Nitrate, Nitr	0.1	1.9	0.2	2.9	0.2	2.3	0.1	1.2	0.2	2.1	0.1	0.68	0.1	ND	0.1	1.2	0.5	2.3	0.1	1.6	0.1	4.1	0.5	3.6	0.1	1.5	0.5	2.6	0.5	4.3	0.5	4.7
Nitrogen/Nitrite	0.02	0.047	0.02	0.034	0.02	ND	0.02	0.052	0.02	0.055	0.02	0.04	0.02	ND	0.02	0.036	0.02	0.053	0.02	0.02	0.02	0.061	0.02	0.046	0.02	ND	0.02	0.044	0.02	0.055	0.02	0.048
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	0.0049	0.0025	0.0034	0.0025	0.0041	0.0025	0.0051	0.0025	0.0072	0.0025	0.0031	0.0025	ND	0.0025	0.0062	0.0025	0.0056	0.0025	0.006	0.0025	0.0045	0.0025	0.0077	0.0025	0.0048	0.0025	0.0032	0.0025	0.0035	0.0025	0.005
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	10	50	20	50	25	55	25	67	20	44	20	48	2	37	5	32	5	32	5	49	5	63	5	67 ^	25	57	15	71	10	64	25	58
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	500	10	470	10	520	10	490	10	460	10	550	10	500	10	470	10	420	10	530	10	520	10	460	30	480	10	450	10	430	10	530
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	0.008	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00053	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	0.0017	0.0025	0.00098	0.0025	ND	0.0025	0.00273	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.14	NA	6.78	NA	6.71	NA	7.64	NA	7.10	NA	7.65	NA	6.77	NA	6.81	NA	7.09	NA	7.72	NA	6.82	NA	6.80	NA	6.85	NA	7.11	NA	7.08	NA	7.01
Temperature	NA	15.50	NA	11.00	NA	8.66	NA	17.00	NA	18.02	NA	16.86	NA	11.80	NA	12.60	NA	14.10	NA	12.61	NA	11.80	NA	12.30	NA	12.90	NA	12.30	NA	12.80	NA	13.00
Conductivity	NA	0.63	NA	0.58	NA	0.51	NA	0.57	NA	0.65	NA	0.64	NA	0.96	NA	0.49	NA	0.19	NA	0.84	NA	0.79	NA	0.24	NA	0.90	NA	0.19	NA	0.71	NA	0.89
Dissolved Oxygen	NA	0.19	NA	3.69	NA	2.33	NA	3.34	NA	8.49	NA	8.63	NA	0.01	NA	0.24	NA	0.48	NA	1.30	NA	0.26	NA	0.22	NA	2.35	NA	0.16	NA	0.57	NA	0.15
ORP	NA	136.7	NA	-95.1	NA	-36.1	NA	-62.9	NA	-116.4	NA	-62.8	NA	118.0	NA	7.2	NA	10.1	NA	-37.0	NA	-14.5	NA	8.6	NA	26.1	NA	33.9	NA	22.4	NA	137.2

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-11	Date	12/16/2010		2/15/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/30/2013		7/30/2013		10/22/2013		3/4/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.0021	NP	0.0025	0.001	0.0019	0.001	0.0016	0.001	0.0019	0.001	0.0021	0.001	0.0032	0.001	0.0038	0.0050	0.03	0.001	0.045	0.0010	0.028	0.0010	0.038	0.0010	0.038	0.0010	0.057
Barium	2.0	NP	0.17	NP	0.11	0.001	0.18	0.001	0.11	0.001	0.11	0.001	0.13	0.001	0.17	0.001	0.22	0.20	ND	0.001	0.2	0.0025	0.15	0.0025	0.19	0.0025	0.18	0.0025	0.22
Beryllium	0.004	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	1.6	NP	1.8	0.012	1.6	0.01	1.5	0.01	1.8	0.01	2.3	0.01	1.9	0.01	2.6	2.0	ND	0.01	1.4	0.050	1.3	0.050	1.5	0.050	1.2	0.050	1.1
Cadmium	0.005	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	70	NP	66	50	120	25	53	50	87	10	54	25	150	10	52	50	83	10	84	10	79	10	110	10	79	2.0	67
Chromium	0.1	NP	ND	NP	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	0.0051	0.004	ND	0.0030	0.015	0.004	0.0099	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	1.0	NP	0.0028	NP	0.0041	0.002	0.0024	0.002	ND	0.002	ND	0.002	0.0024	0.002	0.0039	0.002	0.0049	0.0030	0.0041	0.002	0.0028	0.0010	0.0020	0.0010	0.0023	0.0010	0.0025	0.0010	ND
Copper	0.65	NP	0.0032	NP	0.0032	0.003	0.0043	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	0.0049	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.2	NP	ND	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.53	NP	0.56	0.25	0.67	0.25	0.58	0.25	0.44	0.25	0.42	0.25	0.32	0.25	0.56	0.25	0.64	0.25	0.43	0.10	0.79	0.10	0.80	0.10	0.75	0.10	0.64
Iron	5.0	NP	0.44	NP	0.01	0.010	0.029	0.010	0.018	0.010	ND	0.010	ND	0.010	0.056	0.010	2.0	0.010	0.7	0.01	2.4	0.10	3.1	0.10	3.9	0.10	3.3	0.10	5.8
Lead	0.0075	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0023	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	3.2	NP	3.6	0.001	2.9	0.001	2.2	0.001	2.5	0.001	2.9	0.001	3.7	0.001	4.7	0.20	12	0.001	11	0.025	7.5	0.0025	8.0	0.0025	7.3	0.013	7.9
Mercury	0.002	NP	ND	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.019	NP	0.016	0.005	0.013	0.005	0.011	0.005	0.013	0.005	0.011	0.005	0.013	0.005	0.017	0.010	ND	0.005	0.0088	0.0020	0.0026	0.0020	0.0033	0.0020	0.0036	0.0020	0.0024
Nitrogen/Nitrate	10.0	NP	0.41	NP	0.17	0.02	0.04	0.02	0.74	0.02	1.5	0.02	0.39	0.02	ND	0.20	4.6	0.02	0.39	0.02	0.33	0.10	1.1	0.10	ND	0.10	0.18	0.10	0.34
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	1.1	0.10	ND	0.10	0.18	0.10	0.34
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0026	NP	0.0015	0.001	0.0018	0.001	0.004	0.001	0.0031	0.001	0.0039	0.001	0.0039	0.001	0.004	0.0050	ND	0.001	0.0014	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	170	NP	160	50	210	25	140	50	160	50	130	100	320	25	170	50	200	50	150	50	240	50	280	50	180	50	210
Thallium	0.002	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	740	NP	710	17	930	17	620	17	730	17	740	17	1000	17	760	26	970	26	840	10	850	10	980	10	770	10	760
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	0.012	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.0073	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.88	NA	7.13	NA	7.02	NA	7.31	NA	6.48	NA	7.32	NA	7.15	NA	7.30	NA	7.28	NA	8.27	NA	6.99	NA	7.08	NA	7.23	NA	8.00
Temperature	NA	NA	12.61	NA	13.66	NA	17.58	NA	14.67	NA	13.85	NA	16.31	NA	15.74	NA	17.90	NA	13.95	NA	14.20	NA	17.00	NA	16.66	NA	13.33	NA	9.77
Conductivity	NA	NA	1.27	NA	1.14	NA	1.44	NA	0.85	NA	0.89	NA	0.98	NA	1.26	NA	0.96	NA	1.22	NA	1.30	NA	1.19	NA	1.22	NA	1.10	NA	0.92
Dissolved Oxygen	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	3.73	NA	5.16	NA	2.54	NA	3.55	NA	0.28	NA	0.20	NA	0.76	NA	2.38
ORP	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	0.47	NA	43	NA	-60	NA	-113.2	NA	-147.5	NA	-144.2	NA	-141.3	NA	-108.3

Sample: MW-11	5/29/2014		8/26/2014		10/28/2014		2/24/2015		5/12/2015		8/19/2015		11/19/2015		2/26/2016		5/20/2016		8/17/2016		11/17/2016		2/16/2017		5/3/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	0.036	0.0010	0.068	0.0010	0.045	0.0010	0.022	0.0010	0.052	0.0010	0.027	0.0010	0.015	0.0010	0.0097	0.0010	0.011	0.0010	0.015	0.0010	0.0071	0.0010	0.0077	0.0010	0.0065
Barium	0.0025	0.16	0.0025	0.21	0.0025	0.19	0.0025	0.16	0.0025	0.16	0.0025	0.15	0.0025	0.15	0.0025	0.17	0.0025	0.21	0.0025	0.14	0.0025	0.19	0.0025	0.17	0.0025	0.21
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Boron	0.25	1.4	0.050	0.97	0.050	0.89	0.050	1.7	0.050	1.3	0.050	2.0	0.050	1.5	0.25	1.8	0.050	1.2	0.050	1.1	0.25	1.0	0.050	1.3	0.050	1.1
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	2.0	70	10	120	10	91	2.0	66	2.0	65	2.0	60	2.0	60	10	120	10	130	10	83	10	130	10	120	10	160
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	0.0017	0.0010	0.0017	0.0010	0.0017	0.0010	0.0023	0.0010	0.0017	0.0010	0.0021	0.0010	0.0021	0.0010	0.0020	0.0010	0.0020	0.0010	0.0018	0.0010	0.0024	0.0010	0.0021	0.0010	0.0024
Copper	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.64	0.10	0.71	0.10	0.71	0.10	0.66	0.10	0.79	0.10	0.61	0.10	0.56	0.10	0.53	0.10	0.50	0.10	0.55	0.10	0.45	0.10	0.44	0.10	0.42
Iron	0.10	3.8	0.10	5.5	0.10	5.0	0.10	2.0	0.10	4.2	0.10	2.2	0.10	1.5	0.10	1.2	0.10	1.1	0.10	1.8	0.10	0.80	0.10	0.80	0.10	0.88
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.013	8.0	0.013	8.4	0.013	6.6	0.025	5.5	0.050	7.8	0.025	5.9	0.0025	4.1	0.0025	3.6	0.0025	3.9	0.0025	4.2	0.0025	4.0	0.0025	3.7	0.0025	4.1
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	ND	0.0020	ND	0.0020	0.0023	0.0020	0.0042	0.0020	ND	0.0020	0.0028	0.0020	0.0031	0.0020	0.0045	0.0020	0.0038	0.0020	0.0028	0.0020	0.0040	0.0020	0.0036	0.0020	0.0046
Nitrogen/Nitrate	0.10	0.27	0.10	ND	0.10	ND	0.10	ND	0.10	0.52	0.10	0.20	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	0.10	0.27	0.10	ND	0.10	ND^	0.10	ND	0.10	0.52	0.10	0.20	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	50	170	50	200	50	200	25	120	20	130	50	150	50	210	50	260	50	280	50	210	100	390	100	270	100	410
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	660	10	860	10	790	10	700	10	710	10	750	10	630	10	890	10	950	10	920	10	1100	10	980	10	1300
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0013	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00086	0.0025	0.0041	0.0025	0.00058	0.0025	0.0019	0.0025	ND	0.0025	0.00053	0.0025	ND	0.0025	ND
pH	NA	7.10	NA	7.12	NA	7.37	NA	7.55	NA	7.33	NA	7.25	NA	7.06	NA	7.25	NA	7.10	NA	7.08	NA	7.21	NA	6.62	NA	7.36
Temperature	NA	19.35	NA	22.73	NA	16.12	NA	10.59	NA	16.31	NA	20.65	NA	13.73	NA	11.18	NA	15.78	NA	24.68	NA	21.29	NA	10.32	NA	14.30
Conductivity	NA	1.19	NA	1.38	NA	1.34	NA	0.91	NA	1.17	NA	1.21	NA	0.95	NA	0.96	NA	1.13	NA	1.41	NA	1.32	NA	1.03	NA	1.30
Dissolved Oxygen	NA	0.32	NA	0.98	NA	0.71	NA	2.74	NA	1.62	NA	0.57	NA	0.85	NA	1.10	NA	2.65	NA	1.84	NA	2.86	NA	2.00	NA	5.21
ORP	NA	-126.2	NA	-138.8	NA	-126.3	NA	-110.5	NA	-146.8	NA	-115.3	NA	-40.7	NA	-100.5	NA	-123.5	NA	-115.7	NA	-93.7	NA	-24.3	NA	-98.5

Sample: MW-11	8/29/2017		11/9/2017		3/8/2018		5/16/2018		8/9/2018		11/1/2018		2/27/2019		5/1/2019		8/28/2019		11/14/2019		2/26/2020		4/29/2020		8/12/2020		12/8/2020		2/25/2021		5/13/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.0016	0.001	0.0056	0.001	0.0036	0.001	0.0045	0.001	0.011	0.001	0.064	0.001	0.015	0.001	0.0068	0.001	0.0041	0.001	0.013	0.001	0.0087	0.001	0.0081	0.001	0.0075	0.001	0.0085	0.001	0.0073	0.001	0.011
Barium	0.0025	0.043	0.0025	0.14	0.0025	0.11	0.0025	0.17	0.0025	0.19	0.0025	0.28	0.0025	0.19	0.0025	0.11	0.0025	0.11	0.0025	0.14	0.0025	0.16	0.0025	0.14	0.0025	0.13	0.0025	0.15	0.0025	0.15	0.0025	0.15
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND
Boron	0.25	2.1	0.05	1.9	1	3.4	0.5	2.4	0.25	1.6	0.05	1.3	0.05	1.5	0.25	3.2	0.25	2.5	0.25	1.7	0.25	1.4	0.05	1.3	0.25	1.5	0.25	1.3	0.25	1.3	0.25	1.1
Cadmium	0.0005	0.00059	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	86	2	70	2	41	10	86	10	120	10	92	10	100	2	62	2	50	2	75	2	100	10	110	10	84	10	91	10	120	6	120
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	ND	0.001	0.0021	0.001	0.0011	0.001	0.0026	0.001	0.0022	0.001	0.0029	0.001	0.0022	0.001	0.0011	0.001	0.0016	0.001	0.0015	0.001	0.0018	0.001	0.0015	0.001	0.0015	0.001	0.0016	0.001	0.0017	0.001	0.0016
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.0048	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	0.0056	0.005	ND *	0.005	ND	0.005	0.0053
Fluoride	0.1	0.56	0.1	0.56	0.1	0.45	0.1	0.56	0.1	0.58	0.1	0.61	0.1	0.54	0.1	0.62	0.1	0.53	0.1	0.54	0.1	0.55	0.1	0.6	0.1	0.52	0.1	0.67	0.1	0.64	0.1	0.66
Iron	0.1	0.8	0.1	0.44	0.1	ND	0.1	0.12	0.1	1.4	0.1	10	0.1	1.7	0.1	0.23	0.1	ND	0.1	1.1	0.1	1.1	0.1	0.64	0.1	1.1	0.1	1.3	0.1	0.95	0.1	1.3
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.65	0.0025	3.7	0.0025	1.9	0.0025	4.9	0.0025	4.4	0.0025	4.6	0.0025	4	0.0025	2.1	0.0025	3	0.0025	3.2	0.0025	3.3	0.0025	2.7	0.0025	3.5	0.0025	3.4	0.0025	3.3	0.0025	3.4
Mercury	0.0002	0.00024	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	0.0028	0.002	0.003	0.002	ND	0.002	0.0038	0.002	0.0038	0.002	0.0045	0.002	0.0037	0.002	0.0024	0.002	0.0028	0.002	0.0028	0.002	0.004	0.002	0.0033	0.002	0.0023	0.002	0.0034	0.002	0.0033	0.002	0.0025
Nitrogen/Nitrate	0.1	0.73	0.1	2.6	0.1	5.1	0.1	1.1	0.1	0.42	0.1	ND	0.1	ND	0.1	3.6	0.1	1.9	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nitr	0.1	0.73 F1 F2	0.2	2.6	0.5	5.2	0.1	1.1	0.1	0.42	0.1	ND	0.1	ND	0.5	3.6	0.1	1.9	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND ^+	0.1	ND	0.1	ND
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	0.13	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	100	310	50	250	50	170	100	280	100	310	50	170	20	320	10	210	5	160	20	230	20	350	50	300	25	210	50	210	25	240	25	240
Thallium	0.002	0.0038	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	1000	10	820	10	650	10	1100	10	1100	10	970	10	1100	10	740	10	710	10	880	10	1000	10	1100	30	750	10	780	10	890	10	830
Vanadium	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND ^	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.0007	0.0025	0.00065	0.0025	0.0058	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.23	NA	6.96	NA	7.11	NA	7.89	NA	7.24	NA	7.49	NA	7.05	NA	7.08	NA	7.19	NA	7.43	NA	7.18	NA	7.08	NA	6.95	NA	7.26	NA	7.26	NA	7.26
Temperature	NA	17.20	NA	12.16	NA	9.18	NA	19.41	NA	21.43	NA	14.03	NA	12.90	NA	15.90	NA	17.00	NA	14.82	NA	15.20	NA	15.50	NA	16.50	NA	14.70	NA	15.50	NA	16.90
Conductivity	NA	1.18	NA	1.10	NA	0.66	NA	1.02	NA	1.26	NA	1.15	NA	1.53	NA	0.85	NA	1.25	NA	1.39	NA	1.39	NA	0.30	NA	0.60	NA	0.22	NA	1.21	NA	1.42
Dissolved Oxygen	NA	0.14	NA	3.21	NA	1.42	NA	1.86	NA	3.28	NA	7.23	NA	0.15	NA	0.26	NA	0.30	NA	0.58	NA	0.16	NA	0.20	NA	3.83	NA	0.16	NA	0.35	NA	0.11
ORP	NA	-49.5	NA	-76.5	NA	-83.8	NA	-52.7	NA	-62.5	NA	-26.9	NA	-83.6	NA	-50.1	NA	-23.5	NA	-105.0	NA	-131.1	NA	-126.3	NA	-98.6	NA	-154.4	NA	-109.5	NA	-101.1

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-12	Date	12/15/2010		2/15/2011		6/16/2011		9/19/2011		12/12/2011		3/19/2012		6/25/2012		9/18/2012		12/12/2012		2/27/2013		5/30/2013		7/29/2013		10/22/2013		3/4/2014	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NP	0.0088	NP	0.013	0.001	0.0064	0.001	0.0087	0.001	0.0089	0.001	0.0042	0.001	0.014	0.001	0.011	0.0050	0.022	0.001	0.0066	0.0010	0.0031	0.0010	0.016	0.0010	0.018	0.0010	0.0025
Barium	2.0	NP	0.089	NP	0.11	0.001	0.091	0.001	0.085	0.001	0.09	0.001	0.071	0.001	0.12	0.001	0.11	0.040	0.1	0.001	0.1	0.0025	0.091	0.0025	0.092	0.0025	0.087	0.0025	0.086
Beryllium	0.004	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NP	1.6	NP	1.4	0.012	1.3	0.01	1.2	0.01	1.3	0.01	0.92	0.01	1.2	0.01	1.1	0.40	0.85	0.01	1.1	0.050	3.7	0.050	1.1	0.050	1.1	0.050	0.41
Cadmium	0.005	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NP	170	NP	180	50	180	50	190	50	210	50	170	50	190	50	170	50	210	50	190	10	200	10	190	10	180	10	220
Chromium	0.1	NP	ND	NP	0.0056	0.004	0.0044	0.004	0.0071	0.004	0.0047	0.004	ND	0.004	0.0043	0.004	0.0045	0.0030	0.0079	0.004	0.0052	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^
Cobalt	1.0	NP	ND	NP	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NP	ND	NP	ND	0.003	0.0032	0.003	0.0036	0.003	0.0031	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^
Cyanide	0.2	NP	ND	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NP	0.71	NP	0.61	0.25	0.64	0.25	0.74	0.25	0.61	0.25	0.46	0.25	0.36	0.25	0.42	0.25	0.43	0.25	ND	0.10	0.62	0.10	0.56	0.10	0.51	0.10	0.56
Iron	5.0	NP	5.5	NP	6.3	0.010	5.6	0.010	4.0	0.010	3.1	0.010	4.8	0.010	8.2	0.010	8.9	0.010	6.4	0.01	5.8	0.10	8.9	0.10	4.5	0.10	0.23	0.10	2.4
Lead	0.0075	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NP	0.32	NP	0.58	0.001	0.26	0.001	0.37	0.001	0.25	0.001	0.13	0.001	0.71	0.001	0.64	0.040	1.7	0.001	0.38	0.0025	0.24	0.0025	1.3	0.0025	1.5	0.0025	0.23
Mercury	0.002	NP	ND	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NP	0.0096	NP	0.01	0.005	0.0072	0.005	0.0075	0.005	0.0091	0.005	0.0075	0.005	0.0082	0.005	0.012	0.010	ND	0.005	0.0065	0.0020	ND	0.0020	0.0029	0.0020	0.0028	0.0020	0.0020
Nitrogen/Nitrate	10.0	NP	ND	NP	ND	0.02	0.14	0.02	ND	0.02	ND	0.02	0.04	0.20	ND	0.02	0.03	0.02	ND	0.02	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NP	0.0026	NP	0.0027	0.001	ND	0.001	0.0023	0.001	0.0034	0.001	0.0043	0.001	0.0038	0.001	0.0016	0.0050	ND	0.001	0.002	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	NP	ND	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NP	290	NP	270	50	350	50	360	50	300	50	310	50	430	50	370	50	300	50	350	100	410	100	420	100	270	100	530
Thallium	0.002	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	1,200	NP	980	NP	1000	17	1100	17	970	17	970	17	1000	17	1200	17	1200	26	1100	26	1000	10	1200	10	1200	10	1000	10	1400
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	5.0	NP	ND	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.65	NA	7.51	NA	6.98	NA	7.66	NA	7.38	NA	7.22	NA	7.40	NA	7.50	NA	7.37	NA	8.36	NA	7.17	NA	7.29	NA	7.73	NA	7.99
Temperature	NA	NA	16.90	NA	16.77	NA	18.77	NA	17.75	NA	17.78	NA	19.62	NA	19.07	NA	18.88	NA	17.51	NA	16.30	NA	21.42	NA	17.93	NA	14.78	NA	11.22
Conductivity	NA	NA	1.69	NA	1.66	NA	1.63	NA	1.34	NA	1.38	NA	1.54	NA	1.63	NA	1.61	NA	1.48	NA	1.60	NA	1.63	NA	1.47	NA	1.20	NA	1.30
Dissolved Oxygen	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	0.06	NA	0.11	NA	1.70	NA	0.35	NA	1.04	NA	0.25	NA	0.20	NA	1.43
ORP	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	-168	NA	-157	NA	-130	NA	-141.2	NA	-146.5	NA	-85.9	NA	-205.6	NA	-91.9

Sample: MW-12	5/29/2014		8/26/2014		10/28/2014		2/24/2015		5/12/2015		8/19/2015		11/19/2015		2/26/2016		5/20/2016		8/18/2016		11/18/2016		2/16/2017		5/3/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	0.0017	0.0010	0.0021	0.0010	0.0019	0.0010	ND	0.0010	0.0034	0.0010	0.0025	0.0010	0.0033	0.0010	0.0020	0.0010	0.0045 F1	0.0010	0.0038	0.0010	0.013	0.0010	0.0022	0.0010	0.0020
Barium	0.0025	0.073	0.0025	0.066	0.0025	0.063	0.0025	0.070	0.0025	0.071	0.0025	0.083	0.0025	0.091	0.0025	0.060	0.0025	0.094	0.0025	0.092	0.0025	0.096	0.0025	0.059	0.0025	0.074
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Boron	0.050	0.69	0.050	0.73	0.050	0.59	0.050	0.58	0.050	0.59	0.050	1.5	0.050	0.94	0.050	0.57	0.050	0.50	0.050	0.75	0.10	0.81	0.050	0.40	0.050	0.50
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	10	220	10	210	10	200	10	210	10	230	10	220	10	220	10	210	10	200 F1	10	210	10	180	10	190	10	190
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.42	0.10	0.54	0.10	0.54	0.10	0.58	0.10	0.52	0.10	0.59	0.10	0.58	0.10	0.41	0.10	0.48	0.10	0.53	0.10	0.53	0.10	0.42	0.10	0.37
Iron	0.10	0.39	0.10	0.17	0.10	0.33	0.10	1.7	0.10	0.48	0.10	2.2	0.10	0.61	0.10	0.88	0.10	1.2	0.10	1.5	0.10	2.2	0.10	0.76	0.10	2.1
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0025	0.65	0.0025	1.2	0.0025	1.2	0.0025	0.17	0.0025	0.63	0.0025	0.16	0.0025	1.2	0.0025	0.065	0.0025	0.51	0.0025	1.0	0.0025	0.96	0.0025	0.079	0.0025	0.081
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	0.0026	0.0020	0.0033	0.0020	0.0031	0.0020	0.0031	0.0020	0.0022	0.0020	0.0020	0.0020	0.0023	0.0020	0.0020	0.0020	ND	0.0020	0.0037	0.0020	ND	0.0020	0.0022	0.0020	ND
Nitrogen/Nitrate	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nitr	0.10	ND	0.10	ND	0.10	ND^	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.31	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrite	0.020	ND	0.020	0.048	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	0.024	0.020	ND	0.020	ND	0.040	0.22	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND F1	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	100	560	100	310	100	420	100	450	100	530	100	390	100	750	100	580	100	570	100	600	100	300	100	550	100	450
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	1300 H	10	1100	10	1000	10	1300	10	1400	10	1300	10	1400	10	1300	10	1300	10	1700	10	1300	10	1200	10	1200
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0013	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0061	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.14	NA	7.37	NA	7.33	NA	7.61	NA	7.49	NA	7.43	NA	7.12	NA	7.96	NA	7.28	NA	7.06	NA	7.34	NA	7.54	NA	7.47
Temperature	NA	19.48	NA	22.71	NA	16.37	NA	6.11	NA	18.19	NA	19.48	NA	14.85	NA	9.04	NA	15.14	NA	24.40	NA	17.01	NA	11.48	NA	14.00
Conductivity	NA	1.73	NA	1.69	NA	1.55	NA	1.24	NA	1.76	NA	1.74	NA	1.59	NA	1.29	NA	1.55	NA	1.91	NA	1.39	NA	1.34	NA	1.29
Dissolved Oxygen	NA	1.59	NA	0.36	NA	0.36	NA	1.29	NA	1.87	NA	1.13	NA	1.49	NA	1.31	NA	2.73	NA	2.81	NA	1.51	NA	1.68	NA	3.77
ORP	NA	-23.6	NA	-49.2	NA	6.0	NA	-80.6	NA	-55.7	NA	-109.9	NA	36.6	NA	-134	NA	-91.4	NA	8.9	NA	-110.1	NA	1.9	NA	-74.9

Sample: MW-12	8/29/2017		11/10/2017		3/8/2018		5/16/2018		8/9/2018		11/1/2018		2/27/2019		5/1/2019		8/28/2019		11/14/2019		2/26/2020		4/29/2020		8/12/2020		12/8/2020		2/25/2021		5/13/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.0082	0.001	0.015	0.001	0.0026	0.001	0.0015	0.001	0.0057	0.001	0.0063	0.001	0.0015	0.001	0.002	0.001	0.0045	0.001	0.01	0.001	ND	0.001	ND ^	0.001	0.0059	0.001	0.0079	0.001	ND	0.001	ND
Barium	0.0025	0.12	0.0025	0.096	0.0025	0.065	0.0025	0.067	0.0025	0.061	0.0025	0.058	0.0025	0.044	0.0025	0.052	0.0025	0.057	0.0025	0.058	0.0025	0.028	0.0025	0.035	0.0025	0.051	0.0025	0.053	0.0025	0.031	0.0025	0.053
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND
Boron	0.25	1.5	0.05	0.77	0.05	0.39	0.05	0.45	0.05	0.67	0.05	0.64	0.05	0.4	0.05	0.44	0.05	0.57	0.05	0.67	0.05	0.24	0.05	0.37	0.05	0.5	0.05	0.56	0.05	0.31	0.05	0.34
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	180	10	170	10	180	10	180	10	180	10	150	10	160	10	170	10	180	10	150	10	140	10	150 F1	10	150	10	160	10	130	10	140
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	0.0013	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.005	ND	0.005	ND *	0.005	ND	0.005	ND
Fluoride	0.1	0.53	0.1	0.51	0.1	0.5	0.1	0.48	0.1	0.45	0.1	0.48	0.1	0.44	0.1	0.38	0.1	0.41	0.1	0.47	0.1	0.31	0.1	0.34	0.1	0.48	0.1	0.57	0.1	0.27	0.1	0.19
Iron	0.1	1.1	0.1	2.2	0.1	1.1	0.1	1.1	0.1	1.1	0.1	0.23	0.1	0.88	0.1	0.94	0.1	1	0.1	0.92	0.1	0.28	0.1	0.64	0.1	1.7	0.1	0.77	0.1	0.61	0.1	0.69
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	2.7	0.0025	1.2	0.0025	0.098	0.0025	0.066	0.0025	0.77	0.0025	0.84	0.0025	0.11	0.0025	0.042	0.0025	0.42	0.0025	0.69	0.0025	0.029	0.0025	0.043	0.0025	0.52	0.0025	0.55	0.0025	0.046	0.0025	0.079
Mercury	0.0002	0.00026	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	0.0026	0.002	ND	0.002	ND	0.002	ND	0.002	0.0024	0.002	0.002	0.002	0.0029	0.002	ND	0.002	0.0043	0.002	0.0028	0.002	ND	0.002	ND	0.002	ND	0.002	0.002	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.1	0.11	0.1	ND	0.1	ND	0.1	ND	0.1	1	0.1	0.27	0.1	ND	0.1	ND	0.1	0.13	0.1	ND	0.1	ND	0.1	ND	0.1	0.98	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nitr	0.1	0.14	0.1	ND	0.1	ND	0.1	ND	0.1	1	0.1	0.72	0.1	ND	0.1	ND	0.1	0.13	0.1	ND	0.1	ND ^	0.1	ND	0.1	0.98	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrite	0.02	0.027	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.1	0.45	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0025	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	100	520	100	370	100	610	250	660	100	360	100	260	20	390	20	360	20	390	20	360 F1	20	250	50	350	100	370	50	320	100	270	50	340
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	1400	10	1100	10	1300	10	1600	10	1200	10	1100	10	1000	10	1000	10	1200	10	1100	10	800	10	1000	60	1000	10	920	10	850	10	920
Vanadium	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	0.00056	0.0025	0.0011	0.0025	0.00067	0.0025	ND	0.0025	0.00259	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.34	NA	7.38	NA	7.20	NA	8.12	NA	7.42	NA	7.70	NA	7.43	NA	7.68	NA	7.37	NA	7.61	NA	8.00	NA	7.96	NA	7.18	NA	7.36	NA	7.91	NA	7.39
Temperature	NA	17.30	NA	14.47	NA	9.07	NA	23.82	NA	20.87	NA	13.39	NA	12.20	NA	14.00	NA	15.10	NA	14.41	NA	8.80	NA	10.00	NA	13.20	NA	14.00	NA	9.90	NA	11.10
Conductivity	NA	1.48	NA	1.27	NA	1.13	NA	1.59	NA	1.57	NA	1.19	NA	1.60	NA	0.99	NA	1.70	NA	1.52	NA	1.16	NA	1.33	NA	0.63	NA	0.29	NA	0.95	NA	1.45
Dissolved Oxygen	NA	0.87	NA	1.33	NA	1.54	NA	4.53	NA	5.89	NA	6.50	NA	0.05	NA	0.25	NA	0.57	NA	1.10	NA	0.18	NA	0.24	NA	3.94	NA	0.16	NA	0.45	NA	0.18
ORP	NA	-59.0	NA	-96.9	NA	-23.0	NA	-38.9	NA	-32.6	NA	-11.6	NA	-110.4	NA	-179.2	NA	-0.3	NA	-60.7	NA	-193.5	NA	-220.4	NA	-79.4	NA	-78.8	NA	-160.7	NA	-70.4

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-13	Date	12/15/2010		2/15/2011		4/25/2011		6/16/2011		8/9/2011		10/13/2011		12/12/2011		4/10/2012		12/14/2012		2/28/2013		5/30/2013	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NP	ND	NP	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.0050	ND	0.003	ND	0.0030	ND
Arsenic	0.010	NP	0.011	NP	0.0069	0.001	0.0063	0.001	0.0057	0.001	0.0048	0.001	0.0066	0.001	0.023	0.001	0.027	0.0050	0.041	0.001	0.029	0.0010	0.031
Barium	2.0	NP	0.11	NP	0.052	0.001	0.073	0.001	0.059	0.001	0.046	0.001	0.083	0.001	0.21	0.001	0.14	0.0020	0.3	0.001	0.19	0.0025	0.23
Beryllium	0.004	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0010	ND ^
Boron	2.0	NP	3.9	NP	3.1	0.01	2.6	0.012	3.0	0.01	2.7	0.01	3.0	0.01	4.1	0.01	4.0	1.0	3.6	0.01	4.2	0.050	1.6
Cadmium	0.005	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.00050	ND
Chloride	200.0	NP	160	NP	120	25	100	25	86	25	110	25	110	100	180	50	170	50	210	50	170	10	190
Chromium	0.1	NP	0.0062	NP	0.0042	0.004	0.0045	0.004	ND	0.004	ND	0.004	0.01	0.004	0.0055	0.004	0.0055	0.0030	0.011	0.004	0.0057	0.0050	ND
Cobalt	1.0	NP	0.0031	NP	0.0026	0.002	0.0023	0.002	0.0022	0.002	0.0031	0.002	ND	0.002	ND	0.002	ND	0.0030	ND	0.002	ND	0.0010	ND
Copper	0.65	NP	0.0068	NP	0.0037	0.003	0.0041	0.003	0.004	0.003	0.004	0.003	0.0055	0.003	0.0066	0.003	0.0068	0.010	ND	0.003	0.0037	0.0020	ND
Cyanide	0.2	NP	ND	NP	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.005	ND	0.010	ND
Fluoride	4.0	NP	0.28	NP	0.29	0.25	0.31	0.25	0.44	0.25	0.38	0.25	0.30	0.25	ND	0.25	0.32	0.25	ND	0.25	ND	0.10	0.39
Iron	5.0	NP	0.69	NP	0.052	0.010	0.077	0.010	ND	0.010	0.043	0.010	ND	0.010	0.11	0.010	0.20	0.010	0.066	0.01	0.28	0.10	1.3
Lead	0.0075	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0050	ND	0.001	ND	0.00050	ND
Manganese	0.15	NP	5	NP	3.8	0.001	2.7	0.001	2.9	0.001	2.6	0.001	3.6	0.001	3.5	0.001	3.5	0.0020	3.7	0.001	3.5	0.0025	3.8
Mercury	0.002	NP	ND	NP	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.00020	ND	0.0002	ND	0.00020	ND
Nickel	0.1	NP	0.03	NP	0.023	0.005	0.021	0.005	0.018	0.005	0.016	0.005	0.015	0.005	0.022	0.005	0.02	0.010	ND	0.005	0.011	0.0020	ND
Nitrogen/Nitrate	10.0	NP	0.14	NP	1.3	0.02	1.8	0.20	2.2	0.50	3.6	0.02	1.6	0.02	0.07	0.02	0.06	0.02	ND	0.02	ND	0.10	ND
Nitrogen/Nitrate, Nitr	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.10	ND
Nitrogen/Nitrite	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.020	ND
Perchlorate	0.0049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0040	ND
Selenium	0.05	NP	0.0046	NP	0.0046	0.001	0.0045	0.001	0.0029	0.001	0.0056	0.001	0.004	0.001	0.0036	0.001	0.0037	0.0050	ND	0.001	0.0025	0.0025	0.010
Silver	0.05	NP	ND	NP	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.010	ND	0.005	ND	0.00050	ND
Sulfate	400.0	NP	1400	NP	770	250	580	100	540	100	440	250	660	250	1100	500	1100	500	1100	250	730	250	880
Thallium	0.002	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.0010	ND	0.001	ND	0.0020	ND
Total Dissolved Solic	1,200	NP	2600	NP	1600	17	1400	17	1300	17	1100	17	1500	17	2100	17	2300	26	1900	26	1600	10	2000
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	ND	0.005	ND	0.0050	ND
Zinc	5.0	NP	ND	NP	ND	0.006	ND	0.006	ND	0.006	ND	0.006	0.06	0.006	ND	0.006	ND	0.020	ND	0.006	ND	0.020	ND
Benzene	0.005	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.005	ND	0.005	ND	0.00050	ND
BETX	11.705	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.03	ND	0.03	ND	0.0025	ND
pH	6.5 - 9.0	NA	7.68	NA	7.53	NA	7.26	NA	6.75	NA	7.13	NA	7.31	NA	7.19	NA	8.49	NA	7.92	NA	8.26	NA	7.65
Temperature	NA	NA	12.59	NA	13.82	NA	14.40	NA	16.84	NA	15.92	NA	14.87	NA	13.78	NA	14.90	NA	14.88	NA	14.00	NA	18.10
Conductivity	NA	NA	3.33	NA	2.15	NA	1.92	NA	1.79	NA	1.63	NA	1.59	NA	2.33	NA	2.89	NA	2.15	NA	2.05	NA	2.12
Dissolved Oxygen	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	3.54	NA	1.69	NA	1.16
ORP	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	-20	NA	134	NA	-177.9

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F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC [illegible]
* - Median Value (for temp)
* - LCS or LCSD is outside accept[illegible]

[illegible]

Attachment 9-3 Historical CCA Groundwater Data - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-16	Date	12/15/2010		2/15/2011		4/25/2011		6/16/2011		8/9/2011		10/13/2011		12/12/2011		4/10/2012	
Parameter	Standards	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Arsenic	0.010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Barium	2.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Beryllium	0.004	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Boron	2.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium	0.005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Chloride	200.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Chromium	0.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Cobalt	1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Copper	0.65	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Cyanide	0.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Fluoride	4.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Iron	5.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Lead	0.0075	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Manganese	0.15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mercury	0.002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	0.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nitrogen/Nitrate	10.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nitrogen/Nitrate, Nitr	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nitrogen/Nitrite	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Perchlorate	0.0049	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Selenium	0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Silver	0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sulfate	400.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Thallium	0.002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total Dissolved Soli	1,200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium	0.049	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	5.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Benzene	0.005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BETX	11.705	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
pH	6.5 - 9.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Temperature	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Conductivity	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Dissolved Oxygen	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
ORP	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Sample: MW-16	12/12/2012		2/27/2013		5/29/2013		7/29/2013		10/22/2013		3/3/2014		5/30/2014		8/26/2014		10/30/2014		2/24/2015	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0050	ND	0.001	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Barium	0.020	0.039	0.001	0.042	0.0025	0.038	0.0025	0.035	0.0025	0.037	0.0025	0.060	0.0025	0.036	0.0025	0.035	0.0025	0.034	0.0025	0.038
Beryllium	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	0.20	ND	0.01	0.13	0.050	0.20	0.050	0.26	0.050	0.35	0.050	0.17	0.050	0.17	0.050	0.15	0.050	0.14	0.050	0.17
Cadmium	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	10	26	10	18	2.0	19	2.0	21	2.0	35	10	230	2.0	20	2.0	25	2.0	24	2.0	24
Chromium	0.0030	0.0047	0.004	0.0052	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND	0.0020	ND ^	0.0020	ND	0.0020	ND
Cyanide	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.25	ND	0.25	ND	0.10	ND	0.10	0.11	0.10	0.11	0.10	ND	0.10	0.11	0.10	0.11	0.10	0.10	0.10	0.10
Iron	0.010	0.012	0.01	0.019	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0020	0.022	0.001	0.0053	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0035	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0025
Mercury	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.010	ND	0.005	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	0.50	18	0.5	23	0.10	20	0.10	13	0.10	19	0.10	16	0.10	21	0.10	22	0.10	28	0.10	28
Nitrogen/Nitrate, Nitr	NR	NR	NR	NR	2.5	20	2.5	13	1.0	19	2.0	16	2.5	21	2.0	22	2.5	28	2.0	28
Nitrogen/Nitrite	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0050	ND	0.001	0.0015	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	10	37	10	31	20	50	20	55	20	55	10	34	10	40	10	35	10	54	10	27
Thallium	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	26	520	26	420	10	460	10	440	10	540	10	800	10	390	10	440	10	510	10	490
Vanadium	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	0.03	ND	0.03	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.38	NA	8.31	NA	7.10	NA	7.18	NA	7.27	NA	7.85	NA	7.20	NA	7.41	NA	7.30	NA	7.56
Temperature	NA	12.84	NA	13.10	NA	15.29	NA	16.61	NA	12.74	NA	9.98	NA	17.83 *	NA	22.10	NA	13.09	NA	8.21
Conductivity	NA	0.61	NA	1.17	NA	0.60	NA	0.59	NA	0.63	NA	0.89	NA	0.88	NA	0.75	NA	0.94	NA	0.57
Dissolved Oxygen	NA	9.54	NA	8.53	NA	6.78	NA	4.91	NA	6.24	NA	6.50	NA	6.99	NA	6.84	NA	2.05	NA	8.44
ORP	NA	110	NA	-38	NA	70.2	NA	24.7	NA	-83.4	NA	315.3	NA	74.8	NA	36.7	NA	-2.7	NA	95.6

Sample: MW-16	5/12/2015		8/18/2015		11/16/2015		2/24/2016		5/16/2016		8/19/2016		11/16/2016		2/15/2017		5/2/2017	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Barium	0.0025	0.037	0.0025	0.039	0.0025	0.038	0.0025	0.043	0.0025	0.043	0.0025	0.039	0.0025	0.041	0.0025	0.040	0.0025	0.039
Beryllium	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND ^	0.0010	ND
Boron	0.050	0.15	0.050	0.25	0.050	1.0	0.050	0.63	0.050	0.23	0.050	0.19	0.050	0.18	0.050	0.17	0.050	0.14
Cadmium	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	2.0	29	2.0	29	2.0	33	2.0	45	2.0	33	2.0	33	2.0	26	2.0	29	2.0	33
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Cobalt	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Cyanide	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	0.10	0.11	0.10	0.10	0.10	0.11	0.10	0.11	0.10	0.10	0.10	0.10	0.10	ND	0.10	ND	0.10	ND
Iron	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0059	0.0025	ND	0.0025	ND
Mercury	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	0.10	24	0.10	19	0.10	17	0.10	16	0.10	22	0.10	25	0.10	27	0.10	23	0.10	27
Nitrogen/Nitrate, Nitr	2.0	24	2.0	19	1.0	17	1.0	16	2.0	22	2.0	25	2.0	27	2.5	23	2.5	27
Nitrogen/Nitrite	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	ND ^	0.0025	ND
Silver	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	10	33	20	64	25	57	10	50	10	40	10	43	10	38	10	33	10	43
Thallium	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Soli	10	530	10	540	10	460	10	510	10	530	10	620	10	540	10	520	10	560
Vanadium	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Zinc	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND ^	0.020	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.0011	0.0025	ND	0.0025	0.0018	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.35	NA	7.19	NA	6.78	NA	7.23	NA	7.13	NA	7.09	NA	6.93	NA	6.72	NA	7.14
Temperature	NA	12.56	NA	19.75	NA	13.05	NA	9.13	NA	14.63	NA	22.11	NA	16.10	NA	9.78	NA	13.99
Conductivity	NA	0.67	NA	0.80	NA	0.62	NA	0.59	NA	0.68	NA	0.80	NA	0.67	NA	0.61	NA	0.65
Dissolved Oxygen	NA	7.97	NA	7.43	NA	7.61	NA	7.95	NA	8.26	NA	7.50	NA	6.51	NA	8.00	NA	8.04
ORP	NA	105.0	NA	-9.1	NA	188.1	NA	43.3	NA	57.0	NA	67.0	NA	17.0	NA	214.2	NA	39.1

Sample: MW-16	8/23/2017		11/9/2017		3/8/2018		5/17/2018		8/8/2018		10/31/2018		2/27/2019		5/2/2019	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	0.0031	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	0.004	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.039	0.0025	0.045	0.0025	0.041	0.0025	0.041	0.0025	0.038	0.0025	0.041	0.0025	0.045	0.0025	0.039
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Boron	0.05	0.14	0.05	0.19	0.05	0.13	0.05	0.14	0.05	0.15	0.05	0.18	0.05	0.17	0.05	0.2
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2	22	2	29	2	28	2	23	2	23	2	24	2	25	2	22
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Iron	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.23	0.1	ND
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	ND	0.0025	0.028	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.014	0.0025	ND
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.1	22	0.1	24	0.1	26	0.1	25	0.1	24	0.1	22	0.1	23	0.1	20
Nitrogen/Nitrate, Nitr	2	22	2	24	2	26	2	25	2	24	2	22	2.5	23	2.5	20
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND ^	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	10	34	20	38	20	41	20	30	10	29	10	25	25	36	5	33
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	460	10	530	10	530	10	540	10	470	10	590	10	520	10	550
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	0.00056	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	0.0014	0.0025	0.0009	0.0025	0.00866	0.0025	0.0021	0.0025	ND	0.0025	ND
pH	NA	7.44	NA	6.95	NA	6.93	NA	6.76	NA	7.19	NA	7.85	NA	7.00	NA	6.94
Temperature	NA	16.10	NA	13.06	NA	6.81	NA	17.97	NA	18.67	NA	14.83	NA	12.30	NA	12.40
Conductivity	NA	0.67	NA	0.66	NA	0.53	NA	0.67	NA	0.67	NA	0.63	NA	0.89	NA	0.53
Dissolved Oxygen	NA	7.63	NA	8.10	NA	7.53	NA	8.80	NA	8.26	NA	8.59	NA	8.16	NA	6.89
ORP	NA	170.0	NA	-34.3	NA	-16.9	NA	12.8	NA	5.4	NA	2.4	NA	81.3	NA	75.8

Sample: MW-16	8/27/2019		11/14/2019		2/25/2020		4/27/2020		8/11/2020		12/10/2020		2/23/2021		5/10/2021	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
Antimony	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.001	ND	0.001	ND F1	0.001	ND	0.001	ND ^	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.039	0.0025	0.046	0.0025	0.042	0.0025	0.04	0.0025	0.04	0.0025	0.041	0.0025	0.038	0.0025	0.041
Beryllium	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND ^1+	0.001	ND ^+	0.001	ND ^+
Boron	0.05	0.16	0.05	0.22	0.05	0.16	0.05	0.15	0.05	0.14	0.05	0.12	0.05	0.12	0.05	0.091
Cadmium	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2	31	2	26	2	26	2	18	2	21	2	23	2	24	2	25
Chromium	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Copper	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	0.01	ND	0.01	ND	0.01	ND	0.01	ND F1 F2	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Fluoride	0.1	ND	0.1	0.11	0.1	0.1	0.1	0.12	0.1	ND	0.1	0.11	0.1	0.1	0.1	0.10 H
Iron	0.1	ND	0.1	0.13	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Lead	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.027	0.0025	0.019	0.0025	0.0051	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0058	0.0025	ND
Mercury	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.1	12	0.1	19	0.1	22	0.1	23	0.1	18	0.1	29	0.1	22	0.1	22 H
Nitrogen/Nitrate, Nitr	2.5	12	2.5	19 ^	2.5	22	2	23	1	18	5	29	2	22	2.5	22
Nitrogen/Nitrite	0.02	ND	0.02	ND	0.02	ND	0.02	ND F1	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND F1	0.0025	ND	0.0025	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	5	35	5	32	5	29	5	29	5	25	5	27	5	25	5	30
Thallium	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Soli	10	470	10	480	10	440	10	500	30	400	10	390	10	500	10	210
Vanadium	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Zinc	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	NA	7.03	NA	7.29	NA	7.02	NA	6.94	NA	6.94	NA	7.44	NA	7.21	NA	7.20
Temperature	NA	14.20	NA	12.45	NA	12.30	NA	12.70	NA	13.60	NA	13.30	NA	12.70	NA	12.70
Conductivity	NA	0.79	NA	0.82	NA	0.29	NA	0.72	NA	0.81	NA	0.84	NA	0.64	NA	0.80
Dissolved Oxygen	NA	8.33	NA	8.72	NA	7.14	NA	7.20	NA	7.04	NA	5.21	NA	8.19	NA	8.64
ORP	NA	106.6	NA	-18.7	NA	28.9	NA	13.6	NA	135.3	NA	97.9	NA	58.8	NA	172.1

Notes: Standards obtained from IAC, Title 35, Chapter I, Part 620, Subpart D, Section 620.410 - Groundwater Quality Standards for Class I: Potable Resource Groundwater
All values are in mg/L (ppm) unless otherwise noted.

DL - Detection limit
NA - Not Applicable
ND - Not Detected
NM - Not Measured

NR - Not Required
NS - Not Sampled
H - Prepped/analyzed past hold time
V - Serial Dilution Exceeds Control Limits

F1- MS and/or MSD Recovery outside of limits.
F2- MS/MSD RPD exceeds control limits.
^1+ - Initial Calibration Verification is outside acceptance limits, high biased
^+ - Continuing Calibration Verification is outside acceptance limits, high biased

^ - Denotes instrument related QC exceeds the control limits
* - Median Value (for temp)
* - LCS or LCSD is outside acceptance limits

Temperature °C degrees Celcius
Conductivity ms/cm^c millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

ATTACHMENT 9-4
CERTIFICATION OF GROUNDWATER MONITORING WELL SYSTEM

CERTIFICATION
35 Ill. Adm. Code 845.630

In accordance with Section 35 Ill. Adm. Code 845.630(g), I hereby certify based on review of the information contained within the Initial Operating Permit Application for Powerton Station dated October 29, 2021, the groundwater monitoring system has been designed and constructed to satisfy the requirements of 35 Ill. Adm. Code 845.630. For this site the minimum number of wells required is deemed sufficient based on the following: 1) The number of wells, placement and screened intervals are based on a hydrogeologic assessment performed for the site; 2) hydrogeologic considerations included aquifer characteristics affecting flow velocity and physical transport processes; 3) available historical groundwater flow data indicate consistent flow conditions over time; and 4) Illinois Environmental Protection Agency (IEPA) approved the overall hydrogeologic assessment as part of a larger study.

Certified by: ______________________

Date: 10/29/21

Joshua Davenport, P.E.
Professional Engineer Registration No.: 062-061945
KPRG and Associates, Inc.

JOSHUA D. DAVENPORT
062-061945
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

ATTACHMENT 9-5
CCR COMPLIANCE STATISTICAL APPROACH

KPRG

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

ILLINOIS STATE CCR RULE COMPLIANCE STATISTICAL APPROACH FOR GROUNDWATER DATA EVALUATION

Midwest Generation, LLC
Powerton Generating Station
13082 Manito Rd.
Pekin, Illinois

PREPARED BY: KPRG and Associates, Inc.
14665 West Lisbon Road, Suite 1A
Brookfield, WI 53005

August 23, 2021

TABLE OF CONTENTS

1.0 INTRODUCTION

On April 21, 2021, the Illinois Pollution Control Board (IPCB) and Illinois Environmental Protection Agency (Illinois EPA) enacted a final rule regulating coal combustion residuals (CCR) as part of Ill. Adm. Code Title 35, Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (State CCR Rule). The State CCR Rule specifically requires that the owner or operator of a CCR unit must develop an Operating Permit that will specify a sampling and analysis program that includes procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody (COC) control, and quality assurance and quality control. As a result, each regulated facility must develop a program that meets the State CCR Rule. At the Powerton facility, the Ash Bypass Basin/Ash Surge Basin (ABB/ASB) the Former Ash Basin (FAB) and the Metals Cleaning Basin (MCB) require monitoring under the State CCR Rule. The monitoring well networks around these basins consist of the following wells:

- Combined ABB/ASB monitoring network - upgradient wells MW-01, MW-09 and MW-19 and downgradient wells MW-08, MW-11, MW-12, MW-15, MW-17 and MW-18.

- FAB monitoring network - upgradient wells MW-01 and MW-10 and downgradient wells MW-02 thru MW-05.

- MCB monitoring network – upgradient wells MW-15 and MW-17 and downgradient wells MW-14, MW-20 and MW-21.

The well locations are shown on Figure 1.

Section 845.640(f) of the State CCR Rule requires the development of the statistical approach that will be used for assessing the data and determining whether a statistically significant increase over background concentrations in groundwater has occurred at identified downgradient monitoring points. Potential statistical methods that can be applied to the data are listed in Section 845.640(f) and performance standards are provided in 845.640(g).

This narrative of the statistical approach that will be used for the Powerton facility's groundwater monitoring data is intended to fulfill certification requirements under Section 845.640(f)(2). The professional engineer's certification of this statistical approach is provided in Section 4.0 of this document.

2.0 STATISTICAL METHOD SELECTION and BACKGROUND DATA EVALUATION

Section 845.640(f)(1) identifies five statistical data evaluation methods that can be used for assessing site groundwater data. Relative to the subject site, the prediction interval procedure identified in 845.640(f)(1)(C) will be used. This approach is robust and conforms to varying data distributions and facilitates various non-detect frequencies. U.S. EPA identifies this method as preferred over establishment of tolerance intervals (Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance, March 2009 [Unified Guidance]).

Total recoverable metals groundwater data has been collected for this site at many of the monitoring well locations since 2015 as part of Federal CCR Rule requirements. Under the Federal CCR Rule, the initial eight rounds of quarterly data generated were used to develop a representative background concentration with which to develop applicable prediction limits for subsequent statistical downgradient monitoring well data comparisons. Since additional data has been generated since the initial eight rounds of groundwater monitoring under the Federal CCR Rule, the full, currently available data set through the second quarter 2021 will be evaluated for potential use in developing a representative background dataset. If appending this additional data to the original eight rounds of background sampling is determined to be not statistically appropriate, then the background calculations will be reverted to using the initial eight rounds of background data for subsequent calculations. The established, representative background concentration for the upgradient well locations will be used to develop prediction limits for the regulated unit for each constituent listed in Section 845.600(a) and (b) as provided in Table 1.

Statistical evaluations will be performed with the assistance of the Sanitas™ software package.

2.1 Outlier Testing

The background dataset will be first checked for potential outliers for each constituent. Potential causes of outliers can be, but are not limited to:

- Changes in sampling technique;
- Changes in analytical methods;
- Data transcription errors;
- Unnatural localized event such as a spill; or
- Natural but extreme variations in constituent concentration.

The Unified Guidance does not recommend removing an outlier from the data set unless it can be shown that the outlier is not caused by extreme natural variation. If the outlier can be traced to other than natural causes, the data set will be adjusted appropriately.

2.2 Spatial Variability

If more than one background well is being used for the monitored unit, an evaluation of spatial variability will be performed to determine whether the mean concentration of a constituent varies statistically between the background points. This is generally accomplished by performing an Analysis of Variance (ANOVA). If statistically significant spatial variation is determined to be present, the background points will not be combined between the wells. If the spatial variability is determined to be natural, an intrawell data evaluation approach may be considered for both upgradient and downgradient wells.

2.3 Temporal Variability

Temporal variability in groundwater data from a specific monitoring point occurs when a consistent fluctuation of constituent concentrations occurs over time. The most common example is seasonal variation. If such a variation is noted in the data, the dataset should be corrected to account for the trend; however, any such corrections must be applied judiciously and would be completed in accordance with the Unified Guidance recommended procedures.

2.4 Trend Testing

As discussed above, it is intended to expand the initial background dataset collected under the Federal CCR Rule which consisted of eight rounds of quarterly sampling, with any additional data collected for a specific well since that time to facilitate a larger background data set upon which to develop subsequent interwell, and if necessary intrawell, prediction limits. The expanded background dataset for each upgradient well, for each constituent listed in Table 1, will undergo trend analysis to determine if there may be a potential statistically significant trend in the data. Linear regression will be the primary trend analysis tool, however, other methods such Sen's Slope Estimator may also be used. If a statistically significant trend is identified in the larger combined background dataset, the new data cannot be added to the initial background dataset, and only the original eight rounds of data can be used for that well in background development and associated subsequent calculations.

2.5 Test of Normality

The main underlying assumption in parametric data evaluations, such as establishing prediction limits, is that the underlying data distribution is normal. A quick approximation can be made by calculating the Coefficient of Variance (CV) which is the quotient of the standard deviation divided by the sample mean. In general, if this quotient is greater than 1, the underlying data distribution is probably not normal. The new Unified Guidance is more conservative and suggests that if this quotient is greater than 0.5, the dataset may not be normal and a more robust distribution evaluation should be performed. Therefore, for any CV value greater than 0.5 for a specific dataset, normality will be evaluated using the Shapiro-Wilk Test with an alpha (α) value of 0.05 (or 95%).

If the dataset does not pass this initial test, the data will undergo a log transformation and the test will be repeated for the natural log values of the dataset. If it is determined that this dataset is log-normal, statistical evaluations will be completed on those values and the result converted back to the standard value. If the underlying distribution is also determined not to be log-normal, the Unified Guidance provides for a number of other data transformations that can be performed to evaluate whether those underlying distributions may be normal at which point the entire dataset would be transformed for subsequent calculations.

If a normal underlying distribution can not be determined, non-parametric statistical evaluations will need to be considered which do not rely on a specific underlying distribution.

2.6 Non-Detects

It is not uncommon in environmental datasets to have parameters being detected at low concentrations during one sampling event and being not detected in other sampling events. Having a consistent approach to the handling of non-detect values is an important part of the statistical evaluation process. The handling of non-detect values will be accomplished as follows:

- 100 Percent Non-Detects – Assumed that the constituent is not present and no statistical evaluations will be performed. The upper prediction limit will be set at the Reporting Limit (RL) established by the analytical laboratory.

- 50 Percent or Greater Non-Detects – A non-parametric evaluation will be performed where the confidence interval will be constructed using the highest detected concentration as the upper prediction limit.

- 15 to 50 Percent Non-Detects – Aitchison's Adjustment will be used with subsequent parametric or non-parametric evaluations, as appropriate, based on underlying distributions.

- 0 to 15 Percent Non-Detects - The non-detect values will be replaced with RL/2 and the dataset will be evaluated for distribution normality with subsequent parametric or non-parametric evaluations, as appropriate, based on underlying distributions.

2.7 Prediction Limit Calculation for Normally Distributed Data

For datasets where the distribution or underlying transformed distribution is normal, a parametric statistical approach will be used for establishing the prediction limit at the required 95% statistical confidence. In accordance with Unified Guidance, the following equation will be used:

$$95\%\ \mathit{Prediction\ Limit} = \bar{x} + t_{1-0.05/m,n-1}\, s\sqrt{1+\frac{1}{n}}$$

Where:

$\bar{x}$ = the sample mean of the detected or adjusted results
S = sample standard deviation of the detected or adjusted results
$t_{1-0.05/m,n-1}$ = the students t-coefficient for degrees of freedom (n-1) and confidence level (1-0.05/m)
n = the number of samples
m = the number of future samples

The number of future sampling events (*m*) will be set at 2 which will account for one sampling event and a confirmation resampling. This will assist in limiting the potential number of false positives. An acceptable site-wide false positive (SWFP) rate of 10% or less is acceptable under the Unified Guidance.

2.8 Prediction Limit Calculation for Non-Normally Distributed Data

If the dataset distribution or underlying distribution is determined not to be normal, a non-parametric approach will need to be used for the establishment of the prediction limit. The non-parametric evaluation will use the highest detected concentration as the upper prediction limit for the specific constituent.

3.0 GROUNDWATER MONITORING

The State CCR Rule does not distinguish between detection monitoring or assessment monitoring as was defined under the Federal CCR Rule. To meet the requirements set forth in Section 845.650(b), a minimum of eight rounds of groundwater data need to be collected for establishing background. As noted above, if more than eight rounds of data are available, then the larger dataset will be evaluated to determine whether the background dataset can be expanded to provide a more robust statistical assessment. At that point, statistical evaluation of the background dataset will be performed to establish the upper prediction limits for each Section 845.600(a) and (b) constituent. It is noted that in the case of pH, a lower prediction limit will also be established since this parameter has an established upper and lower value range for compliance.

Site specific Groundwater Protection Standards (GWPSs) will be developed in accordance with Section 845.600(a)(2) as follows:

- If the constituent has an established State standard listed in Section 845.600(a)(1) and the standard is greater than the calculated background upper prediction limit, then the standard will serve as the GWPS. If the background upper prediction limit is greater than the standard, the upper prediction limit will serve as the GWPS.

- If the constituent does not have an established standard (i.e., calcium and turbidity) then the calculated upper prediction limit will serve as the GWPS.

Once the proposed GWPSs are determined and approved by Illinois EPA, subsequent downgradient well concentrations will be compared against the upper prediction limit (and lower prediction limit in the case of pH), and the GWPSs. If an exceedance of the GWPS is identified during a quarterly sampling event, an immediate resampling of the specific well(s) will be completed for those specific parameters. If the exceedance is confirmed by the resampling, the Illinois EPA will be notified of the exceedance(s) and the notification will be placed in the facilities operating record in accordance with 845.800(d)(16). It is noted that there are some constituents that historically may have had no detections (i.e., 100% non-detects). In this case, in accordance with the Unified Guidance, if there is a detection of such a constituent, then the Double Quantification Rule will be applied. Under this rule, a confirmed exceedance is registered if any well-constituent pair in the 100% non-detect group exhibits quantified measurements (i.e., at or above the Reporting Limit in two consecutive sample and resample events.

If an exceedance of the GWPS is recorded and reported to Illinois EPA, an Alternate Source Demonstration (ASD) may be completed within 60-days of the confirmed exceedance in accordance with Section 845.650(e) and submitted to the Illinois EPA as well as placing the ASD on the facility's publically accessible CCR website. Illinois EPA will review and approve or disapprove the ASD.

If it is decided not to complete an ASD or if Illinois EPA does not concur with and approve the ASD, a characterization of the nature and extent of the potential release must be completed in accordance with Section 845.650(d)(1) as well as meeting the requirements of Sections 845.660, 845.670 and 845.680.

4.0 CERTIFICATION

In accordance with Section 845.640(f)(2) of the State CCR Rule, I hereby certify based on a review of the information contained within this Illinois State CCR Rule Compliance Statistical Approach for Groundwater Data Evaluation dated August 23, 2021, the statistical procedures developed and selected for evaluation of groundwater data associated with the Midwest Generation Powerton Station CCR Units are adequate and appropriate for evaluating the groundwater data.

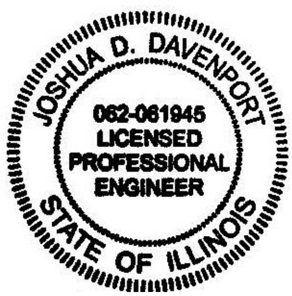
Certified by: ______________________________

Date: 823/21

Joshua Davenport, P.E.

Professional Engineer Registration No. 062-061945

KPRG and Associates, Inc.



FIGURE

W:\projects\midwest generation\12313 groundwater\figures\powerton\ccr\powerton ccr 4q2018 gw map.dwg

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG

KPRG and Associates, inc.

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

CCR MONITORING WELL SITE MAP

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 350'

Date: June 10, 2021

KPRG Project No. 12313.1

FIGURE 1

TABLE

Table 1. Section 845.600 Groundwater Monitoring Parameter List

Parameter	Section 845.600 Standards
Antimony	0.006
Arsenic	0.01
Barium	2
Beryllium	0.004
Boron	2.0
Cadmium	0.005
Chloride	200
Chromium	0.1
Cobalt	0.006
Combined Radium 226 + 228 (pCi/L)	5.0
Fluoride	4.0
Lead	0.0075
Lithium	0.04
Mercury	0.002
Molybdenum	0.10
pH (standard units)	6.5-9.0
Selenium	0.05
Sulfate	400
Thallium	0.002
Total Dissolved Solids	1200
Calcium	NE
Turbidity	NE

All vaues in mg/l unless otherwise specified.
NE- Not Established

ATTACHMENT 11-1
OWNER CERTIFICATION

I, Todd Mundorf, as an authorized representative of Midwest Generation, certify that the public notification and public meeting requirements were completed in accordance with 35 Ill. Adm. Code 845.240.

Signature: [signature]

Title: Plant Manager

ATTACHMENT 11-2
PUBLIC MEETING GENERAL SUMMARY

Midwest Generation, LLC
Powerton Generating Station
Bypass Basin Retrofit and Former Ash Basin Closure
Public Meeting General Summary

INTRODUCTION

In accordance with Title 35 of the Illinois Administrative Code ("35 IAC") Section 845.240, Midwest Generation, LLC (MWG) posted the public meeting notice for closure of the Powerton Generating Station's Former Ash Basin and the Retrofit Plan for the Bypass Basin on its publicly available website and provided a copy of such notice to the Illinois Environmental Protection Agency (Illinois EPA or Agency) to email to its listserv for this facility. The public meeting notice was also mailed to all residents within at least 1 mile of the facility on April 14, 2022, which totaled 986 residential mailing addresses. The notice was also posted in 31 public locations within 10 miles of the facility boundary.

The public meetings for Powerton Generating Station's Bypass Basin and Former Ash Basin (FAB) were held on May 18, 2022 from 6:00 p.m. to 8:00 p.m. and on May 19, 2022 from 10:00 a.m. to 12:00 p.m. The meetings were held in a hybrid format – in person and via Zoom or telephone. Seven members of the public attended the May 18th meeting in person; four attended via Zoom. Seven members of the public attended the May 19th meeting in person; eleven attended via Zoom. The remaining attendees were MWG affiliate employees and consultants. Attendees who wished to sign up for a copy of the meeting summary and/or be added to Illinois EPA's listserv for the facility were asked to sign up via a form provided at the in-person location or a link to a Google form that was provided within the chat function of the Zoom meeting and posted on MWG's website, midwestgenerationllc.com. Seventeen attendees requested a copy of the meeting summary, eleven of whom requested transmittal of their email address to the Agency to be added to the Agency's listserv for the facility. It was also announced that the link would be available on MWG's public website for two weeks. After an introduction and approximate 50-minute presentation on the proposed retrofit and closure construction plans, the public was given approximately 1 hour during each meeting to ask questions and provide comments.

This document serves as a summary of the issues and questions raised during the meeting.

MWG proposes to retrofit the Bypass Basin by removing and disposing of the remaining material in the basin, decontaminating the existing geomembrane liner so that it will act as another protective layer in the composite liner system, and installing a composite liner system and leachate collection system. MWG proposes to close the Former Ash Basin in-place by installing an alternate final cover system (ClosureTurf®).

SUMMARY OF ISSUES AND QUESTIONS RAISED DURING THE MEETING

General

Powerton Lake

In response to a specific question, there is one fish advisory specific to Powerton Lake, for the channel catfish. The advisory is for polychlorinated biphenyls (PCBs) and the Illinois Department of Public Health recommends that people consume no more than 1 meal per week of channel catfish that are between 15 and 19 inches in size, and no more than 1 meal per month of channel catfish that are 19 inches or longer. Note that the Illinois Department of Natural Resources (IDNR) leases Powerton Lake for fishing, waterfowl hunting, and other recreation uses; IDNR has leased Powerton Lake since 1984. In 2021, IDNR stocked the Powerton Lake with over 230,000 fish across three species: blue catfish, smallmouth bass, and hybrid striped bass. Information on IDNR's management of the fishery at Powerton Lake can be found on IDNR's website (https://www.ifishillinois.org/profiles/waterbody.php?waternum=00039).

Labor

Midwest Generation, LLC operates under a Power House Labor Agreement (PHLA) that gives preference to Union labor for construction and maintenance activities at all plants that MWG owns and/or operates in Illinois. MWG will continue to abide by PHLA.

Availability of Information

Questions were raised about availability of information regarding MWG's plans for retrofitting the Bypass Basin and closing the FAB. Generally, MWG posts all required reports and assessments to its publicly available website within 14 days of completion. This information can be found at midwestgenerationllc.com.

Former Ash Basin

FAB History

Questions were asked about whether ash has washed out of the FAB into the Illinois River, if MWG has studied whether potential contaminants have leached over time into the Illinois River, and whether MWG has studied the Illinois River.

> The ash that is currently in the FAB is stable and not moving. Powerton Station personnel inspect the FAB weekly and the FAB is inspected by a third-party Professional Engineer annually. The inspection reports are posted at midwestgenerationllc.com.

MWG has not studied whether potential contaminants have leached over time because MWG is unable to recreate the initial conditions that likely produced the ash that is in the FAB. Powerton Station began operation in the late 1920's with pulverized coal-fired (PC) boilers (Units 1 through 4) that burned Illinois coal. Units 1 through 4 were retired before MWG began operating Powerton Station, presumably in the 1970's, the same decade that placement of ash in the FAB ceased.

Ash from the FAB was sampled and analyzed as required by the IL CCR Rule. The results of that sampling can be found in the Initial Operating Permit application, available at midwestgenerationllc.com. MWG did not identify any constituent levels of concern in that sampling.

MWG does not study the Illinois River. Instead, we monitor our discharges to the Illinois River and report those to the Illinois EPA as required by the Station's NPDES permit.

<u>Groundwater Monitoring</u>

Groundwater monitoring at the FAB shows that groundwater from each of the four downgradient monitoring wells meet the Section 845.600(a) groundwater protection standards which are based on the Illinois Class I Potable Resource Groundwater standards.

<u>Closure in Place Regulations and Financial Assurance</u>

Several questions were asked about whether the regulations allow for closure in place of the FAB as it is unlined and not separated from the uppermost aquifer by at least five feet.

The regulations do not distinguish between closure methods for unlined or lined CCR surface impoundments, nor do the regulations distinguish between closure methods for CCR surface impoundments that fail any location restrictions. Instead, the regulations require impoundments that are unlined or fail one or more location restrictions to close. The closure alternatives analysis compared three methods of closure in place and one closure by removal. Various transportation methods were examined for closure by removal.

Under Illinois EPA oversight, MWG will be required to inspect and monitor any CCR surface impoundment that is closed in place for at least 30 years after the closure construction is complete. Post-closure care includes continued groundwater monitoring, impoundment inspections, as-needed repairs to the final cover system, and corrective actions as necessary. Once 30 years of monitoring have been completed, the owner or operator of a CCR surface impoundment must request Illinois EPA approval to terminate post-closure care. While MWG cannot predict future events, the Illinois EPA will continue to have oversight for CCR surface impoundments until the Agency agrees that its oversight is no longer necessary.

Owners and operators of CCR surface impoundments are required to financially assure the costs of closure and post-closure care through the end of the post-closure care period. Financial assurance would be used only in the case of owner insolvency; otherwise costs for closure, post-closure care, and any necessary remedial activities are paid by the surface impoundment owner and/or operator. The responsibility for a CCR surface impoundment would transfer to any future owner, similarly to how the FAB responsibility transferred to MWG when MWG became the operator of Powerton Station in 1999. Additionally, should any additional corrective actions be required in the future, 35 IAC Part 845 requires the owner to financially assure the costs of the additional corrective actions. In addition, the corrective action would be performed by the CCR surface impoundment owner to ensure that impacts to the environment, including groundwater, do not occur or are corrected under EPA oversight. Groundwater modeling may be used as part of evaluating the appropriate corrective action to demonstrate the selected corrective action's effectiveness in remedying the environmental impacts.

Closure in Place Design

Several questions were asked about the northern berm that is included in the closure in place design. The berm is designed to be three to four feet above grade to prevent flooding of the impoundment once the final cover system is placed. The berm will be constructed of fill material composed of natural soils, but the specific materials have not been chosen at this time. Material specifications will be included in construction bid requests. Construction bid requests will not occur until a final closure construction permit is issued by the Agency.

The FAB will be dewatered before placement of the final cover system. The final cover system will be the proprietary ClosureTurf cover system that consists of an impermeable geomembrane liner covered with synthetic turf and sand infill. The impermeable geomembrane liner is a specially designed plastic liner that minimizes precipitation from passing through it and moves precipitation off the liner, so it does not accumulate on top of the liner. The synthetic turf and sand infill protect the geomembrane liner from animal, weather, and UV damage. Third party testing has demonstrated the geomembrane liner has a permeability of $1x10^{-13}$ centimeters per second (cm/s) and a lifespan of at 100 years. Additional testing has demonstrated that the freeze-thaw cycle has no impact on the integrity and effectiveness of the geomembrane liner.

Questions were raised regarding potential future concerns, specifically seismic activity and rising water levels. On its website, the United States Geological Survey (USGS) lists earthquakes in Illinois since 1900. No earthquakes have been recorded in Tazewell County in the 122-year period recorded by the USGS. Closure in place requires continued monitoring of the surface impoundment and corrective action if necessary. As part of the Initial FAB Operating Permit application, the location of the FAB was determined to not be located in a seismic impact zone, not in a fault area, and not in an unstable area.

Onsite Landfill/Consolidate and Close

An onsite landfill was considered and ultimately ruled out because of the lengthy process of siting a new landfill and lack of available space vertically and horizontally. One commentor suggested MWG examine removing ash from the northern portion of the FAB, placing a liner in that area, and consolidating the ash in the northern portion. While MWG did not overtly examine this scenario in the closure alternatives analysis, it was considered and eliminated because installation of a liner and consolidating the ash in the northern portion could be considered construction of a CCR landfill, further delaying the closure of the FAB.

The rail line that separates the northern portion of the FAB from southern portion acts as a berm to prevent flooding of the southern portion from the Illinois River, so consolidation in the southern half could be the better option for protection of the environment. This alternative option is still being internally considered/evaluated, but consideration could not be finalized within the 14 days that this summary is required to be posted.

Closure Costs

The selected option for closure of the FAB is not the least expensive based on engineering analysis that is documented in the Closure Alternatives Analysis. Costs were not determinative in selecting closure in place.

Bypass Basin

Bypass Basin Underlying Surface

Questions were asked about whether the Bypass Basin currently has a Poz-o-Pac liner, had a Poz-o-Pac liner, and whether the Bypass Basin retrofit includes reusing the Poz-o-Pac liner if it exists.

> During the May 18 meeting, MWG mistakenly stated that the Bypass Basin never had a Poz-o-Pac liner and corrected that statement during the May 19 meeting when the question was asked again. The original construction documents show that a 12-inch-thick layer of Poz-o-Pac was installed over the Bypass Basin's original Hypalon® liner along the basin floor.
>
> Both the Poz-o-Pac and Hypalon® liners were removed from the Bypass Basin when the basin was relined in 2010 with a 60-mil HDPE geomembrane liner. Currently, the Bypass Basin does not have either of its original Poz-o-Pac or Hypalon® liners; only the relatively new 60-mil HDPE geomembrane liner is present.

It should be noted that Poz-o-Pac is a cementitious material and has been used as a supporting surface for things like roads, highways, and parking lots (in addition to similar pozzolan-stabilized base materials). According to the Federal Highway Administration, Poz-o-Pac was used at over 100 sites throughout Illinois between 1955 and 1985.

Questions were asked about the material that underlies the Bypass Basin's current HDPE geomembrane liner and whether this material will be tested during the retrofit process. The plan for retrofitting the Bypass Basin does not include testing of soils beneath the HDPE geomembrane liner unless tears in the liner are discovered which may indicate the potential release of contaminants into the Bypass Basin's subgrade. The competency of the Bypass Basin's existing HDPE geomembrane liner will be verified by conducting an electrical leak location survey, which involves placing a voltage across the entire liner and using a detection probe to determine whether any tears are present in the liner. Where a tear is present, the probe will identify an electrical current flowing through the tear. If a tear is discovered, the soils under the tear will be inspected to determine whether any contaminants have been released into the basin subgrade. Contaminated soils identified during this inspection will be removed and replaced with structural fill.

Retrofit Design

Questions were asked about the structural fill material that will be used to establish the slopes for the retrofitted Bypass Basin's leachate collection system. This fill material will be comprised of natural soils, not CCR; however, the specific soil materials have not been chosen at this time. Material specifications will be included in construction bid requests. Construction bid requests will not occur until a final retrofit construction permit is issued by the Illinois EPA.

SUMMARY OF REVISIONS, CHANGES, AND CONSIDERATIONS

Public engagement is an important part of the permitting process. Midwest Generation, LLC valued the opportunity to hear and consider the comments of community members and others who participated in the public meetings. At this time, Midwest Generation is proceeding with the proposal for retrofitting the Bypass Basin and closing the Former Ash Basin in-place as presented at the public meetings. Taking public comments into consideration, the current analysis continues to indicate that the proposed plan – which remains subject to regulatory review and approval – prioritizes the environment and community well-being.

Timestamp	Email Address	Name	What is your home city?	The Illinois Environmental Protection Agency is creating a listserv for the facility. Would you like us to transmit your email address to the Agency to be added to the listserv?
Virtual				
5/18/2022 16:37:26	kg@nijmanfranzetti.com	Kristen Gale	La Grange	Yes
5/18/2022 18:02:59	kcourtney@elpc.org	Kiana Courtney	Chicago	Yes
5/19/2022 10:04:22	fbugel@gmail.com	Faith E Bugel	Wilmette	Yes
5/19/2022 12:03:21	ryan.hidden+NRG@sierraclub.org	Ryan Hidden	Peoria	Yes
5/19/2022 12:18:59	ewatkins@forgen.com	Emily Watkins	Point Pleasant	Yes
5/19/2022 15:46:20	hannahlee.flath@sierraclub.org	Hannah Flath	Chicago	Yes
5/20/2022 9:22:13	logan@iuoe649.org	Luke Ogan	Bloomington	Yes
5/23/2022 12:52:40	tsshel1@ilstu.edu	Tim Shelley	Peoria	Yes
In-Person				
5/18/2022	rowe@bradley.edu	Robert Rowe	Peoria	No
5/18/2022	johnwosik@outlook.com	John Wosik	Dunlap	No
5/18/2022	jestpn@aol.com	Diane Jorgensen	East Peoria	No
5/18/2022	johchoices@hotmail.com	Joyce Harnett	Pekin	Yes
5/18/2022		Dave Grooms	Pleasant Baine?	No
5/18/2022	jobluem@yahoo.com	Joyce Bluemshine	Peoria	No
5/18/2022	jdickson@comcast.net	Jeff Dickson	Green Valley	No
5/19/2022		Lawrence Farlington	Pekin	No
5/19/2022		Joseph Kotas	Aurora	No
5/19/2022	petalnrose@gmail.com	Robin Nolting	Pekin	Yes
5/19/2022	jestpr@aol.com	Bob Jorgensen	East Peoria	Yes
5/19/2022	nclong405@yahoo.com	Nancy Long	Peoria	Yes
5/19/2022	moseynme@mtco.com	David Grebner	Peoria Heights	No