Thomas J. Dehlin, P.E.
Project Engineer (Licensed in IL, KY, and WY)
(312) 269-6373
tdehlin@sargentlundy.com

July 19, 2023

Illinois Environmental Protection Agency
DWPC – Permits MC #15
Attn: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Powerton Metal Cleaning Basin Retrofit Construction Permit Application

To Whom It May Concern:

On behalf of Midwest Generation, LLC (MWG), Sargent & Lundy (S&L) respectfully submits the enclosed construction permit application to retrofit the Metal Cleaning Basin (Illinois EPA ID No. W1798010008-03) at MWG's Powerton Generating Station pursuant to 35 Ill. Adm. Code 845.770. The enclosed permit application has been prepared in accordance with 35 Ill. Adm. Code 845.220(a)–(b). As detailed in the application, MWG is proposing to retrofit the Metal Cleaning Basin with a new composite liner system and a new leachate collection system.

We look forward to working with the Illinois EPA on this project. Please contact me ((312) 269-6373 or tdehlin@sargentlundy.com) or Mr. Joseph Kotas at the Powerton Generating Station ((309) 477-5216 or Joseph.Kotas@nrg.com) with any questions or concerns regarding this permit application.

Best Regards,

Th. Dehlin

Thomas J. Dehlin, P.E.

Enclosures:

1. Form CCR 1 – General Provisions
2. Form CCR 2CN – New Construction
3. Application for Retrofit Construction Permit

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 Tazwell	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)	Title	Phone Number
Todd Mundorf	Plant Manager	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	State	Zip Code
Princeton	NJ	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.

W1798010008-03	☑	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
	7/18/23

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.
		Metal Cleaning Basin
	1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).
		W1798010008-03
	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 Metal Cleaning Basin is primarily used for temporarily storing gas-side boiler cleaning wash water. When no wash water is present, the basin is also used to temporarily store dry bottom ash and dry fly ash collected during routine cleaning activities at the Station.
	1.5	How long has the CCR surface impoundment been in operation?
		45 Years (Since 1978)
	1.6	List the types of CCR that have been placed in the CCR surface impoundment.
		Gas-side boiler cleaning wash water, which may contain boiler slag. When not used for managing wash water, dry bottom ash and dry fly ash are temporarily stored in the impoundment and are removed as quickly as possible.
	1.7	List the name of the watershed within which the CCR surface impoundment is located.
		Pekin Lake-Illinois River Watershed

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)

Narrative Description	2.1	List the types of CCR expected in the CCR surface impoundments.	
		Gas-side boiler cleaning wash water, which may contain boiler slag. Dry bottom ash. Dry fly 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 Metal Cleaning Basin's maximum capacity is approximately 12,800 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.			
		40,000	GPD		dTn
	2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.			
		Approximately 4 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
Metal Cleaning Basin
(IEPA ID No. W1798010008-03)

Application for Retrofit Construction Permit

Revision 0

July 19, 2023

Issue Purpose: Permit

Project No.: 12661-152

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

Sargent & Lundy

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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). Each of the four boilers are typically cleaned on an annual basis during scheduled outages. During these cleanings, gas-side boiler cleaning wash water is pumped to the Station's Metal Cleaning Basin for temporary storage. This wash water is ultimately discharged into the Station's Metal Cleaning Treatment System for the removal of dissolved metals and suspended solids. When the Metal Cleaning Basin is not being used to store gas-side boiler cleaning wash water, the Station has historically used it to temporarily store dry bottom ash and fly ash collected during routine cleaning activities at the Station.

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 Metal Cleaning Basin with a new composite liner system and a new leachate collection and removal system. The purpose of this report and all attachments hereto is to demonstrate that the design, construction, and operation of the retrofitted Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin is operated by Midwest Generation, LLC, whose address is 804 Carnegie Center, Princeton, NJ, 08540. The Metal Cleaning Basin's Illinois EPA identification number is W1798010008-03.

1.2 PURPOSE OF THE CCR SURFACE IMPOUNDMENT

Powerton primarily uses the Metal Cleaning Basin for temporarily storing gas-side boiler cleaning wash water prior to treatment in the Station's Metal Cleaning Treatment System for the removal of dissolved metals and suspended solids. The Station also uses the basin (when no wash water is present) to temporarily store dry bottom ash and fly ash collected during routine cleaning activities at the Station. After it has been retrofitted with a new composite liner system and a new leachate collection and removal system, the Metal Cleaning Basin will continue to be used for these purposes.

1.3 CCR SURFACE IMPOUNDMENT SERVICE HISTORY

The Metal Cleaning Basin was originally constructed circa 1978 and has been operating since that time.

1.4 TYPES OF CCR IN THE SURFACE IMPOUNDMENT

The Metal Cleaning Basin accepts gas-side boiler cleaning wash water, which may contain boiler slag, when the Station's boilers are cleaned during scheduled outages. The Station also uses the basin (when no wash water is present) to temporarily store dry fly ash removed from the fly ash silos when they are cleaned, and dry bottom ash collected during routine cleaning activities at the Station. The chemical constituents that make up these CCRs are discussed in detail in Section 2.1.

1.5 NAME & SIZE OF SURROUNDING WATERSHED

The Metal Cleaning 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 Metal Cleaning Basin is limited to the area within the embankment crests because the basin is 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 Metal Cleaning Basin's foundation materials are taken from the history of construction in the initial operating permit application prepared by KPRG and Associates, Inc. (KPRG) for the basin in 2022 (KPRG, 2022a).

The physical properties of the foundation materials in which the Metal Cleaning Basin is constructed range from sand and clay. Alluvial sands and gravels with some minor clay underlie the site. This information was obtained from published geologic information and field investigations performed by KPRG in 2005, Patrick Engineering in 2011, and Geosyntec in 2016. Publicly available geologic information shows the site is underlain by approximately 100 to 125 feet of alluvial sands and gravels with minor interspersed clay. Patrick Engineering (2011) and Geosyntec (2016) investigations show that the silt and clay layers identified range from 16 to 20 feet with approximately 34 to 43 feet of medium dense poorly graded sand and gravel below. Finally, no abutments are present.

The physical properties of the embankment fill materials consist of fine to coarse silty sand in the east embankment and clay with intermingled sand and gravel layers in the west embankment. The soils that underly the Metal Cleaning Basin consists of clay with some sand and gravel.

1.6.2 ENGINEERING PROPERTIES OF FOUNDATION MATERIALS

The following descriptions of the engineering properties of the Metal Cleaning Basin's foundation materials are taken from the initial structural stability and safety factor assessments prepared by Civil & Environmental Consultants, Inc. (CEC) for the basin in 2021 (CEC, 2021).

The foundation materials for the Metal Cleaning 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	128	34	50	600
Sand	125	32	0	--

1.7 DESCRIPTION OF CONSTRUCTION MATERIALS, METHODS, AND DATES

The following descriptions of the historical construction materials, methods, and dates for the Metal Cleaning Basin are based on the construction plans prepared by (1) NUS Corporation in 1978 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 Metal Cleaning Basin were not available detailing the actual methods and materials used to construct the basin circa 1978.

1.7.1 PHYSICAL & ENGINEERING PROPERTIES OF CONSTRUCTION MATERIALS

Based on the original construction plans for the Metal Cleaning Basin prepared by NUS Corporation in 1978, the basin's embankments were constructed using compacted fill. Engineering properties for the compacted fill were estimated by CEC as shown in Table 1.7-1 for use in the Metal Cleaning Basin's initial safety factor assessment (CEC, 2021). These estimated engineering properties were based on site investigations, published data, and laboratory testing of the Metal Cleaning 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

The Metal Cleaning Basin shares its east embankment with the Ash Surge Basin's west embankment. This embankment was initially designed to have a gravel-surfaced access road, which was eventually paved with asphalt at some point during the basins' operating histories. The Metal Cleaning Basin's north, west, and south embankments are vegetated, and the north and west embankments' crests have gravel surfacing.

The Metal Cleaning Basin's interior slopes were originally lined with a Hypalon® liner, and the base and the upper few feet of the interior slopes were lined with a Poz-O-Pac liner. In 2010, the Hypalon® and Poz-O-Pac liners along the interior slopes were removed and replaced with a new 60-mil high-density polyethylene (HDPE) geomembrane liner. Except for the area north of the basin's weir wall, the original Poz-O-Pac liner along the basin floor was left in-place and covered with the new HDPE geomembrane liner

1.7.2 CONSTRUCTION METHODS

The Metal Cleaning Basin was constructed circa 1978 by placing compacted fill to form the basin's four embankments. All four embankments were constructed with 3-horizontal to 1-vertical (3H:1V) exterior and interior side slopes to crest elevations of 468 feet (+/-) above mean seal level (amsl). Based on existing grade at the time of their construction, minor fill quantities were required to construct the south and east embankments relative to the north and west embankments. The south embankment consists of

approximately 3 feet of compacted fill, while the remaining 10 feet of the southern interior slope was excavated below existing grade at the time. Meanwhile, the north embankment consists entirely of compacted fill. The crests of the west and south embankments were originally designed to be 5 feet wide, whereas the crests of the east and north embankments were designed to be 40 and 30 feet wide, respectively, in order to support gravel access roads.

The bottom of the Metal Cleaning Basin and the lower four feet of its embankments were originally lined with a 12-in.-thick Poz-O-Pac liner, which was to be installed in two 6-in.-thick lifts. The remaining portions of the basin's interior slopes were lined with a Hypalon® liner.

In 2010, the Metal Cleaning Basin was re-lined with a new 60-mil HDPE geomembrane. Prior to installing the new HDPE geomembrane liner, the existing Hypalon® and Poz-O-Pac liners along the basin's interior slopes were removed. However, except for the area north of the basin's weir wall, the original Poz-O-Pac liner installed along the floor of Metal Cleaning Basin was left in-place and covered with the new HPDE geomembrane liner. Meanwhile, the original Poz-O-Pac liner on the north side of the outlet weir was removed and replaced with a 60-mil HDPE geomembrane that was then covered with 18 inches of riprap. The remainder of the HDPE geomembrane liner along the Metal Cleaning Basin floor was covered with 18 inches of fine and coarse aggregate material.

1.7.3 CONSTRUCTION DATES

Exact dates for construction of the Metal Cleaning Basin's embankments, original liner system, and appurtenant structures are unknown; however, construction drawings were approved for construction in June 1978. As previously stated, the Metal Cleaning Basin was re-lined with a 60-mil HDPE geomembrane liner in 2010.

1.8 DETAILED DIMENSIONAL DRAWINGS

The original construction plans for the Metal Cleaning Basin prepared by NUS Corporation in 1978 are provided in Attachment 1-1. Meanwhile, the as-built drawings for replacing the Metal Cleaning Basin's liner prepared by NRT in 2011 (documenting the re-lining work completed in late 2010) are provided in Attachment 1-2.

1.9 INSTRUMENTATION

Electronic instrumentation is not present in the Metal Cleaning Basin. However, 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 Metal Cleaning Basin is provided in Attachment 1-5.

1.11 SPILLWAY AND DIVERSION DESIGN FEATURE CAPACITIES AND CALCULATIONS

The Metal Cleaning Basin does not have an emergency spillway.

1.12 SURVEILLANCE, MAINTENANCE, & REPAIR CONSTRUCTION SPECIFICATIONS

Technical specifications for the Metal Cleaning Basin liner replacement project performed in 2010 are provided in Attachment 1-3, and the permit issued by the Illinois EPA for the liner replacement project is provided in Attachment 1-4.

1.13 RECORD OF STRUCTURAL INSTABILITY

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

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

2.1 CCR TYPES & CHEMICAL ANALYSES

As previously stated in Section 1.4, the gas-side boiler cleaning wash water sent to the Metal Cleaning Basin when the Station's boilers are cleaned may contain boiler slag. When wash water is not present in the Metal Cleaning Basin, the Station has historically used the basin to temporarily store dry bottom ash and dry fly ash. These CCRs 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. Sample of the CCRs present in the Metal Cleaning Basin were 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 Metal Cleaning Basin

Parameter	CCR Sample (06-23-2021)	Parameter	CCR Sample (06-23-2021)
Antimony	< 1.8	Cobalt	< 22
Arsenic	7.6	Fluoride	22
Barium	1,900	Lead	66
Beryllium	1.5	Lithium	16
Boron	100	Mercury	0.26
Cadmium	4.3	Molybdenum	5.3
Calcium	120,000	Selenium	7.1
Chloride	110	Sulfate	21,000
Chromium	52	Thallium	4.0

Notes:
1. All results are in milligrams per kilogram (mg/kg), except for percent solids, which is percent (%).

2.2 MAXIMUM CAPACITY

The Metal Cleaning Basin's maximum capacity is approximately 12,800 cubic yards.

2.3 WASTE STREAMS

As shown in the Station's process flow diagram provided in Attachment 2-2, the Station sends gas-side boiler cleaning wash water to the Metal Cleaning Basin. As previously mentioned, the Station also uses the Metal Cleaning Basin when no wash water is present to temporarily store dry fly ash and dry bottom ash collected during routine cleaning activities at the Station. The Station plans to continue sending these waste streams to the Metal Cleaning Basin after it has been retrofitted with a new composite liner system and a new leachate collection and removal system.

The Station cleans each boiler once per year over a 5-day period. During this period, gas-side boiler cleaning wastewater is pumped to the Metal Cleaning Basin at an average rate of 1,200 gallons per minute over 20 hours. Thus, each cleaning event produces approximately 7.2 million gallons of gas-side boiler cleaning wastewater. For the two units, this intermittent flow has an equivalent annual average continuous flow rate of approximately 40,000 gallons per day.

2.4 OPERATING LIFE

The Metal Cleaning Basin is currently anticipated to receive the CCR waste streams listed in Section 2.3 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 route for vehicle access to the Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 typically 10 miles per hour.

The Metal Cleaning 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 southeast corner of the Metal Cleaning 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 which is located southeast of the Metal Cleaning Basin. There is a gravel road along the Bypass Basin's northern and eastern embankments which will allow vehicles to reach the Metal Cleaning Basin's access ramp located in the southeast corner of the basin. These roads will be used by construction personnel to bring materials and

equipment required for the retrofit activities to the Metal Cleaning Basin. Larger construction equipment may utilize the existing road around the Ash Surge Basin to navigate around the Station's CCR surface impoundments back south to the heavy equipment gate. Such equipment will also have either backup alarms or spotters for backing up as needed.

Transportation access to the Metal Cleaning Basin will not be required during normal day-to-day operations after the Metal Cleaning 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 Metal Cleaning 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 9-0. Finally, cross sections near / through the Station's CCR surface impoundments are shown on Figures 9-2 through 9-4 in Attachment 9-0.

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

The proposed construction plans and specifications for retrofitting the Metal Cleaning 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 Metal Cleaning Basin is retrofitted in accordance with the proposed construction plans and specifications. The technical specifications for the retrofit construction and CQA work are provided in Attachment 5-2.

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

1. Removing any remaining boiler wash water sediments from the basin and transporting the material to a permitted disposal facility in accordance with current and historic Station maintenance procedures for the Metal Cleaning Basin;
2. Obtaining a construction permit from the Illinois EPA for retrofitting the Metal Cleaning Basin;
3. Removing the gravel warning, sand cushion, and riprap layers over the existing geomembrane liner from the basin and transporting these materials to a permitted disposal facility;
4. 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 competent and is not contaminated with CCR constituents in accordance with 35 Ill. Adm. Code 845.770(a)(4);
5. Decontaminating the basin's appurtenant structures (e.g., inlet aprons, weir walls, piping);
6. 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;
7. Installing a composite liner system consisting of a 60-mil HDPE geomembrane over a geosynthetic clay liner (GCL); and
8. Installing a leachate collection and removal system consisting of a drainage geocomposite, leachate collection pipe, and submersible sump pump;
9. Installing a filter layer over the leachate collection and removal system; and
10. Installing a protective warning layer over the sand filter layer.

5.1 CCR REMOVAL & DECONTAMINATION

After temporarily ceasing all flows into the Metal Cleaning Basin, MWG will remove any remaining boiler wash water sediments stored above the granular protective layers covering the Metal Cleaning Basin's existing geomembrane liner in accordance with the Station's usual cleaning and maintenance practices.

Upon approval of the retrofit construction permit application, the retrofit activities will begin with removal of the granular protective layers covering the Metal Cleaning Basin's existing geomembrane liner: a 6-in.-thick gravel warning layer and a 12-in.-thick sand cushion layer. MWG will also remove an 18-inch-thick layer of riprap above the basin's existing geomembrane liner between the basin's concrete weir wall and discharge pipe. These 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 boiler wash water sediments, 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 and riprap in the Metal Cleaning 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 aprons, weir walls, 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 boiler wash water sediments. 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-MCB-CSK-004 (see Attachment 5-1) to demonstrate that the liner is not contaminated with CCR constituents.

5.2 STRUCTURAL FILL

After the existing granular protective layers and riprap have been removed and the Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin's new composite liner system will be installed. The proposed new composite liner system for the Metal Cleaning 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 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 the GCL and HDPE geomembrane liner will be secured along the crests of the Metal Cleaning Basin's embankments by either (1) placing fill material over horizontal run-outs of the composite liner components or (2) placing both components in an anchor trench. The horizontal run-outs will be at least 15 feet long and covered with 18 inches of fill material, while the anchor trenches will be approximately two feet deep and will be backfilled to anchor the geosynthetic components of the Metal Cleaning 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 placed over horizontal run-outs and in anchor trenches will be properly compacted to prevent the geosynthetic components from pulling out of the anchor trenches or under the backfill placed over the horizontal run-outs.

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 Metal Cleaning 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 ultimately convey collected

leachate to the existing discharge pipe at the northern end of the retrofitted Metal Cleaning Basin. A wye branch in the leachate collection pipe will also be installed and lead to a non-perforated riser pipe in the northeastern quadrant of the basin, where a wheeled, submersible pump will be installed. The Station will use this pump to dewater the Metal Cleaning Basin during periodic cleanings, at the time of closure, and as needed during the post-closure care period.

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 along the crests of the Metal Cleaning Basin's embankments, either under backfill placed over horizontal run-outs or in anchor trenches.

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.

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 Metal Cleaning Basin, a sand filter layer will be installed above the new LCRS to prevent boiler wash water 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 boiler wash water sediments pumped into the retrofitted Metal Cleaning Basin. Along the floor of the retrofitted Metal Cleaning 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 boiler wash water sediments 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 Metal Cleaning 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.

Each of the Station's four boilers is typically cleaned on an annual basis during scheduled outages. During these cleanings, the gas-side boiler wash water, which may contain boiler slag, is pumped to the Metal Cleaning Basin for temporary storage via elevated piping supported on a pipe rack. As shown on Figure 4-2, this pipe rack emanates from the north end of the boiler building and follows the eastern edge of the Old Intake Channel to the Metal Cleaning Basin. The wash water flows into the Metal Cleaning Basin over three concrete aprons at the southern edge of the basin. Upon entering the basin, the boiler wash water sediments suspended in the transport water settle to the basin floor as the wash water migrates towards the northern end of the basin. Wash water is ultimately conveyed to the Station's Metal Cleaning Treatment System through a reinforced concrete pipe at the northern end of the Metal Cleaning Basin.

After the Station's Metal Cleaning Treatment System removes dissolved metals and suspended solids from the gas-side boiler wash water, the treated water is discharged to the Ash Surge Basin. Water in the Ash Surge Basin ultimately drains 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[1] 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.

Finally, when wash water is not present in the Metal Cleaning Basin, the Station will use the basin to temporarily store dry fly ash and dry bottom ash collected during routine cleaning activities. The Station places this material in the basin via end dumping.

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

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

This section demonstrates the retrofitted Metal Cleaning 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

Per the demonstration submitted with MWG's initial operating permit application for the Metal Cleaning Basin in March 2022 (KPRG, 2022a), which is included in Attachment 7-1, the upper limit of the uppermost aquifer under the Metal Cleaning Basin is at El. 450.14 feet above mean seal level (amsl) (KPRG, 2022b). Per Drawing POW-MCB-CSK-006 in Attachment 5-1, the base of the Metal Cleaning Basin's new composite liner system will be at El. 455.67 feet amsl. Therefore, the base of the retrofitted Metal Cleaning Basin will be separated by more than five feet from the upper limit of the uppermost aquifer. Thus, the location of the retrofitted Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), the Metal Cleaning Basin is not located in mapped wetlands. This conclusion is based on the corresponding demonstration KPRG performed for the Metal Cleaning Basin in March 2022 (KPRG, 2022c), 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 Metal Cleaning Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Metal Cleaning Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), the Metal Cleaning 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 KPRG performed for the Metal Cleaning Basin in March 2022 (KPRG, 2022d), 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 Metal Cleaning Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Metal Cleaning Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), the Metal Cleaning 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 KPRG performed for the Metal Cleaning Basin in March 2022 (KPRG, 2022e), 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 Metal Cleaning Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Metal Cleaning Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), the Metal Cleaning Basin is not located in an unstable area. This conclusion is based on the corresponding demonstration KPRG performed for the Metal Cleaning Basin in March 2022 (KPRG, 2022f), 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 Metal Cleaning Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Metal Cleaning Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), the Metal Cleaning 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 Metal Cleaning Basin, and no lateral expansions are planned for the basin's existing embankments. Therefore, the demonstration provided in the Metal Cleaning Basin's initial operating permit application remains valid and, thus, the location of the retrofitted Metal Cleaning Basin complies with 35 Ill. Adm. Code 845.340(c).

7.2 LINER DESIGN CRITERIA

As discussed in Section 5.3, the Metal Cleaning 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 Metal Cleaning 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 convey and/or 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-MCB-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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a), slope protection for the basin's exterior slopes consists of vegetative cover. The northern, western, and southern exterior slopes have grassy vegetation. Meanwhile, the eastern exterior slope is an interior slope for the Ash Surge Basin, which is lined with an HDPE

geomembrane liner. 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 Metal Cleaning 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 Metal Cleaning Basin will remain unchanged, including the existing slope protection measures. Thus, the protection measures for the retrofitted Metal Cleaning 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 Metal Cleaning Basin in accordance with its "CCR Compliance Fugitive Dust Control Plan" (KPRG, 2021), which also covers the Station's Ash Surge Basin, Former Ash Basin, and Bypass 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin site, MWG plans to continue using the existing groundwater monitoring well network that was established for the Metal Cleaning Basin. The details of this groundwater monitoring program are provided in Section 9.0 of MWG's initial operating permit application for the Metal Cleaning Basin that was submitted to the Illinois EPA in March 2022 (KPRG, 2022a). 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 Metal Cleaning Basin, 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 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 (USDA, 1996), 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, 2022a). 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 groundwater monitoring well network around the Metal Cleaning Basin consists of five wells. Monitoring wells MW-15 and MW-17 are upgradient monitoring wells situated between the Ash Surge Basin to the east and the Metal Cleaning Basin to the west. Monitoring wells MW-14, MW-20 and MW-21 are situated immediately downgradient of the Metal Cleaning Basin, along its western side. Well MW-13, located at the east portion of the south side of the Metal Cleaning Basin, has also been being sampled concurrently with the above noted wells. This well was initially installed in 2010 by Patrick Engineering as an upgradient well location for the Metal Cleaning Basin as part of the relining construction permit requirements (Permit No. 2009-EB-2748). It is noted, however, that this well is actually located side-gradient relative to groundwater flow within the clay/silty clay unit and its screen extends down into the underlying, more extensive sand and gravel unit (see Figures 9-2 and 9-3). Therefore, it has been determined that the water quality data from this well, although

useful in evaluating overall site conditions, is not representative of groundwater data for the purposes of leak detection monitoring for the Metal Cleaning Basin.

Groundwater elevation data from the monitoring wells around the MCB are provided in Table 9-2 (from KPRG, 2022a). A hydrograph of water levels for the MCB leak detection monitoring wells are provide as Figure 9-5. A review of the hydrographs shows some temporal fluctuations with the highest water levels occurring within the first or second quarters of the year. It is noted that the water levels in the two new monitoring wells are consistently several feet lower than the other wells, however, based on the boring log data, the wells are all screened within the clay/silty clay unit.

Monthly groundwater flow maps April 2021 through December 2021 are provided in Attachment 9-3. The water elevation data within the clay/silt unit indicates localized groundwater flow beneath the Metal Cleaning Basin in a westerly direction.

Table 9-3 (from KPRG, 2022a) provides a summary of the flow direction, gradients and an estimated rate of groundwater flow based on the monthly flow maps provided in Attachment 9-3. 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)

The average hydraulic conductivity of 3.28×10^{-7} ft/sec (silt/clay unit) in Table 9-3 (from KPRG, 2022a) is consistent with estimates from current ongoing groundwater modeling evaluations in support of construction permit evaluations and literature values (Freeze and Cherry, 1979). The estimated effective porosity of the silt/clay materials (0.40) was 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, including the Metal Cleaning Basin, 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 9-6. 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 Metal Cleaning Basin 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 9-7. 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 of the Metal Cleaning Basin to the Old Intake Canal, which is a hydrogeologic flow boundary, minimal to no downward vertical flow mixing is 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 Metal Cleaning Basin 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 monitoring wells MW-13 and MW-15 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 9-4.

The Metal Cleaning Basin is not subject to the federal regulation for CCR groundwater monitoring networks under 40 CFR 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. However, monitoring wells MW-15 and MW-17 are also part of the CCR monitoring well network for the Bypass Basin and Ash Surge Basin which are subject to the Federal CCR Rule. Therefore, as required under the Federal CCR Rule, eight rounds of background sampling were completed for the monitoring wells within the monitoring network for the Bypass Basin and Ash Surge Basin. 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, 2022a).

9.2 GROUNDWATER MONITORING SYSTEM DESIGN & CONSTRUCTION PLANS

A monitoring well network that includes other basins in the vicinity of the Metal Cleaning Basin was established in 2010 and expanded pursuant to the CCA. In addition, wells MW-20 and MW-21 were installed in March 2021 on the west side of the Metal Cleaning Basin to meet 35 Ill. Adm. Code Part 845 requirements. The well depths were determined based on depth to groundwater and the base elevations of the basin being monitored. The following groundwater monitoring network is established for the Metal Cleaning Basin:

- Upgradient / Background Wells: MW-15 and MW-17
- Downgradient Monitoring Wells: MW-14, MW-20, and MW-21

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

As previously discussed, well MW-13, located at the east portion of the south side of the Metal Cleaning Basin, has also been being sampled concurrently with the above noted detection wells. This well was initially installed in 2010 by Patrick Engineering as an upgradient well location for the Metal Cleaning Basin as part of the relining construction permit requirements (Permit No. 2009-EB-2748). It is noted, however, that this well is actually located side-gradient relative to groundwater flow within the clay/silty clay unit and its screen extends down into the underlying, more extensive sand and gravel unit (see Figures 9-2 and 9-3). Therefore, it has been determined that the water quality data from this well, although useful in evaluating overall site conditions, is not representative of groundwater data for the purposes of leak detection monitoring for the Metal Cleaning Basin.

Monitoring wells MW-14 and MW-15 were installed in 2010 by Patrick Engineering, Inc. Wells MW-17, MW-20, and MW-21 were installed by KPRG at varying times since the initial 2010 well installations (well MW-17 in September 2015 and wells MW-20 and 21 in March 2021). 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 9-5 includes an Illinois licensed Professional Engineer certification of the above-defined monitoring system.

9.3 GROUNDWATER SAMPLING & ANALYSIS PROGRAM

9.3.1 SAMPLE FREQUENCY

As noted in Section 9.1, wells MW-15 and MW-17 are also part of the CCR groundwater monitoring well network for the Bypass Basin and Ash Surge Basin, which are regulated under the Federal CCR Rule. As such, these two wells 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 35 Ill. Adm. Code 845.600(a) plus calcium. Monitoring wells MW-14, MW-20, and MW-21 had eight rounds of CCR sampling done to meet 35 Ill. Adm. Code Part

845 requirements starting in April 2021 through December 2021. 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). All available data will be used in statistical evaluations and in developing an appropriate and representative background for 35 Ill. Adm. Code Part 845 compliance. 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 along with Metal Cleaning Basin water level elevations.

Quarterly groundwater monitoring will continue during the remaining active life of the Metal Cleaning 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. At that point, the well will be considered ready for sampling per procedures described below.

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 foot 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 9-6 (from KPRG, 2022a) includes a summary of sample bottle requirements, preservatives and holding times.

All groundwater samples collected shall be transferred to the laboratory under proper chain-of-custody (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 9-6 (from KPRG, 2022a). 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 9-6 (from KPRG, 2022a).

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 duplicate samples. 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. If there are any questions regarding the duplicate 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 9-6 along with a certification of the plan by an Illinois licensed Professional Engineer.

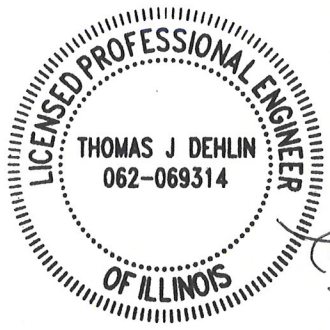
10.0 PROFESSIONAL ENGINEER CERTIFICATION (845.220(A)(8))

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 19, 2023

Seal:



Th. Dehlin
7/19/2023
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

CEC. (2021.) “Structural Stability and Factor of Safety Assessment, Metal Cleaning Basin, Powerton Station.” June.

FEMA. (2017.) “Flood Insurance Rate Map, Tazewell County, Illinois and Incorporated Areas.” Map No. 17179C0175E. Panel No. 175. Accessed June 7, 2023.

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

KPRG. (2021.) “CCR Compliance Fugitive Dust Control Plan; Midwest Generation, LLC; Powerton Generating Station; 13082 East Manito Road; Pekin, Illinois.” October 19.

KPRG. (2022a.) “Powerton Generating Station, Application for Initial Operating Permit – Metal Cleaning Basin.” March.

KPRG. (2022b.) “Placement Above the Uppermost Aquifer Location Restriction, Metal Cleaning Basin, Powerton Generating Station.” March.

KPRG. (2022c.) “Wetlands Location Restriction, Metal Cleaning Basin, Powerton Generating Station.” March.

KPRG. (2022d.) “Fault Areas Location Restriction, Metal Cleaning Basin, Powerton Generating Station.” March.

KPRG. (2022e.) “Seismic Impact Zones Location Restriction, Metal Cleaning Basin, Powerton Generating Station.” March.

KPRG. (2022f.) “Unstable Areas and Floodplains Location Restriction, Metal Cleaning Basin, Powerton Generating Station.” March.

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.

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
1978 ORIGINAL CONSTRUCTION DRAWINGS

5080 C5008

LAYOUT CONTROL FOR ROADS

NO.	N-S	E-W	RADIUS±	TAN±
6	N9+67	E4+67	150'	85.3
7	N8+25	E4+67	—	—
8	N8+30	E+.36	—	—
9	N11+00	E3+36	100'	15'
10	N11+07	E+.67	100'	15
11	N12+53	E4+67	68'	68
12	N16+33	E8+33	68'	68'
13	N12+18	E8+33	—	—
14	N13+27	E8+33	68'	37.7
15	N7+55	E0+10	68'	19.5
16	N7+55	E10+15	—	—
17	N9+55	E10+15	100'	15'
18	N10+20	E0+95	100'	15'
19	N11+82	E3+05	45'	37'

REVISIONS		
REV.	DESCRIPTION	
1	APPROVED FOR CONSTRUCTION	12/14/78
2	POZ-O-PAC & HYPALON LINER	7/19/78
3	ADDED RISER & BAFFLE	10/17/78

NOTES:
1. FOR GENERAL NOTES SEE DWG. C 5001.
2. FOR LEGEND SEE DWG. C 5000-1.
3. FOR TYPICAL ROAD AND ROAD DETAILS SEE DWG. C 5015-1

DRAWING STATUS

APPROVED FOR CONSTRUCTION

Date 12/14/78

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

DETAIL PLAN METAL CLEANING & LIMESTONE RUNOFF BASINS

DRAWN	D. W. Burton	9/14/77
CHECKED		9/15/77
CDC ENGINEER		9/21/77
DISCIP. MGR. APPVL.		11/21/77
APPROVAL		11/4/77
APPROVAL		
APPROVAL		11/17/77

CECO CONTRACT: 802887 CECO DWG. NO.

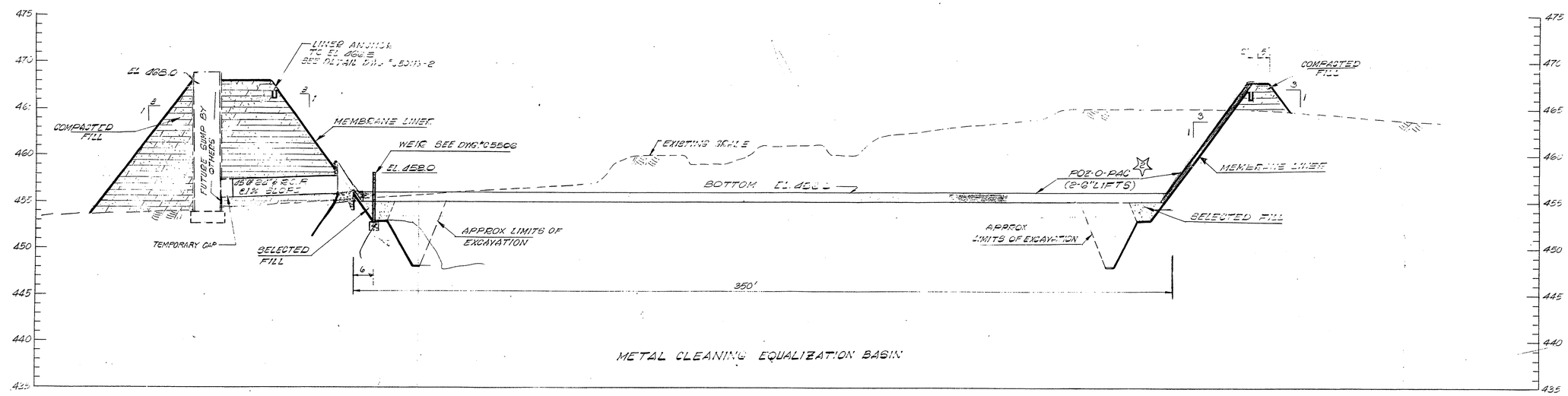
NUS CORPORATION ROCKVILLE, MD.

DRAWING NO. 5080.C5008

SCALE 1" = 20' SHEET 1 OF 1

DWG. NO. 5080 C5013 REV. 2

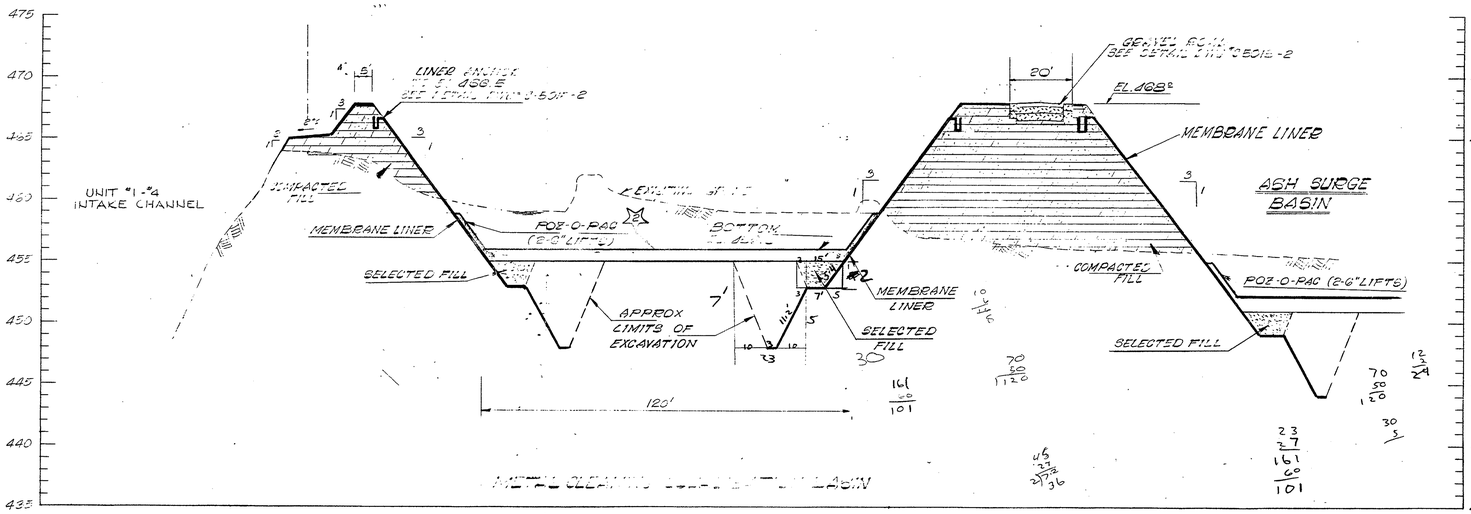
REVISIONS	
REV.	DESCRIPTION
1	APPROVED FOR CONSTRUCTION
2	FOR POZ-O-PAC HYPALON LINER AND TYPICAL DETAIL ADDED.



METAL CLEANING EQUALIZATION BASIN

SECTION (D) (5008)

FOR TYPICAL DETAIL POZ-O-PAC HYPALON LINER SEE THIS SHEET ☆2



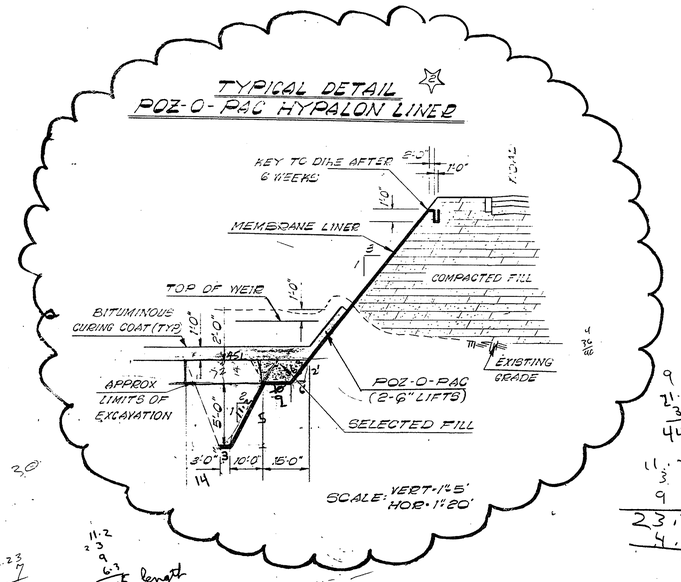
METAL CLEANING EQUALIZATION BASIN

SECTION (E) (5008)

SCALE: HOR 1"=20' VERT 1"=5'

NOTES:

1. FOR GENERAL NOTES SEE DWG. C-5001
2. FOR LEGEND SEE DWG. C-5000
3. CONTRACTOR TO DEWATER CONSTRUCTION AREA TO EL 448.0 BY APPROVED METHOD(S) PRIOR TO BASIN CONSTRUCTION.



SCALE: VERT. 1"=5' HOR. 1"=20'

APPROVED FOR CONSTRUCTION
Date 5/12/1978

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

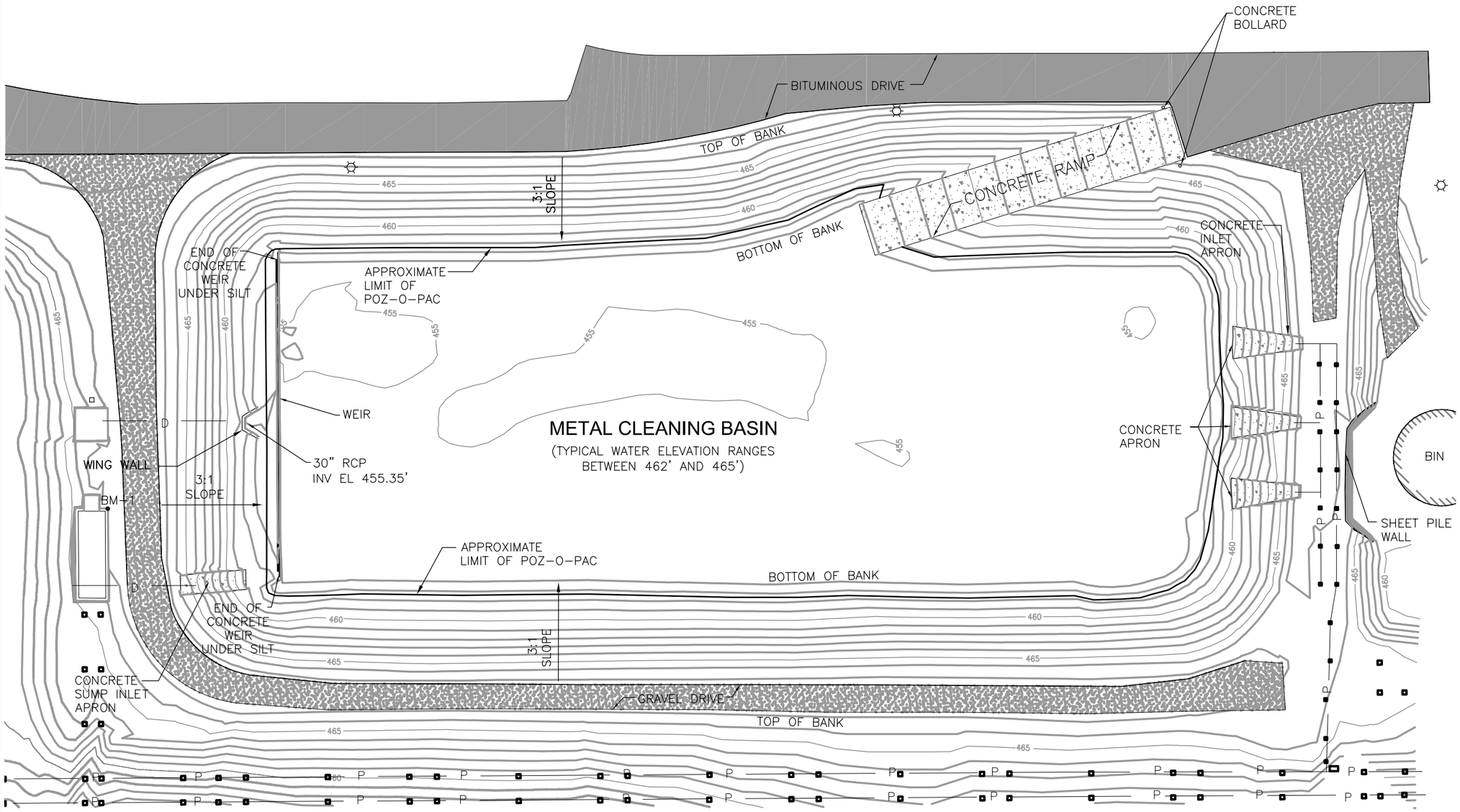
METAL CLEANING BASIN SECTIONS

DRAWN		
CHECKED	RJSR	4/19/78
COG. ENGINEER		4/19/78
DISCIP. MGR. APPVL.		4/19/78
APPROVAL		4/19/78
APPROVAL		
APPROVAL		
APPROVAL		4/19/78

CECO CONTRACT 802867 | CECO DWG. NO. | REV.

NUS CORPORATION ROCKVILLE, MD. | DRAWING NO. 5080 C5013 | REV. 2 | SCALE: AS NOTED | SHEET 1 OF 1

ATTACHMENT 1-2
2010 LINER REPLACEMENT DRAWINGS



LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- LIGHT POLE
- 460 — GROUND SURFACE CONTOUR

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978.

N

0 10 20 40
SCALE IN FEET

	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.	RECORD DOCUMENTATION	06/16/11	HMS
3.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
2.	ADDENDUM 1	10/22/09	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS

NATURAL RESOURCE TECHNOLOGY

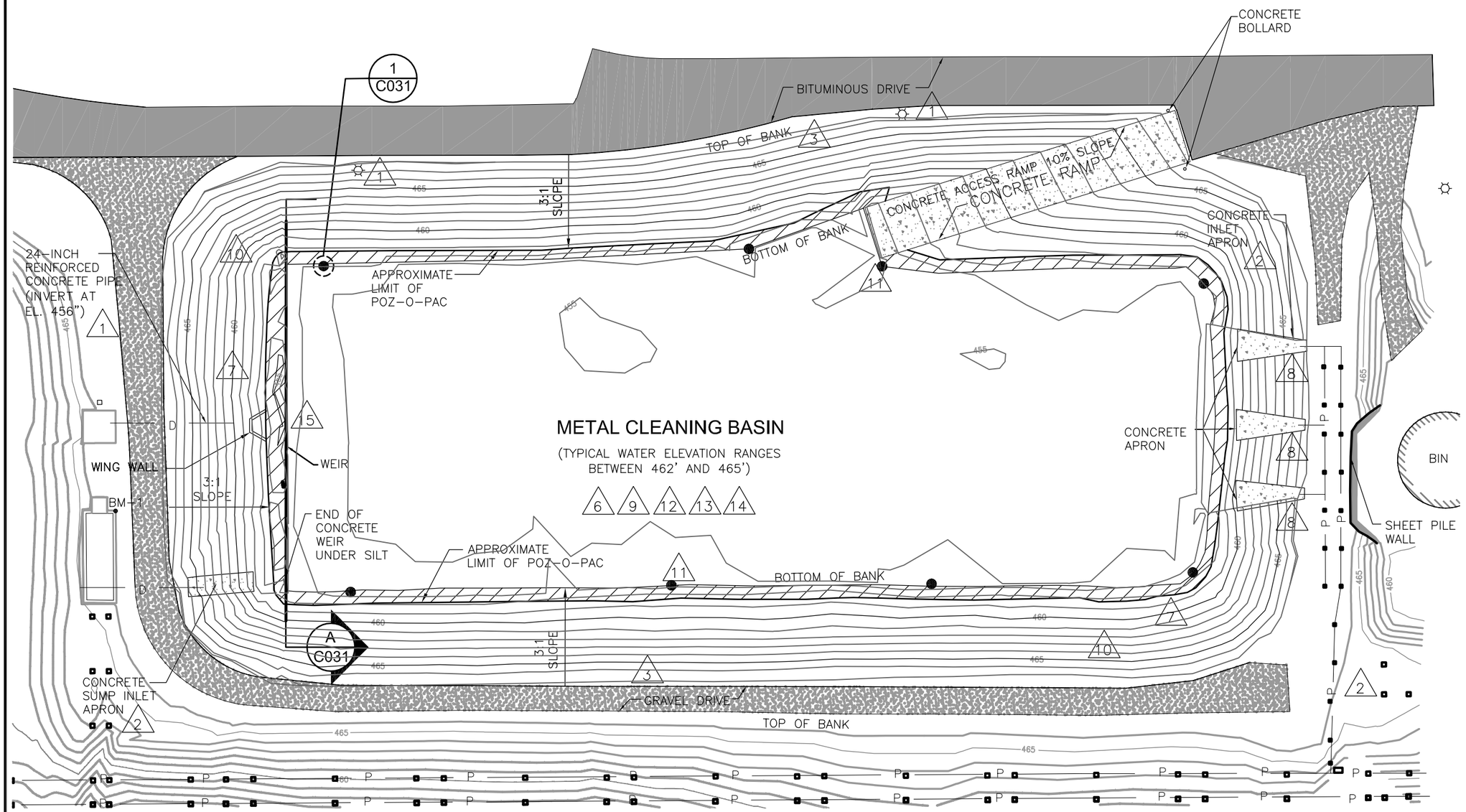
PROJECT NO. 1965/4.0
DRAWN BY: RLH/KNW 07/17/09
CHECKED BY: RJG 07/17/09
APPROVED BY: HMS 07/27/09

PRE-CONSTRUCTION CONDITIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C010-04
REFERENCE: .

SHEET NO. C010



METAL CLEANING BASIN

(TYPICAL WATER ELEVATION RANGES BETWEEN 462' AND 465')

6 9 12 13 14

LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- LIGHT POLE
- 460 — PREPARED SUBGRADE SURFACE CONTOUR
- MARKER POST LOCATION
- POZ-O-PAC REMOVAL AREA

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. CLEAR AND GRUB ALL BRUSH ALONG TOP OF SLOPE OF BASIN.
4. CONTRACTOR SHALL STORE ALL GEOSYNTHETICS AND SUBGRADE MATERIALS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
5. CONTRACTOR SHALL STORE AND STAGE EQUIPMENT AT LOCATION APPROVED BY OWNER.
6. PROTECT ALL CONCRETE AND UTILITY STRUCTURES TO REMAIN IN PLACE THROUGHOUT PROJECT DURATION.
7. REMOVE EXISTING 12-INCH POZ-O-PAC LAYER ALONG SIDE SLOPES. POZ-O-PAC LAYER AT BASE OF BASIN TO REMAIN IN PLACE, EXCEPT NORTH OF WEIR. CONTRACTOR SHALL REMOVE AN ADDITIONAL 6 INCHES OF SUBGRADE MATERIAL LOCATED BETWEEN THE WEIR AND THE WING WALL ALONG THE NORTH BOTTOM OF BANK, AS SHOWN ON SECTION B, SHEET C031.
8. CONTRACTOR SHALL REMOVE INLET APRONS AND HAUL MATERIAL TO RECYCLING FACILITY.
9. CONTRACTOR SHALL REMOVE ALL VEGETATION, ROCKS, AND OTHER DEBRIS FROM EXISTING LINER AND DISPOSE OF IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
10. CONTRACTOR SHALL REMOVE "SOFT" SUBGRADE MATERIAL BENEATH EXISTING HYPALON LINER, AS DIRECTED BY OWNER AND/OR ENGINEER. BACKFILL AREAS WITH FILL IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. CUT HYPALON LINER AS NEEDED TO REPAIR THE "SOFT" SUBGRADE AREAS.
11. 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.
12. SUBGRADE MUST BE APPROVED BY OWNER AND/OR ENGINEER PRIOR TO INSTALLATION OF GEOMEMBRANE.
13. CONTRACTOR SHALL PLACE 16 OZ. NONWOVEN GEOTEXTILE OVER THE SUBGRADE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
14. CONTRACTOR SHALL PROVIDE MEANS TO PROTECT SUBGRADE LAYER FROM EROSION, STORM WATER, AND HEAVY EQUIPMENT TRAFFIC. DAMAGE TO SUBGRADE LAYER SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
15. CONTRACTOR SHALL EXTEND CONCRETE WEIR UP BY 18" IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND SECTION A ON SHEET C031.

N

0 10 20 40

SCALE IN FEET

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978.

BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS

NATURAL RESOURCE TECHNOLOGY

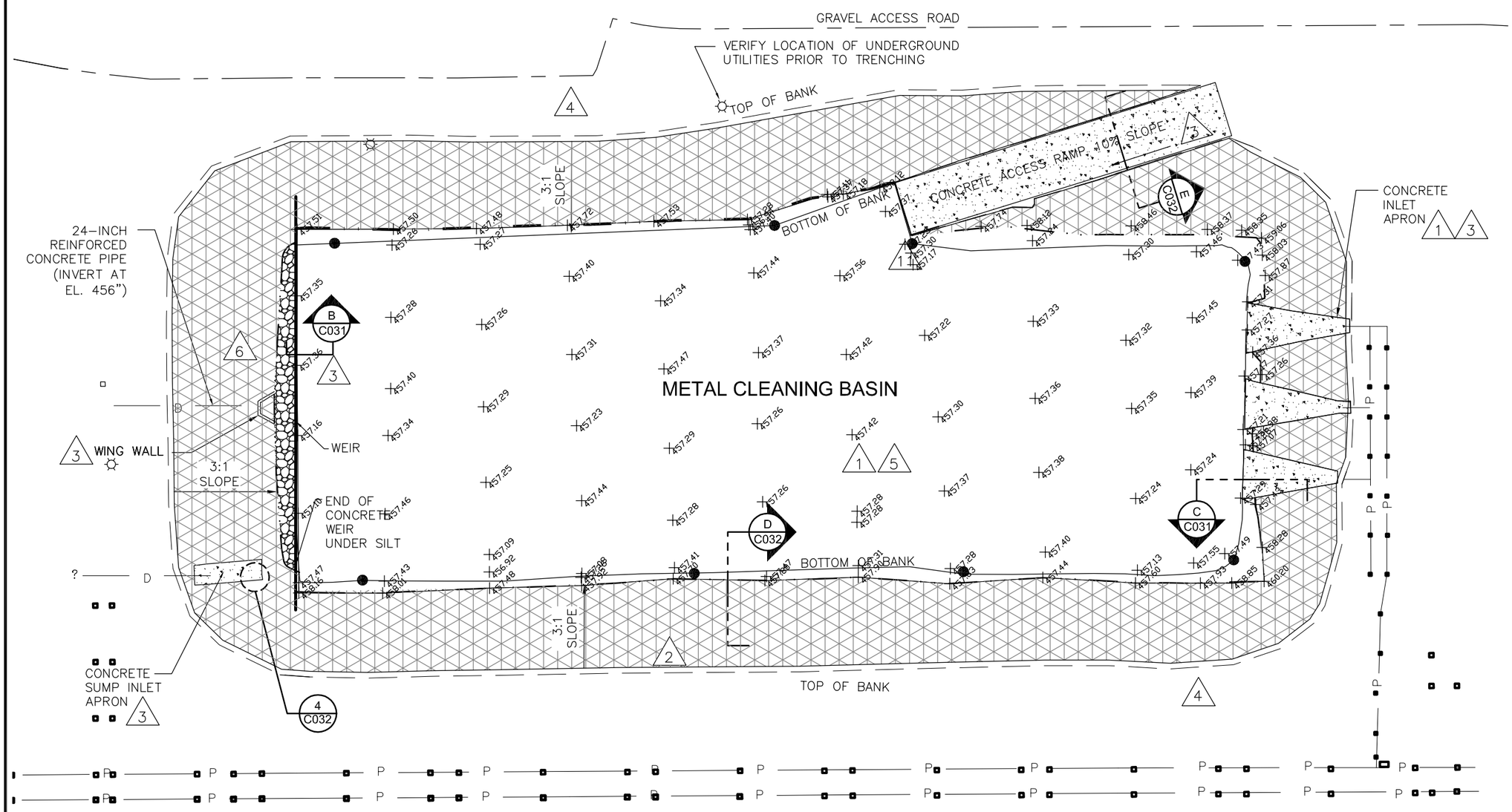
PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

LINER SUBGRADE PREPARATION

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C020-03
REFERENCE: .

SHEET NO. C020



LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- ANCHOR TRENCH
- 12 OZ. NON-WOVEN GEOTEXTILE
- LIGHT POLE
- MARKER POST LOCATION
- × 457.32 — TOP OF WARNING LAYER (ELEVATION, FT.)
- HDPE GEOMEMBRANE
- CONCRETE
- RIPRAP

CONTRACTOR NOTES:

1. PRIOR TO GEOMEMBRANE INSTALLATION CONTRACTOR SHALL CONSTRUCT INLET APRONS WITH HDPE WELD STRIPS AROUND PERIMETER AND 12-INCH DEEP FOOTING AT TOP AND BOTTOM OF APRON TO MATCH PREEXISTING APRON CONSTRUCTION. APRON TO EXTEND AT MINIMUM 3 FEET BEYOND TOE OF BANK. SEE DETAIL.
2. 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.
3. CONTRACTOR SHALL ATTACH GEOMEMBRANE TO STRUCTURES IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION AND DETAILS ON SHEET C031 AND C032.
4. GEOMEMBRANE SHALL BE ANCHORED INTO 2.5 FEET DEEP TRENCHES ALONG TOP OF BANK, AS SHOWN ON SHEET C031. CONTRACTOR SHALL ADVISE OWNER AND/OR ENGINEER IF PROPOSED LOCATION FOR ANCHOR TRENCH IS NOT FEASIBLE.
5. 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).
6. CONTRACTOR SHALL PLACE RIPRAP 18 INCHES THICK, BETWEEN WEIR AND WING WALL ALONG THE BOTTOM OF BANK.
7. CONTRACTOR SHALL PROVIDE SURVEY DOCUMENTATION OF THE ITEMS LISTED IN THE TECHNICAL SPECIFICATIONS.
8. CONTRACTOR SHALL PERFORM A LEAK LOCATION SURVEY IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
9. RESTORE AREAS DISTURBED BY EQUIPMENT AND MATERIAL LAYDOWN.

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978. BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

N

0 10 20 40
SCALE IN FEET

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

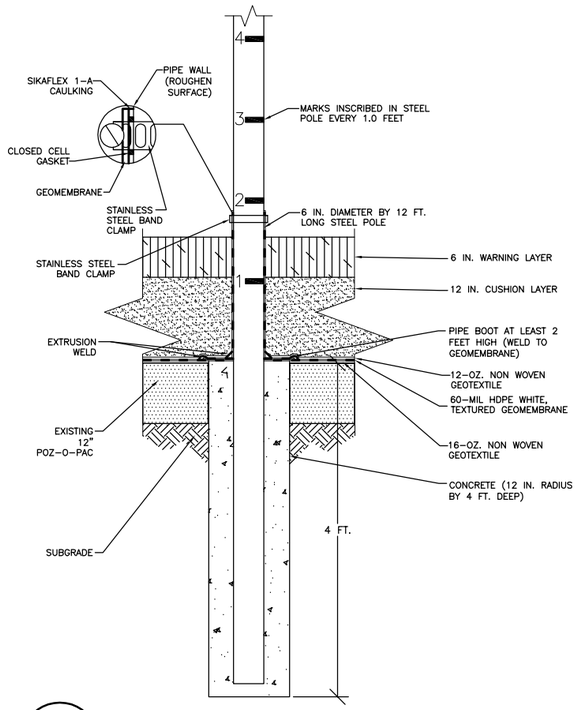
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

WARNING LAYER

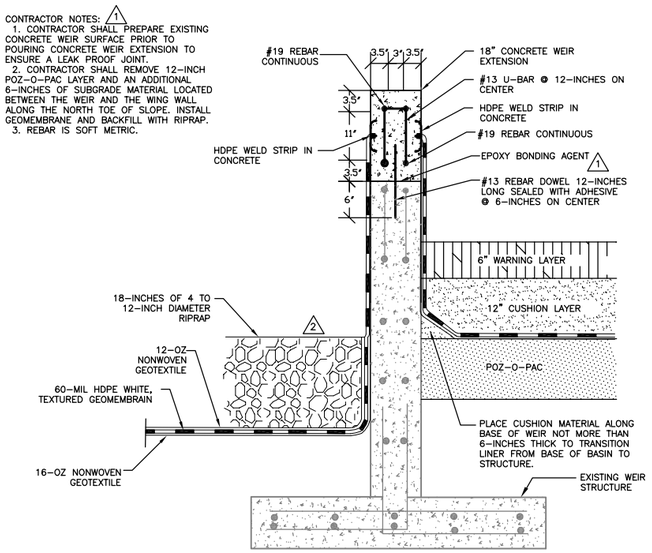
METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C030-03
REFERENCE: -
SHEET NO. C030

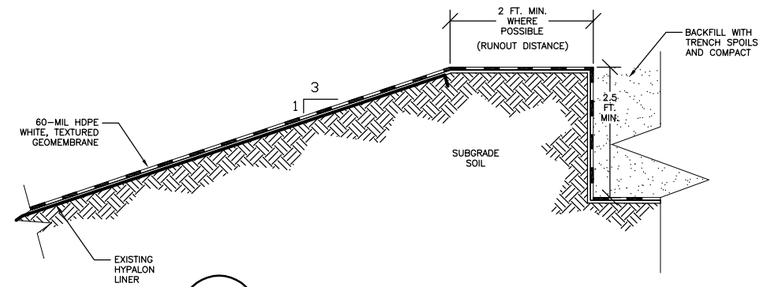


1 / C020 MARKER POST DETAIL
NOT TO SCALE

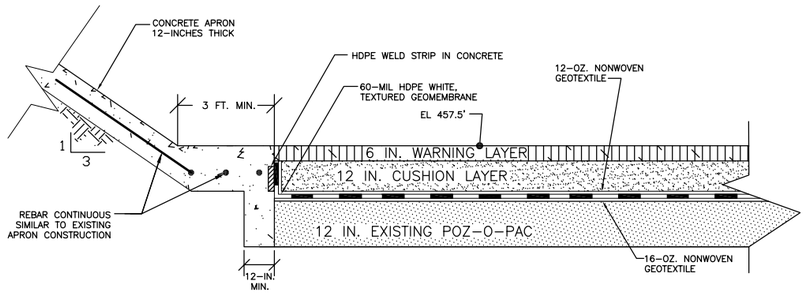
CONTRACTOR NOTES: △1
1. CONTRACTOR SHALL PREPARE EXISTING CONCRETE WEIR SURFACE PRIOR TO POURING CONCRETE WEIR EXTENSION TO ENSURE A LEAK PROOF JOINT.
2. CONTRACTOR SHALL REMOVE 12-INCH POZ-O-PAC LAYER AND AN ADDITIONAL 6-INCHES OF SUBGRADE MATERIAL LOCATED BETWEEN THE WEIR AND THE WING WALL ALONG THE NORTH TOE OF SLOPE. INSTALL GEOMEMBRANE AND BACKFILL WITH RIPRAP.
3. REBAR IS SOFT METRIC.



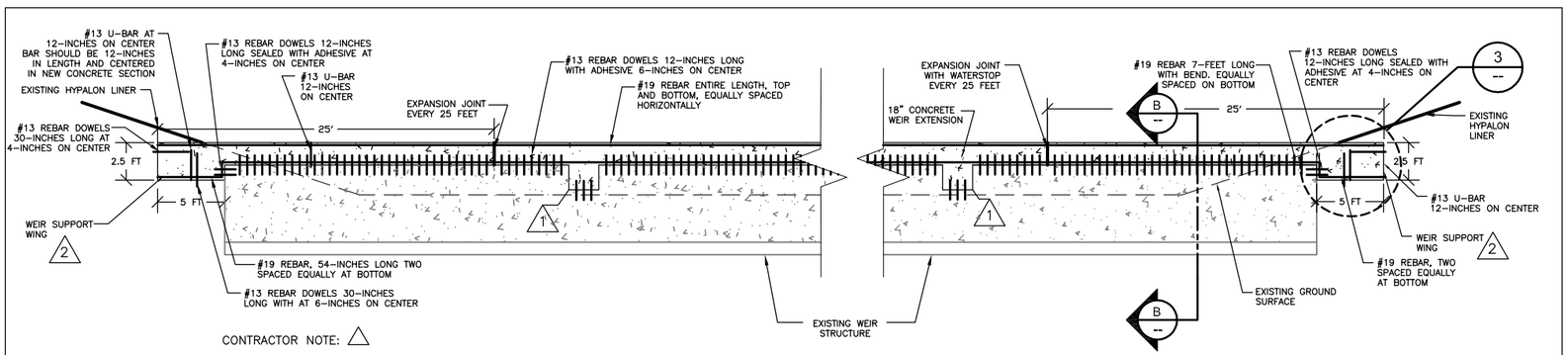
B / -- CONCRETE WEIR EXTENSION DETAIL
NOT TO SCALE



2 / C030 ANCHOR TRENCH SECTION
NOT TO SCALE



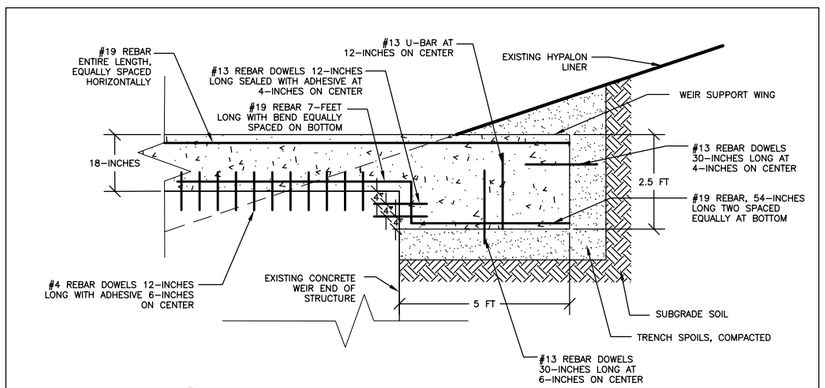
C / C030 CONCRETE INLET APRON SECTION
NOT TO SCALE



CONTRACTOR NOTE: △

1. CONTRACTOR SHALL REMOVE METAL SLIDING GATES AND REPLACE WITH CONCRETE REBAR DOWELS AND ADHESIVE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION.
2. CONTRACTOR SHALL INSTALL WEIR SUPPORT WINGS AND BACKFILL WITH TRENCH SPOILS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. REBAR IS SOFT METRIC.

A / C020 CONCRETE WEIR EXTENSION SECTION
NOT TO SCALE



3 / - WEIR SUPPORT WING DETAIL
NOT TO SCALE

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

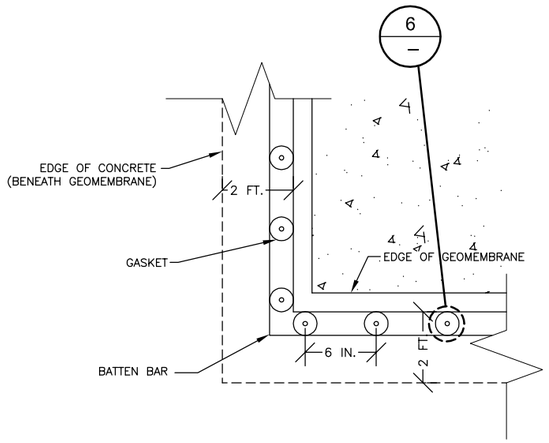
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/12/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

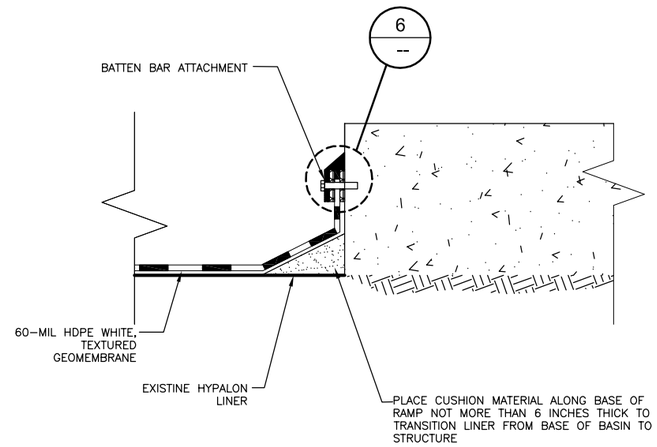
DETAILS AND SECTIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

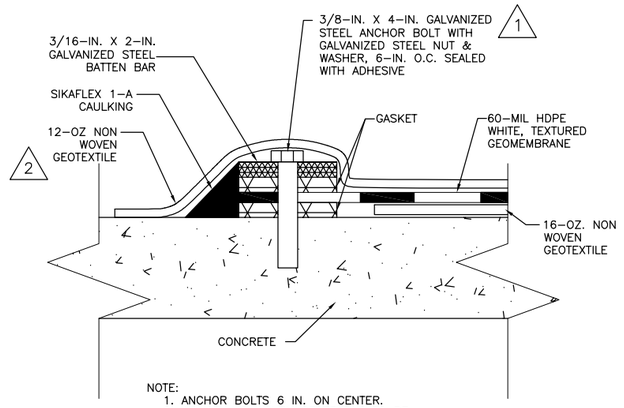
DRAWING NO: D1965C031-03
REFERENCE:.
SHEET NO. C031



4 / C030 SUMP INLET APRON DETAIL
NOT TO SCALE

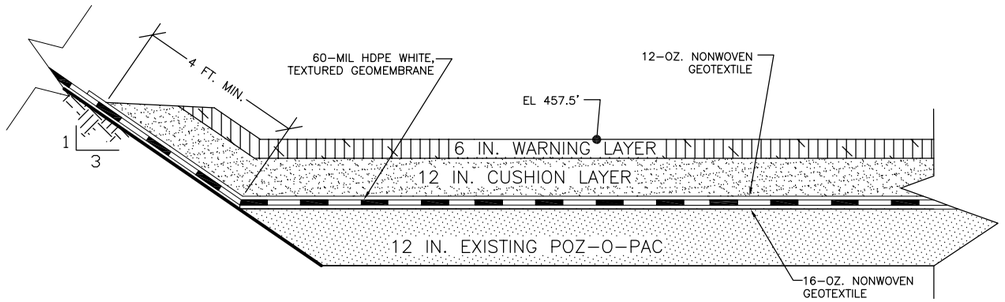


5 / -.-. CONCRETE RAMP CONNECTION DETAIL
NOT TO SCALE



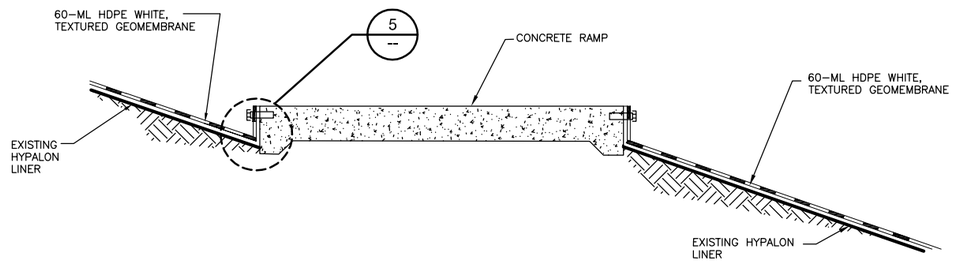
NOTE:
1. ANCHOR BOLTS 6 IN. ON CENTER.
2. 12–OZ. NONWOVEN GEOTEXTILE TO BE USED TO PROTECT GEOMEMBRANE BELOW CUSHION LAYER OR RIPRAP LAYER.

6 / -- BATTEN BAR ATTACHMENT
NOT TO SCALE



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

D / C030 SLOPE TRANSITION SECTION
NOT TO SCALE



E / C030 CONCRETE RAMP SECTION
NOT TO SCALE

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

DETAILS AND SECTIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C032–03
REFERENCE:1965/4/

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 D5641 – Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber

B. ASTM D5820 – Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes

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

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

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

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

G. 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 may 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.

3. The Geomembrane Manufacturer and/or Geomembrane Installer may perform independent tests in accordance with methods and procedures specified in GRI GM 13. 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.

B. Seaming Processes/Equipment

1. Approved processes for field seaming (panel to panel) are extrusion or hot wedge fusion-type seam methods. No other processes can be used without prior written authorization from the Geosynthetic Quality Assurance Consultant. Only equipment which has been specifically approved by make and model shall be used, if applicable.

4. The Geomembrane Installer will meet the following requirements regarding use, availability, and cleaning of welding equipment at job site:

   a. Intersecting hot wedge seams shall be patched using extrusion welding process.

   b. Electric generator for equipment shall be placed on a smooth base such that no damage occurs to geomembrane. A smooth insulating plate or fabric shall be placed beneath hot equipment after usage.

3. The Geomembrane Installer shall keep records for performance and testing of all seams.

C. Seaming Requirements/Procedures

1. Weather Conditions - Range of weather conditions under which geomembrane seaming can be performed are as follows:

   a. Unless otherwise authorized in writing by Geosynthetic Quality Assurance Consultant, no seaming shall be attempted or performed at an ambient temperature below 41 degrees F (5 degrees C) or above 104 degrees F (40 degrees C).

   b. Between ambient temperatures of 32 degrees F (0 degrees C) and 41 degrees F (5 degrees C), seaming shall be performed only if geomembrane is preheated by either sun or a hot air device, provided there is no excessive ambient cooling resulting from high winds. Pre-qualification seams shall be produced under identical conditions.

   c. Above 41 degrees F (5 degrees C), no preheating of geomembrane will be required.

   d. Geomembrane shall be dry and protected from wind.

   e. Seaming shall not be performed during any precipitation event.

f. Seaming shall not be performed in areas where ponded water has collected below surface of geomembrane.

2. If the Geomembrane Installer chooses to use methods which may allow seaming at ambient temperatures below 41 degrees F or above 104 degrees F, the Geomembrane Installer shall demonstrate and submit certification to Geosynthetic Quality Assurance Consultant that methods and techniques used to perform seaming produce seams that are equivalent to seams produced at temperatures above 41 degrees F and below 104 degrees F. The Geosynthetic Quality Assurance Consultant may deny approval for use of the proposed technique regardless of demonstration results.

3. Overlapping - Geomembrane panels shall have finished overlap as follows:

   a. Minimum of 6 inches for thermal fusion welding.

   b. Insufficient overlap will be considered a failed seam.

4. Pre-qualification tests for geomembrane fusion welding shall be conducted by a minimum of 2 pre-qualification seams conducted per day per welding machine by each seaming technician performing welding with that machine. At least one test shall be performed at the start of each work day, with tests at intervals of no greater than 5 hours and additional pre-qualification tests following work interruptions, weather changes, changes to machine settings, or as directed by the Geosynthetic Quality Assurance Consultant. Pre-qualification seams shall be made under the same conditions as the actual seams.

   a. Pre-qualification seam samples shall be 5 feet long by 1-foot wide (minimum) after seaming, with seam centered along its length. Each pre-qualification seam shall be labeled with the date, geomembrane temperature, seaming unit identifier, seam number or test location, technician performing the test seam and description of testing results.

   b. Seam overlap shall be in accordance with Subsection 3.04(C)(3).

   c. Pre-qualification seams shall be inspected for proper squeeze-out, footprint pressure, and general appearance.

   d. Four specimens, each 1-inch in length, shall be cut from opposite ends of the pre-qualification seam sample by the Geomembrane Installer. The remainder of pre-qualification seam shall be retained by the Geosynthetic Quality Assurance Consultant and may be submitted for laboratory testing.

   e. The Geomembrane Installer shall complete two shear tests and two peel tests in accordance with GRI GM 19.

   f. Pre-qualification seams failed by inspection or testing may be retested at request of the Geomembrane Installer. If the second pre-qualification seam fails, then the seaming apparatus or seaming technique shall be

disqualified from use until two consecutive, satisfactory pre-qualification seams are obtained.

5. Seam Preparation

   a. Prior to seaming, seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.

   b. Seams shall be aligned so as to minimize number of wrinkles and fishmouths.

6. General Seaming Procedures

   a. Fishmouths or wrinkles at seam overlaps shall be cut along ridge of the wrinkle to achieve a flat overlap. Cut fishmouths or wrinkles shall be repaired, and/or patched in accordance with Part 3.08.

   b. Seaming shall extend to the outside edge of geomembrane panels including material placed in anchor trenches.

   c. The intersecting thermal fusion seams shall be patched using the extrusion welding process.

3.05 NON-DESTRUCTIVE TESTING

A. Each field seam shall be non-destructively tested over its entire length by the Installer. Testing shall be conducted as field seaming progresses, not at completion of all seams, unless specifically agreed to by the Geosynthetic Quality Assurance Consultant in writing.

B. Vacuum Testing – shall be performed in accordance with ASTM D5641.

C. Air Pressure Testing – shall be performed in accordance with ASTM D5820, and GRI GM 6, Pressurized Air Channel Test for Dual Seamed Geomembranes.

D. Each seam tested non-destructively shall be marked with the date of the test, name of the testing technician, length of the seam, test method and results. The same shall also be recorded by the Geosynthetic Quality Assurance Consultant on the appropriate CQA documentation.

E. Non-Destructive Seam Test Failures

   1. Seams failing non-destructive testing shall be repaired by the Geomembrane Installer according to Part 3.08. Seams shall be non-destructively retested. If the seam defect cannot be located, the entire section of seam affected shall be repaired and retested.

3.06 DESTRUCTIVE TESTING

A. The Owner shall have the option to destructively test geomembrane panel seams completed in the field. Destructive seam testing shall be performed by the Geomembrane Installer under the observation of the Geosynthetic Quality Assurance Consultant.

B. Sampling Procedure

1. For each sample location, the Geosynthetic Installer will:

   a. Assign a sample number and mark the sample accordingly.

   b. Record the sample location on the as-built layout drawing.

   c. By sample number, record reason for collecting sample (e.g., as part of statistical testing program, suspicious seam, retest, etc.).

   d. Record pertinent information, including date, time, seam number, number of seaming unit, and name of seamer, on the seam sample.

2. Each destructive sample shall be at least 12 inches wide (at least 6 inches on each side of seam) by 54 inches long. Samples will be cut by the Geomembrane Installer and distributed as follows:

   a. A 12-inch by 12-inch portion shall be cut and tested in accordance with Subsection 3.06(C) by the Geomembrane Installer.

   b. A 12-inch by 12-inch portion shall be cut and retained by the Geomembrane Installer. The Geomembrane Installer may elect to omit this requirement.

   c. A 12-inch by 12-inch portion shall be cut and retained by the Geosynthetic Quality Assurance Consultant as an archive sample.

   d. A 12-inch by 18-inch portion shall be submitted by the Geosynthetic Quality Assurance Consultant for laboratory testing as described in Part 3.06(D).

3. Ten specimens, each 1 inch wide by 12 inches long with seam centered perpendicular to width, shall be collected and field tested by the Geomembrane Installer prior to shipping the sample to the laboratory. If all samples pass field tensiometer test described in Part 3.06(C), then the laboratory sample shall be submitted for testing by the Geosynthetic Quality Assurance Consultant.

4. Holes cut into geomembrane resulting from destructive seam sampling shall be immediately repaired by Geomembrane Installer in accordance with repair procedures described in Part 3.08.

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
2010 LINER REPLACEMENT PERMIT FROM ILLINOIS EPA

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 2748-09 **PERMIT NO.:** 2009-EB-2748

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS
PREPARED BY: Natural Resource Technology Group

DATE ISSUED: NOV 13 2009

SUBJECT: MIDWEST GENERATION LLC - Powerton Generating Station - Metal Cleaning Basin Liner Replacement - Discharge Tributary to the Illinois River

PERMITTEE TO CONSTRUCT AND OPERATE

Midwest Generation, LLC
235 Remington Blvd., Suite A
Bolingbrook, IL 60440

Permit is hereby granted to the above designated permittee(s) to construct and operate water pollution control facilities described as follows:

The Metal Cleaning Basin at the Powerton Generating Station located at 13082 East Manito Rd. in Pekin, Illinois will undergo a liner upgrade by the addition of a 60 mil HDPE geomembrane liner. At the base, a 12 inch thick sand or limestone cushion layer and a 6 inch coarse aggregate warning layer will be placed on top of the new HDPE liner.

Once complete the liner system will consist of the existing chlorosulfonated polyethylene liner and the new 60 mil HDPE geomembrane liner. The DMF of 1.19 MGD and working volume of 5.4 million gallons at 3 to 6 feet of freeboard for the Metal Cleaning Basin will remain unchanged.

This operating permit expires on September 30, 2014.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: The Permittee to Construct shall be responsible for obtaining an NPDES Storm Water Permit prior to initiating construction if the construction activities associated with this project will result in the disturbance of one (1) or more acres total land area.

An NPDES Storm Water Permit may be obtained by submitting a properly completed Notice of Intent (NOI) form by certified mail to the Agency's Division of Water Pollution Control - Permit Section.")

SPECIAL CONDITION 2: The operational portion of this permit shall be governed by NPDES Permit No. IL0002232.

SPECIAL CONDITION 3: All sludges generated on site shall be disposed of at a site and in a manner acceptable to the Agency.

SPECIAL CONDITION 4: The existing Midwest Generation waste storage lagoon shall adhere to the following groundwater protection elements:

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

SAK:JAR:2748-09.docx

DIVISION OF WATER POLLUTION CONTROL

Alan Keller by DER

Alan Keller, P.E.
Manager, Permit Section

cc: EPA-Peoria FOS
Natural Resource Technology Group
Records - Industrial
Binds

LOG NUMBERS: 2748-09 **PERMIT NO.:** 2009-EB-2748

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS
PREPARED BY: Natural Resource Technology Group

DATE ISSUED: NOV 13 2009

SUBJECT: MIDWEST GENERATION LLC - Powerton Generating Station - Metal Cleaning Basin Liner Replacement - Discharge Tributary to the Illinois River

1. A minimum of three monitoring wells must be installed around the waste storage lagoon, no more than 25 feet from the outermost edge of the waste storage lagoon. At least one of the monitoring wells must be located down gradient of the waste storage lagoon. The monitoring wells should be screened in the upper most water bearing materials. Provide drillers logs and well completion reports, and an updated monitoring well location map after well completion.

2. At least six groundwater samples must be collected from each monitoring well within one year, to establish a statistically valid representation of existing (background) concentrations.

3. Sample monitoring wells for the chemical parameters listed in 35 IAC 620.410(a) and (d). The sampling plan will be required as part of the permit. The following parameters listed below should also be sampled.

   Specific Conductance
   Temperature
   Depth to Water (bls)
   Depth to Water (bmp)
   Elevation of MP
   Elevation of GW Surface

4. After a background concentration for each constituent is determined, monitoring will be conducted and reported monthly during waste storage lagoon use.

5. In the event that any Class I: Potable Resource Groundwater Quality Standards are exceeded in any potable water supply well, and is attributable to the operation of the waste storage lagoon, an alternative water supply shall be supplied with all costs of providing the alternative supply being borne by the owner of waste storage lagoon.

6. A corrective action plan is required, if monitoring well analysis indicates impacted groundwater from the waste storage lagoon.

7. The liner must be protected from degradation.

8. Copies of the groundwater monitoring well sample analysis shall be submitted to the following addresses:

   Illinois EPA
   Division of Water Pollution Control
   Compliance Assurance Section
   1021 North Grand Avenue East
   P.O. Box 19276
   Springfield, Illinois 62794-9276

   Illinois EPA
   DWPC - Peoria Region
   5415 North University Ave.
   Peoria, Illinois 61614

   Illinois EPA
   Hydrogeology and Compliance Unit
   1021 North Grand Avenue East
   P.O. Box 19276
   Springfield, Illinois 62794-9276

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes Chapter 111-12. Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentations of credentials:

   a. to enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit;

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit;

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit;

   d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants;

   e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

   d. does not take into consideration or attest to the structural stability of any units or parts of the project;

   e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

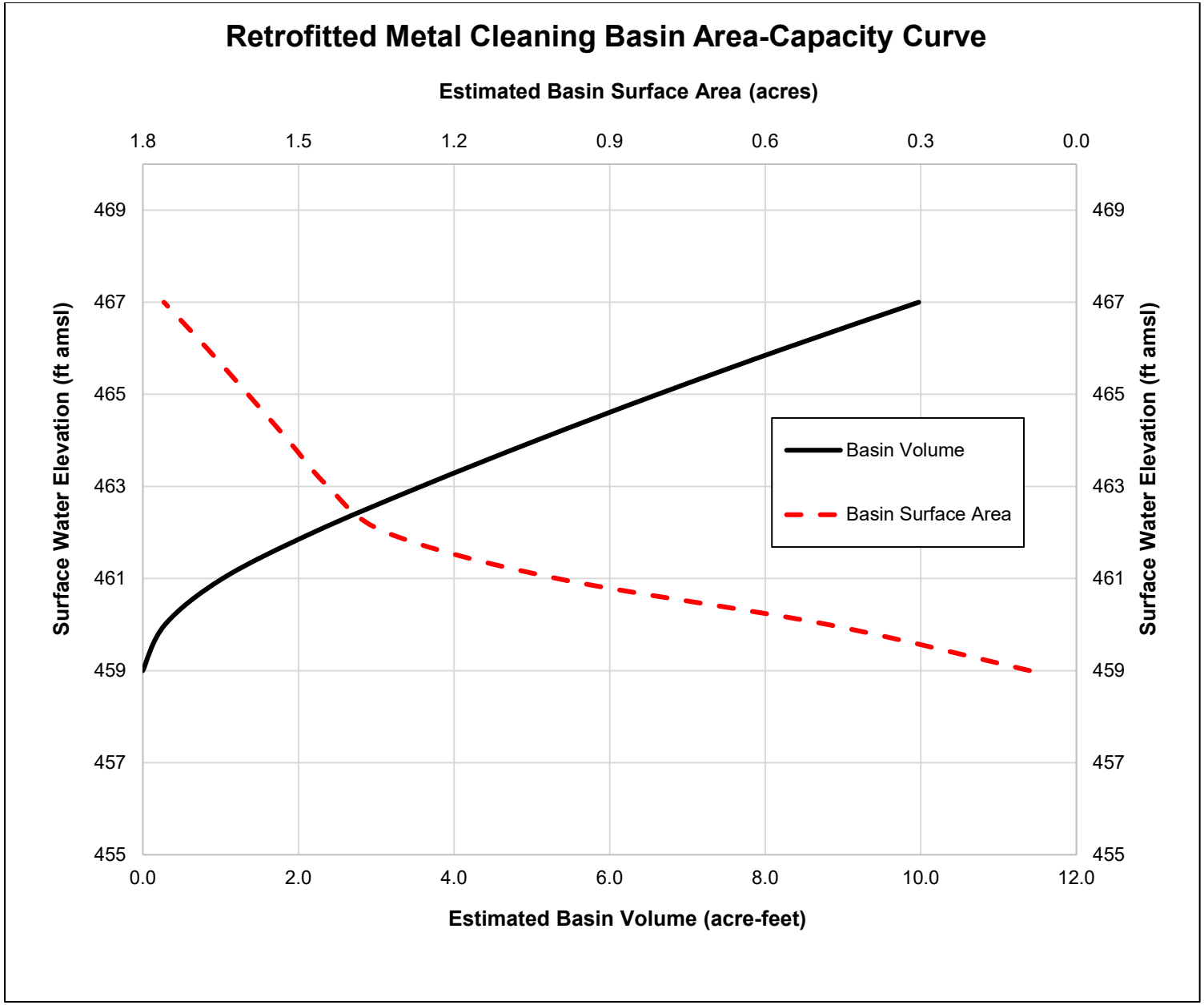
8. The Agency may file a complaint with the Board for suspension or revocation of a permit:

   a. upon discovery that the permit application contained misrepresentations, misinformation or false statement or that all relevant facts were not disclosed; or

   b. upon finding that any standard or special conditions have been violated; or

   c. upon any violation of the Environmental Protection Act or any Rules or Regulation effective thereunder as a result of the construction or development authorized by this permit.

ATTACHMENT 1-5
RETROFITTED METAL CLEANING BASIN AREA-CAPACITY CURVE


Retrofitted Metal Cleaning Basin Area-Capacity Curve
Estimated Basin Surface Area (acres)
1.8
1.5
1.2
0.9
0.6
0.3
0.0
Surface Water Elevation (ft amsl)
469
467
465
463
461
459
457
455
Basin Volume
Basin Surface Area
0.0
2.0
4.0
6.0
8.0
10.0
12.0
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

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

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

Table of Contents

Case Narrative

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

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: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Client Sample ID: FAB

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

Lab Sample ID: 500-201436-1

Matrix: Solid

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: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Client Sample ID: ASH BASIN

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

Lab Sample ID: 500-201436-2

Matrix: Solid

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: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Client Sample ID: METALS CB

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

Lab Sample ID: 500-201436-3

Matrix: Solid

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

Definitions/Glossary

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

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	

QC Association Summary

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

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
Matrix: Solid
Analysis Batch: 608625

Client Sample ID: Method Blank
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 608625

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 608143

Client Sample ID: Method Blank
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 608143

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 608919

Client Sample ID: Method Blank
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 608919

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 607925

Client Sample ID: Method Blank
Prep Type: Total/NA
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
Matrix: Solid
Analysis Batch: 607925

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
Chloride	200	205		mg/Kg		103	85 - 115

Lab Sample ID: LCSD 500-607760/3-A
Matrix: Solid
Analysis Batch: 607925

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
Chloride	200	206		mg/Kg		103	85 - 115	0	20

Method: SM 4500 F C - Fluoride

Lab Sample ID: MB 500-607760/1-A
Matrix: Solid
Analysis Batch: 607876

Client Sample ID: Method Blank
Prep Type: Total/NA
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

Lab Chronicle

Client: Midwest Generation EME LLC
Project/Site: Ash

Job ID: 500-201436-1

Client Sample ID: FAB
Date Collected: 06/23/21 13:30
Date Received: 06/24/21 15:35

Lab Sample ID: 500-201436-1
Matrix: Solid

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

Lab Sample ID: 500-201436-2
Matrix: Solid

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

Lab Sample ID: 500-201436-3
Matrix: Solid

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
Project/Site: Ash

Job ID: 500-201436-1

Client Sample ID: METALS CB

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

Lab Sample ID: 500-201436-3

Matrix: Solid

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

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:			Job #: 500-201436

Address: 13082 E Manito Road	Due Date Requested:
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#:

Analysis Requested

500-201436 COC

Preservation Codes

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

Other

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	13 30	C	Solid				X			
				Solid							
2 ASH BASIN	6/23/21	14 23	C	Sol				X			
1 ASH2	6/23/21	14:23	C	Sol			X		X		
3 Metals2	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:	Date/Time:	Company	Received by:	Date/Time:	Company
JN Kotas	6/23/21 4:30		Stephanie Hernandez	6/24/21 1535	EEA-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

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

J211321033101uw

THU - 24 JUN 4:30P
STANDARD OVERNIGHT

TRK# 0201 **7740 8262 9809**

60484
UF JOTA IL-US **ORD**

48qt.

for 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

Warning 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 charges along with the cancellation of your FedEx account number
Use 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 for 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 value, 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 from 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 direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value Recovery cannot exceed actual documented loss Maximum for items of extraordinary value is $1,000, e g jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide Written claims must be filed within strict time limits, see current FedEx Service Guide

Login Sample Receipt Checklist

Client: Midwest Generation EME LLC

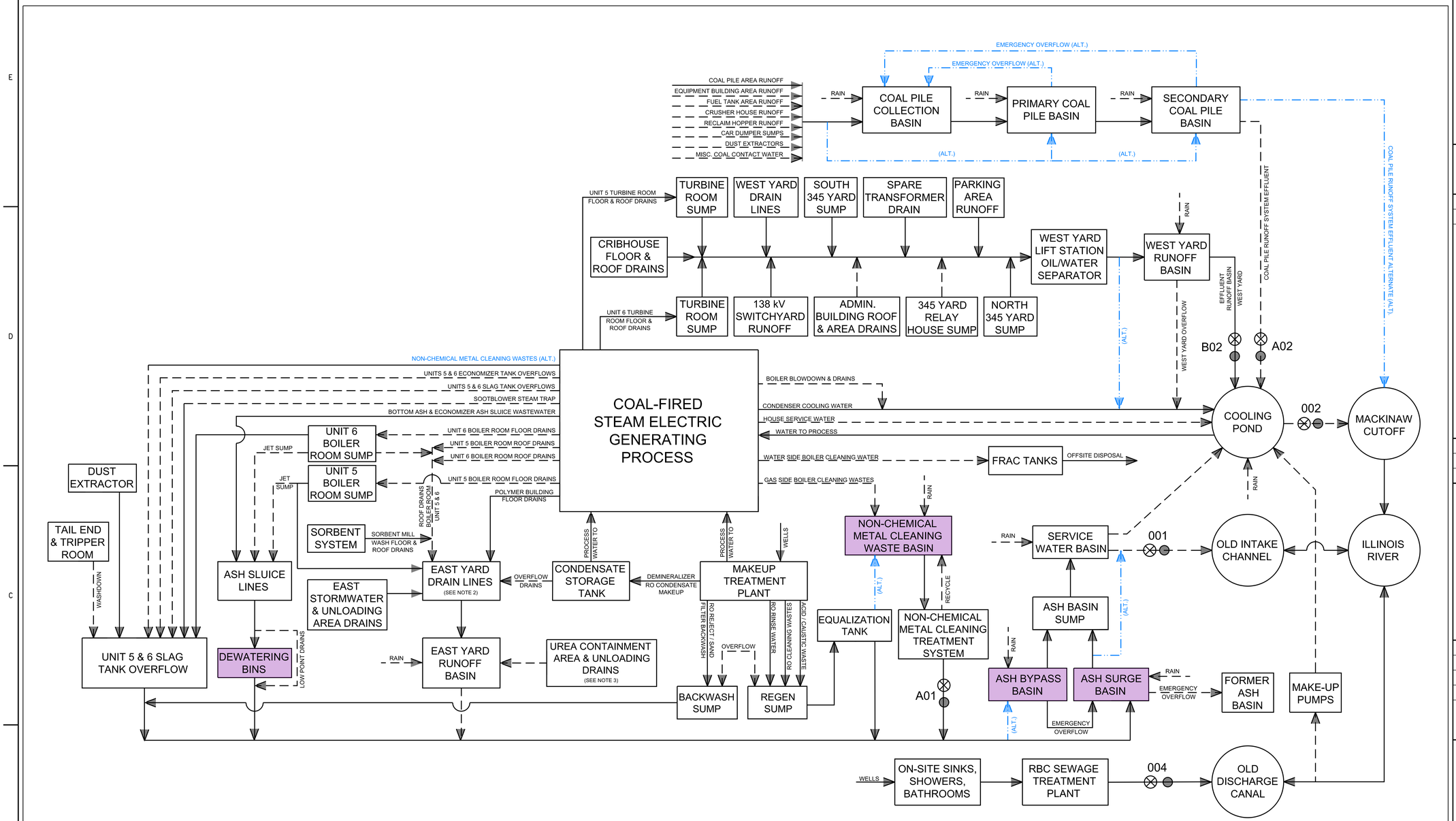
Job Number: 500-201436-1

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
- 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

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

PD111153/DM1864/S:\#Civil\Design\2-Powerton - CCR\#Drawings\#POW-CSK-PFD-001.dgn
Form 00G-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	METAL CLEANING BASIN SITE TRANSPORTATION MAP

NORTH

150' 0' 150' 300'

GRAPHIC SCALE

LEGEND

- TYPICAL VEHICLE ACCESS TO METAL CLEANING BASIN
- LARGE VEHICLE ACCESS TO METAL CLEANING BASIN
- METAL CLEANING BASIN BOUNDARY

NOTES

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.

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	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	N/A
PROJECT NO.:	A12661.152

CAD FILE NAME:	MCB-FIGURE 2.DGN
PREPARED BY:	M. KARNIA / 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
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

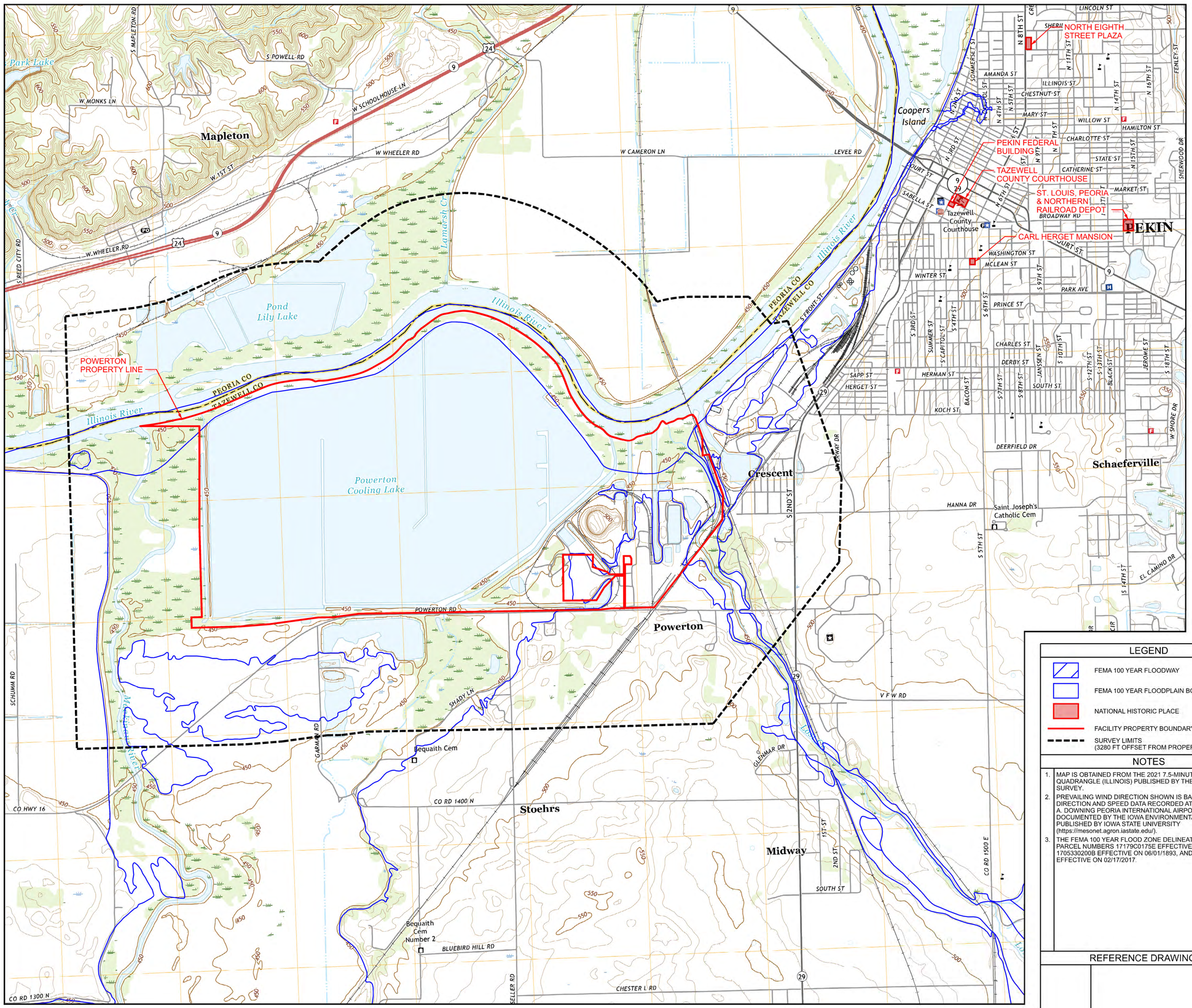
METAL CLEANING BASIN
SITE TRANSPORTATION MAP

DRAWING NUMBER	REVISION
FIGURE 2	0
SHEET 1 OF 1	

7/19/2023 8:07:59 AM
...\MCB-FIGURE 2.dgn

PL:\27930\M1864\D:\00-Civil Home Work\2-Powerton CCR\Metal Cleaning Basin Retrofit Construction Permit Application Figures\MCB-FIGURE 2.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

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	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	N/A
PROJECT NO.:	A12661.152

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

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MIDWEST GENERATION, LLC
POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

SITE LOCATION MAP

DRAWING NUMBER	REVISION
ATTACHMENT 3	0

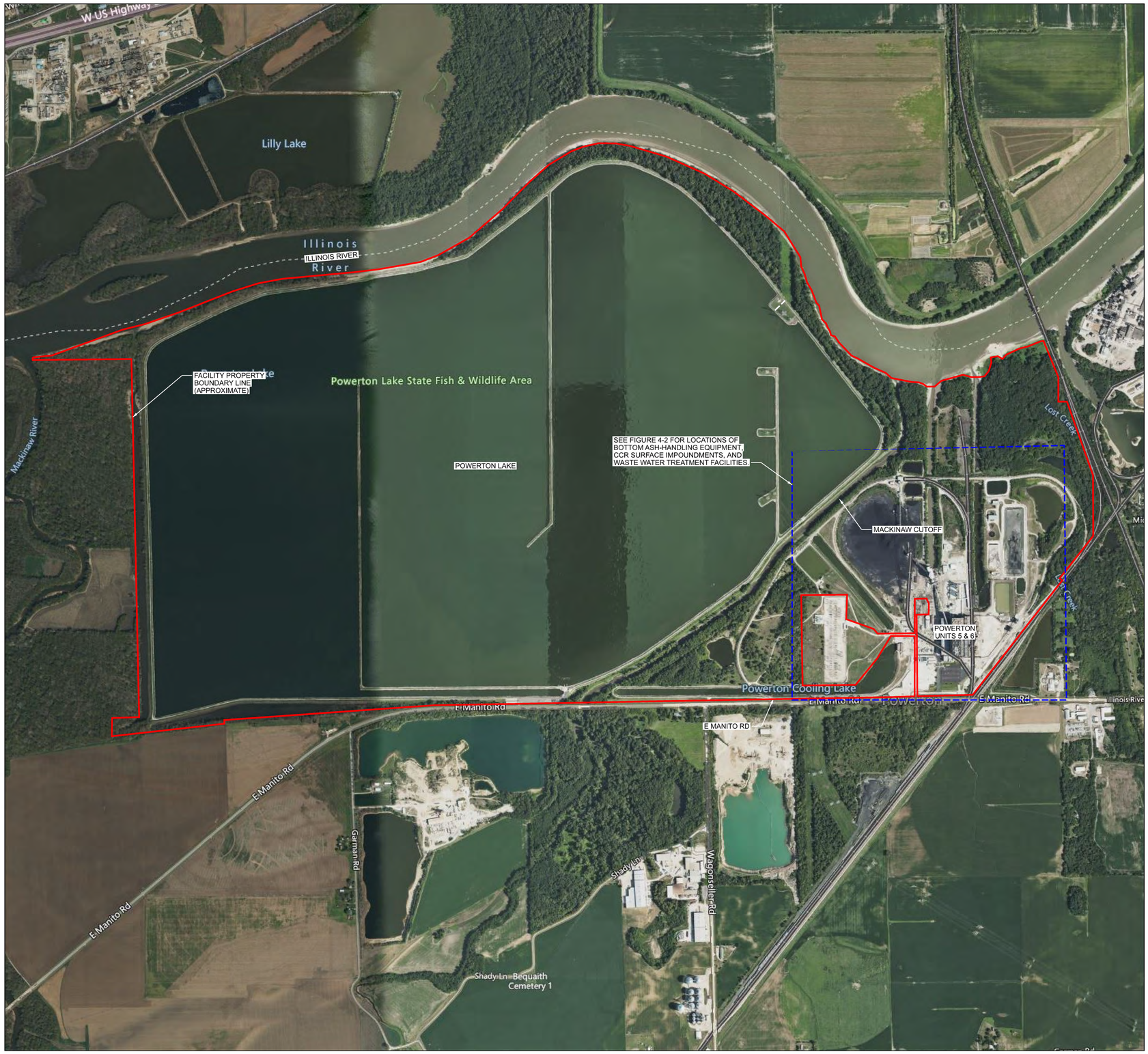
SHEET 1 OF 1

PL:\2793\0M1864\D:\00-Civil Home Work\2-Powerton CCR\Metal Cleaning Basin Retrofit Construction Permit Application Figures\MCB-Attachment 3.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

7/19/2023 8:12:00 AM
...\MCB-Attachment 3.dgn

ATTACHMENT 4
SITE PLAN MAPS

FIGURE	REV.	TITLE
FIGURE 4-1	0	SITE PLAN MAP
FIGURE 4-2	0	BOTTOM ASH-HANDLING EQUIPMENT AND CCR SURFACE IMPOUNDMENTS



NORTH

600' 0' 600' 1200'

GRAPHIC SCALE

LEGEND

FACILITY PROPERTY BOUNDARY LINE

NOTES

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

REFERENCE DRAWINGS

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FOR PERMIT
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HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	N/A
PROJECT NO.:	A12661.152
CAD FILE NAME:	MCB-FIGURE 4-1.DGN
PREPARED BY:	M. KARNIA / 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
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

SITE PLAN MAP

DRAWING NUMBER	REVISION
FIGURE 4-1	0
SHEET 1 OF 1	

7/19/2023 10:35:26 AM ...\MCB-FIGURE 4-1.dgn

PL:12793/0M1864/D:\00-Civil Home Work\2-Powerton CCR\Metal Cleaning Basin Retrofit Construction Permit Application Figures\MCB-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

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

FOR PERMIT
NOT FOR CONSTRUCTION

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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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	N/A
PROJECT NO.:	A12661.152

CAD FILE NAME:	MCB-FIGURE 4-2.DGN
PREPARED BY:	M. KARNIA / 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
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

BOTTOM ASH-HANDLING EQUIPMENT AND CCR SURFACE IMPOUNDMENTS

DRAWING NUMBER	REVISION
FIGURE 4-2	0

SHEET 1 OF 1

ATTACHMENT 5-1
CONSTRUCTION PLANS & SPECIFICATIONS

MWG

Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1800

METAL CLEANING BASIN RETROFIT

S&L PROJECT NO.: 12661-152

REVISION 0C

ISSUE PURPOSE: PERMIT

ISSUE DATE: 07-19-2023

Sargent & Lundy

SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-14-2023	All
0B	Public Comment	03-24-2023	All
0C	Permit	07-19-2023	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	A. Sahlas	T. Dehlin	--
0B	A. Sahlas	T. Dehlin	--
0C	A. Sahlas	T. Dehlin	T. Dehlin

SECTION 000107

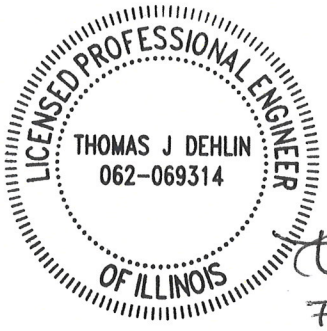
CERTIFICATION PAGE

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 19, 2023

Seal:



Th. Dehlin
7/19/2023
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: Metal Cleaning 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 Metal Cleaning 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.

102.2 The Metal Cleaning Basin will be retrofitted by first removing all boiler wash water sediments remaining in the basin; removing the basin's existing gravel warning, sand cushion, and riprap layers; and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following material removal 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 Metal Cleaning 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 Metal Cleaning Basin at the Powerton Generating Station. The Work includes the following activities:

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

b. Retrofitting the Metal Cleaning Basin by:

b1. Removing all boiler wash water sediments, gravel warning layer, sand cushion, and riprap layers 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 retrofitted Bypass Basin or as otherwise directed by the Owner.

b2. 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.

b3. Ensuring all appropriate measures are taken to protect the Metal Cleaning Basin's existing HDPE geomembrane liner system from damage.

b4. Placing, compacting, and grading Structural Fill to establish the lines and grades for the basin's LCRS as specified on the Design Drawings.

b5. 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).

b6. 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 heat-laminated to each side of the geonet – over a perforated HDPE collection pipe installed within a pipe bedding layer.

b7. Installing a Sand Filter Layer above the drainage geocomposite.

b8. Installing a Protective Warning Layer above the Sand Filter Layer on the basin floor.

b9. 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.

c. Restoring and cleaning the project site.

d. 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.

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. Disposing of excess excavated material and other construction related debris in an off-site 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.

k. 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 Contractor at least 2 workdays 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.

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 GW 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 the 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. The Owner will ultimately be responsible for the retrofit construction for the Metal Cleaning 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 Metal Cleaning Basin.

b. The Design Engineer will assure that the retrofit design meets or exceeds 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:

a. The Illinois EPA is the Permitting Authority and is responsible for reviewing the permit application for retrofitting the Metal Cleaning 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 Metal Cleaning 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:

a1. Earthwork and sitework.

a2. Removal of existing boiler wash water sediments and protective layers above the Metal Cleaning Basin's existing geomembrane liner.

a3. 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.

a4. Placement of fill material over liner run-outs.

a5. Placement of bedding material around and installation of the leachate collection pipe.

a6. 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 supplying and installing 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 installing 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-1801.

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 boiler wash sediments from the Metal Cleaning Basin.

a1. The GW Contractor shall be responsible for dewatering (if necessary) and removing all boiler wash water sediments remaining in the Metal Cleaning Basin after the GW Contractor mobilizes to the site.

a2. Estimated quantity of boiler wash water sediments and existing protective layer materials 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-1801 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 Metal Cleaning 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, or mis-descriptions 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 GW 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, above-ground utilities, and underground utilities and to avoid damage thereto. The GW Contractor shall, at no addition expense to the Owner, repair any damage caused by its operations or by that of its subcontractors.

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 GW 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 Metal Cleaning Basin construction.

113.2 The GW Contractor shall satisfy itself as to the accuracy of the dimensions of the existing Metal Cleaning 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 Metal Cleaning Basin was prepared in June 2021. 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 use the existing benchmarks established at the site, as identified on the survey drawings included in the reference documents for the project, to lay out lines and grades on the project site. 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.

115.3 The GW Contractor shall preserve and maintain existing benchmarks and reference points established at the project site. Should the GW Contractor, during execution of the Work, destroy or remove any existing benchmark or reference point, the cost to the Owner for re-establishing the benchmark or reference point will be charged to the GW Contractor.

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.

117.2 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.

118.2 Refer to Attachments 2 and 3 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 preparing and placing Structural Fill within the Metal Cleaning Basin and other tasks associated with installing a new composite liner system for the Metal Cleaning 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, grubbing, and topsoil stripping.

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

c. Cleaning and decontaminating the existing liner system and basin appurtenances remaining in-place.

d. Placing and compacting Structural Fill.

e. Preparing the Structural Fill surface to be lined with the Metal Cleaning Basin's new composite liner system.

f. Preparing concrete surfaces that will come into contact with geosynthetic materials.

g. Excavating crest anchor trenches where indicated on the Design Drawings.

h. Placing fill materials over run-outs and in crest anchor trenches for geosynthetic materials.

i. Placing crushed stone to re-surface existing roads on the top of the Metal Cleaning Basin's dikes where indicated on the Design Drawings.

j. Disposing excess or unsuitable excavated earthen material and debris in an off-site, permitted landfill approved by the Owner.

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-1800:

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 Metal Cleaning Basin's new LCRS.

b. CQA Specification P-1801:

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 agencies 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 (as 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 Metal Cleaning 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-1801.

PART 2 - PRODUCTS

201. MATERIAL FOR STRUCTURAL FILL

201.1 Definitions:

a. Structural Fill is fill placed within the Metal Cleaning 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 one 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.

201.4 Material Sources:

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

202. RESTRICTIONS ON THE USE OF MATERIAL FOR ANY PURPOSE

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 Metal Cleaning Basin's new composite liner system or on roads outside of the basin.

203. CRUSHED STONE SURFACING FOR ROADS

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.

PART 3 - EXECUTION

301. DEMOLITION, CLEARING, GRUBBING AND STRIPPING

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. 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.

b. 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. EXCAVATION

302.1 All material within the Metal Cleaning 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 Metal Cleaning Basin shall be disposed of as specified on the Design Drawings.

303. PLACEMENT OF STRUCTURAL FILL

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 Metal Cleaning 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 eastern dike.

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 existing geomembrane liner during periods of warm weather can cause wrinkling and damage to the liner. 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 existing geomembrane 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 material 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 Metal Cleaning 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 Metal Cleaning 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.

e. Prior to placing Structural Fill material on the existing concrete ramp and concrete aprons within the Metal Cleaning Basin, the Earthwork Contractor shall intentionally roughen the existing concrete surfaces receiving Structural Fill to a minimum amplitude of 1/4 inch.

303.5 Compacting Structural Fill:

a. Equipment:

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

a2. 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.

a3. 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 Metal Cleaning 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 for the geosynthetic clay liner (GCL) 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 Earthwork Contractor's Responsibility:

a. The Earthwork Contractor shall be responsible for preparing the surface of the Structural Fill beneath the GCL prior to placement of the GCL.

b. The subgrade is subject to inspection and acceptance by the Owner and the CQA Geosynthetics Inspector prior to installation of the GCL.

304.3 Inspection:

a. The Earthwork Contractor, the Owner, the Geosynthetics Contractor, and the CQA Geosynthetics 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.

304.5 Geosynthetic Contractor's Responsibility:

a. After the surface for the Metal Cleaning Basin's new composite liner system has been accepted by the Geosynthetics Contractor, the responsibility for changes or repair work become the Geosynthetics Contractor's.

b. Necessary changes or repairs made to the surface after the surface has been accepted by the Geosynthetics Contractor shall be made at no additional cost to the Owner.

305. PREPARATION OF CONCRETE SURFACES

305.1 All concrete surfaces on which Structural Fill material will be placed shall be intentionally roughened in accordance with Paragraph 303.4e.

305.2 All concrete surfaces that will come in contact with the Metal Cleaning 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. Where specified on the Design Drawings, geotextiles shall be placed between the concrete surface and the new composite liner system components to act as protective cushioning layers for the new liner components.

306. CREST ANCHORAGE OF GEOSYNTHETIC MATERIALS

306.1 Anchor Trench Excavation and Shaping:

a. Where specified on the Design Drawings, anchor trenches 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 Metal Cleaning 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. Anchor trenches shall be adequately drained to prevent ponding or softening of the adjacent soils while the trenches are open.

306.2 Fill Placement Over Liner Run-Outs and in Anchor Trenches:

a. The Earthwork Contractor shall place fill over liner run-outs or in an anchor trench after all geosynthetic materials are in place and seams are welded.

b. Fill placement over liner run-outs and in anchor trenches 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 placed above geosynthetic materials in an 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 Metal Cleaning Basin's new composite liner system, and the minimum material and installation requirements for the drainage geocomposite to be used in the retrofitted Metal Cleaning 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 using liner run-outs or anchor trenches as specified on the Design Drawings.

f. Attachment of the geomembrane to concrete structures and existing marker posts.

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 manufacturing and transporting the HDPE geomembrane liner 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.

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 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-1800:

a1. Section 319005 – Earthwork.

a2. Section 319025 – Geosynthetic Clay Liner.

a3. Section 319050 – Leachate Collection and Removal System.

b. CQA Specification P-1801:

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 agencies 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. GM9 Cold Weather Seaming of Geomembranes

c. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet.

d. GM13 Standard Specification for Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

e. GM14 Standard Guide for Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes.

f. 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. 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 (as 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.

c1.1 The minimum period of warranty for materials shall be 20 years with first year non-prorated.

c1.2 The minimum period of warranty for installation shall be 5 years with the first year non-prorated.

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-1801.

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 Installation 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-1801.

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 textured on both sides and meet the requirements of Table 319020-1.

b. The top surface of the HDPE geomembrane shall be white.

c. Textured surfaces shall be manufactured using a co-extrusion process, have uniform texturing appearance, and be free from agglomerated texturing material and such defects that would affect the specified properties of the HDPE geomembrane.

d. Each roll of HDPE geomembrane shall have 6-inch wide (minimum) smooth edges to provide suitable seaming surfaces. Textured HDPE geomembrane without smooth edges may be provided if approved by the Owner.

e. 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, which shall be limited to at most 10%. No post-consumer resin (PCR) of any type shall be added to the formulation.

f. The resin used to produce the HDPE geomembrane shall be formulated to be resistant to chemical and ultraviolet degradation.

g. The HDPE geomembrane shall be free of plasticizers, leachable additives, and per- and polyfluoroalkyl substances (PFAS).

h. During manufacture, each roll of HDPE geomembrane shall be continuously monitored across the width to assure uniformity of thickness. Thickness measurements shall meet the requirements of Table 319020-1.

i. The HDPE geomembrane shall be free of factory seams.

j. The HDPE 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.

k. Panels of HDPE geomembrane shall be capable of being seamed in the field to yield seams that are as resistant to waste liquids as the sheeting.

l. The HDPE geomembrane shall be manufactured in the United States or Canada.

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. Each 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 run-out distance / 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. All HDPE geomembrane liner material shall be shipped to the project site in rolls. No HDPE geomembrane liner material shall be folded.

b. Packaging and transportation of all HDPE geomembrane liner materials to the project site shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility of the material until the material is accepted at the site. The Geosynthetics Contractor shall be responsible for unloading the HDPE geomembrane liner material at the project site.

c. A label shall be attached or adhered to each roll of the HDPE geomembrane. The label shall identify the following:

c1. Name of GM/GC Manufacturer.

c2. Product identification (e.g., brand name, product code), 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. Order number.

c4. Date of manufacture.

c5. Manufacturing lot number.

c6. Geomembrane thickness and type.

c7. Roll identification number.

c8. Roll dimensions (length and width) and weight.

c9. Panel number, which shall be referenced to the proposed HDPE geomembrane liner panel layout drawing prepared by the GM/GC Manufacturer.

202. DRAINAGE GEOCOMPOSITE

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.

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 1,500 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 of all drainage geocomposite materials to the project site shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility until the drainage geocomposite is accepted at the site. The Geosynthetics Contractor shall be responsible for unloading the drainage geocomposite material at the project site.

c. A label shall be attached or adhered to each roll of the drainage geocomposite. The label shall identify the following:

c1.1 Name of GM/GC Manufacturer.

c1.2 Product identification (e.g., brand name, product code).

c1.3 Order number.

c1.4 Date of manufacture.

c1.5 Manufacturing lot number.

c1.6 Drainage geocomposite thickness and type.

c1.7 Roll identification number.

c1.8 Roll dimensions (length and width) and weight.

c1.9 Panel number.

203. MATERIALS FOR ATTACHMENT OF GEOMEMBRANE TO CONCRETE

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 Gaskets for Batten Strips:

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 Unloading:

a. Handling and unloading of materials shall be responsibility of the Geosynthetics Contractor.

b. Upon arrival at the site, the rolls of geomembrane liner and drainage geocomposite shall be carefully unloaded by the Geosynthetics Contractor in accordance with the GM/GC Manufacturer's recommendations and in a manner to ensure that the material is not damaged.

301.2 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 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.

301.3 Storage:

a. The Owner will provide on-site, outdoor storage space in a location near the area to be lined.

b. The Geosynthetics Contractor shall store and stage the rolls such that on-site transportation and handling are minimized.

c. The Geosynthetics Contractor shall be responsible for protecting the rolls of geomembrane liner and drainage geocomposite from damage, moisture, theft, and vandalism.

d. The rolls of geomembrane and drainage geocomposite shall be placed on a smooth surface free of rocks and standing water.

302. PREPARATION OF SURFACES TO BE LINED

302.1 Geosynthetic Clay Liner:

a. See Section 319025 regarding installation, inspection, and acceptance of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner.

302.2 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.

303. INSTALLATION OF HDPE GEOMEMBRANE LINER

303.1 Weather:

a. Geomembrane shall not be placed when the air temperature is above 104°F or below 41°F 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. Under no circumstances shall geomembrane be deployed when the air temperature is below 5°F.

a1. If the air temperature is above 32°F, trial welds shall be as described in Paragraph 303.7c.

a2. If the air temperature is at or below 32°F, trial welds and field seaming shall be as described in GRI Test Method GM9.

b. Geomembrane shall not be deployed or placed in any of the following conditions:

b1. During any rainfall or snowfall.

b2. In ponded water.

b3. During high winds.

b4. In the presence of excessive moisture due to fog or dew.

b5. On frozen subgrade.

303.2 Precautions to Prevent Wind Damage:

a. If possible, work shall be oriented in the direction of the prevailing wind.

b. To prevent uplift of the geomembrane by wind, the Geosynthetics Contractor shall provide adequate temporary loading and/or anchoring of the edges of the exposed sheets using sandbags, tires, or other means which will not damage the geomembrane.

303.3 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 shall be provided.

303.4 Panel Layout:

a. The panels shall be placed in accordance with the GM/GC 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 and the CQA Contractor after all of the geomembrane has been placed and seamed.

303.5 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 and folds 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.

303.6 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 covered with fill material or to be placed in an 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 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 Geosynthetics 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 GM/GC 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 A vehicle-mounted automated hot wedge welding apparatus shall be used to make each 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 GM/GC 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 Geosynthetics 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. For every seam that fails a seam test:

b4.1 The leak or suspected leak shall be located and repaired.

b4.2 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.

b5. 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 reports 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 303.9b1.

b3. Each sample location shall be numbered and marked with permanent identification, and every sample location 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 in the presence of the CQA Geosynthetics Inspector.

b5. Test samples shall be cut every shift and taken by the CQA Geosynthetics Inspector 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.

c2. As agreed to with the Owner, a sample may be increased in size to accommodate the requirements of the third-party 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. Samples shall be tested for shear strength and peel adhesion in accordance with ASTM D6392. Five specimens shall be tested for each test method.

e2. 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. In accordance with CQA Specification P-1801, verbal laboratory test results will be given by the CQA Contractor to the Geosynthetics Contractor within 24 hours of receipt of the samples. Written results will 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 the geomembrane liner is installed.

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 the 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 with temporary ballasting material (e.g., sand bags) at the top of the slope or, as specified in the Design Drawings, in an anchor trench and then rolled down the slope in such a manner as to continuously keep the drainage geocomposite in tension. If necessary, the drainage geocomposite shall be positioned by hand after unrolling to minimize wrinkles and folds.

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. Cutting tools shall not be left on 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 1-foot centers.

e. Horizontal and end seams in anchor trenches shall be joined on 1-foot 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 At the top of a slope, the HDPE geomembrane liner and the drainage geocomposite shall extend to the run-out distance indicated on the Design Drawings or, if otherwise indicated on the Design Drawings, shall be anchored in an anchor trench.

305.2 Prior to the placement of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner, and if specified on the Design Drawings, 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 and shaping requirements specified in Section 319005.

305.3 After installation of the LCRS in accordance with Section 319050, the Earthwork Contractor shall place fill over the geosynthetic materials along the specified run-out distance or in the anchor trench as shown on the Design Drawings.

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 a geosynthetic clay liner (GCL) to be used as the lower component of the retrofitted Metal Cleaning 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 using liner run-outs or anchor trenches as specified on the Design Drawings.

e. Sealing GCL around existing marker posts and on existing concrete surfaces.

f. Visual inspection of the completed GCL.

g. Patching and repairs as necessary.

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 manufacturing and 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.

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-1800:

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a3. Section 319050 – Leachate Collection and Removal System.

b. CQA Specification P-1801:

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 agencies 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 (as 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 Installation is Complete:

a. As-built panel layout.

b. 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-1801.

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® DN.

a2. Solmax BentoLiner® NW.

a3. AGRU America GeoClay® N66.

a4. Owner-approved alternative(s) meeting the requirements herein.

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 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 shall have the properties listed in Table 319025-2.

TABLE 319025-2
PROPERTIES OF FINISHED GCL MATERIALS

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)(5)	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.
(5) Hydraulic conductivity based on 7-mm-thick bentonite layer.

201.4 Packing and Shipping:

a. All GCL material shall be shipped to the project site in rolls. No GCL material shall be folded.

b. Transportation of GCL materials to the project site shall be the responsibility of the GCL Manufacturer who shall retain responsibility of the material until the material is accepted at the project site. The Geosynthetics Contractor will be responsible for unloading the GCL material at the project site.

c. 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.

d. A label shall be attached or adhered to each roll of the GCL. The label shall identify the following:

d1. Name of GCL Manufacturer.

d2. Product identification (brand name, product code).

d3. Order number.

d4. Date of manufacture.

d5. Manufacturing lot number.

d6. GCL thickness.

d7. Roll identification number.

d8. Roll dimensions (i.e., length and width) and weight.

d9. Panel number, which shall be referenced to the proposed GCL panel layout drawing prepared by the GCL Manufacturer.

e. 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.

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 and in a manner to ensure the material is not damaged.

301.2 Inspection:

a. Upon delivery of the material to the project site, the Geosynthetics Contractor shall conduct a visual inspection of all rolls of GCL for damage (rips, tears, etc.). Any protective sleeve damage shall be repaired immediately with tape or additional plastic sheeting.

b. Any damage to a roll of GCL or its protective sleeve shall be noted and immediately reported to the Owner, the GCL Manufacturer, and 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.

301.3 Storage:

a. The Owner will provide on-site, outdoor storage space in a location near the area to be lined.

b. The Geosynthetics Contractor shall store and stage the GCL rolls such that on-site transportation and handling are minimized.

c. The Geosynthetics Contractor shall be responsible for protecting the GCL rolls from damage, moisture, theft, and vandalism.

d. Rolls of GCL shall be:

d1. Stored horizontally in their original, unopened, wrapped cover in a clean, dry area.

d2. Stored off the ground on pallets or plywood in small stacks not to exceed five rolls in height. Rolls shall be stacked in a manner recommended by the GCL Manufacturer that prevents them from sliding or rolling.

d3. Covered with a heavy, protective tarpaulin or plastic sheeting.

e. The Geosynthetics Contractor shall keep the GCL clean and free from debris prior to installation.

f. 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.

302. PREPARATION OF SURFACE TO BE LINED

302.1 The Earthwork Contractor shall be responsible for the initial preparation and maintenance 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. GENERAL INSTALLATION REQUIREMENTS

303.1 Weather:

a. GCL shall not be deployed or placed in the following conditions:

a1. During any rainfall or snowfall.

a2. In ponded water.

a3. During high winds.

a4. In the presence of excessive moisture due to fog or dew.

a5. On frozen subgrade.

b. GCL shall not be deployed when the air temperature is above 104°F or below 41°F unless it can be demonstrated to the approval of the Owner by trial welds the overlying HDPE geomembrane liner sheets can be welded at the prevailing temperature in accordance with the field seaming requirements specified in Section 319020. Under no circumstances shall GCL be deployed when the air temperature is below 5°F.

303.2 Precautions to Prevent Wind Damage

a. If possible, work shall be oriented in the direction of the prevailing wind.

b. To prevent uplift of the GCL by wind, the Geosynthetics Contractor shall provide adequate temporary loading and/or anchoring of the edges of the exposed sheets using sandbags, tires, or other means which will not damage the GCL.

303.3 Other Precautions to Prevent Damage

a. Protection of the GCL 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 shall be provided.

303.4 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 and the CQA Contractor after all of the GCL has been placed and seamed.

304. PANEL DEPLOYMENT

304.1 Deploy only as much GCL as can be covered with the HDPE geomembrane liner (in accordance with section 319020) by the end of the day or in a reasonably short time in the event of precipitation.

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 Where required by the Design Drawings, the anchor trench for the area to be lined shall be excavated before installation of the GCL begins.

304.4 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, is freely suspended, and can unroll freely. The core bar and spreader bar shall not flex or bend excessively when a full roll is lifted.

304.5 The cap material 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 and folds 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. FIELD SEAMING

305.1 General Requirements for Seaming:

a. Horizontal seams shall be located at least 5 feet from the toe of a 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 6 inch minimum overlap on the longitudinal seams and 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 12 inches on longitudinal seams and 36 inches on end seams, or to 4% of the distance to the next parallel seam, whichever is greater.

305.2 Seaming:

a. Seaming shall be performed in accordance with the GCL Manufacturer's written recommended procedures.

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. All dry granular bentonite used shall be that provided by the GCL Manufacturer.

e. Seam overlap on the bottom of a slope 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.

306. SEALING AROUND AND AGAINST EXISTING STRUCTURES

306.1 The GCL shall be sealed to existing structures within the Metal Cleaning Basin.

306.2 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.

306.3 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.

306.4 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.

306.5 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.

307. INSPECTION

307.1 After seaming is complete, the Geosynthetics Contractor and the CQA Geosynthetics Inspector shall conduct a detailed walkdown to visually check all seams and non-seam areas of the GCL.

307.2 All defects, holes, blisters, tears, and signs of damage during installation shall be marked for repair.

308. PATCHING AND REPAIRS

308.1 Patching shall be used to repair small defects, blisters, holes, and tears.

308.2 All dirt and debris present in the patched area shall be removed.

308.3 All patches shall be round or oval or shall have rounded corners.

308.4 All patches shall be made of the base GCL and shall extend a minimum of 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-quarter pound per lineal foot prior to placing the patch. Adhesive, such as wood glue, may be used if necessary to secure the patch.

309. CREST ANCHORAGE

309.1 At the top of a slope, the GCL shall extend to the run-out distance indicated on the Design Drawings or, if otherwise indicated on the Design Drawings, shall be anchored in an anchor trench.

309.2 Prior to the placement of the GCL and if indicated on the Design Drawings, 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 and shaping requirements specified in Section 319005.

309.3 After installation of the LCRS in accordance with Section 319050, the Earthwork Contractor shall place fill over the geosynthetic materials along the specified run-out distance or in the anchor trench as shown on the Design Drawings.

310. PROTECTIVE COVER

310.1 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.

310.2 To prevent premature hydration or contraction, only the amount of GCL that can be installed, inspected, repaired, and covered in the same day shall be installed.

310.3 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.

311. CORRECTIVE MEASURES FOR PREMATURE HYDRATION OF GCL

311.1 If the GCL is prematurely hydrated, becomes saturated, etc., then the following corrective action program shall be implemented:

a. The affected panels shall be identified, documented, and exposed so that they can dry. Traffic over the impacted area shall be kept to a minimum during the drying process.

b. Once the affected panels have had enough time to dry, the Geosynthetics Contractor, the CQA Geosynthetics Inspector, and the Owner shall evaluate the impacted area for damage.

c. Following evaluation of the impacted area, the Geosynthetics Contractor shall recommend to either leave the GCL in place or to replace the GCL. The Geosynthetics Contractor's recommendation shall be made in writing, submitted with photographs documenting the evaluated area, and based on the extent of damage (or lack thereof).

c1. If the Geosynthetics Contractor's recommendation is to replace the affected GCL panels, then they shall be replaced at no additional cost to the Owner.

c2. If the Geosynthetics Contractor's recommendation is to leave the affected GCL panels in-place, and if the Owner or CQA Geosynthetics Inspector disagree with that recommendation, then the Owner will contact the GCL Manufacturer for their recommendation.

c2.1 If the GCL Manufacturer's recommendation is to replace the affected GCL panels, then they shall be replaced at no additional cost to the Owner.

c2.2 If the GCL Manufacturer's recommendation is to leave the affected GCL panels in-place, and if either the Owner or CQA Geosynthetics Inspector disagree with that recommendation, then the GCL panels shall be removed in accordance with a negotiated agreement between the Owner and the GW Contractor.

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 Metal Cleaning 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-1800:

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a3. Section 319025 – Geosynthetic Clay Liner.

b. CQA Specification P-1801:

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 agencies 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-1801.

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.

d. The Earthwork Contractor shall prepare and maintain logs of pipe joints indicating, at a minimum:

d1. Locations with corresponding pipe markings.

d2. Visual inspection results.

d3. For each joint that did not pass visual inspection, the work done to correct the improper fusion weld.

304. INSTALLATION OF GRANULAR AND RIPRAP MATERIALS

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

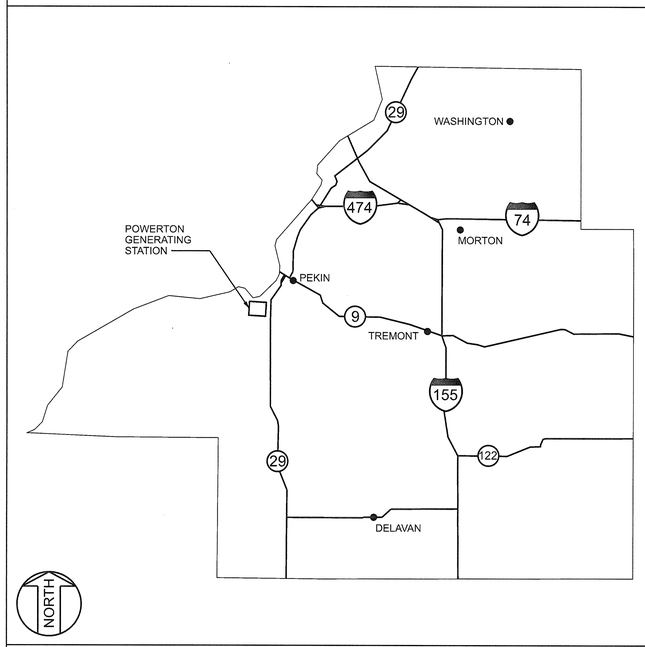
ATTACHMENT 1

DESIGN DRAWINGS

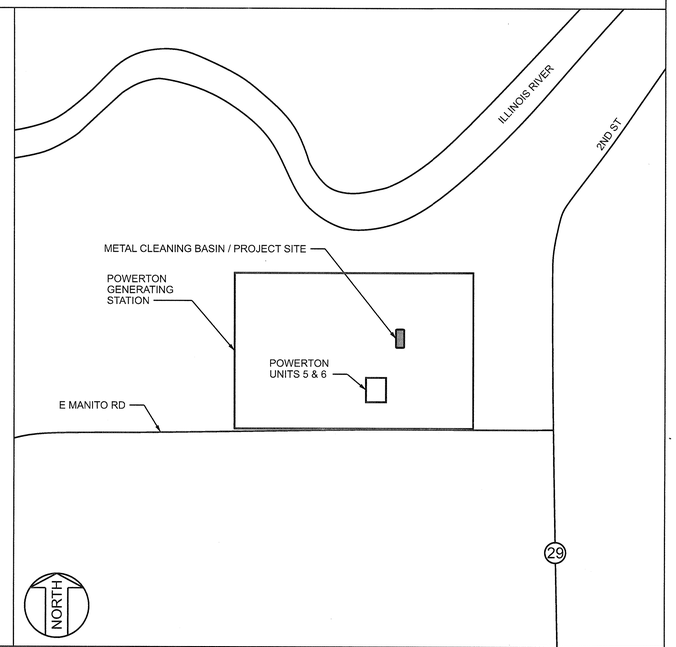
DRAWING NO.	REV.	TITLE
POW-MCB-CSK-001	0C	COVER SHEET
POW-MCB-CSK-002	0C	GENERAL NOTES
POW-MCB-CSK-003	0C	EXISTING CONDITIONS
POW-MCB-CSK-004	0C	EXCAVATION PLAN
POW-MCB-CSK-005	0C	EXCAVATION SECTIONS & DETAILS
POW-MCB-CSK-006	0C	STRUCTURAL FILL GRADING PLAN
POW-MCB-CSK-007	0C	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-MCB-CSK-008	0C	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS – SHEET 1
POW-MCB-CSK-009	0C	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS – SHEET 2

MIDWEST GENERATION, LLC
POWERTON GENERATING STATION
METAL CLEANING 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 METAL CLEANING BASIN RETROFIT PROJECT DRAWING LIST	
DWG NO.	DRAWING TITLE
POW-MCB-CSK-001	COVER SHEET
POW-MCB-CSK-002	GENERAL NOTES
POW-MCB-CSK-003	EXISTING CONDITIONS
POW-MCB-CSK-004	EXCAVATION PLAN
POW-MCB-CSK-005	EXCAVATION SECTIONS & DETAILS
POW-MCB-CSK-006	STRUCTURAL FILL GRADING PLAN
POW-MCB-CSK-007	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-MCB-CSK-008	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS - SHEET 1
POW-MCB-CSK-009	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS - SHEET 2

FOR PERMIT
NOT FOR CONSTRUCTION

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)) FERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-16-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT
0C	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	P-1800
PROJECT NO.:	12661-152

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
07-19-2023

MY LICENSE RENEWAL DATE IS: 11-30-2023
PAGES OR SHEETS COVERED BY THIS SEAL:
THIS DOCUMENT ONLY.

LICENSED PROFESSIONAL ENGINEER
THOMAS J. DEHLIN
062-060314
OF ILLINOIS

CAD FILE NAME:	POW-MCB-CSK-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
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

COVER SHEET

DRAWING NUMBER	REVISION
POW-MCB-CSK-001	0C
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

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED BY A GENERAL WORK (GW) CONTRACTOR ACCORDING TO THE REQUIREMENTS OF SPECIFICATION P-1800 UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS.
2. THE GW 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 GW CONTRACTOR SHALL CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, COMPOSED OF THE DESIGN DRAWINGS AND SPECIFICATIONS.
3. ALL WORK DONE BY GW CONTRACTOR 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 GW CONTRACTOR'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.
4. THE GW 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 GW 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. 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.
7. COMPACTION:

   SEE SPECIFICATION P-1800 FOR COMPACTION AND EARTHWORK REQUIREMENTS.
8. 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.
9. CONSTRUCTION QUALITY ASSURANCE:
   - A. MATERIALS AND CONSTRUCTION PROCEDURES WILL BE SUBJECT TO INSPECTION AND TESTING BY A CONSTRUCTION QUALITY ASSURANCE (CQA) CONTRACTOR EMPLOYED BY THE OWNER. SUCH INSPECTIONS AND TESTS WILL NOT RELIEVE THE GW CONTRACTOR OF THE RESPONSIBILITY FOR PROVIDING MATERIALS AND INSTALLATION IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.
   - B. THE OWNER RESERVES THE RIGHT, AT ANY TIME BEFORE FINAL ACCEPTANCE, TO REJECT MATERIALS OR WORKMANSHIP NOT COMPLYING WITH SPECIFIED REQUIREMENTS. THE GW CONTRACTOR SHALL CORRECT THE DEFICIENCIES WHICH THE INSPECTIONS AND TESTS HAVE INDICATED ARE NOT IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.
   - C. CQA ACTIVITIES WILL BE PERFORMED AS DESCRIBED ON THE DESIGN DRAWINGS AND IN SPECIFICATION P-1801.
10. TOPOGRAPHIC MAP & COORDINATES:
    - A. EXISTING TOPOGRAPHY FOR THE PROJECT SITE SHOWN ON THE DESIGN DRAWINGS WAS PREPARED IN 2022 BY RUETTIGER, TONELLI & ASSOCIATES, INC.
    - 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.
11. HORIZONTAL AND VERTICAL CONTROL:
    - A. THE BASIS FOR HORIZONTAL CONTROL IS AS DESCRIBED IN NOTE 10.
    - B. THE BASIS FOR VERTICAL CONTROL IS THE LOCAL PLANT DATUM.
    - C. THE FOLLOWING PERMANENT BENCHMARKS FOR HORIZONTAL AND VERTICAL CONTROL HAVE BEEN ESTABLISHED AT THE PROJECT SITE. THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY DISCREPANCIES IN EXISTING BENCHMARK LOCATIONS AND/OR ELEVATIONS.

ID #	NORTHING	EASTING	ELEVATION
528	1,412,067.47	2,432,531.82	465.02
1193	1,412,960.21	2,432,343.81	459.51

    - D. GW CONTRACTOR IS RESPONSIBLE FOR SETTING ADDITIONAL MONUMENTS AND CONTROL POINTS THAT THEY DEEM NECESSARY FOR COMPLETION OF THE WORK.
12. GEOTECHNICAL WORK:

    A STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT FOR THE METAL CLEANING BASIN WAS PREPARED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. IN MAY 2021. SITE SPECIFIC SOIL DATA AND GEOTECHNICAL RECOMMENDATIONS ARE PROVIDED AND REFERENCED THEREIN.
13. EXISTING CONDITIONS:
    - A. DIMENSIONS OF EXISTING WORK SHALL BE VERIFIED BY THE GW 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. GW CONTRACTOR 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 GW CONTRACTOR 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 GW CONTRACTOR'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 GW 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
C0	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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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-16-2023	FOR CLIENT COMMENT
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0C	07-19-2023	FOR PERMIT

ISSUE PURPOSE: PERMIT
SPECIFICATION: P-1800
PROJECT NO.: 12661-152

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
07-19-2023

LICENSED PROFESSIONAL ENGINEER — THOMAS J. DEHLIN — 062-068314 — STATE OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
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CAD FILE NAME: POW-MCB-CSK-002.DGN
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REVIEWED BY: T. DEHLIN
APPROVED BY: T. DEHLIN

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CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

GENERAL NOTES

DRAWING NUMBER	REVISION
POW-MCB-CSK-002	0C
SHEET 1 OF 1	

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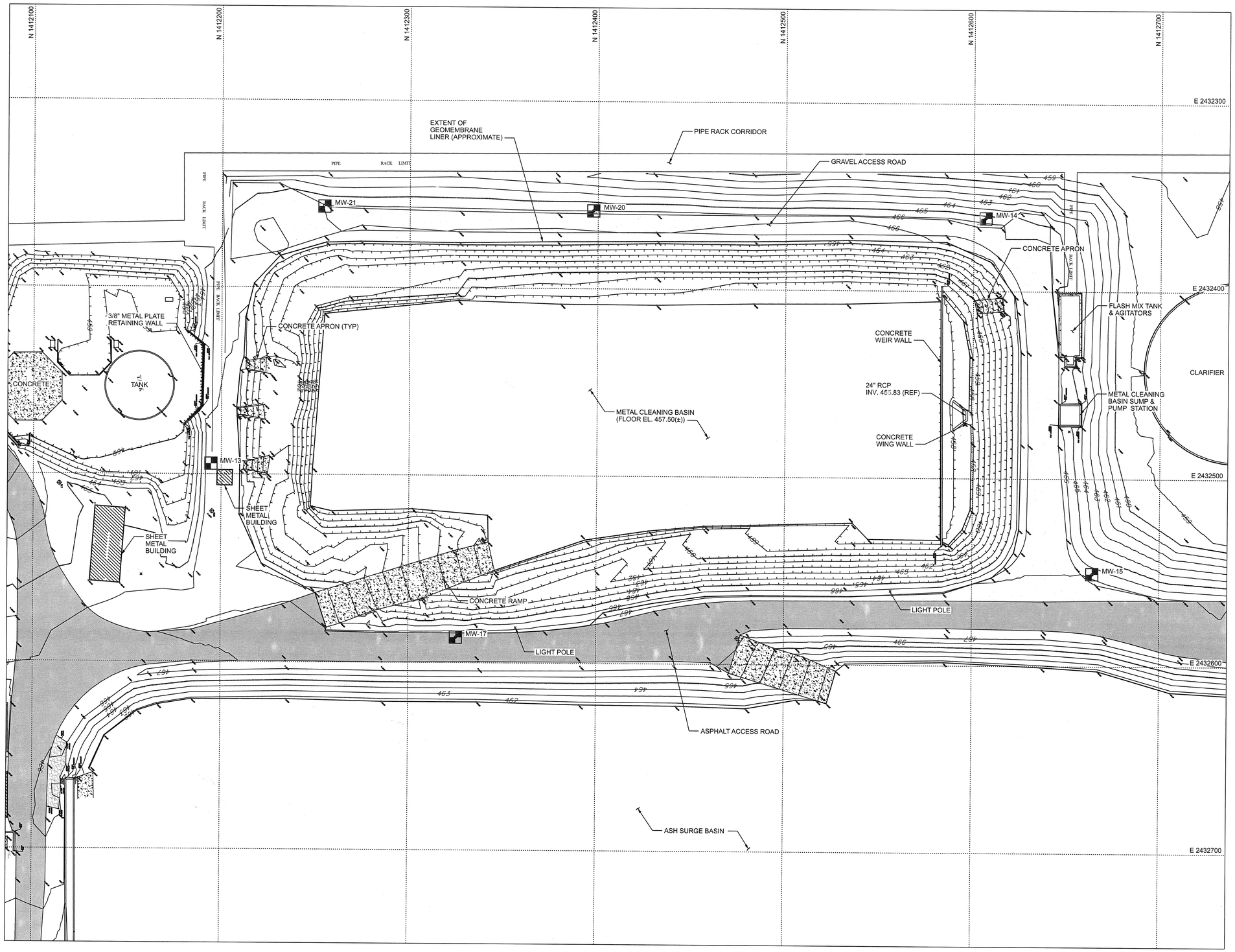

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1800 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-MCB-CSK-002.
3. GW CONTRACTOR SHALL TAKE ADEQUATE PRECAUTIONS TO PROTECT AND AVOID DAMAGE TO THE EXISTING MONITORING WELLS. GW CONTRACTOR SHALL REPAIR ANY DAMAGE TO THE EXISTING MONITORING WELLS CAUSED BY ITS OPERATIONS AT NO ADDITIONAL COST TO THE OWNER.

REFERENCE DRAWINGS

D1965C030-03	METAL CLEANING BASIN LINER REPLACEMENT WARNING LAYER PLAN
3B-0-2093	WASTE WATER TREATMENT FACILITY WING WALL PLANS, SECTIONS & DETAILS

LEGEND

MW- MONITORING WELL

NORTH

20' 0' 20' 40'

GRAPHIC SCALE

FOR PERMIT
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ISSUE PURPOSE:	PERMIT
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07-19-2023

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-069314
OF ILLINOIS

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PROJECT

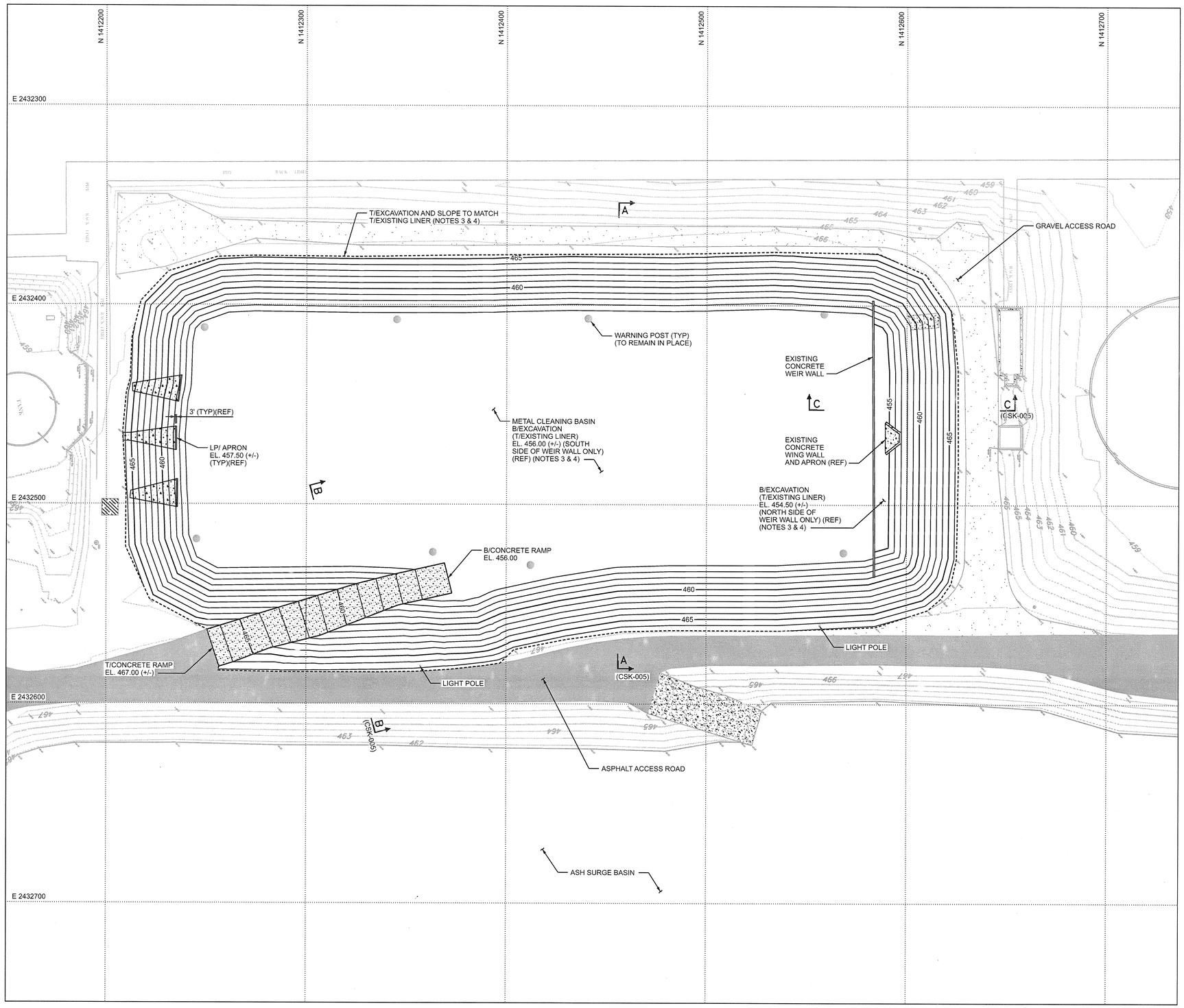
POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

EXISTING CONDITIONS

DRAWING NUMBER	REVISION
POW-MCB-CSK-003	0C
SHEET 1 OF 1	

PL14003(0V5344Y:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Metal Cleaning Basin Retrofit Drawings\POW-MCB-CSK-003.dgn
Form GDC-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010
POW-MCB-CSK-003.dgn 7/19/2023 8:12:13 AM
7/19/2023 8:12:12 AM ...\POW-MCB-CSK-003.dgn



NOTES

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2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-MCB-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 METAL CLEANING 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 METAL CLEANING 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 METAL CLEANING BASIN SHALL BE PERFORMED IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(1).
     - II. ALL LIQUID WASTE SHALL BE DISPOSED OF IN AN ON-SITE LOCATION AS DIRECTED BY THE OWNER.
   - D. GW CONTRACTOR SHALL DEVELOP AND IMPLEMENT FUGITIVE DUST CONTROLS DURING MATERIAL REMOVAL FROM THE METAL CLEANING 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 METAL CLEANING BASIN AREA IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(4).
   - F. AT THE END OF EACH MONTH DURING WHICH MATERIAL IS REMOVED FROM THE METAL CLEANING 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 AN ON-SITE LOCATION AS DIRECTED BY THE OWNER.
   - B. AS AN AREA WITHIN THE METAL CLEANING BASIN IS DECONTAMINATED, THE GW CONTRACTOR AND CQA CONTRACTOR (P-1801) 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-1801) 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 METAL CLEANING 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 METAL CLEANING BASIN). AFTER RECLEANING A GIVEN AREA, THE CQA CONTRACTOR (P-1801) 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	EXCAVATION SECTIONS & DETAILS
D1965C010-04	METAL CLEANING BASIN LINER REPLACEMENT PRE-CONSTRUCTION CONDITIONS
D1965C031-03	METAL CLEANING BASIN LINER REPLACEMENT DETAILS AND SECTIONS
3B-0-2093	WASTE WATER TREATMENT FACILITY WING WALL PLANS, SECTIONS & DETAILS

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NOT FOR CONSTRUCTION

NORTH

20' 0' 20' 40'
GRAPHIC SCALE

HOLD INFORMATION

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062-069314
OF ILLINOIS

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CAD FILE NAME:	POW-MCB-CSK-004.DGN
PREPARED BY:	J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	T. DEHLIN

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PROJECT

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

EXCAVATION PLAN

DRAWING NUMBER	REVISION
POW-MCB-CSK-004	0C
SHEET 1 OF 1	

PL:\2793\0M1864\Z:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Metal Cleaning Basin Retrofit Drawings\POW-MCB-CSK-004.dgn
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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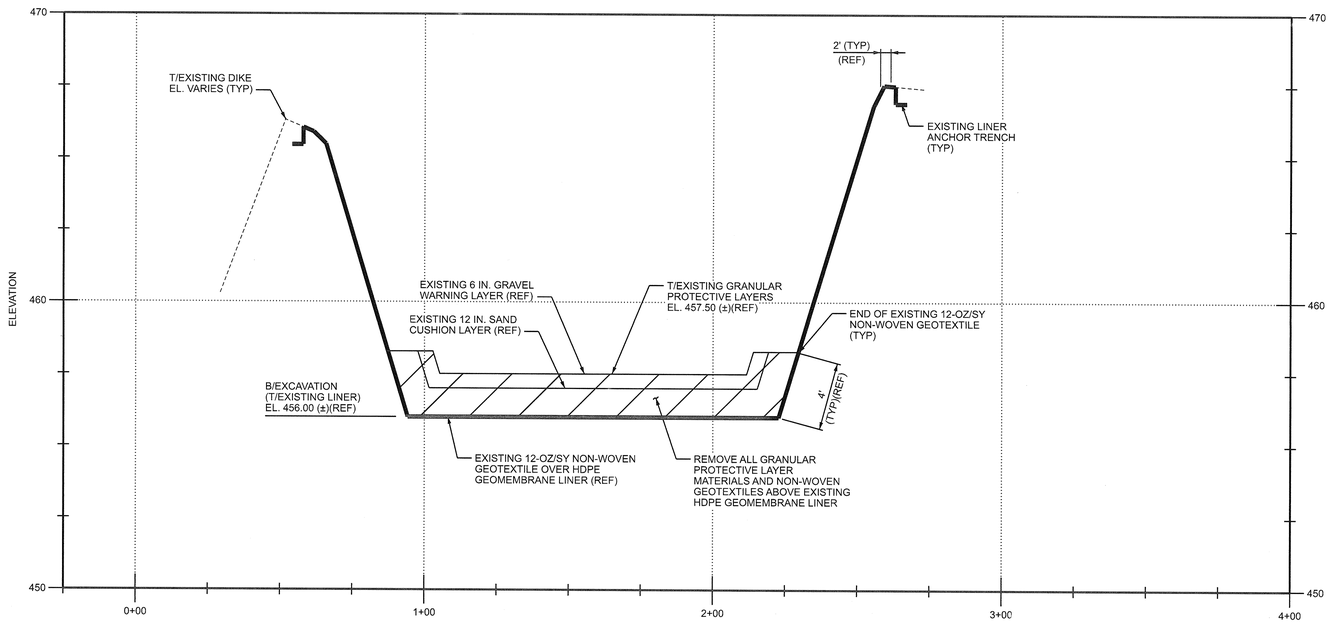
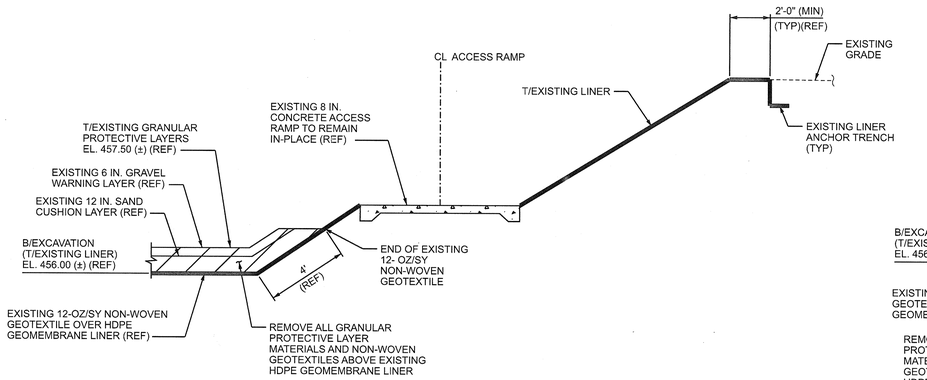
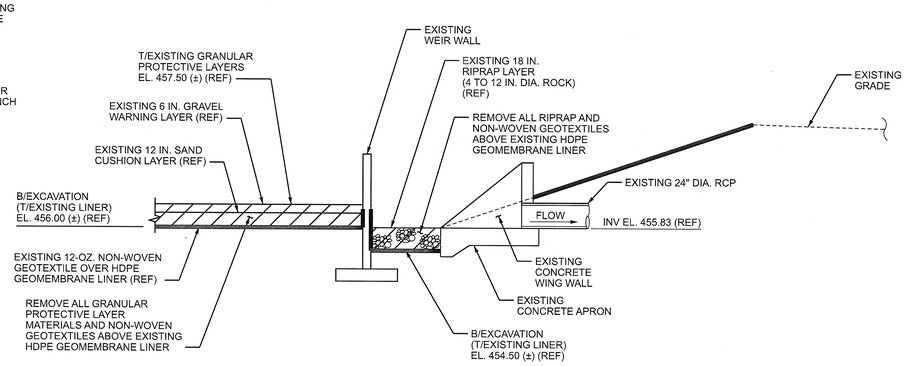


SECTION A
HORIZONTIAL SCALE 1"=20'
VERTICAL SCALE 1"=2'
(CSK-004)



SECTION B
SCALE: N.T.S.
(CSK-004)



SECTION C
SCALE: N.T.S.
(CSK-004)

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2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-MCB-CSK-002.

REFERENCE DRAWINGS

CSK-004	METAL CLEANING BASIN EXCAVATION PLAN
D1965C031-03	METAL CLEANING BASIN LINER REPLACEMENT DETAILS AND SECTIONS
D1965C032-03	METAL CLEANING BASIN LINER REPLACEMENT DETAILS AND SECTIONS
5080-C-5015	WASTE WATER TREATMENT FACILITIES, POWERTON, MISCELLANEOUS SECTIONS & DETAILS
3B-0-2093	WASTE WATER TREATMENT FACILITY, WING WALL PLANS, SECTIONS, & DETAILS

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07-19-2023

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062-069314
OF ILLINOIS

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REVIEWED BY:	T. DEHLIN
APPROVED BY:	T. DEHLIN

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Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

EXCAVATION SECTIONS & DETAILS

DRAWING NUMBER	REVISION
POW-MCB-CSK-005	0C
SHEET 1 OF 1	

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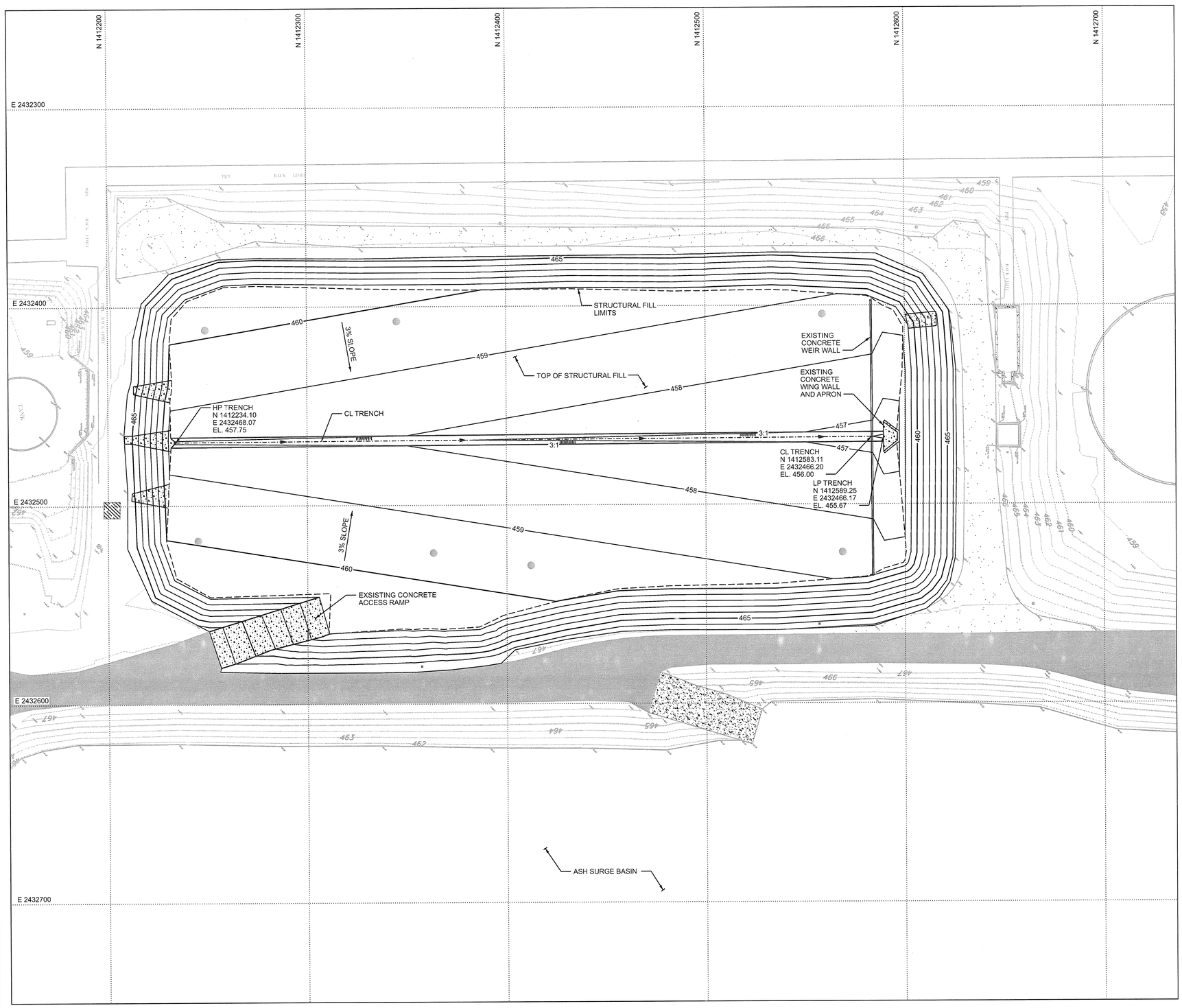
Form GDC-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



NORTH

20' 0' 20' 40'

GRAPHIC SCALE

LEGEND

460 — MAJOR CONTOUR

459 — MINOR CONTOUR

NOTES

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REFERENCE DRAWINGS

CSK-004	EXCAVATION PLAN

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th. Dehlin

THOMAS DEHLIN
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LICENSED PROFESSIONAL ENGINEER
THOMAS J. DEHLIN
062-068314
OF ILLINOIS

CAD FILE NAME: POW-MCB-CSK-006.DGN

PREPARED BY: J. CHAVEZ

REVIEWED BY: T. DEHLIN

APPROVED BY: T. DEHLIN

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PROJECT

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

STRUCTURAL FILL GRADING PLAN

DRAWING NUMBER	REVISION
POW-MCB-CSK-006	0C
SHEET 1 OF 1	

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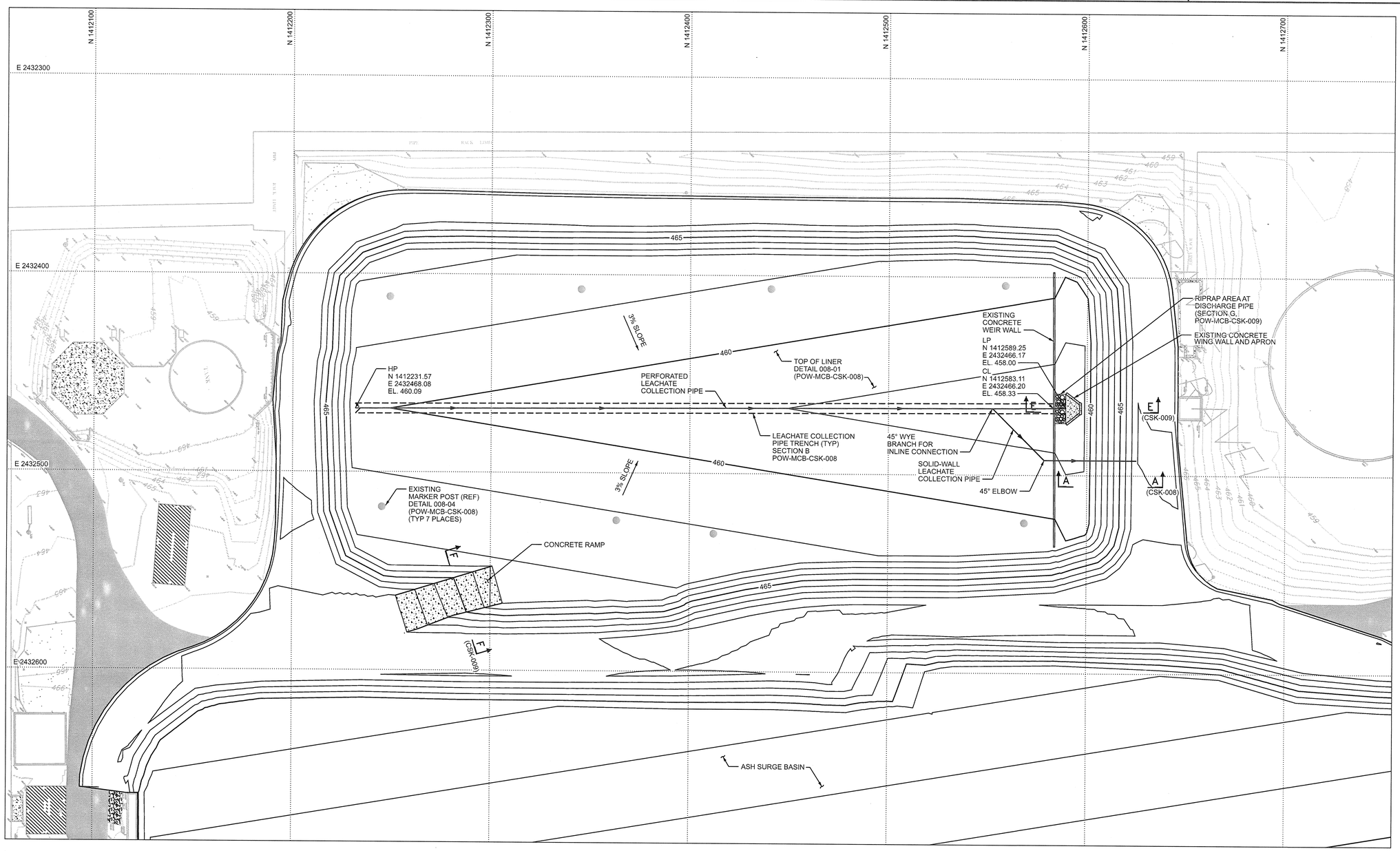
Form GDC-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



NOTES	LEGEND
1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1800 UNLESS NOTED OTHERWISE. 2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-MCB-CSK-002.	465 MAJOR CONTOUR 464 MINOR CONTOUR

REFERENCE DRAWINGS

FOR PERMIT
NOT FOR CONSTRUCTION

NORTH

20' 0' 20' 40'
GRAPHIC SCALE

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HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-16-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT
0C	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	P-1800
PROJECT NO.:	12661-152

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
07-19-2023

LICENSED PROFESSIONAL ENGINEER
THOMAS J DEHLIN
062-068314
OF ILLINOIS

MY LICENSE RENEWAL DATE IS: 11-30-2023
PAGES OR SHEETS COVERED BY THIS SEAL:
THIS DOCUMENT ONLY.

CAD FILE NAME:	POW-MCB-CSK-007.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

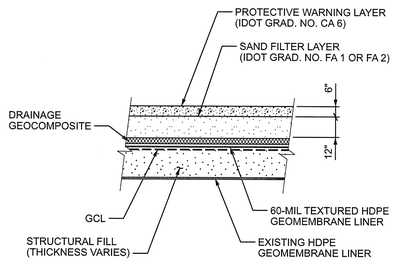
POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

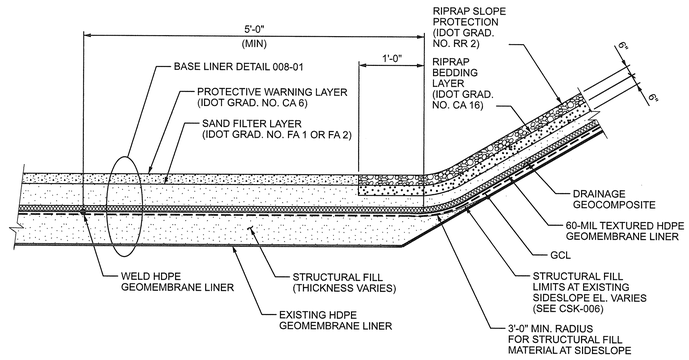
COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN

DRAWING NUMBER	REVISION
POW-MCB-CSK-007	0C
SHEET 1 OF 1	

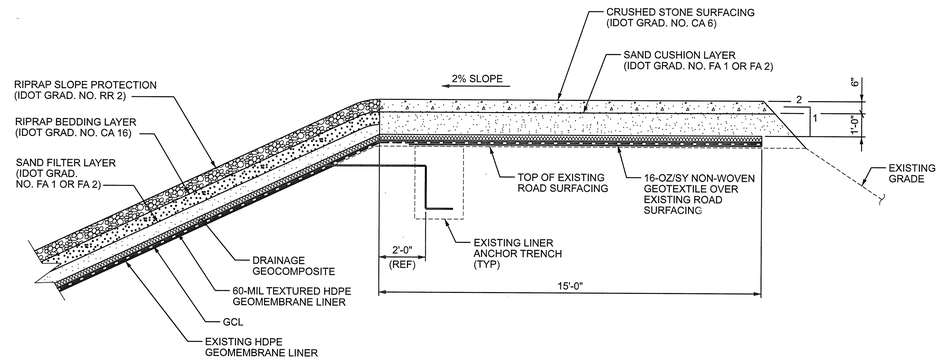
PL:\27930\M1864\Z:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Metal Cleaning Basin Retrofit Drawings\POW-MCB-CSK-007.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010
7/19/2023 11:02:41 AM
...\POW-MCB-CSK-007.dgn



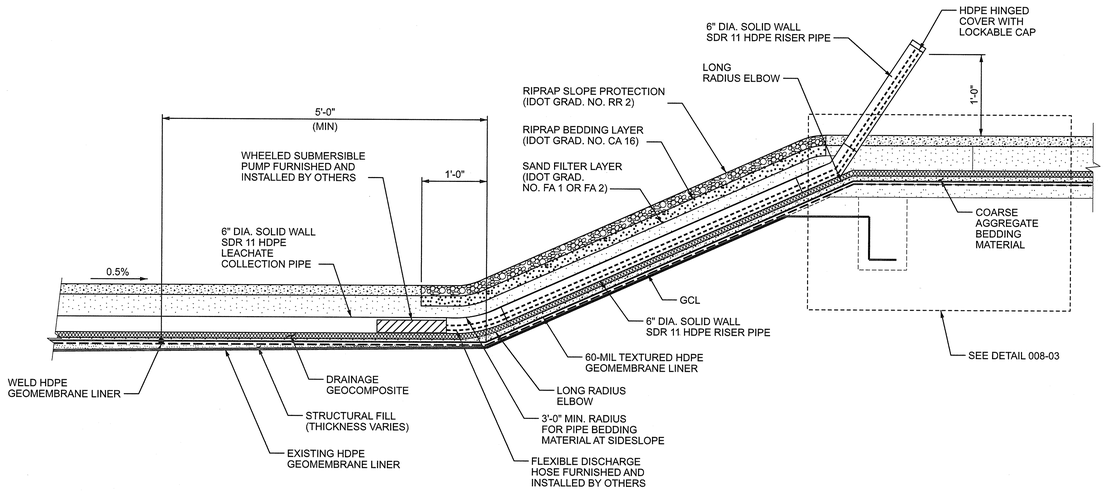
TYPICAL LINER BASE DETAIL
DETAIL 008-01
N.T.S.



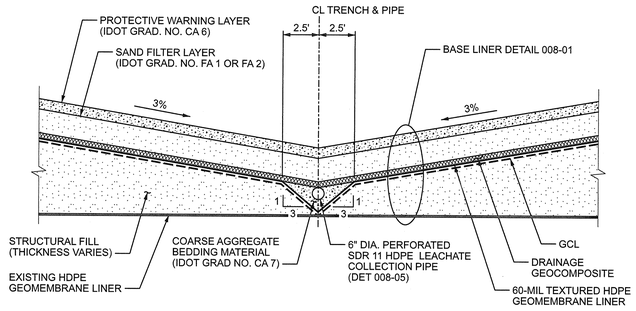
TYPICAL SLOPE TRANSITION DETAIL
DETAIL 008-02
N.T.S.



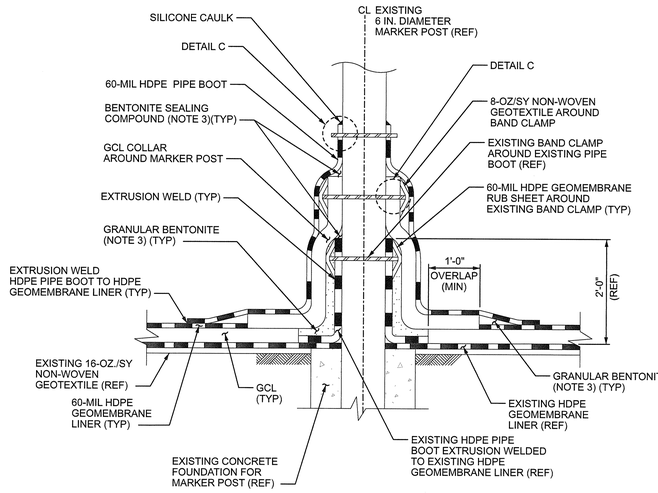
TYPICAL ANCHOR LINER RUN-OUT DETAIL AT DIKE CREST
DETAIL 008-03
N.T.S.



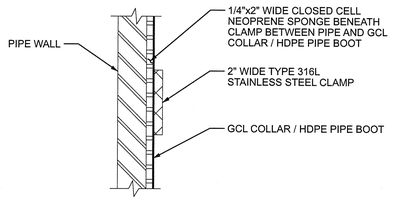
SECTION AT LEACHATE COLLECTION SUMP PUMP
SECTION A
N.T.S.



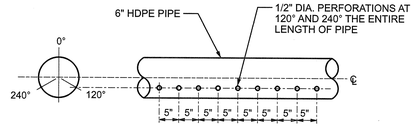
TYPICAL SECTION AT LEACHATE COLLECTION TRENCH
SECTION B
N.T.S.



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.



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-1800 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-MCB-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

D1965C031-03	METAL CLEANING BASIN LINER REPLACEMENT DETAILS AND SECTIONS

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0C	07-19-2023	FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	P-1800
PROJECT NO.:	12661-152

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
07-19-2023

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-MCB-CSK-008.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

POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

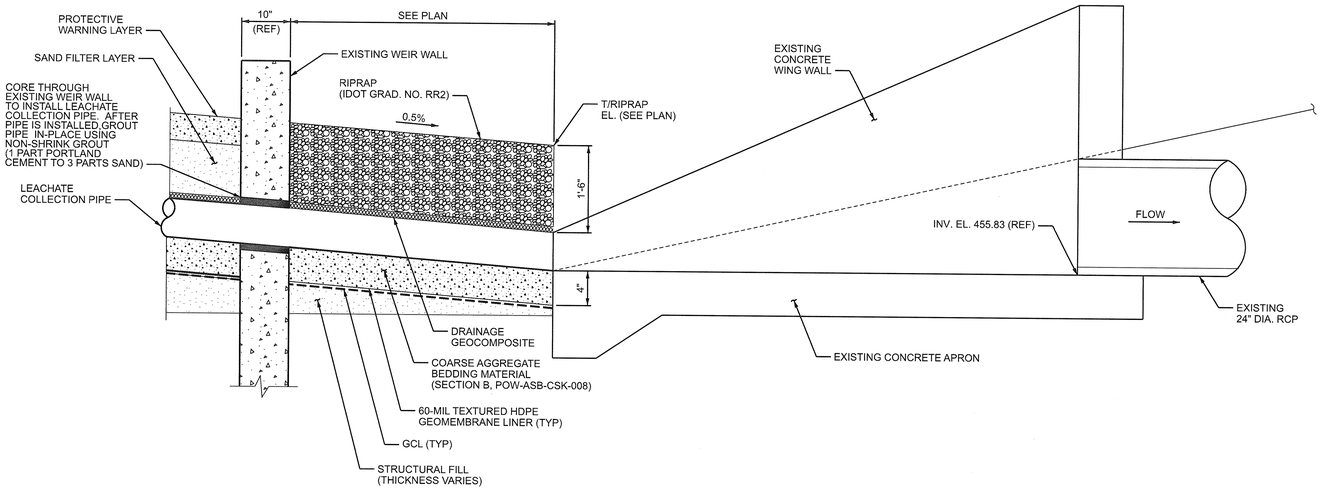
COMPOSITE LINER & LEACHATE
COLLECTION SYSTEM
SECTIONS & DETAILS - SHEET 1

DRAWING NUMBER	REVISION
POW-MCB-CSK-008	0C
SHEET 1 OF 1	

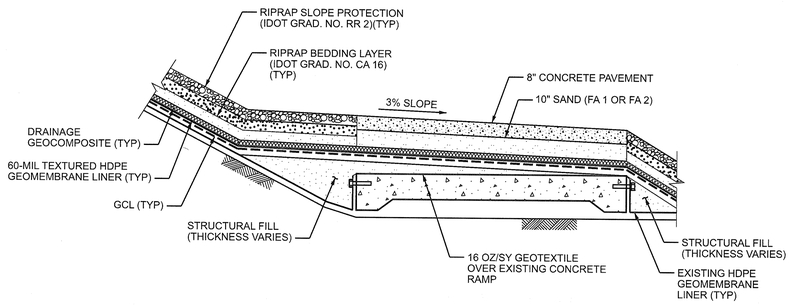
7/19/2023 8:48:26 AM
...\POW-MCB-CSK-008.dgn

PL:14003/0/V5344/Y:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Metal Cleaning Basin Retrofit Drawings\POW-MCB-CSK-008.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

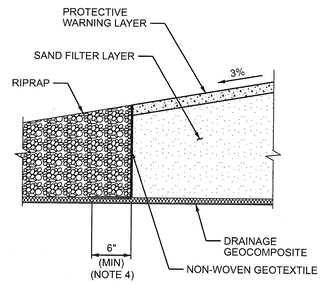
...W-MCB-CSK-008.dgn 7/19/2023 8:48:26 AM



SECTION E
N.T.S.



CONCRETE RAMP SECTION
SECTION F
N.T.S.



SECTION G
N.T.S.

HOLD INFORMATION	
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LICENSED PROFESSIONAL ENGINEER — THOMAS J DEHLIN — 062-068314 — OF ILLINOIS

CAD FILE NAME:	POW-MCB-CSK-009.DGN
PREPARED BY:	J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	T. DEHLIN

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POWERTON
GENERATING STATION
METAL CLEANING BASIN RETROFIT

DRAWING TITLE

COMPOSITE LINER & LEACHATE COLLECTION SYSTEM
SECTIONS & DETAILS - SHEET 2

DRAWING NUMBER	REVISION
POW-MCB-CSK-009	0C

SHEET 1 OF 1

NOTES

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REFERENCE DRAWINGS

D1965C031-03	METAL CLEANING BASIN LINER REPLACEMENT DETAILS AND SECTIONS
3B-0-2093	WASTE WATER TREATMENT FACILITY WING WALL PLANS, SECTIONS & DETAILS

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FOR PERMIT
NOT FOR CONSTRUCTION

ATTACHMENT 2

REFERENCE DRAWINGS

ATTACHMENT 2-1

1978 CONSTRUCTION DRAWINGS

DRAWING NO.	TITLE
5080-C-5008	DETAIL PLAN, METAL CLEANING & LIMESTONE RUNOFF BASINS
5080-C-5013	METAL CLEANING BASIN SECTIONS
5080-C-5015	MISCELLANEOUS SECTIONS & DETAILS
3B-0-2093	WING WALL PLANS, SECTIONS & DETAILS

5080 C5008

LAYOUT CONTROL FOR ROADS

NO.	N-S	E-W	RADIUS±	TAN±
6	N9+67	E4+67	150'	85.3
7	N8+25	E4+67	—	—
8	N8+30	E+.36	—	—
9	N11+00	E3+36	100'	15'
10	N11+07	E+.67	100'	15
11	N12+53	E4+67	68'	68
12	N16+33	E8+33	68'	68'
13	N12+18	E8+33	—	—
14	N13+27	E8+33	68'	37.7
15	N7+55	E0+10	68'	19.5
16	N7+55	E10+15	—	—
17	N9+55	E10+15	100'	15'
18	N10+20	E0+95	100'	15'
19	N11+82	E3+05	45'	37'

REVISIONS		
REV.	DESCRIPTION	
1	APPROVED FOR CONSTRUCTION	12/14/78
2	POZ-O-PAC & HYPALON LINER	7/19/78
3	ADDED RISER & BAFFLE	10/17/78

NOTES:
1. FOR GENERAL NOTES SEE DWG. C 5001.
2. FOR LEGEND SEE DWG. C 5000-1.
3. FOR TYPICAL ROAD AND ROAD DETAILS SEE DWG. C 5015-1

DRAWING STATUS

APPROVED FOR CONSTRUCTION

Date 12/14/78

COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

DETAIL PLAN METAL CLEANING & LIMESTONE RUNOFF BASINS

DRAWN	D. W. Burton	9/14/77
CHECKED		9/15/77
CDC ENGINEER		9/21/77
DISCIP. MGR. APPVL.		11/21/77
APPROVAL		11/4/77
APPROVAL		
APPROVAL		11/17/77

CECO CONTRACT: 802887 CECO DWG. NO.

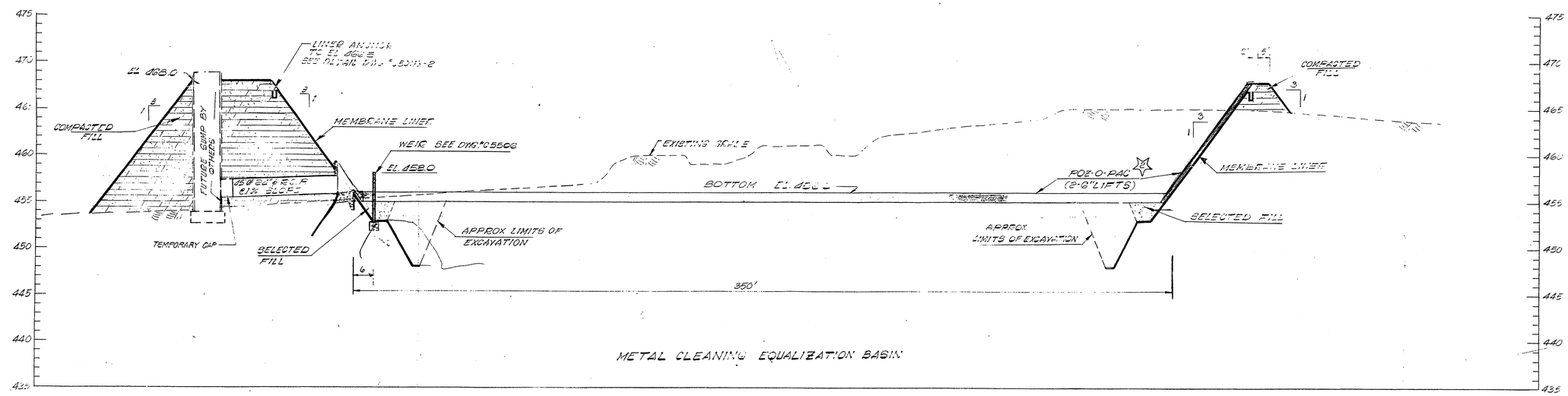
NUS CORPORATION ROCKVILLE, MD.

DRAWING NO. 5080.C5008

SCALE 1" = 20' SHEET 1 OF 1

DWG. NO. 5080 C5013 REV. 2

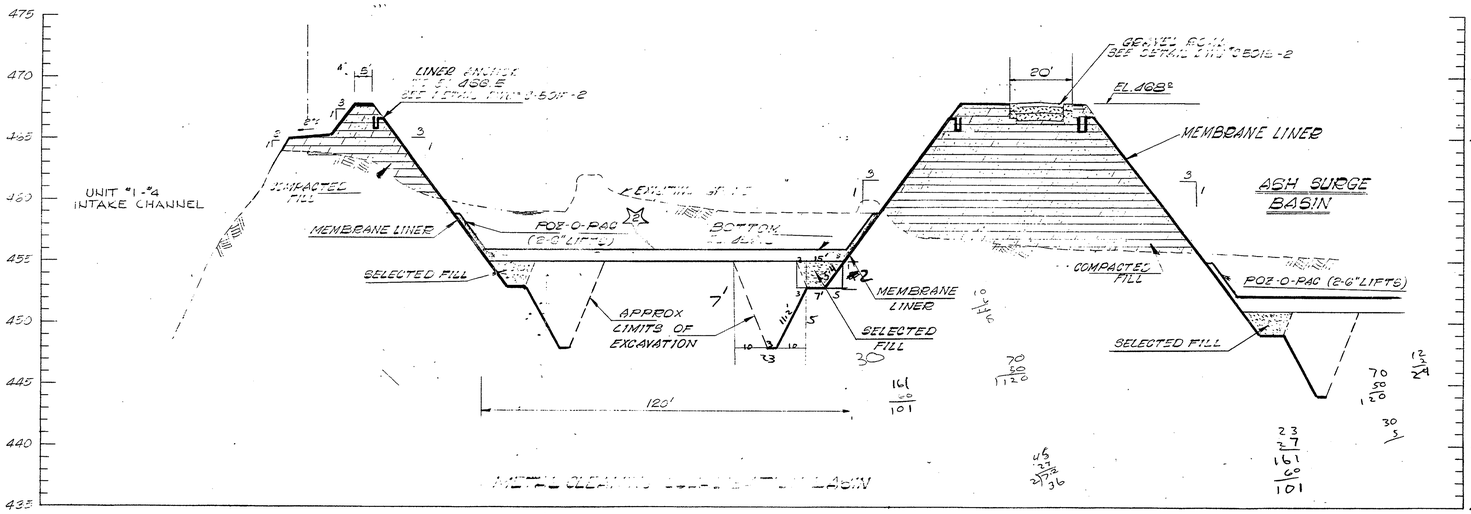
REVISIONS	
REV.	DESCRIPTION
1	APPROVED FOR CONSTRUCTION
2	FOR POZ-O-PAC HYPALON LINER AND TYPICAL DETAIL ADDED.



METAL CLEANING EQUALIZATION BASIN

SECTION (D) (5008)

FOR TYPICAL DETAIL POZ-O-PAC HYPALON LINER SEE THIS SHEET ☆2



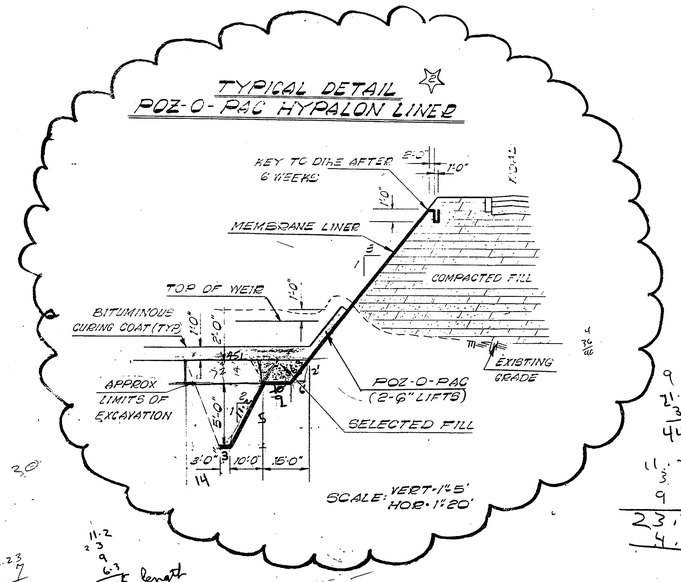
METAL CLEANING EQUALIZATION BASIN

SECTION (E) (5008)

SCALE: HOR 1"=20' VERT 1"=5'

NOTES:

1. FOR GENERAL NOTES SEE DWG. C-5001
2. FOR LEGEND SEE DWG. C-5000
3. CONTRACTOR TO DEWATER CONSTRUCTION AREA TO EL 448.0 BY APPROVED METHOD(S) PRIOR TO BASIN CONSTRUCTION.



SCALE: VERT. 1"=5' HOR. 1"=20'

APPROVED FOR CONSTRUCTION
Date 5/12/1978

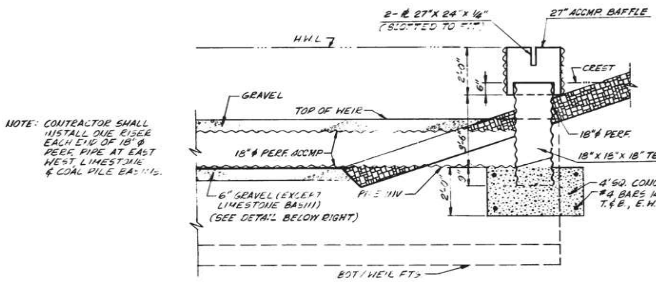
COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON

METAL CLEANING BASIN SECTIONS

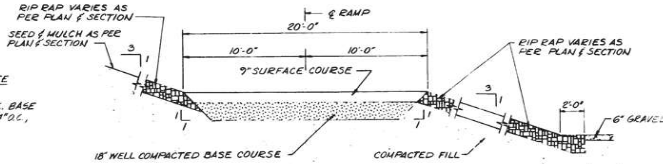
DRAWN		
CHECKED	RJSR	4/19/78
COG. ENGINEER		4/19/78
DISCIP. MGR. APPVL.		4/19/78
APPROVAL		4/19/78
APPROVAL		
APPROVAL		
APPROVAL		4/19/78

CECO CONTRACT 802867 | CECO DWG. NO. | REV.

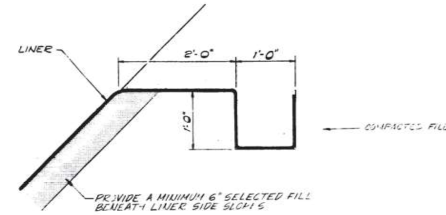
NUS CORPORATION ROCKVILLE, MD. | DRAWING NO. 5080 C5013 | REV. 2 | SCALE: AS NOTED | SHEET 1 OF 1

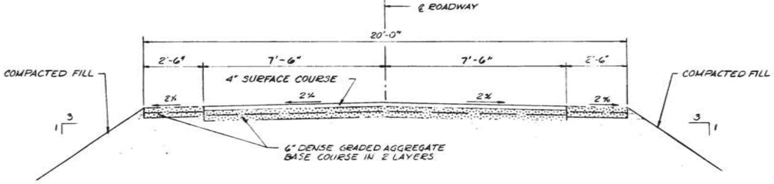


☆ TYP. SECTION-RISER & BAFFLE FOR PERF. PIPE
SCALE: 1/2"=1'-0"

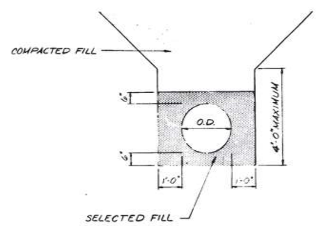


TYPICAL SECTION
GRAVEL RAMP
SCALE 1"=4'

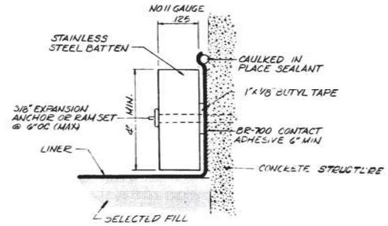




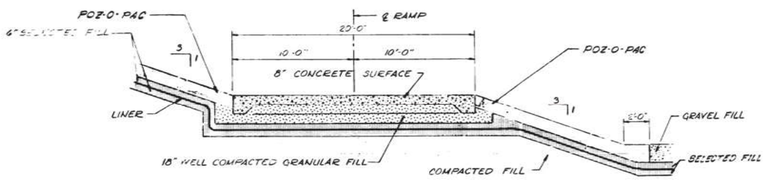
TYPICAL ROAD SECTION
SCALE: HOR. 1"=8' VERT. 1"=4'



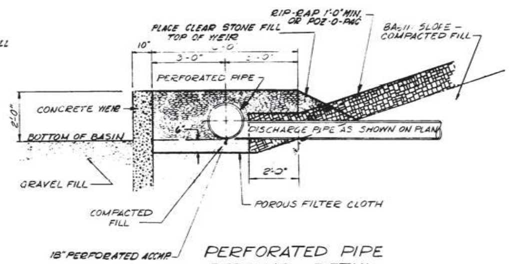
PIPE BEDDING DETAIL
SCALE 1"=2'



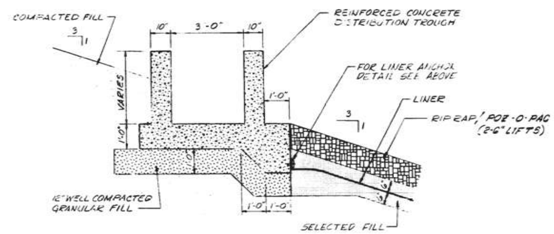
LINER ANCHOR DETAILS
NO SCALE



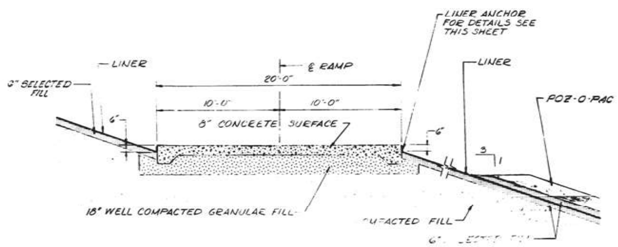
TYPICAL CONCRETE RAMP SECTION
LINER BELOW RAMP



PERFORATED PIPE
BEDDING DETAIL
SCALE 1"=2'



LINER ANCHORAGE FOR
DISTRIBUTION TROUGH
SCALE: 1"=2'



TYPICAL CONCRETE RAMP SECTION
LINER ON GRADE
SCALE 1"=4'
FOR TYPICAL SECTION SEE DWG #C55

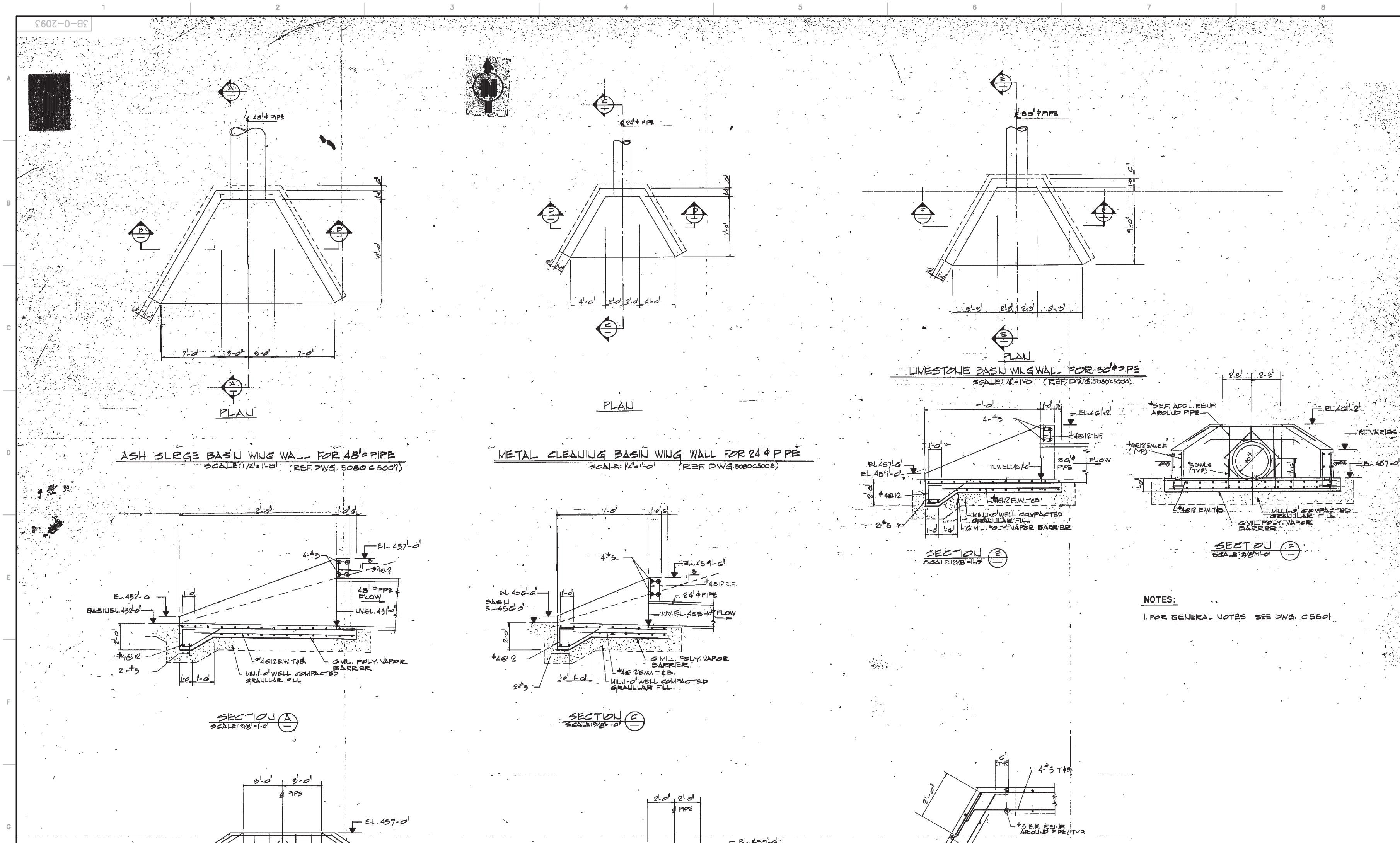
NOTES:
1. FOR GENERAL NOTES SEE DWG. C-5001
2. FOR LEGEND SEE DWG. C-5000-1

GRAPHIC SCALE

APPROVED FOR CONSTRUCTION 12/14/78

COMMONWEALTH EDISON COMPANY	WASTE WATER TREATMENT FACILITIES POWERTON
MISCELLANEOUS SECTIONS & DETAILS	
CECO CONTRACT: 802467	DRAWING NO. 5080 C 5015
NUS CORPORATION ROCKVILLE, MD.	SCALE: AS SHOWN

CONSTRUCTION
ADDED RISER BAFFLE DETAIL



DRAWING STATUS
APPROVED FOR CONSTRUCTION
4/19/78 Date

REDRAWN FROM NUS DWG. #5080 C 5510 1 OF 1, REV. 1, DTD. 4-19-78

BY	REV	DATE	REVISION	BY	CKD	ENG	APPD
BY:							
BY:							
BY:							
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--	--
BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG	APPD

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
WING WALL PLANS.
SECTIONS & DETAILS

STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL℠ Company

SCALE AS SHOWN | DC –
DATE 03-06-03 | SC –

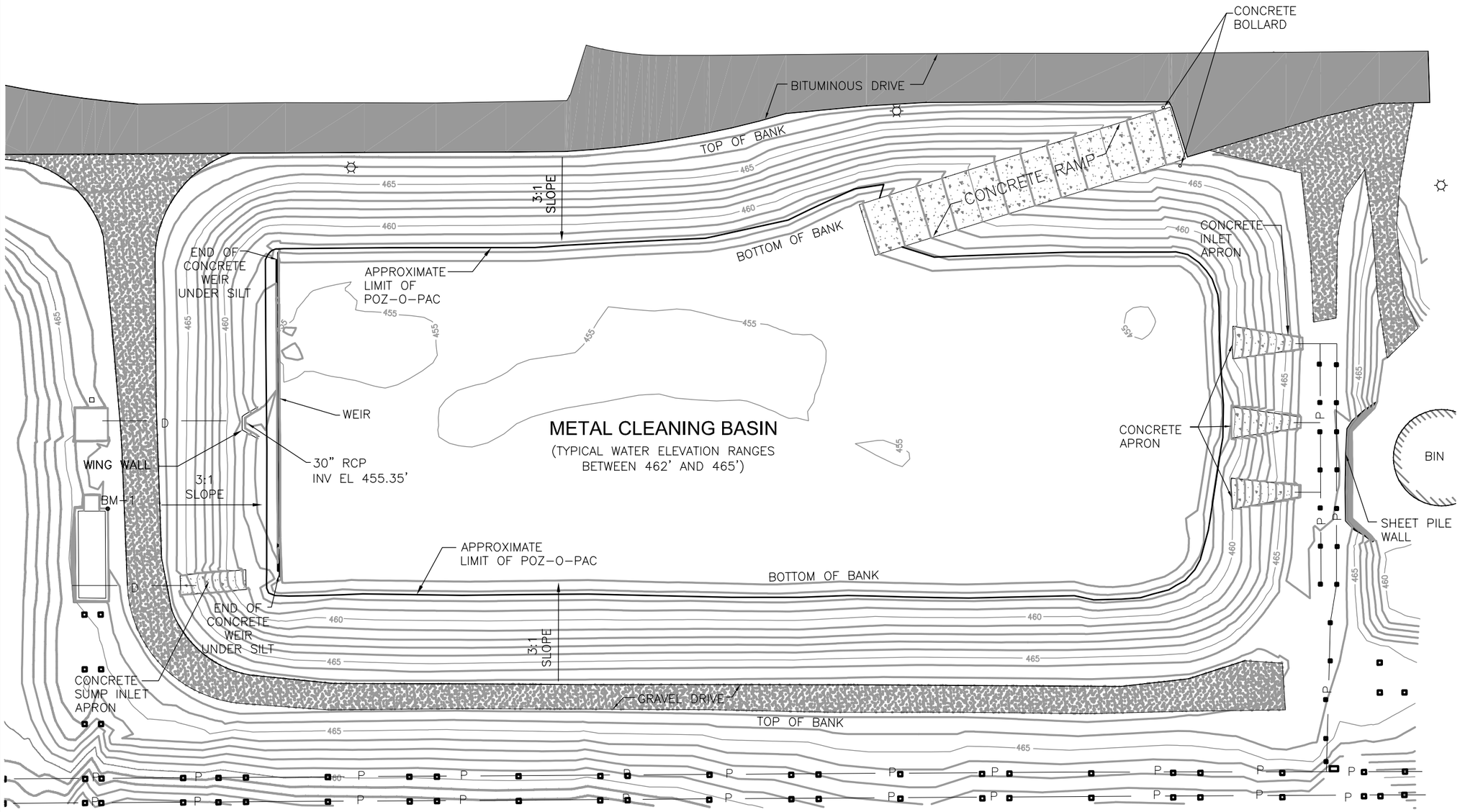
3B-0-2093

RCAD 3B-0-2093_A.TIF J. L. MEECE ENG. 03-06-03

ATTACHMENT 2-2

2010 LINER REPLACEMENT DRAWINGS

DRAWING NO.	TITLE
D1965C010-04	PRE-CONSTRUCTION CONDITIONS
D1965C020-03	LINER SUBGRADE PREPARATION
D1965C030-03	WARNING LAYER PLAN
D1965C031-03	DETAILS AND SECTIONS
D1965C032-03	DETAILS AND SECTIONS



LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- LIGHT POLE
- 460 — GROUND SURFACE CONTOUR

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978.

N

0 10 20 40
SCALE IN FEET

	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.	RECORD DOCUMENTATION	06/16/11	HMS
3.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
2.	ADDENDUM 1	10/22/09	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS

NATURAL RESOURCE TECHNOLOGY

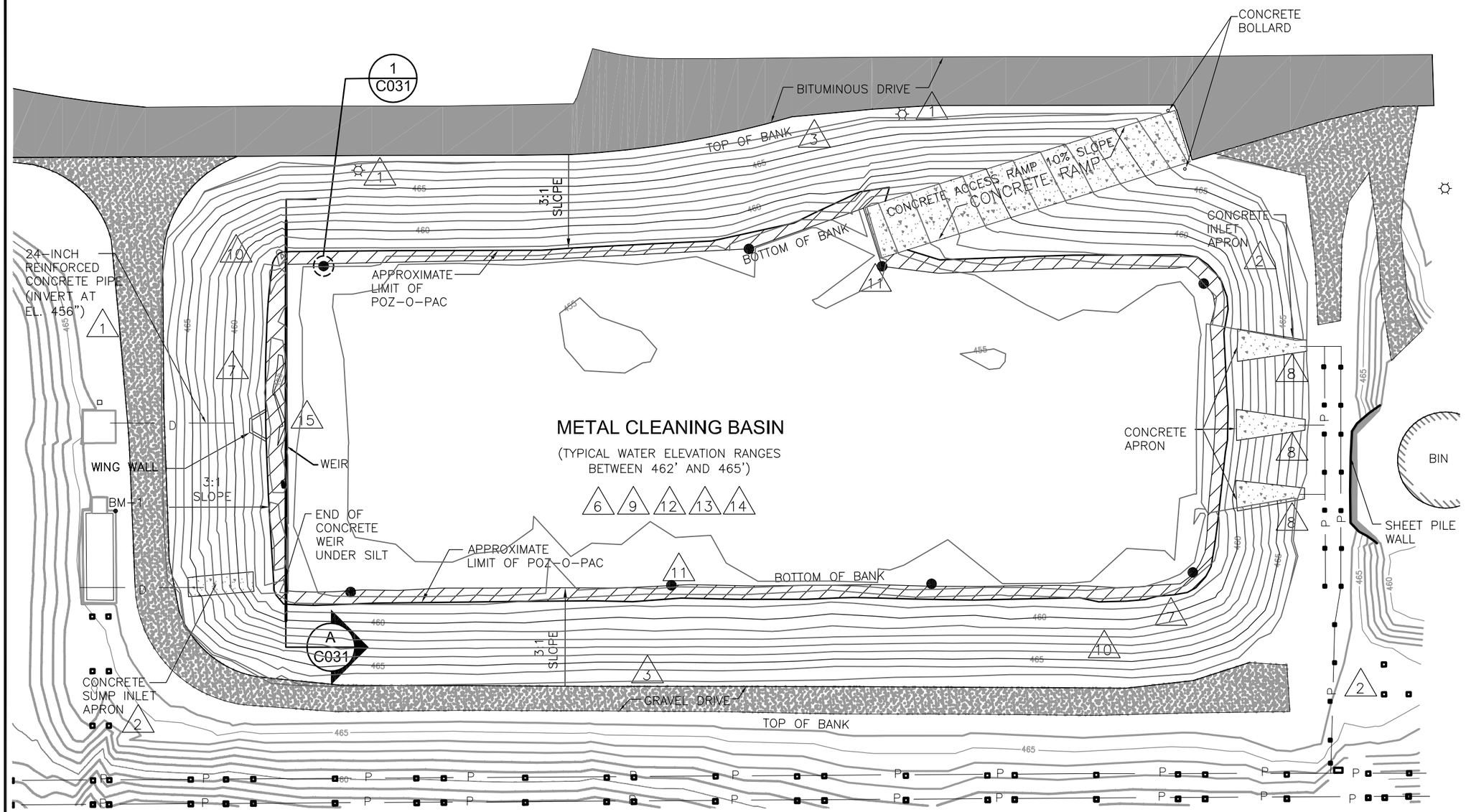
PROJECT NO. 1965/4.0
DRAWN BY: RLH/KNW 07/17/09
CHECKED BY: RJG 07/17/09
APPROVED BY: HMS 07/27/09

PRE-CONSTRUCTION CONDITIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C010-04
REFERENCE: .

SHEET NO. C010



METAL CLEANING BASIN

(TYPICAL WATER ELEVATION RANGES BETWEEN 462' AND 465')

6 9 12 13 14

LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- LIGHT POLE
- 460 — PREPARED SUBGRADE SURFACE CONTOUR
- MARKER POST LOCATION
- POZ-O-PAC REMOVAL AREA

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. CLEAR AND GRUB ALL BRUSH ALONG TOP OF SLOPE OF BASIN.
4. CONTRACTOR SHALL STORE ALL GEOSYNTHETICS AND SUBGRADE MATERIALS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
5. CONTRACTOR SHALL STORE AND STAGE EQUIPMENT AT LOCATION APPROVED BY OWNER.
6. PROTECT ALL CONCRETE AND UTILITY STRUCTURES TO REMAIN IN PLACE THROUGHOUT PROJECT DURATION.
7. REMOVE EXISTING 12-INCH POZ-O-PAC LAYER ALONG SIDE SLOPES. POZ-O-PAC LAYER AT BASE OF BASIN TO REMAIN IN PLACE, EXCEPT NORTH OF WEIR. CONTRACTOR SHALL REMOVE AN ADDITIONAL 6 INCHES OF SUBGRADE MATERIAL LOCATED BETWEEN THE WEIR AND THE WING WALL ALONG THE NORTH BOTTOM OF BANK, AS SHOWN ON SECTION B, SHEET C031.
8. CONTRACTOR SHALL REMOVE INLET APRONS AND HAUL MATERIAL TO RECYCLING FACILITY.
9. CONTRACTOR SHALL REMOVE ALL VEGETATION, ROCKS, AND OTHER DEBRIS FROM EXISTING LINER AND DISPOSE OF IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
10. CONTRACTOR SHALL REMOVE "SOFT" SUBGRADE MATERIAL BENEATH EXISTING HYPALON LINER, AS DIRECTED BY OWNER AND/OR ENGINEER. BACKFILL AREAS WITH FILL IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. CUT HYPALON LINER AS NEEDED TO REPAIR THE "SOFT" SUBGRADE AREAS.
11. 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.
12. SUBGRADE MUST BE APPROVED BY OWNER AND/OR ENGINEER PRIOR TO INSTALLATION OF GEOMEMBRANE.
13. CONTRACTOR SHALL PLACE 16 OZ. NONWOVEN GEOTEXTILE OVER THE SUBGRADE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
14. CONTRACTOR SHALL PROVIDE MEANS TO PROTECT SUBGRADE LAYER FROM EROSION, STORM WATER, AND HEAVY EQUIPMENT TRAFFIC. DAMAGE TO SUBGRADE LAYER SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
15. CONTRACTOR SHALL EXTEND CONCRETE WEIR UP BY 18" IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND SECTION A ON SHEET C031.

N

0 10 20 40

SCALE IN FEET

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978.

BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS

NATURAL RESOURCE TECHNOLOGY

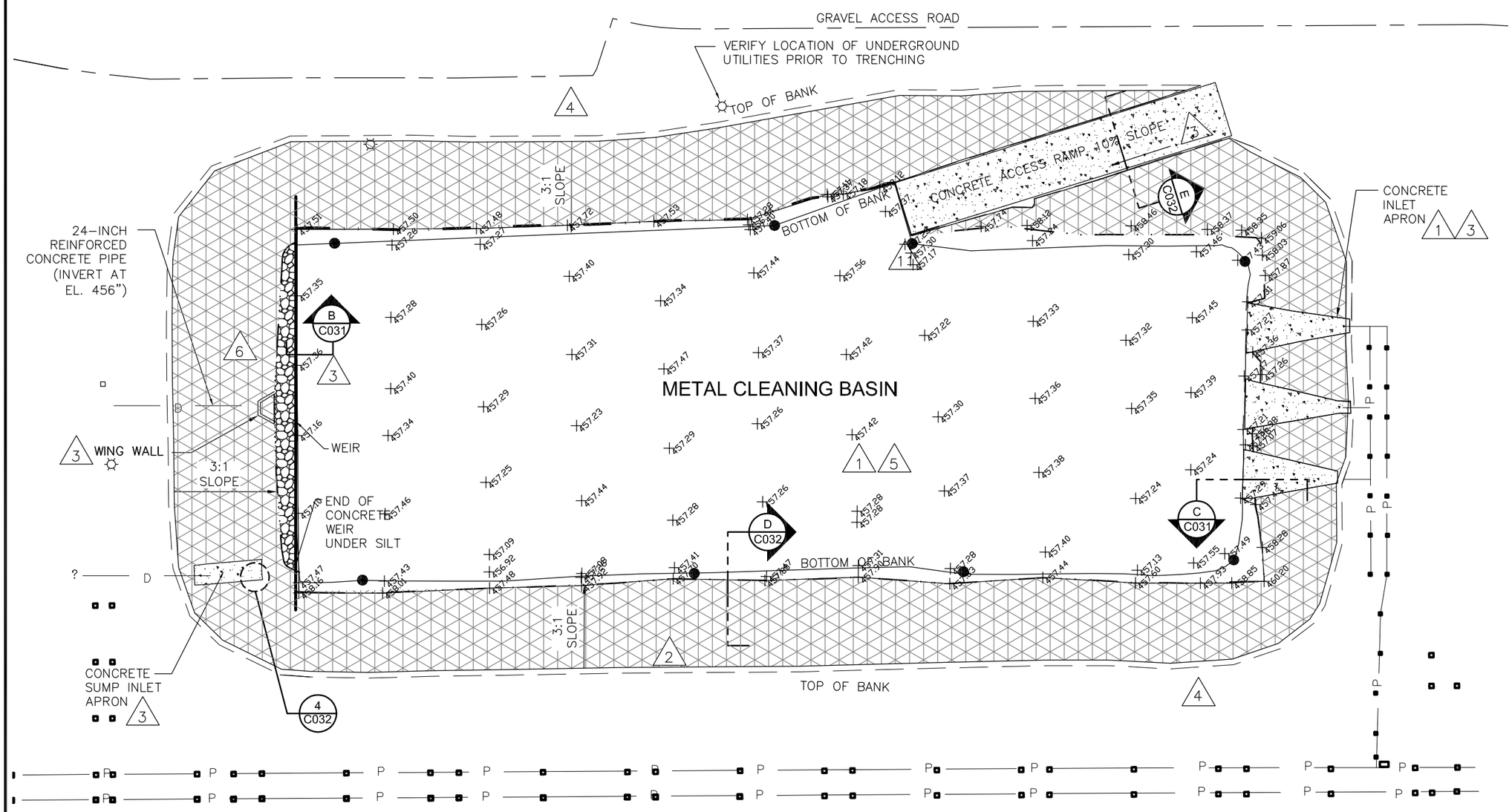
PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

LINER SUBGRADE PREPARATION

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C020-03
REFERENCE: .

SHEET NO. C020



LEGEND

- D — UNDERGROUND DISCHARGE PIPE
- P — ABOVEGROUND PIPE RACK
- ANCHOR TRENCH
- 12 OZ. NON-WOVEN GEOTEXTILE
- LIGHT POLE
- MARKER POST LOCATION
- × 457.32 — TOP OF WARNING LAYER (ELEVATION, FT.)
- HDPE GEOMEMBRANE
- CONCRETE
- RIPRAP

CONTRACTOR NOTES:

1. PRIOR TO GEOMEMBRANE INSTALLATION CONTRACTOR SHALL CONSTRUCT INLET APRONS WITH HDPE WELD STRIPS AROUND PERIMETER AND 12-INCH DEEP FOOTING AT TOP AND BOTTOM OF APRON TO MATCH PREEXISTING APRON CONSTRUCTION. APRON TO EXTEND AT MINIMUM 3 FEET BEYOND TOE OF BANK. SEE DETAIL.
2. 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.
3. CONTRACTOR SHALL ATTACH GEOMEMBRANE TO STRUCTURES IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION AND DETAILS ON SHEET C031 AND C032.
4. GEOMEMBRANE SHALL BE ANCHORED INTO 2.5 FEET DEEP TRENCHES ALONG TOP OF BANK, AS SHOWN ON SHEET C031. CONTRACTOR SHALL ADVISE OWNER AND/OR ENGINEER IF PROPOSED LOCATION FOR ANCHOR TRENCH IS NOT FEASIBLE.
5. 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).
6. CONTRACTOR SHALL PLACE RIPRAP 18 INCHES THICK, BETWEEN WEIR AND WING WALL ALONG THE BOTTOM OF BANK.
7. CONTRACTOR SHALL PROVIDE SURVEY DOCUMENTATION OF THE ITEMS LISTED IN THE TECHNICAL SPECIFICATIONS.
8. CONTRACTOR SHALL PERFORM A LEAK LOCATION SURVEY IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
9. RESTORE AREAS DISTURBED BY EQUIPMENT AND MATERIAL LAYDOWN.

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

VERTICAL DATUM:
LOCAL PLANT DATUM

BENCHMARK-1:
SE CORNER TOP CONCRETE WALL
ELEVATION = 468.09 FT.

SOURCE NOTES:

THIS DRAWING WAS DEVELOPED FROM A SURVEY BY MAURER-STUTZ, INC. DATED 10/20/09, DRAWING NO. 23209009.

LOCATION OF EXISTING LINER TAKEN FROM MIDWEST GENERATION DRAWING NO. 5080 C5008, DATED 12-19-1978. BASIN SUBGRADE AND SITE IMPROVEMENTS FROM A SURVEY PROVIDED BY MILLENNIA PROFESSIONAL SERVICES, MARCH 2011.

N

0 10 20 40
SCALE IN FEET

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

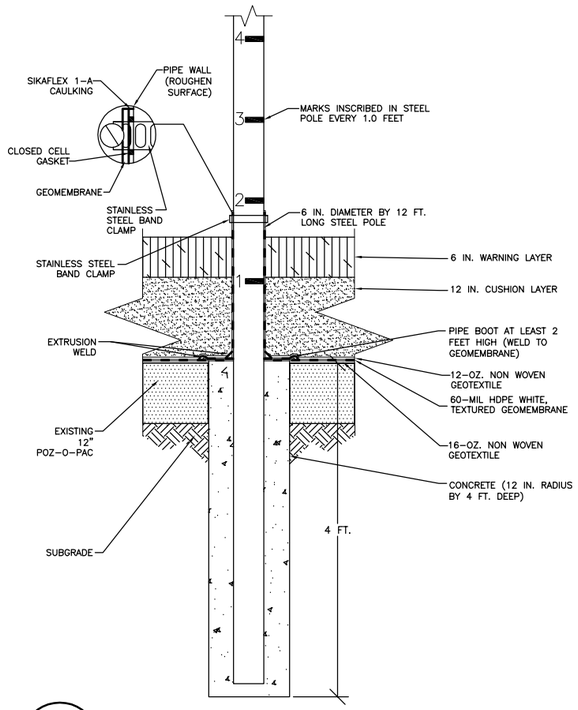
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

WARNING LAYER

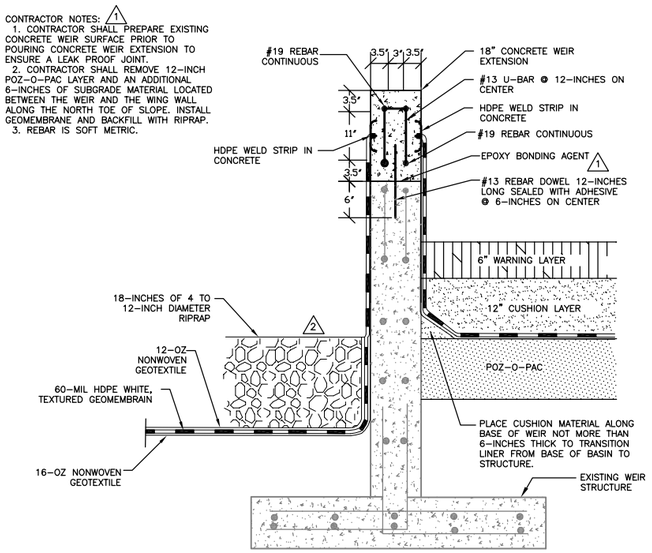
METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C030-03
REFERENCE: -
SHEET NO. C030

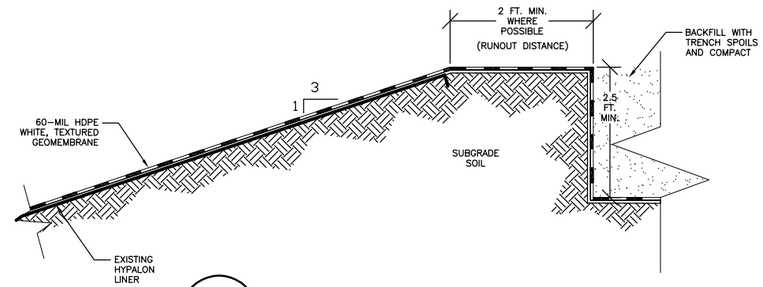


1 / C020 MARKER POST DETAIL
NOT TO SCALE

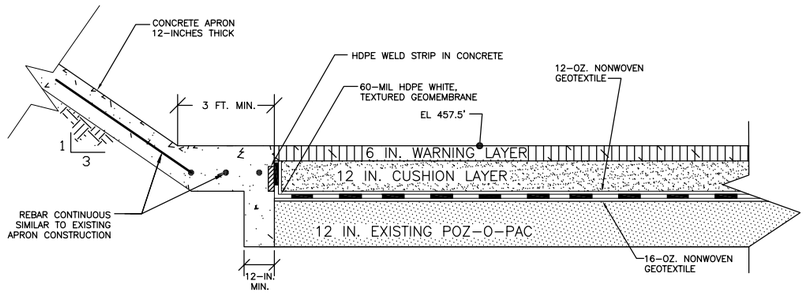
CONTRACTOR NOTES: △1
1. CONTRACTOR SHALL PREPARE EXISTING CONCRETE WEIR SURFACE PRIOR TO POURING CONCRETE WEIR EXTENSION TO ENSURE A LEAK PROOF JOINT.
2. CONTRACTOR SHALL REMOVE 12-INCH POZ-O-PAC LAYER AND AN ADDITIONAL 6-INCHES OF SUBGRADE MATERIAL LOCATED BETWEEN THE WEIR AND THE WING WALL ALONG THE NORTH TOE OF SLOPE. INSTALL GEOMEMBRANE AND BACKFILL WITH RIPRAP.
3. REBAR IS SOFT METRIC.



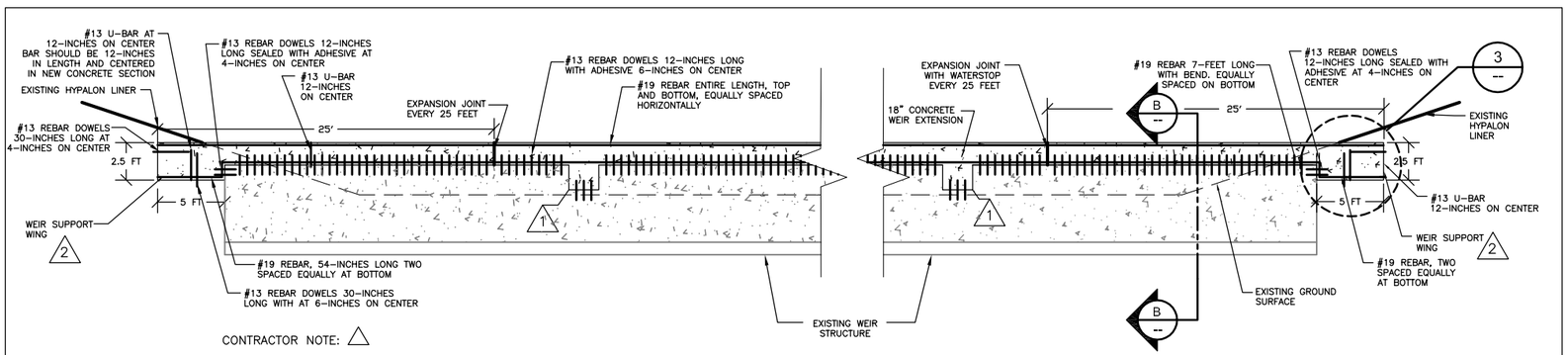
B / -- CONCRETE WEIR EXTENSION DETAIL
NOT TO SCALE



2 / C030 ANCHOR TRENCH SECTION
NOT TO SCALE



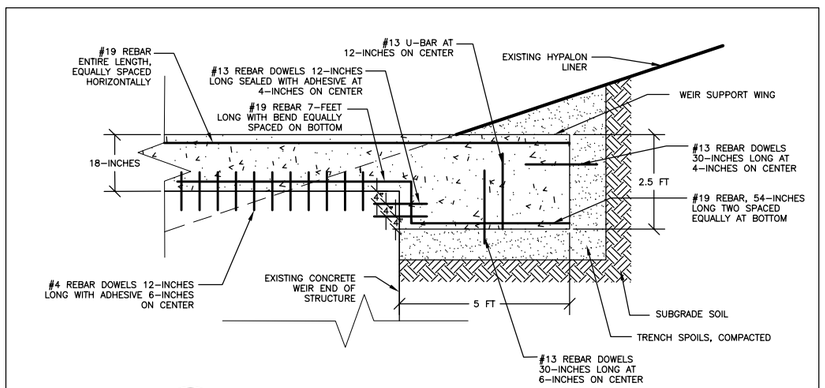
C / C030 CONCRETE INLET APRON SECTION
NOT TO SCALE



CONTRACTOR NOTE: △

1. CONTRACTOR SHALL REMOVE METAL SLIDING GATES AND REPLACE WITH CONCRETE REBAR DOWELS AND ADHESIVE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION.
2. CONTRACTOR SHALL INSTALL WEIR SUPPORT WINGS AND BACKFILL WITH TRENCH SPOILS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. REBAR IS SOFT METRIC.

A / C020 CONCRETE WEIR EXTENSION SECTION
NOT TO SCALE



3 / - WEIR SUPPORT WING DETAIL
NOT TO SCALE

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

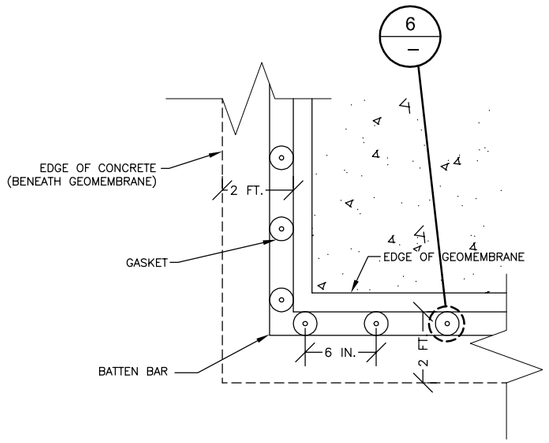
NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/12/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

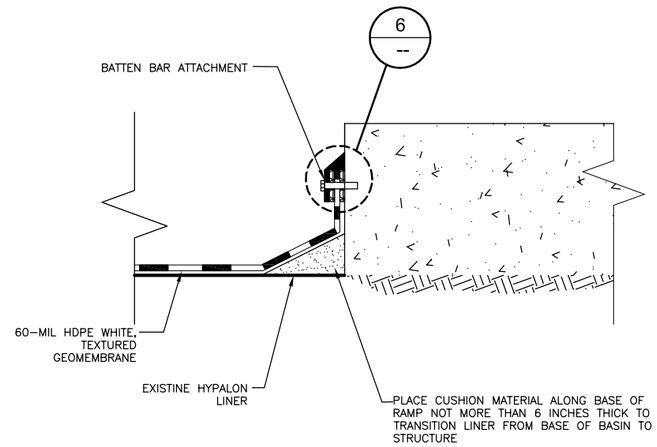
DETAILS AND SECTIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

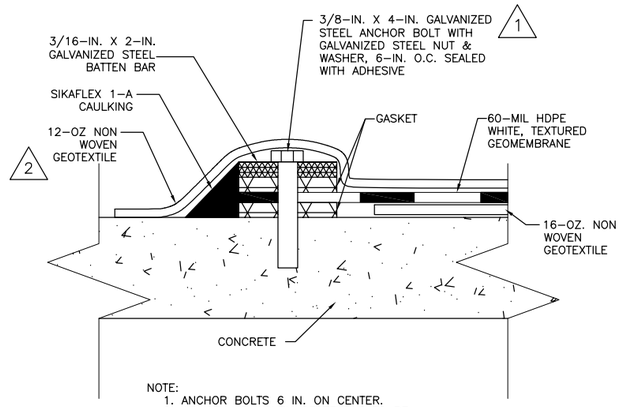
DRAWING NO: D1965C031-03
REFERENCE:.
SHEET NO. C031



4 / C030 SUMP INLET APRON DETAIL
NOT TO SCALE

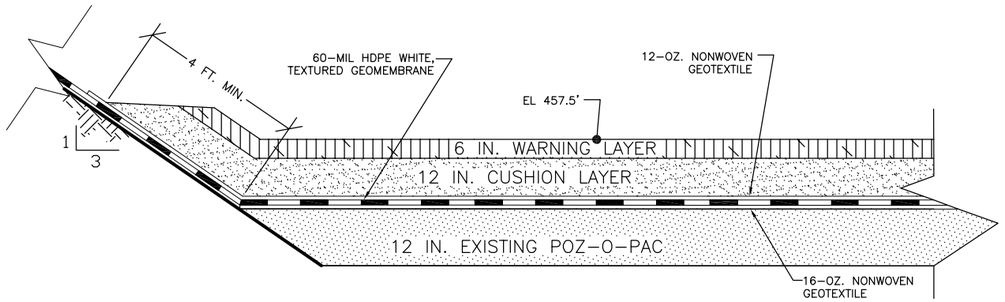


5 / -.-. CONCRETE RAMP CONNECTION DETAIL
NOT TO SCALE



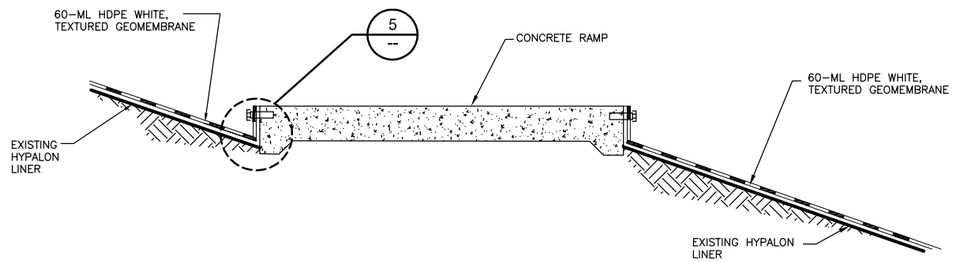
NOTE:
1. ANCHOR BOLTS 6 IN. ON CENTER.
2. 12–OZ. NONWOVEN GEOTEXTILE TO BE USED TO PROTECT GEOMEMBRANE BELOW CUSHION LAYER OR RIPRAP LAYER.

6 / -- BATTEN BAR ATTACHMENT
NOT TO SCALE



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

D / C030 SLOPE TRANSITION SECTION
NOT TO SCALE



E / C030 CONCRETE RAMP SECTION
NOT TO SCALE

6.			
5.			
4.			
3.	RECORD DOCUMENTATION	06/08/11	HMS
2.	ISSUED FOR CONSTRUCTION	10/22/10	HMS
1.	ISSUED FOR BID	10/05/09	HMS
0.	ISSUED FOR PERMIT	07/27/09	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1965/4.0
DRAWN BY: KNW 08/25/09
CHECKED BY: RJG 10/05/09
APPROVED BY: HMS 10/05/09

DETAILS AND SECTIONS

METAL CLEANING BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON POWER STATION
PEKIN, ILLINOIS

DRAWING NO: D1965C032–03
REFERENCE:1965/4/

SHEET NO. C032

ATTACHMENT 3

2021 STRUCTURAL STABILITY & FACTOR OF SAFETY ASSESSMENT

STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT
METAL CLEANING BASIN
POWERTON STATION
JUNE 2021

This report has been prepared for the Metal Cleaning Basin (herein referred to as the Basin) at Powerton Station pursuant to Sections 845.450 Structural Stability Assessment and 845.460 Safety Factor Assessment of Title 35 Subtitle G Subchapter I Subchapter j Coal Combustion Waste Surface Impoundments. The purpose of this project is to perform the initial structural stability and factor of safety assessments for the Basin by a licensed professional engineer. Civil & Environmental Consultants, Inc. (CEC) completed this structural stability and factor of safety assessment as described in the following sections.

1.0 REGULATION REQUIREMENTS 845.450 AND 845.460

In accordance with Sections 845.450 and 845.460, owners or operator of a coal combustion residuals (CCR) impoundment are required to conduct initial and annual structural stability assessments to document whether the design, construction, operation, and maintenance of the CCR surface impoundment is consistent with recognized and generally accepted engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded; and to conduct an initial and annual safety factor assessment for each CCR surface impoundment and document whether the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified for the critical cross section of the embankment.

2.0 SITE CONDITIONS

The Basin is located at Powerton Station in Pekin, Illinois situated northeast of the main power building, south of the Wastewater Building and between the Ash Surge Basin and former Cooling Water Intake Canal, See Figure 1. Measuring 450 feet long and 225 feet wide, approximately 2.3 acres in size, the Basin is lined with a 60-mil high-density polyethylene (HDPE) liner. Gravel access roads are located along the north, east, and west sides.

Based on information provided by station personnel, the Basin was constructed in the late 1970s or early 1980s, and has not undergone significant changes in the geometry. The original operation was designed to receive bottom ash and, twice a year, boiler wash via sluicing with wastewater treated in the wastewater treatment plant. Operation of the basin has changed to also receive bottom ash and fly ash by end dumping into the basin. Wastewater is periodically pumped from the Basin, treated to remove elevated metal concentrations, and discharged into the Ash Surge Basin. The Basin is inspected weekly by the environmental specialist including checking water level in the Basin.

3.0 STRUCTURAL STABILITY ASSESSMENT - SECTION 845.540

The following sections describe the structural stability assessment.

3.1 Stable Foundation and Abutments - 845.450(a)(1)

This assessment indicates the soils forming the Basin foundation are stable. Soils data from within the vicinity of the Basin shows up to 28 feet of clay soils overlying approximately 35 to 40 feet of loose to very dense poorly graded sand and silty sand with some gravel. Soil data developed from soil borings completed for this assessment are consistent with the above soil descriptions.

Inspection of the Basin did not show signs of distress due to settlement of the underlying foundation soils. Furthermore both elastic settlement and primary consolidation settlement of the underlying soils would have occurred soon after construction of the basin in the late 1970s or early 1980s, and the secondary consolidation settlement, which would have been expected to be minimal considering the type of soils and associated loading, would also have occurred. Without significant changes in the operation of the Basin that would significantly increase loading on the foundation material, there should be no significant settlement of the foundation soils.

The Basin is partially incised and supported by earthen embankment on the west. This type of basin constructed with earthen berms does not require abutments, and therefore consideration of abutment design, construction, and operation is not required.

3.2 Adequate Slope Protection - 845.450(a)(2)

The Basin is constructed with a 60-mil HDPE liner that provides adequate protection of the interior slopes against surface erosion, wave action, and adverse effects of sudden drawdown.

3.3 Dike Compaction - 845.450(a)(3)

As-built construction documents for the Basin are unavailable. It would be standard practice for the dikes to be mechanically compacted to a density sufficient to withstand the range of loading conditions in the Basin. This is supported by the consideration that the Basin has been in operation since the 1980s, and that the station has no record of observed distress or repair. Furthermore, the initial inspection of the dike did not shows signs of distress that would be indicative of improperly placed and/or loosely compacted soils.

3.4 Downstream Slope Protection - 845.450(a)(4)

Consistent with Section 845.430, the Basin slope protection consists of vegetative cover over the downstream slopes and pertinent surrounding areas. Inspection shows the grassy vegetation is well maintained; protective against surface erosion, wave action, and adverse effect of rapid

drawdown; easily observable and accessible; and free of woody vegetation. At the time of inspection, the vegetation did not exceed 12 inches in height.

3.5 Spillway - 845.450(a)(5)

Section 845.450 specifies a single spillway or a combination of spillways configured as specified in subsection (a)(5)(A) and that the combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in subsection (a)(5)(B). Our inspection shows the Basin was designed and has been operated without an emergency spillway.

Although the Basin has been designed, constructed and operated for more than forty years without an emergency spillway, and the basin is inspected weekly by the environmental specialst with the intent to maintain the water level no higher than the weir elevation, not having an emergency spillway is considered a deficiency in accordance with the Section 845.450(a)(5).

3.6 Structural Integrity Of Hydraulic Structures - 845.450(a)(6)

A hydraulic structure, 24-inch pipe, passes through the dike between the north, incised end of the Basin and the Basin Discharge Sump. At the time of our inspection, the water level in the Basin was over the top of the pipe and a thorough inspection could not be conducted. Evidence showing the structural integrity of the pipe free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris could not be made. At the time of this report, inspection report for the pipe were unavailable.

3.7 Down Stream Slopes Adjacent To Water Bodies - 845.450(a)(7)

The former Cooling Water Intake is downstream of the Basin and a stability analysis was performed for both a low pool and rapid draw down condition. Stability analysis shows that the embankment is designed and constructed to maintain stability during both low pool and rapid draw down conditions.

3.8 Structural Stability Assessment Deficiencies

Structural deficiencies associated with the Basin were identified in the initial structural stability assessment, and the following corrective actions are required:

1) The Basin has been designed, constructed, and operated for more than forty years without an emergency spillway. Furthermore the basin is inspected weekly by the environmental specialist, who observes the water level in the pond with the intent to maintain the water level no higher than the weir elevation (approximately 658.0 mean sea level). Although the basin is out of compliance with Section 845.450, the probability of storm water over flowing the basin dike is low.

2) The 24-inch diameter pipe between Basin and the Discharge Sump could not be inspected for signs of distress at the time of inspection. Although our inspection did not identify distress that would suggest the existence of a structural deficiency, the 24-inch diameter pipe should be inspected in accordance with 845.450(a)(6).

3.9 Annual Inspection Requirement

In completing the structural stability assessment, the Basin was inspected for signs of distress that would have the potential to disrupt operation and safety. This inspection can suffice for the 2021 inspection.

4.0 SAFETY FACTOR ASSESSMENT - SECTION 845.460

In accordance with Section 845.460, the owner or operator of a CCR surface impoundment must conduct initial and annual safety factor assessments for each CCR surface impoundment and document whether the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

4.1 Slope Stability Methodology

Slope stability software Slide2 was used to calculate the minimum factor of safety (FS) at Cross Section A-A. The program uses 2D limit equilibrium methods to determine the minimum FS against slope instability. The auto-refine, non-circular search method with optimization was used utilizing Spencer's method to calculate the FS for each design criteria scenario, as discussed below. For each section analyzed, the program searches for the sliding surface that procures the lowest FS which is defined as the ratio of the shear forces and moment resisting movement along the sliding surface to the forces and moments driving the instability.

Soil data obtained by CEC and supplemented with available soil information provided by the Station was used to develop soil properties for the slope stability analysis. The soil properties were confirmed and modified using the subsurface data obtained by CEC in 2021. The data shows the soil materials in the vicinity of the Basin consists of up to 28 feet of clay soils overlying approximately 35 to 40 feet of loose to very dense, poorly graded sand and silty sand with some gravel.

4.2 Slope Stability Analysis - 845.460

Four cases were analyzed to satisfy the safety factor assessment as per Section 845.460(a)(2) through (a)(4).

4.2.1 Static, Long-Term - 845.460(a)(2)

The static, long-term condition with the maximum surcharge loading on the embankment was evaluated. The static, long-term analysis included a pool elevation at 458 feet mean sea level and a groundwater elevation at 440 feet mean sea level.

4.2.2 Static, Maximum Storage Pool - 845.460(a)(3)

The static, long-term, maximum storage pool condition with the maximum surcharge loading on the embankment was evaluated. The static, long-term analysis included a pool elevation set at the lowest points of the embankment crest, 466 feet mean sea level, and a groundwater elevation at 440 feet mean sea level.

4.2.3 Seismic - 845.460(a)(4)

Seismic analysis was performed by incorporating pseudo static seismic loading scenarios in the long-term global stability analysis calculations. A pseudo-static seismic horizontal load was applied to the long-term maximum storage pool loading condition model.

The seismic factor of safety is defined in the proposed CCR regulations as "the factor of safety (safety factor) determined using analysis under earthquake conditions using the peak ground acceleration (PGA) for a seismic event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the U.S. Geological Survey (USGS) seismic hazard maps for seismic events with this return period for the region where the CCR surface impoundment is located".

4.2.4 Liquefaction - 845.460(a)(5)

For dikes constructed of soils susceptible to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20. Soils with potential for liquefaction typically consist of poorly drained fine-grained soils. Soil borings indicate that the embankment for the Basin was constructed with a well-graded, well-drained sand with silt and gravel material, which is not typically susceptible to liquefaction. Additionally, the geomembrane liner system makes it unlikely the embankment would become saturated or inundated. Because the likelihood of liquefaction and associated shear strength loss of the embankment soils is very low, the liquefaction condition is represented by the static factor of safety analysis and a separate analyses was not performed.

4.3 Factor of Safety Assessment Results

Results of the slope stability analysis for the critical cross section of the Basin are summarized in Table 1, below, and presented in Figures 2, 3, and 4. The results meet the factor of safety requirements presented in 845.460(a)(2) through (4).

Table 1: Safety Factor Results

Loading Condition	Required FS	Calculated FS
Static, Long Term - 845.460(a)(2)	1.50	1.50
Static, Maximum Storage Pool - 845.460(a)(3)	1.40	1.50
Seismic - 845.460(a)(4)	1.00	1.28
Liquefaction - 845.460(a)(5)	1.20	>1.20

5.0 LIMITATIONS AND CERTIFICATION

This Initial Structural Stability and Factor of Safety Assessment was prepared to meet the requirements of Parts 845.450 and 845.460 of draft Title 35 Subtitle G Subchapter I Subchapter j Coal Combustion Waste Surface Impoundments, and was prepared under the direction of Mr. M. Dean Jones, P.E.

By affixing my seal to this, I do hereby certify to the best of my knowledge, information, and belief that the information contained in this report is true and correct. I further certify I am licensed to practice in the State of Illinois and that it is within my professional expertise to verify the correctness of the information. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Seal:

Signature: _____

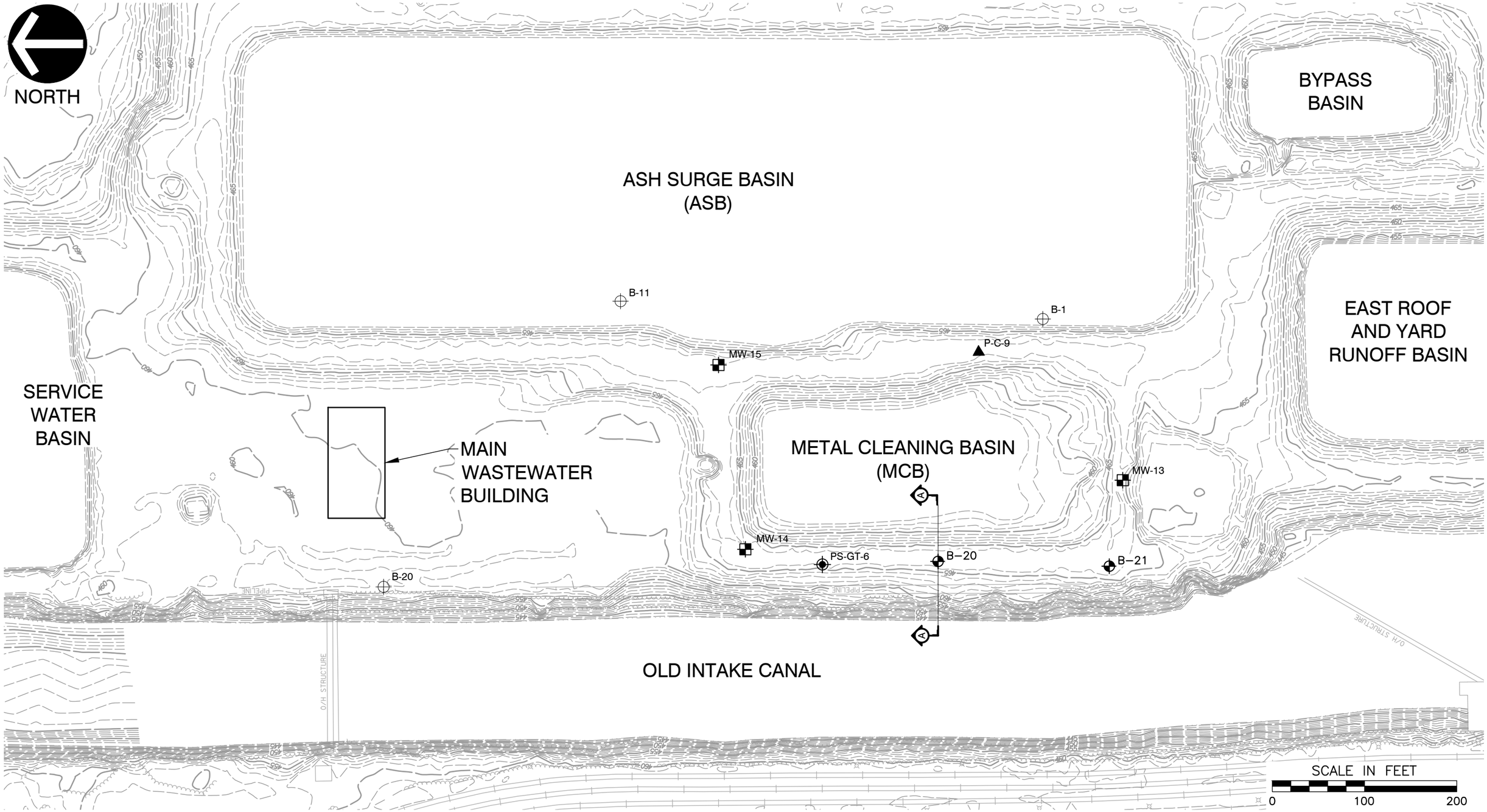
Name: M. Dean Jones, P.E.

Date of Certification: June 8, 2021

Illinois Professional Engineer No.: 062-051317

Expiration Date: November 30, 2021

FIGURES



REFERENCE

1. TOPOGRAPHIC INFORMATION SOUTH OF SECONDARY ASH SETTLING BASIN AND FAB IS BASED ON AERIAL SURVEY PERFORMED BY AEROMETRIC, INC. DATED JUNE 19, 2008. TOPOGRAPHIC INFORMATION NORTH OF ASH SURGE BASIN IS BASED ON SURVEY BY RIDGELINE CONSULTANTS, PERFORMED IN FEBRUARY AND MARCH, 2016.

LEGEND

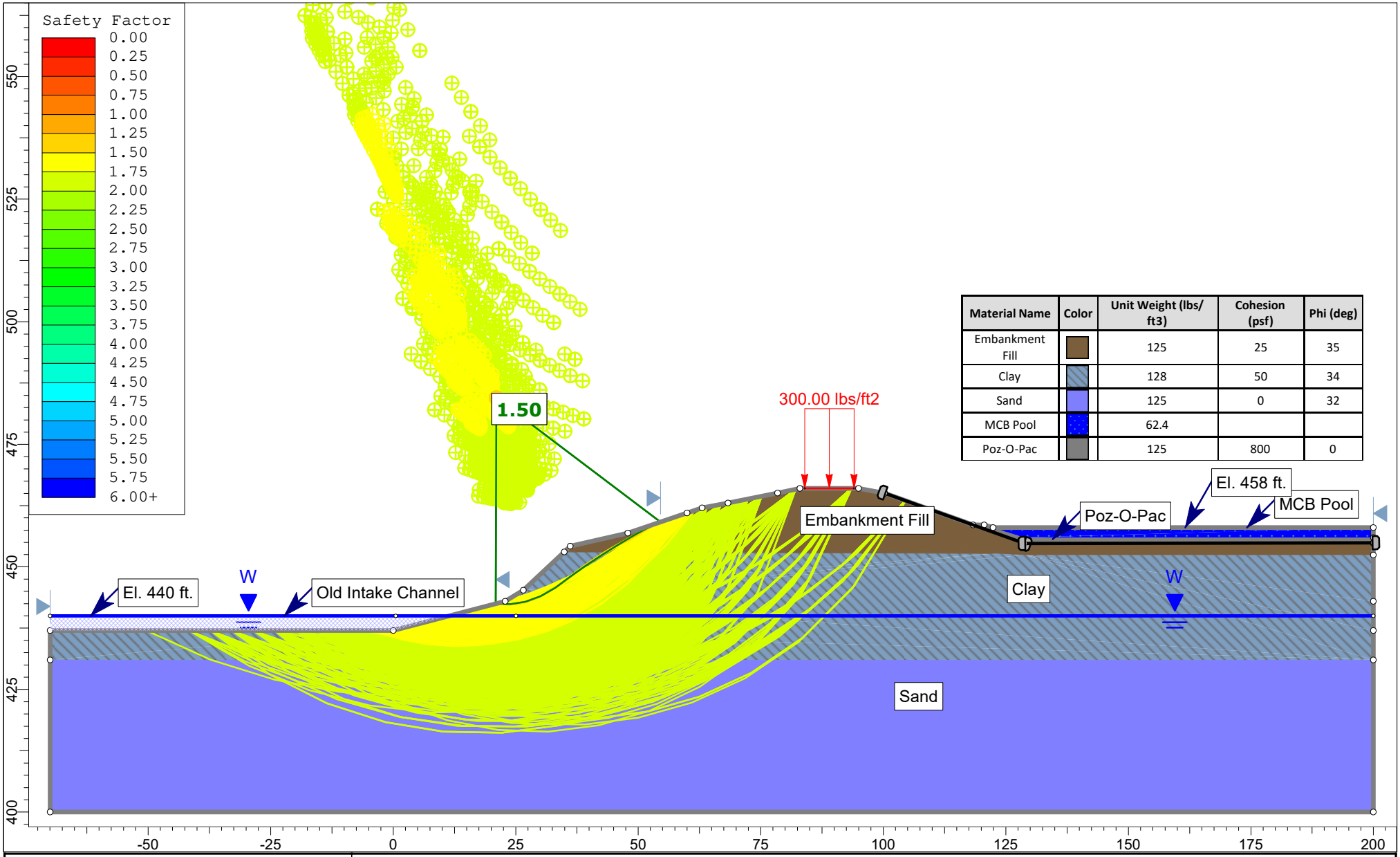
B-1	APPROXIMATE SOIL BORING LOCATION (1978)	PS-GT-6	APPROXIMATE SOIL BORING LOCATION (KPRG, 2005)
P-C-9	APPROXIMATE CPT SOUNDING LOCATION (GEOSYNTEC, 2016)	MW-13	APPROXIMATE EXISTING MONITORING WELL LOCATION (PATRICK, 2011)
B-21	SOIL BORING LOCATION (2021)	A A'	SLOPE STABILITY CROSS SECTION

Civil & Environmental Consultants, Inc.
1230 East Diehl Road, Suite 200 - Naperville, IL 60563
630-963-6026 · 877-963-6026
www.cecinc.com

NRG/MIDWEST GENERATION LLC
POWERTON STATION
METAL CLEANING BASIN SLOPE STABILITY
PEKIN, TAZEWELL COUNTY, ILLINOIS

SITE PLAN WITH CROSS-SECTION

DRAWN BY:	CAC	CHECKED BY:	MDB	APPROVED BY:	MDJ	FIGURE NO.:	1
DATE:	05/13/2021	DWG SCALE:	1"=60'	PROJECT NO:	310-533		

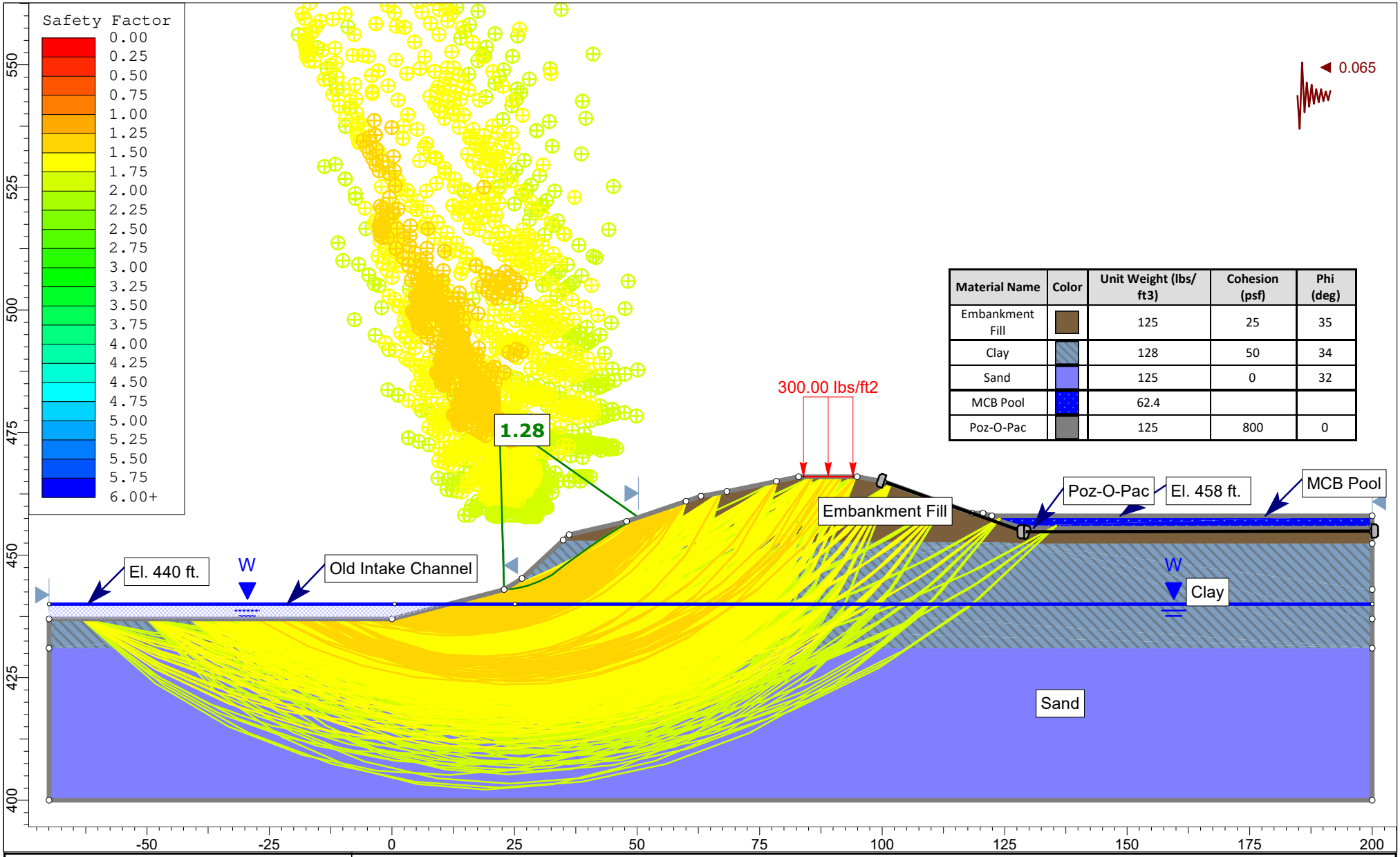


Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Embankment Fill		125	25	35
Clay		128	50	34
Sand		125	0	32
MCB Pool		62.4		
Poz-O-Pac		125	800	0

Civil & Environmental Consultants, Inc.

SLIDEINTERPRET 9.009

Project	**Metal Cleaning Basin Slope Stability Analysis**			
Analysis: Spencer	Scale: 1:325		Scenario: Figure 2: Long-Term; Maximum Storage - Static	
Drawn By: CAC	Checked By: MDJ	Approved By: MDJ	Company: Civil & Environmental Consultants, Inc.	
Date: 05/06/2021	Date: 05/19/2021	Date: 05/19/2021	File Name: 310-533 MCB Slope Stability-long term.slmd	

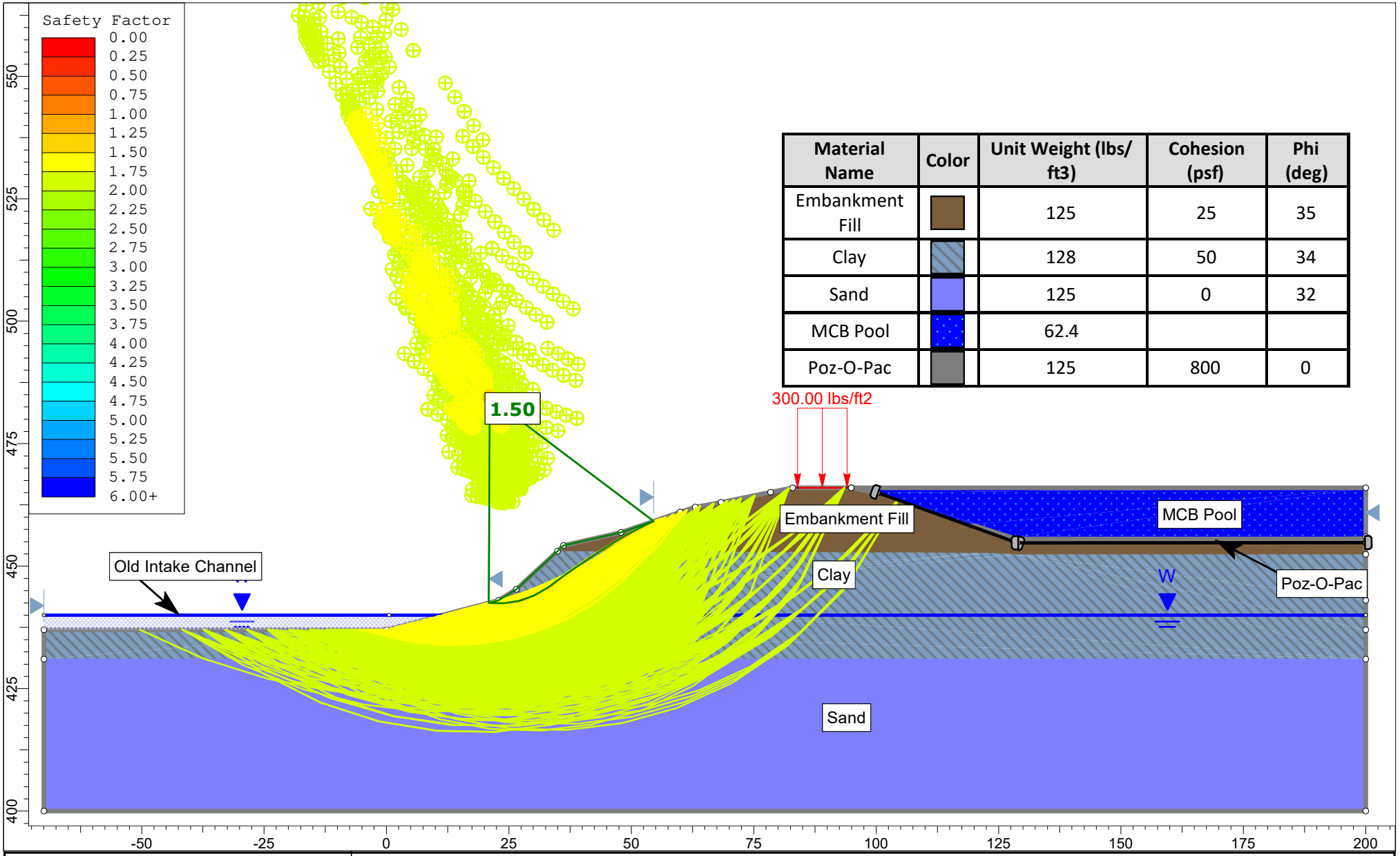


Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Embankment Fill		125	25	35
Clay		128	50	34
Sand		125	0	32
MCB Pool		62.4		
Poz-O-Pac		125	800	0

Civil & Environmental Consultants, Inc.

SLIDEINTERPRET 9.009

Project	**Metal Cleaning Basin Slope Stability Analysis**		
Analysis: Spencer	Scale: 1:325	Scenario: Figure 3: Long-Term; Maximum Storage - Seismic	
Drawn By: CAC	Checked By: MDJ	Approved By: MDJ	Company: Civil & Environmental Consultants, Inc.
Date: 05/06/2021	Date: 05/19/2021	Date: 05/19/2021	File Name: 310-533 MCB Slope Stability-long term.slmd

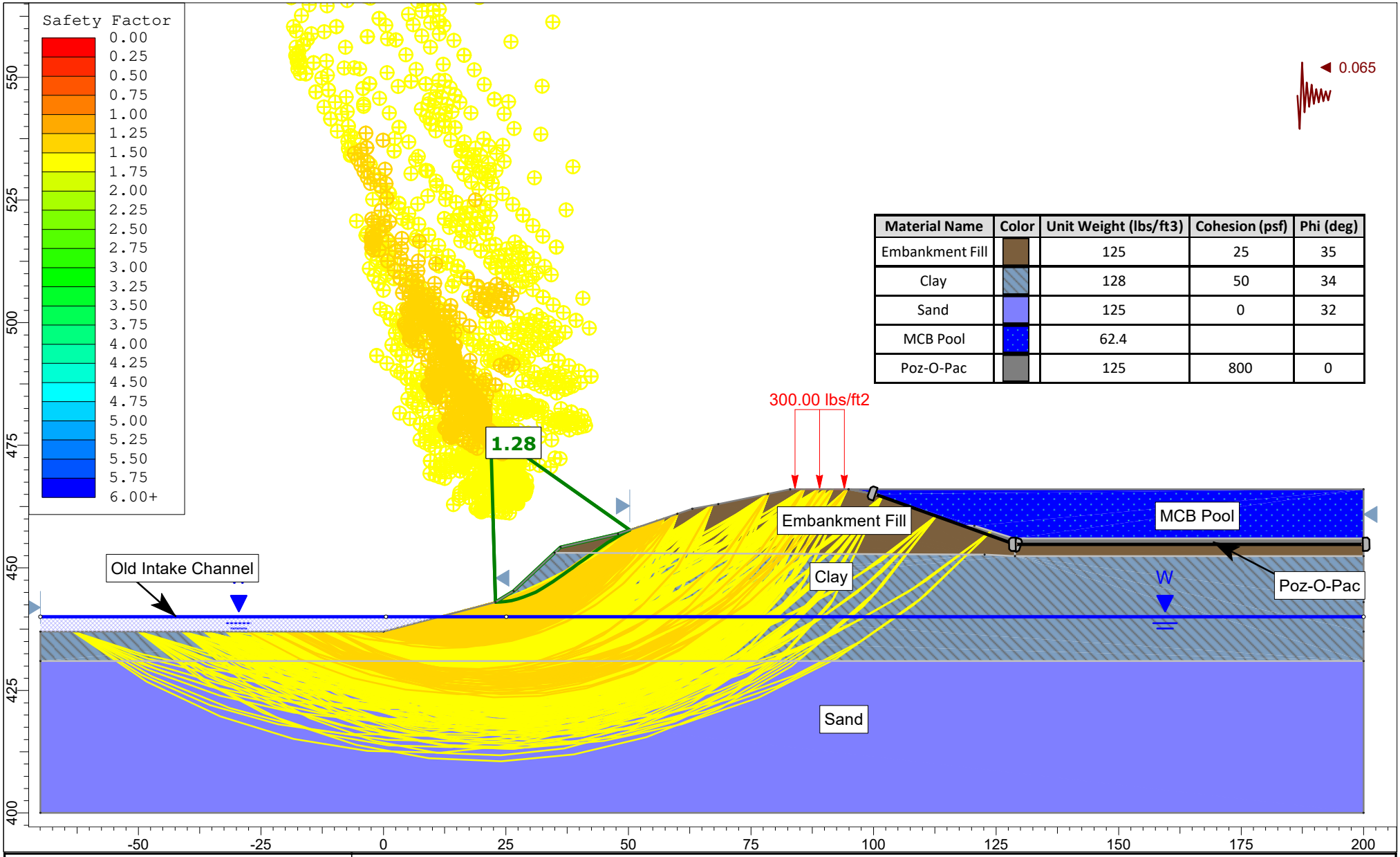


Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Embankment Fill		125	25	35
Clay		128	50	34
Sand		125	0	32
MCB Pool		62.4		
Poz-O-Pac		125	800	0

Civil & Environmental Consultants, Inc.

SLIDEINTERPRET 9.009

Project	**Metal Cleaning Basin Slope Stability Analysis**		
Analysis: Spencer	Scale: 1:325	Scenario: Figure 4: Long-Term; Maximum Surcharge Pool - Static	
Drawn By: CAC	Checked By: MDJ	Approved By: MDJ	Company: Civil & Environmental Consultants, Inc.
Date: 05/06/2021	Date: 05/19/2021	Date: 05/19/2021	File Name: 310-533 MCB Slope Stability-long term.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Embankment Fill		125	25	35
Clay		128	50	34
Sand		125	0	32
MCB Pool		62.4		
Poz-O-Pac		125	800	0

Civil & Environmental Consultants, Inc.

SLIDEINTERPRET 9.009

Project	**Metal Cleaning Basin Slope Stability Analysis**			
Analysis: Spencer	Scale: 1:325		Scenario: Figure 5: Long-Term; Maximum Surcharge Pool - Seismic	
Drawn By: CAC	Checked By: MDJ	Approved By: MDJ	Company: Civil & Environmental Consultants, Inc.	
Date: 05/06/2021	Date: 05/19/2021	Date: 05/19/2021	File Name: 310-533 MCB Slope Stability-long term.slmd	

ATTACHMENT 5-2
CQA SPECIFICATIONS

MWG

Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1801

CONSTRUCTION QUALITY ASSURANCE FOR METAL CLEANING BASIN RETROFIT

S&L PROJECT NO.: 12661-152

REVISION 0C

ISSUE PURPOSE: PERMIT

ISSUE DATE: 07-19-2023

Sargent & Lundy

SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-14-2023	All
0B	Public Comment	03-24-2023	All
0C	Permit	07-19-2023	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	A. Sahlas	T. Dehlin	--
0B	A. Sahlas	T. Dehlin	--
0C	A. Sahlas	T. Dehlin	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 19, 2023

Seal:

Th. Dehlin
7/19/2023
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 Metal Cleaning 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 Metal Cleaning 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.

102.2 The Metal Cleaning Basin will be retrofitted by first removing all boiler wash water sediments remaining in the basin; removing the basin's existing gravel warning, sand cushion, and riprap layers; and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following material removal and decontamination of the basin facilities remaining in-place, a new composite liner system and a new leachate collection and removal system (LCRS) will be installed within the Metal Cleaning 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 Metal Cleaning Basin at the Powerton Generating Station is retrofitted in accordance with the General Work (GW) Specification (P-1800), the Design Drawings, and permit requirements.

103.2 The CQA Work shall include, but not be limited, to the following activities:

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 Metal Cleaning Basin's existing geomembrane liner from damage during material removal and liner decontamination activities at the basin.

c. Verify and document decontamination of the Metal Cleaning 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 an independent, third-party testing laboratory 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 an independent, third-party testing laboratory 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin.

c2. The Design Engineer will assure that the retrofit design meets or exceeds the construction and operational 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-1800) 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 Metal Cleaning 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. Throughout the project, at least one CQA inspector for earthwork (CQA Earthwork Inspector) and at least one CQA inspector for geosynthetics work (CQA Geosynthetics Inspector), each with specialized knowledge and training, shall be present at the site. However, each inspector only needs to be present at the project site if the GW Contractor

is conducting work associated with their scope of responsibility (e.g., the CQA Geosynthetics Inspector only needs to be present when the Geosynthetics Contractor is performing 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. 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 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. PROJECT MEETINGS

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 composite liner system and LCRS materials for construction use.

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 composite liner system materials until completion of the work.

e. Weekly audit of reports and test data sheets during and after installation of LCRS 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 Metal Cleaning Basin are in accordance with the General Work (GW) Specification P-1800, 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 scheduled by the Owner or 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. Perform audits of material certifications.

c2. Perform field observations, inspections, and tests and review test results.

c3. Perform laboratory tests and review 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, 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-1800, responsible for manufacturing and transporting GCL materials to the site.

a2. GM/GC Manufacturer: The manufacturer who is, pursuant to Specification P-1800, responsible for manufacturing and transporting geomembrane and drainage geocomposite materials to the site.

a3. Pipe Manufacturer: The manufacturer who is, pursuant to Specification P-1800, responsible for manufacturing and transporting LCRS pipe materials and fittings to the site.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 CQA Specification P-1801:

a. Section 011100 – Summary of Work.

102.2 GW Specification P-1800:

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.	D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
v.	D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual-Seamed Geomembranes.
w.	D5887	Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
x.	D5890	Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
y.	D5891	Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.
z.	D5993	Standard Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners.
aa.	D5994	Standard Test Method for Measuring Core Thickness of Textured Geomembranes.
bb.	D6243	Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
cc.	D6496	Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.

dd. D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

ee. D6768 Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

ff. D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

gg. D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

103.5 GRI – Geosynthetic Research Institute:

a. GM6 Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembrane.

103.6 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, 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 Metal Cleaning 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 to the Owner and Design Engineer for their review and comment within one week after completion of CQA Work.

b3.3 Within one 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 Metal Cleaning Basin Retrofit project are defined in Section 011100.

b. The responsibilities and authorities of the organizations and personnel associated with the Metal Cleaning Basin Retrofit project 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 Metal Cleaning Basin are specified in their respective technical specification sections in the GW Specification.

201.2 All permanent materials to be used in the Metal Cleaning Basin Retrofit project will be supplied by the GW Contractor. The CQA Contractor shall coordinate with the GW Contractor on obtaining material certifications and samples for performing the audits and tests required by this Specification.

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 or hand-held GPS receiver provided the receiver indicates an error of 20 ft or less at the time the coordinates are recorded. All locations should be reported in appropriate significant figures. Locations of seams, damage to geosynthetics, and repairs to geosynthetics shall be obtained through quality survey methodologies.

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 Metal Cleaning 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 Metal Cleaning 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, Bypass Basin, and/or Metal Cleaning Basin.

b5. Verify and document that all material removal and decontamination work is performed in a systematic manner to remove all boiler wash water sediments 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 Metal Cleaning Basin area when less than 10 inches of earthen material are above the basin's existing geomembrane liner.

c2.2 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.

c2.3 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 Metal Cleaning 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. CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOSYNTHETIC CLAY LINER COMPONENT OF COMPOSITE LINER SYSTEM

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 labeled and that each label identifies the following information:

a2.1 Name of GCL Manufacturer.

a2.2 Product identification (brand name, product code).

a2.3 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 GCL thickness.

a2.7 Roll identification number.

a2.8 Roll dimensions (i.e., length and width) and weight.

a2.9 Panel number, which shall be referenced to the proposed GCL panel layout drawing prepared by the GCL Manufacturer.

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 Metal Cleaning 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 (e.g., temperature, 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, Seams, and Repairs:

c2.1 As each panel is unrolled, visually inspect the GCL to ensure there are no flaws or damage. The CQA Geosynthetics 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.

c2.2 Document that the location of the seams meet the general requirements for seaming contained in GW Specification Section 319025.

c2.3 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.

c2.4 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.

c2.5 Document improper GCL panel placement and, as a result, inadequate coverage with the available materials or an excess number of field seams.

c2.6 Document inadequate sheet overlap resulting in poor quality seams.

c2.7 Document unseamed or cut panels.

c2.8 Document repair of damage. Documentation shall include location, type, and method of repair.

305. CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOMEMBRANE COMPONENT OF COMPOSITE LINER SYSTEM

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 10% 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 labeled and that each label identifies the following information:

a2.1 Name of GM/GC Manufacturer.

a2.2 Product identification (e.g., brand name, product code), 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 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 Geomembrane thickness and type.

a2.7 Roll identification number.

a2.8 Roll dimensions (i.e., length and width) and weight.

a2.9 Panel number, which shall be referenced to the proposed HDPE geomembrane liner panel layout drawing prepared by the GM/GC Manufacturer.

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 Metal Cleaning 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 (e.g., temperature, 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 Geosynthetics 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 (e.g., 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, precipitation, wind) to ensure that they are acceptable for seaming.

d2.8 Record measurements of temperatures, pressures, and speeds 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 Geosynthetics 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 Field Testing. 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 Testing:

f2.1 Destructive seam testing shall be performed at the frequencies specified in GW Specification Section 319020.

f2.2 The CQA Geosynthetics Inspector shall specify the location where each sample shall be taken and record data for each sample.

f2.3 The CQA Geosynthetics 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. Verbal laboratory test results shall be given to the Geosynthetics Contractor within 24 hours of receipt of the test samples. Written results shall follow within one week.

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. <u>CQA TESTING AND INSPECTION REQUIREMENTS FOR DRAINAGE GEOCOMPOSITE OF LEACHATE COLLECTION AND REMOVAL SYSTEM</u>

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, the geotextile cap and carrier, and the finished drainage geocomposite as specified in Specification P-1800 Section 319020 and a summary of the test results.

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 (e.g., brand name, product code).

a2.3 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 Drainage geocomposite thickness and type.

a2.7 Roll identification number.

a2.8 Roll dimensions (length and width) and weight.

a2.9 Panel 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 Metal Cleaning 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 (e.g., 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 that 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 Metal Cleaning Basin area when less than 10 inches of earthen material are above geosynthetic materials (i.e., drainage geocomposite, geomembrane liner, GCL).

b3.2 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.

b3.3 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. CQA TESTING AND INSPECTION REQUIREMENTS FOR LEACHATE COLLECTION PIPING AND SIDESLOPE RISERS

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 rejected pipes are 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. CQA TESTING AND INSPECTION REQUIREMENTS FOR CREST ANCHOR TRENCH

309.1 Inspections and Testing During Construction:

a. CQA activities during excavation, formation, and backfilling of crest anchor trenches for the retrofitted Metal Cleaning Basin's geosynthetic materials shall include visual observations and field testing to ensure that, where specified on the Design Drawings, crest anchor trenches are 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 are 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 after the geosynthetic materials being anchored are installed and compacted in a manner that does not damage the geosynthetic materials.

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 are 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	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

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Trench Geometry	Measurement		2 locations per trench 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	Two per lift 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 Method Reference	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 Method Reference	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	Double-Wedge Fusion Welds: ASTM D5820 and GRI GM6 Extrusion Welds: ASTM D5641 Inaccessible Seams: Electric Wire Testing	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 Method Reference	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 7-1
LOCATION RESTRICTIONS COMPLIANCE DEMONSTRATION

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTION
METAL CLEANING BASIN
POWERTON GENERATING STATION
MARCH 2022

This location restriction determination has been prepared in accordance with 35 Ill. Adm. Code Subpart C, Section 845.300 for the Metal Cleaning Basin (MCB) at the Powerton Generating Station, operated by Midwest Generation, LLC (Midwest Generation), in Pekin, Illinois to document compliance with location restrictions related to placement above the uppermost aquifer.

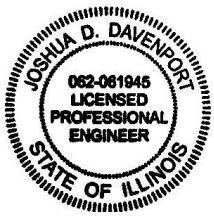
1. Placement Location Restriction Determination

The base of the MCB is approximately elevation 457.5 ft amsl and the upper limit groundwater elevation is 450.14 ft amsl. The MCB is separated from the upper limit of the uppermost aquifer by a minimum of five (5) feet. Therefore, the location of the MCB is in compliance with the requirements outlined in 845.300.

2. Professional Engineer's 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 environmental engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG 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.

Joshua D. Davenport, P.E.
Illinois Professional Engineer No. 062.061945
License Expires: 11/30/2023



WETLANDS LOCATION RESTRICTION
METAL CLEANING BASIN
POWERTON GENERATING STATION
MARCH 2022

This location restriction determination has been prepared in accordance with 35 Ill. Adm. Code Subpart C, Section 845.310 for the Metal Cleaning Basin (MCB) at the Powerton Generating Station, operated by Midwest Generation, LLC (Midwest Generation), in Pekin, IL, to document compliance with location restrictions related to wetlands.

1. Placement Location Restriction Determination

In accordance with 845.310, an existing CCR surface impoundment must not be located in wetlands, unless it can be demonstrated that the CCR unit meets the requirements of paragraphs 845.310(a)(1) through 845.310(a)(5). The identification of wetlands near the MCB was determined using the National Wetlands Inventory (NWI) presented by the U.S. fish and Wildlife Service. The NWI identified the MCB is not located in mapped wetlands. Therefore, the location of the MCB complies with 845.310.

2. Professional Engineer's 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 environmental engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG 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. Reference

U.S. Fish and Wildlife Service, 2022. "National Wetlands Inventory," https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper, accessed March 9, 2022.

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

FAULT AREAS LOCATION RESTRICTION
METAL CLEANING BASIN
POWERTON GENERATING STATION
MARCH 2022

This location restriction determination has been prepared in accordance with 35 Ill. Adm. Code Subpart C, Section 845.320 for the Metal Cleaning Basin (MCB) at the Powerton Generating Station, operated by Midwest Generation, LLC (Midwest Generation), in Pekin, Illinois to document compliance with location restrictions related to fault areas.

1. Fault Areas Location Restriction Determination

The MCB is 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. Therefore, the location of the MCB complies with the requirements outlined in §845.320.

2. Professional Engineer's 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 environmental engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG 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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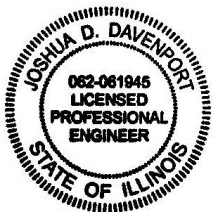

3. References

U.S. Geological Survey and Illinois State Geological Survey, Quaternary Fault and Fold Database for the United States, accessed March 9, 2022, at https://www.usgs.gov/natural-hazards/earthquake-hazards/faults.

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

SEISMIC IMPACT ZONES LOCATION RESTRICTION
METAL CLEANING BASIN
POWERTON GENERATING STATION
MARCH 2022

This location restriction determination has been prepared in accordance with 35 Ill. Adm. Code Subpart C, Section 845.320 for the Metal Cleaning Basin (MCB) at the Powerton Generating Station, operated by Midwest Generation, LLC (Midwest Generation), in Pekin, Illinois to document compliance with location restrictions related to seismic impact zones.

1. Seismic Impact Zones Location Restriction Determination

The U.S. Geological Survey (USGS) National Seismic Hazard Tool website was used to provide the peak ground acceleration based on a 2% probability in 50 years, with a land designation of 'a site on rock' with a ground acceleration of 760 m/s in the upper 30 meters. The peak ground acceleration was determined to be 0.0651 g in 50 years, which is less than 0.10 g in 50 years. Therefore, the MCB complies with the location requirement in 845.330 and is not located in a seismic impact zone.

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 environmental engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG 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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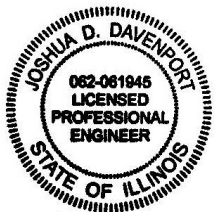

3. References

U.S. Geological Survey, 2018. Earthquake Hazards Program, "National Seismic Hazard Tool," https://www.earthquake.usgs.gov/hazards/interactive/, accessed March 9, 2022.

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

UNSTABLE AREAS AND FLOODPLAINS LOCATION RESTRICTIONS
METAL CLEANING BASIN
POWERTON GENERATING STATION
MARCH 2022

This location restriction determination has been prepared in accordance with 35 Ill. Adm. Code Subpart C, Section 845.340 for the Metal Cleaning Basin (MCB) at the Powerton Generating Station, operated by Midwest Generation, LLC (Midwest Generation), in Pekin, Illinois, to document compliance with location restrictions related to unstable areas and floodplains.

1. Unstable Areas Location Restriction Determination

The MCB is not located in unstable areas. Therefore, the location of the MCB complies with the requirements outlined in 845.340.

2. Floodplains Location Restriction Determination

The MCB is not located in a floodplain with a 1% chance or greater of occurring according to the National Flood Hazard Layer FIRMette Map No. 17179C0175E as mapped by the Federal Emergency Management Agency. The 1% flood elevation listed on FIRMette Map No. 17179C0175E is 457 ft above mean sea level (amsl) and the embankment crest of the MCB is between 467 to 468 ft amsl. Therefore, the location of the MCB complies with Section 845.340.

3. 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 environmental engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG 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.

Joshua D. Davenport, P.E.
Illinois Professional Engineer No. 062.061945
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4. Reference

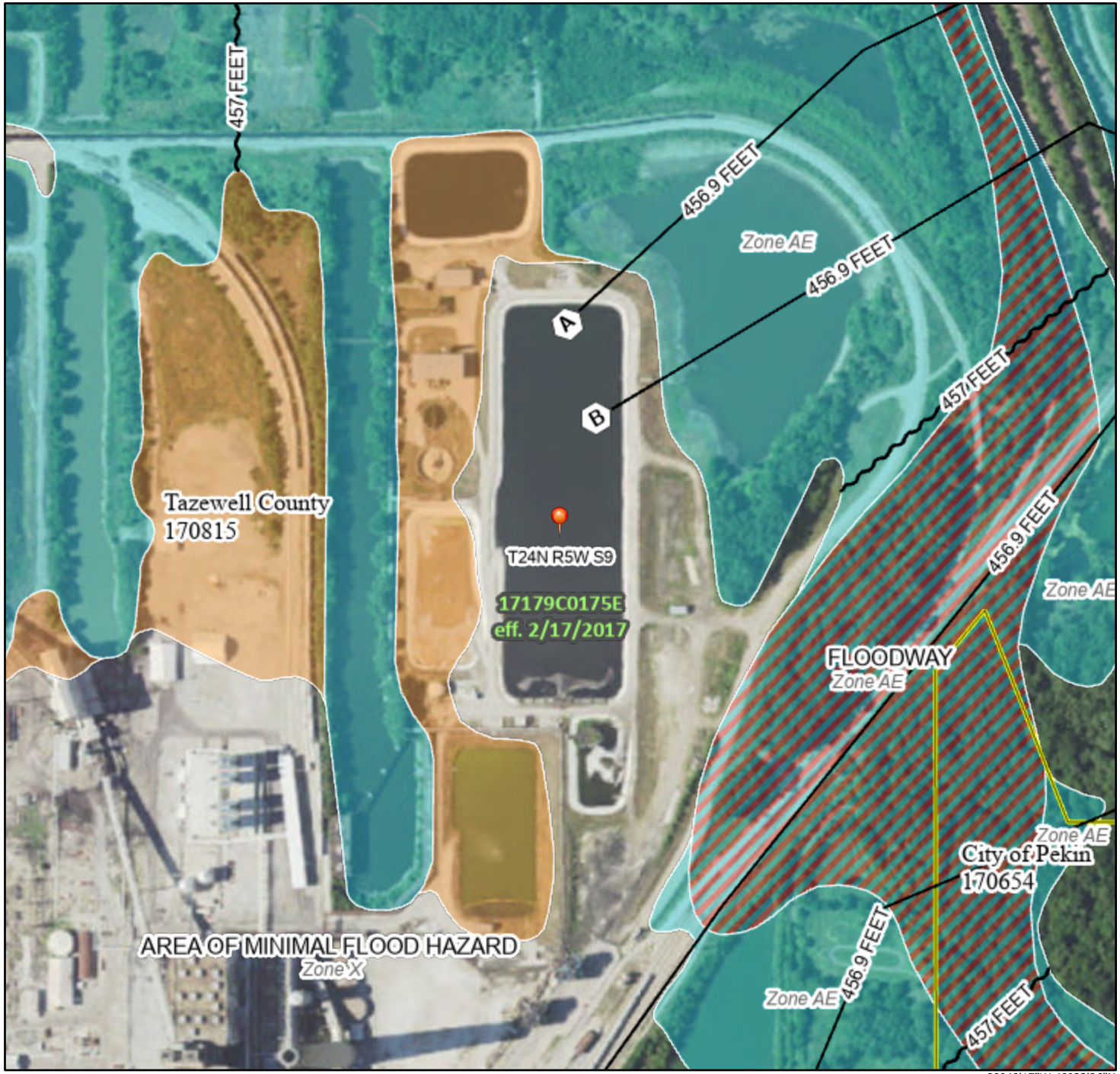
Federal Emergency Management Agency (FEMA), 2020, *National Flood Hazard Layer FIRMette 17179C0175E*, 25 March 2022. https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd.

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
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 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 Metal Cleaning Basin

Revision 0

July 19, 2023

Issue Purpose: Use

Project No.: 12661-152

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 845.410(c)

1.1 PURPOSE

The Metal Cleaning 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 Metal Cleaning 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 845.410(c), this document demonstrates and provides certification that the design of the new composite liner system for the retrofitted Metal Cleaning Basin complies with the requirements of 35 Ill. Adm. Code 845.410 for an alternative composite liner.

1.2 SCOPE

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.

  $Q/A = q = k ((h/t)+1)$

  where:

  Q = flow rate (cubic centimeters/second)

  A = surface area of the liner (squared centimeters)

  q = flow rate per unit area (cubic centimeters / second / square centimeter)

  k = hydraulic conductivity of the liner (centimeters / second)

  h = hydraulic head above the liner (centimeters); and

  t = thickness of the liner (centimeters)

2.0 DEMONSTRATION

The alternative composite liner design for the retrofitted Metal Cleaning 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)

The upper component of the alternative composite liner design for the retrofitted Metal Cleaning Basin consists of a 60-mil HDPE geomembrane. This complies with 35 Ill. Adm. Code 845.400(c)(1).

2.2 LOWER COMPONENT

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.400(c)(2) & 845.400(c)(3)

The lower component of the alternative composite liner design for the retrofitted Metal Cleaning 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), 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 Metal Cleaning 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).

Table 1 – Liquid Flow Rate Comparison Between Compacted Soil Liner & GCL for Retrofitted Metal Cleaning Basin

Parameter	Symbol	Compacted Soil Liner	GCL
Crest Elevation	EL_{crest}	467.00 feet	
Minimum Elevation of Composite Liner System	EL_{floor}	455.67 feet	
Hydraulic Head on Liner (Omitting Geomembrane Thickness)	$h = EL_{crest} - EL_{floor}$	11.33 feet	
Thickness of Liner Lower Component	t	2 feet	7 mm = 0.023 feet
Hydraulic Gradient Through Liner	$i = h / t$	5.67	492.61
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)	$q = k \times (i + 1)$	6.67×10^{-7} cm^3/sec/cm^2	5.93×10^{-7} cm^3/sec/cm^2

3.0 CERTIFICATION

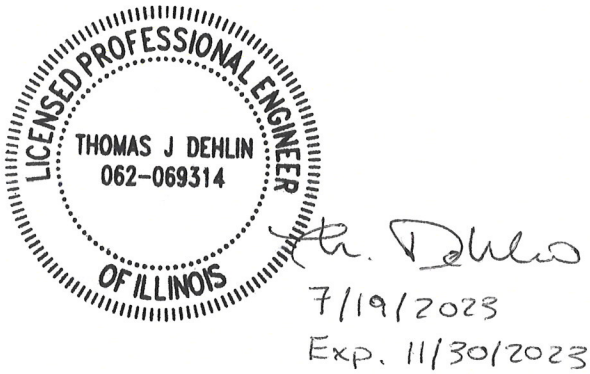
Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(c)

I hereby certify that:

- Per the preceding demonstration and pursuant to 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3), the design liquid flow rate through the lower component of the alternative composite liner for the retrofitted Metal Cleaning 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 Metal Cleaning Basin complies with the requirements of 35 Ill. Adm. Code 845.410.
- 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 19, 2023

Seal:



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 July 18, 2023.

ATTACHMENT 7-4
LEACHATE COLLECTION SYSTEM DESIGN CERTIFICATION

MWG

Midwest Generation, LLC

Powerton Generating Station

Leachate Collection System Design Certification for Retrofitted Metal Cleaning Basin

Revision 0

July 19, 2023

Issue Purpose: Use

Project No.: 12661-152

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

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TABLE OF CONTENTS

1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)

1.1 PURPOSE

The Metal Cleaning Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing surface impoundment that is being retrofitted with a new composite liner system and a new leachate collection and removal system (LCRS). The Metal Cleaning 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 Metal Cleaning 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 collection 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 during post closure care.

2.0 DEMONSTRATION

The LCRS design for the retrofitted Metal Cleaning 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 Metal Cleaning 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 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). This filter layer will consist of sand, except north of the weir wall where riprap will be installed near the basin's existing drain outlet.

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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin. This complies with 35 Ill. Adm. Code 845.420(a)(6).

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 Metal Cleaning Basin to collect leachate from the drainage geocomposite component of the LCRS. The leachate collection pipe will be sloped towards the basin's existing drain outlet, a 24-inch-diameter reinforced concrete pipe, to convey leachate out of the basin. The slopes of the retrofitted Metal Cleaning Basin's LCRS will ensure flow from all points within the retrofitted Metal Cleaning Basin is directed to the leachate collection pipe and ultimately conveyed to the existing drain outlet. A wye branch in the leachate collection pipe will also be installed and lead to a non-perforated riser pipe in the northeastern quadrant of the basin, where a wheeled, submersible pump will be installed. The Station will use this pump to dewater the Metal Cleaning Basin during periodic cleanings, at the time of closure, and as needed during the post-closure care period. 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 Metal Cleaning 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. North of the weir wall near the basin's existing drain outlet, the protective warning layer will consist of riprap. 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 Metal Cleaning 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 Metal Cleaning Basin when the basin is closed and during the basin's post-closure care period.

3.0 CERTIFICATION

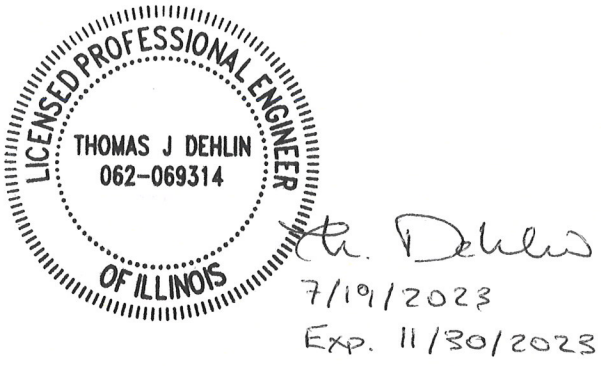
Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)

I hereby certify that:

- The design of the leachate collection system for the retrofitted Metal Cleaning 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 19, 2023

Seal:



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 30, 2023.

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

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APPENDICES

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.

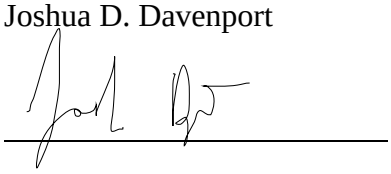
- Provide notification to the IEPA and, if applicable, the Tribal authority when the Plan and reports are placed in the facility's operating record and publicly accessible internet site.

- 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

ENVIRONMENTAL CONSULTATION & REMEDIATION

K P R G

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 2B Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

SITE DIAGRAM/FUGITIVE DUST SOURCES

POWERTON GENERATING STATION
PEKIN, ILLINOIS

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

Metal Cleaning Basin Retrofit Plan

Revision 0

July 19, 2023

Issue Purpose: Use

Project No.: 12661-152

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 (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.

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1.0 PURPOSE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)

Midwest Generation, LLC (MWG) plans to retrofit the Metal Cleaning 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 Metal Cleaning Basin is a surface impoundment that the Station primarily uses for temporarily storing gas-side boiler cleaning wash water prior to treatment in the Station's Metal Cleaning Treatment System for the removal of dissolved metals and suspended solids. The basin is currently lined with a 60-mil high-density polyethylene (HDPE) geomembrane liner, has a surface area of approximately 1.8 acres, and has a storage capacity of approximately 21,000 cubic yards.

The Metal Cleaning Basin is regulated by the Illinois Pollution Control Board's regulations for coal combustion residual (CCR) surface impoundments as codified in Title 35, Part 845 to the Illinois Administrative Code (35 Ill. Adm. Code 845), also referred to herein as the Illinois CCR Rule. Pursuant to 35 Ill. Adm. Code 845.770(c), this document provides MWG's written retrofit plan for the Metal Cleaning Basin.

2.0 RETROFIT PLAN NARRATIVE DESCRIPTION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(A)

MWG plans to retrofit the Metal Cleaning Basin by executing the following sequential steps:

1. Removing any remaining boiler wash water sediments from the basin and transporting the material to a permitted disposal facility in accordance with current and historic Station maintenance procedures for the Metal Cleaning Basin;
2. Obtaining a construction permit from the Illinois EPA for retrofitting the Metal Cleaning Basin;
3. Removing the gravel warning, sand cushion, and riprap layers over the existing geomembrane liner from the basin and transporting these materials to a permitted disposal facility;
4. 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 not contaminated with CCR constituents in accordance with 35 Ill. Adm. Code 845.770(a)(4);
5. Decontaminating the basin's appurtenant structures (*e.g.*, inlet aprons, weir walls, piping);
6. 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);
7. Installing an alternative composite liner system in accordance with 35 Ill. Adm. Code 845.410 (see Section 2.2);
8. Installing a leachate collection and removal system in accordance with 35 Ill. Adm. Code 845.420 (see Section 2.3);

9. 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 Metal Cleaning Basin has been retrofitted in accordance with the activities outlined in this retrofit plan (or subsequent amendment of this retrofit plan) and the requirements stipulated in 35 Ill. Adm. Code Part 845.

2.1 STRUCTURAL FILL

Pursuant to 35 Ill. Adm. Code 845.420(a)(3), the retrofitted Metal Cleaning 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 Metal Cleaning 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 Metal Cleaning Basin's existing HDPE geomembrane liner.

2.2 COMPOSITE LINER SYSTEM

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(a) & 845.400(c)

MWG plans to retrofit the Metal Cleaning Basin with an alternative composite liner system that meets the requirements of 35 Ill. Adm. Code 845.400(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), 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 Metal Cleaning 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 the existing discharge pipe at the northern end of the retrofitted Metal Cleaning Basin to ultimately be discharged out of the basin. A wye branch in the leachate collection pipe will also be installed and lead to a non-perforated riser pipe in the northeastern quadrant of the basin, where a wheeled, submersible pump will be installed. The Station will use this pump to dewater the Metal Cleaning Basin during periodic cleanings, at the time of closure, and as needed during the post-closure care period. The drainage geocomposite and collection pipe system will ensure leachate flows from all points within the basin to the existing drain outlet, 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 Metal Cleaning 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 flowing into the retrofitted Metal Cleaning Basin. Along the floor of the retrofitted Metal Cleaning 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)

After temporarily ceasing all flows into the impoundment, MWG will remove any remaining boiler wash water sediments stored above the granular protective layers covering the Metal Cleaning Basin's existing geomembrane liner in accordance with the Station's usual cleaning and maintenance practices. After the boiler wash water sediments stored in the Metal Cleaning Basin have been removed, 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 Metal Cleaning Basin's existing geomembrane liner: a 6-inch-thick gravel warning layer and a 12-inch-thick sand cushion layer. MWG will also remove an 18-inch-thick layer of riprap above the basin's existing geomembrane liner between the basin's concrete weir wall and discharge pipe. These materials will be loaded onto trucks and transported to a permitted disposal facility. Because these materials are likely to contain boiler wash water sediments, 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 particulates with boiler wash water sediments, the basin's granular protective layers, and riprap are being removed and 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 Metal Cleaning 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 and riprap in the basin have been removed, MWG will begin decontaminating the Metal Cleaning Basin's existing geomembrane liner to be re-used as a supplemental liner under the new composite liner. The basin's inlet aprons, weir walls, 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 boiler wash water sediments. 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 not 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 Metal Cleaning Basin.

4.0 ESTIMATED MAXIMUM INVENTORY OF CCR TO BE REMOVED

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(C)

For the purposes of this retrofit plan, the maximum amount of CCR that will be removed during the retrofit of the Metal Cleaning Basin is conservatively based on the estimated maximum capacity of the basin: 21,000 cubic yards.

5.0 ESTIMATED LARGEST AREA TO BE RETROFITTED

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(D)

The estimated largest area of the Metal Cleaning Basin to be retrofitted is anticipated to be the basin's full surface area: 1.8 acres.

6.0 RETROFIT SCHEDULE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(1)(E)

MWG expects to complete the retrofit work for the Metal Cleaning Basin in 2025. Table 1 lists the major milestones necessary for retrofitting the Metal Cleaning Basin and the expected duration for completing each milestone.

Table 1 – Planning Level Schedule for Retrofitting the Metal Cleaning Basin

Activity	Estimated Duration
Prepare Retrofit Construction Design Documents	2 Months
Obtain Retrofit Construction Permit from Illinois EPA	18 Months
Hire Contractor to Complete Retrofit Activities in Accordance with Illinois EPA Permit	4 Months
Remove Protective Granular Layers Above Existing Liner	2 Weeks
Decontaminate Existing Liner and Basin Appurtenances (Including Laboratory Testing)	6 Weeks
Obtain Approval from Illinois EPA to Re-Use Existing Liner as Supplemental Liner	6 Weeks
Install Composite Liner System	2 Weeks
Install Leachate Collection and Removal System (Including Filter and Protective Layers)	2 Weeks
Submit Retrofit Completion Report and Certification to Illinois EPA	2 Weeks
Obtain Approval of Retrofit Completion Report and Certification from Illinois EPA	6 Weeks
Complete and Certify Retrofit of the Metal Cleaning Basin	--

7.0 AMENDMENTS TO CLOSURE PLAN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(3)

This retrofit plan will be amended in accordance with 35 Ill. Adm. Code 845.770(c)(3) if a change in the operation of the Metal Cleaning 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).

8.0 COMPLETION OF RETROFIT ACTIVITIES

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(g)

Upon completion of all retrofit activities required by 35 Ill. Adm. Code Part 845 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), the certification will be prepared by an independent, qualified professional engineer licensed in the State of Illinois and will verify that the Metal Cleaning Basin has been retrofitted in accordance with this retrofit plan (or subsequent amendment of this retrofit plan) and the requirements of 35 Ill. Adm. Code Part 845. 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

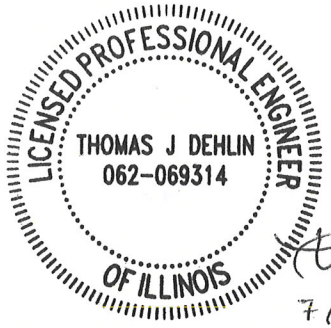
Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.770(c)(4)

I certify that:

- This written retrofit plan for the Metal Cleaning 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.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 19, 2023

Seal:



Th. Dehlin
7/19/2023
Exp. 11/30/2023

ATTACHMENT 8-2
PRELIMINARY WRITTEN CLOSURE PLAN

MWG

Midwest Generation, LLC

Powerton Generating Station

Preliminary Written Closure Plan for Metal Cleaning Basin

Revision 0

July 19, 2023

Issue Purpose: Use

Project No.: 12661-152

55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

Sargent & Lundy

TABLE OF CONTENTS

1.0 PURPOSE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)

The Metal Cleaning Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing surface impoundment that the Station uses for temporarily storing gas-side boiler cleaning wash water prior to treatment in the Station's Metal Cleaning Treatment System for the removal of dissolved metals and suspended solids. The Metal Cleaning Basin 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 Title 35, Part 845 to the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and are also referred to herein as the "Illinois CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.720(a), this document provides the preliminary written closure plan for the Metal Cleaning Basin at Powerton. In accordance with the Illinois CCR Rule, this document describes the steps necessary to close the Metal Cleaning Basin at any point during its active life. MWG intends to first retrofit this CCR surface impoundment with a composite liner and a leachate collection and removal system in accordance with 35 Ill. Adm. Code 845.770(a)(1). After Powerton ceases coal-fired power generating operations, the Station will initiate closure of the surface impoundment. This preliminary written closure plan describes the steps necessary to close the Metal Cleaning Basin after it has been retrofitted.

2.0 CLOSURE PLAN NARRATIVE DESCRIPTION

Illinois CCR Rule References: 35 Ill. Adm. Code 845.720(a)(1)(A) & 845.740(a)

MWG plans to close the retrofitted Metal Cleaning Basin by removing boiler wash water sediments remaining in the basin at the time of closure and decontaminating affected areas pursuant to 35 Ill. Adm. Code 845.740(a). The Metal Cleaning 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 inflows to and material placement in the basin;
3. Drawing down free surface water in the basin by draining water north towards the basin's drain outlet and by operating the LCRS;
4. Removing the boiler wash sediments from the retrofitted basin, loading the material onto trucks, and transporting the material to a permitted off-site disposal facility;
5. 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;
6. Removing the retrofitted basin's composite liner system;

7. 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));
8. Inspecting the basin subgrade to verity it is not contaminated with CCR constituents;
9. Removing the retrofitted basin's appurtenant structures (*e.g.*, inlet aprons, weir wall, associated piping);
10. 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
11. 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)

The preliminary closure plan for the retrofitted Metal Cleaning 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 Metal Cleaning Basin and after permanent cessation of all flows into the impoundment, MWG will first draw down the free surface water remaining in the surface impoundment and dewater the boiler wash water sediments stored therein. Free water remaining in the retrofitted basin will be drawn down by allowing the water to drain through the basin's drain outlet and by using the LCRS pump.

Once the boiler wash water sediments remaining in the impoundment are sufficiently dewatered to handle, construction equipment will then be used to load the sediments onto trucks and transported to a permitted off-site disposal facility. Trucks transporting the sediments 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 and CCR mixed materials 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 particulates while boiler wash water sediments, the basin's granular warning and filter layers, and riprap are being removed and 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 boiler wash water sediments from the retrofitted Metal Cleaning 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 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 Metal Cleaning 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 aprons, weir wall, piping, *etc*.) will also be removed. Materials removed from the impoundment site will be loaded onto trucks and transported to permitted off-site 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), CCR removal and decontamination will be complete when constituent concentrations throughout the retrofitted Metal Cleaning 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 Metal Cleaning Basin have 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)

Detailed records of the maximum inventory of CCR ever stored in the Metal Cleaning 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 Metal Cleaning Basin is conservatively based on the estimated maximum capacity of the basin prior to retrofit: 21,000 cubic yards.

5.0 CLOSURE SCHEDULE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(1)(F)

Closure activities for the retrofitted Metal Cleaning 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 Metal Cleaning Basin

Activity	Estimated Duration
Prepare Closure Construction Design Documents	6 Months
Cease All Flows into Retrofitted Metal Cleaning Basin	--
Obtain Closure Construction Permit from Illinois EPA	18 Months
Hire Contractor to Complete Closure Activities in Accordance with Illinois EPA Permit	4 Months
Draw Down Water & Dewater Impounded Boiler Wash Water Sediments	1 Month
Remove Boiler Wash Water Sediments	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 Metal Cleaning Basin	--

6.0 AMENDMENTS TO CLOSURE PLAN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.720(a)(3)

This closure plan will be amended in accordance with 35 Ill. Adm. Code 845.720(a)(3) if a change in the operation of the Metal Cleaning 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).

7.0 COMPLETION OF CLOSURE ACTIVITIES

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.760

Upon completion of all CCR removal and decontamination activities required by 35 Ill. Adm. Code Part 845 and approved by the Illinois EPA in a construction permit, a closure report and a closure certification for the retrofitted Metal Cleaning 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 closurree 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), the certification will be prepared by an independent, qualified professional engineer licensed in the State of Illinois and will verify that the retrofitted Metal Cleaning Basin has been closed in accordance with the closure plan in effect at the time of the closure work and the requirements of 35 Ill. Adm. Code Part 845. 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)

I certify that:

- This preliminary written closure plan for the Metal Cleaning 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.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: July 19, 2023

Seal:

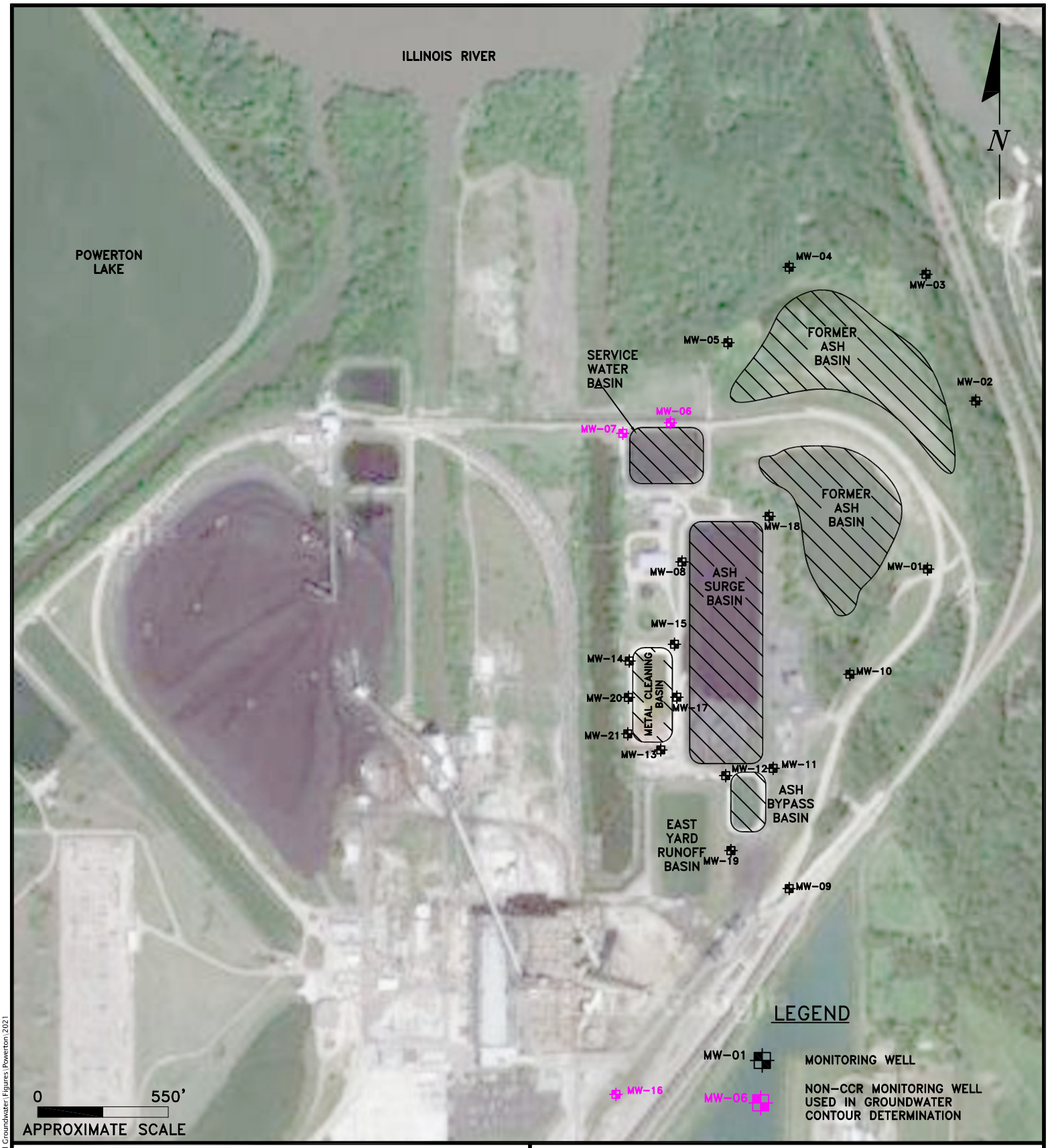
7/19/2023
Exp. 11/30/2023

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 July 18, 2021.

ATTACHMENT 9-0
GROUNDWATER MONITORING FIGURES & TABLES

FIGURE	TITLE
FIGURE 9-1	MONITORING WELL MAP
FIGURE 9-2	METAL CLEANING BASIN CROSS SECTION A–A’
FIGURE 9-3	METAL CLEANING BASIN CROSS SECTION B–B’
FIGURE 9-4	METAL CLEANING BASIN CROSS SECTION C–C’
FIGURE 9-5	MCB WELLS HYDROGRAPH
FIGURE 9-6	GROUNDWATER MANAGEMENT ZONE & ENVIRONMENTAL LAND USE CLASSIFICATION FOR CCR SURFACE IMPOUNDMENTS
FIGURE 9-7	2500’ RADIUS POTABLE WELL MAP



W:\Projects\Midwest Generation\12313 Ash Pond Groundwater\Figures\Powerton\2021

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, inc.

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

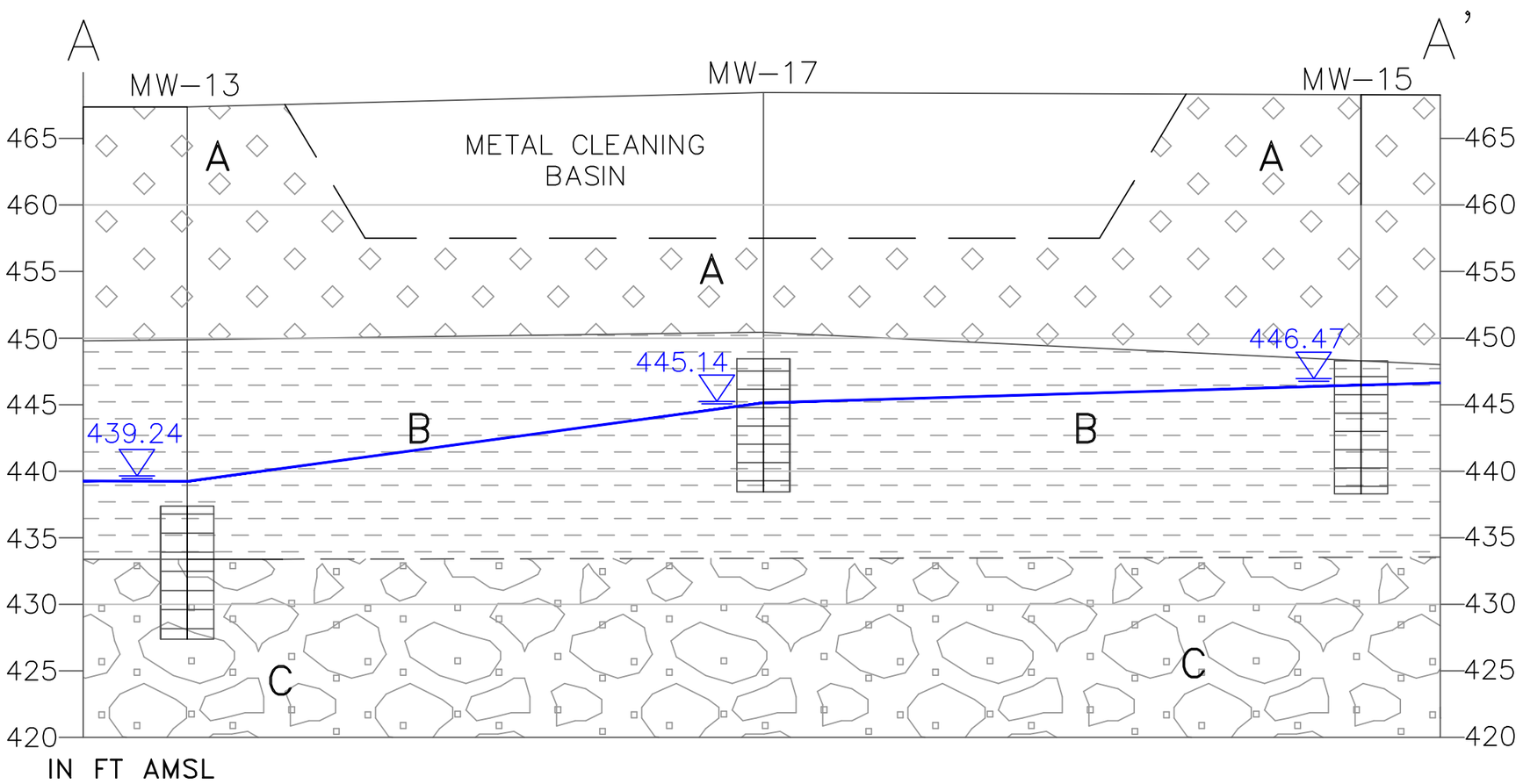
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

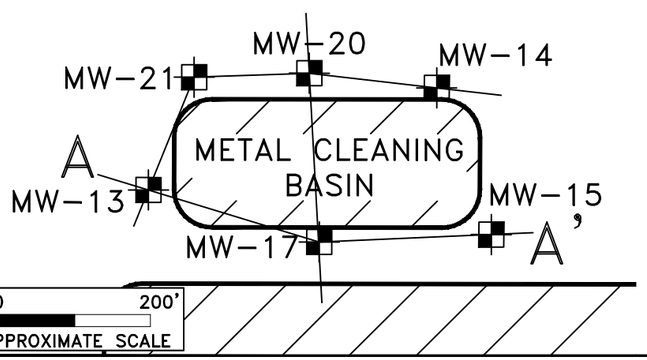
MONITORING WELL MAP

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550' | Date: August 31, 2021

KPRG Project No. 19520.1 | FIGURE 9-1





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 (12/21)

POND OUTLINE

10'
0
50'
APPROXIMATE SCALE

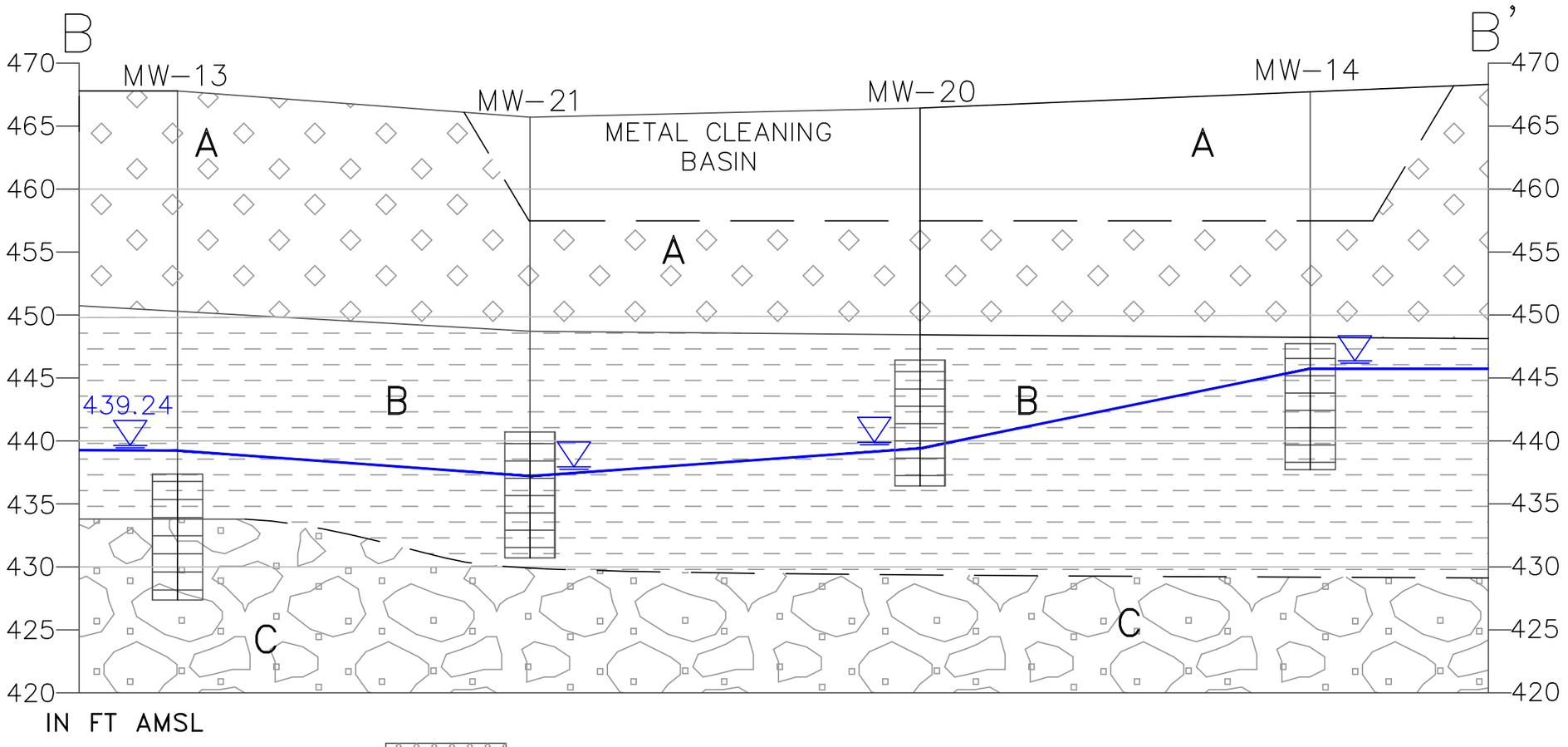
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, inc.
14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

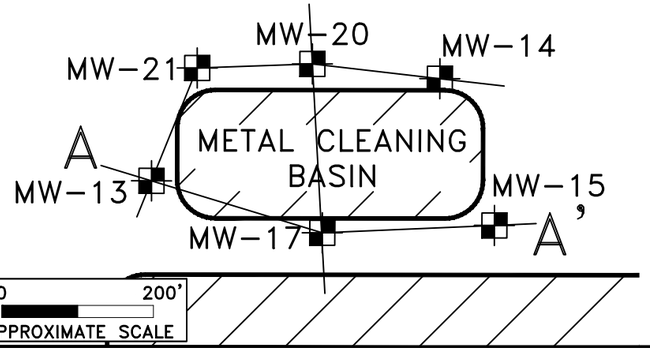
METAL CLEANING BASIN CROSS SECTION A–A'

POWERTON STATION
PEKIN, ILLINOIS

SEE SCALE | Date: March 14, 2022

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 (12/21)

POND OUTLINE

10'
0
50'
APPROXIMATE SCALE

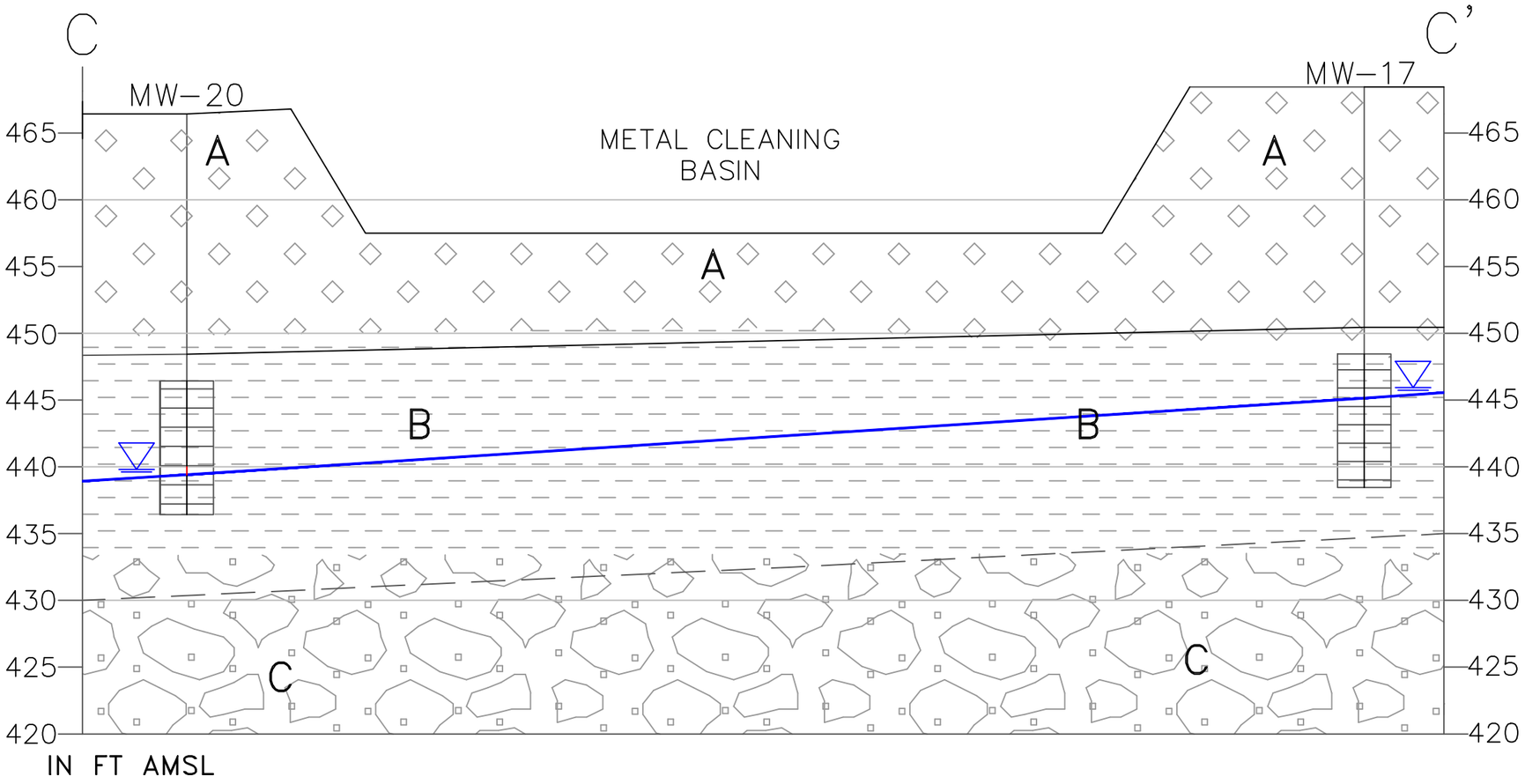
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, inc.
14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

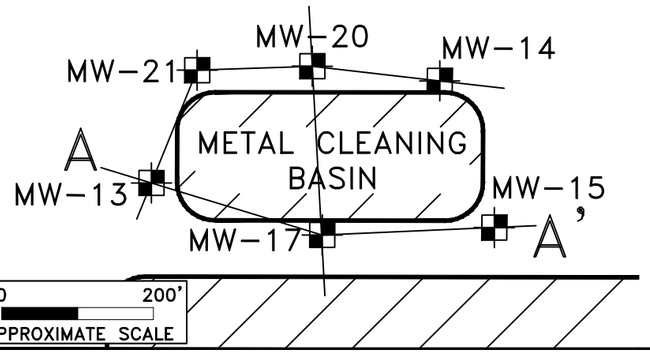
METAL CLEANING BASIN CROSS SECTION B–B'

POWERTON STATION
PEKIN, ILLINOIS

SEE SCALE | Date: March 14, 2022

KPRG Project No. 19520.1 | FIGURE 9–3





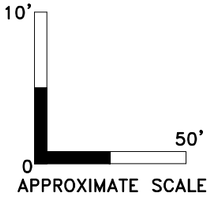
A — FILL: CONSISTING OF TAN, BROWN AND BLACK FINE TO MEDIUM SAND WITH SOME GRAVEL AND CLAY SEAMS. SEVERAL LOCATIONS ALSO INCLUDED BLACK CINDERS AND BRICK FRAGMENTS.

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)

POND OUTLINE



ENVIRONMENTAL CONSULTATION & REMEDIATION
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KPRG and Associates, inc.
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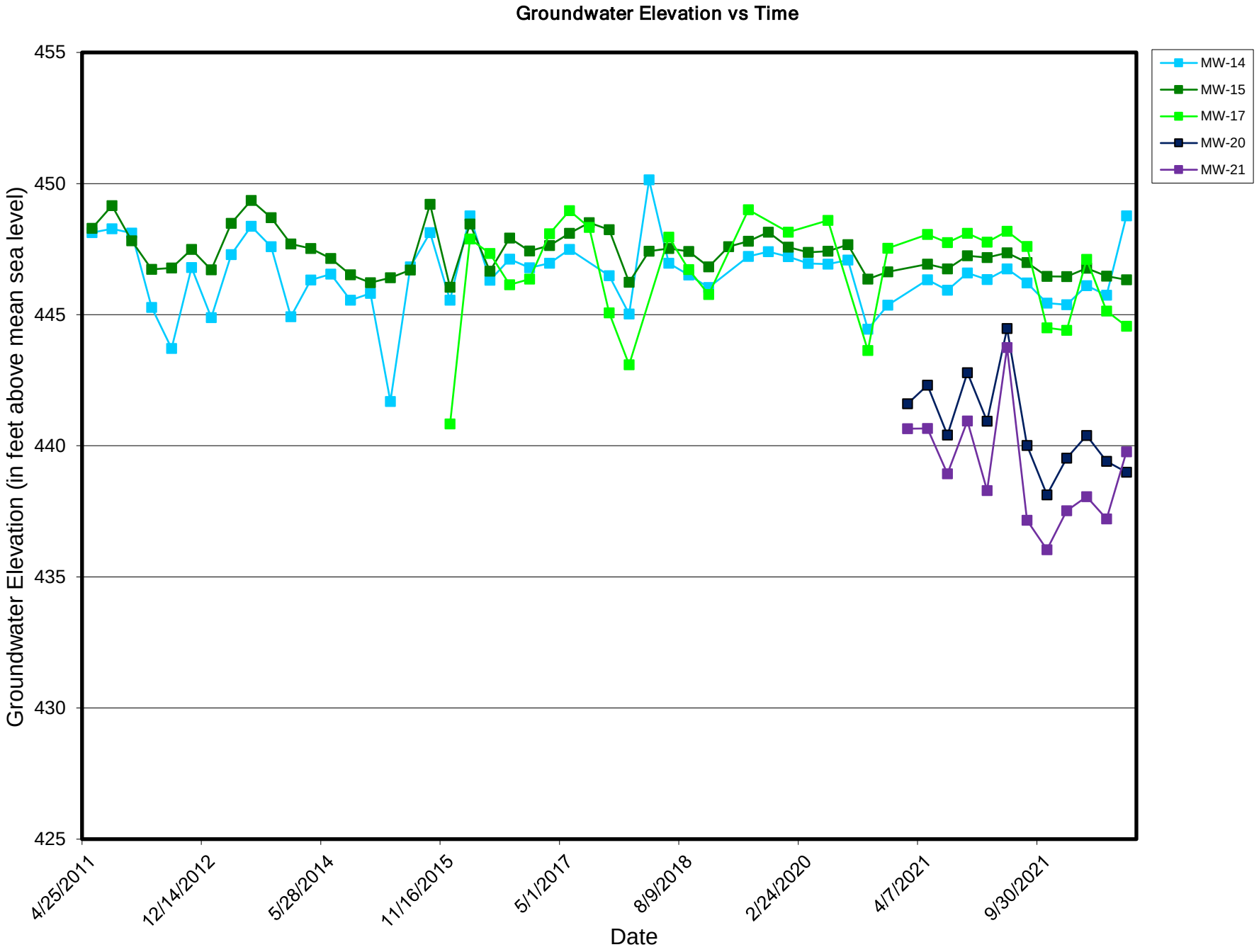
METAL CLEANING BASIN CROSS SECTION C–C'

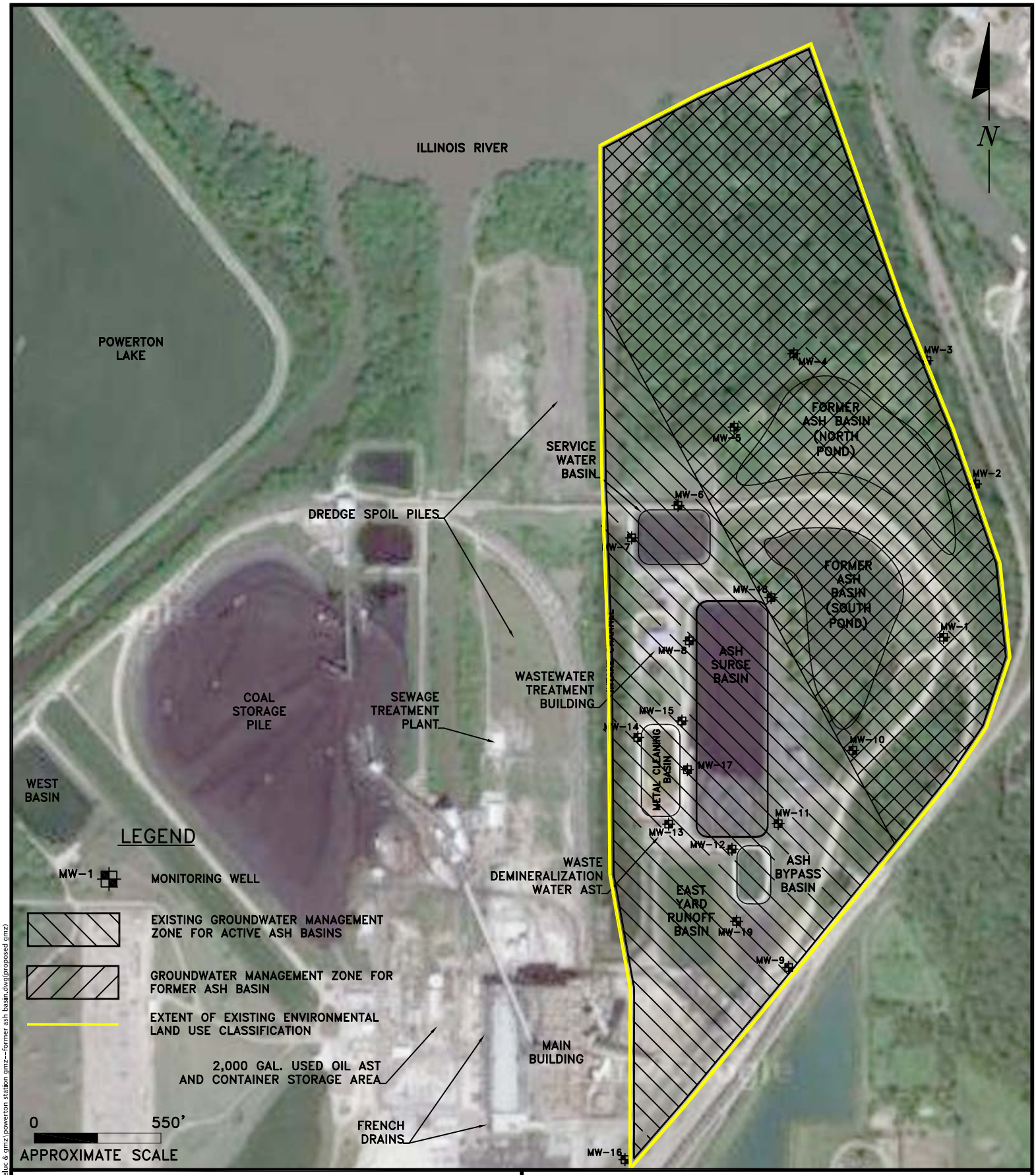
POWERTON STATION
PEKIN, ILLINOIS

SEE SCALE | Date: March 14, 2022

KPRG Project No. 19520.1 | FIGURE 9–4

Figure 9-5. Midwest Generation Powerton Station (MCB), Pekin, IL





ENVIRONMENTAL CONSULTATION & REMEDIATION

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GROUNDWATER MANAGEMENT ZONE & ENVIRONMENTAL LAND USE CLASSIFICATION FOR CCR SURFACE IMPOUNDMENTS

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 550' | Date: March 10, 2022

KPRG Project No. 19520.1 | Figure 9-6

W:\projects\midwest generation\ash pond issues\elec & gmz\powerton station gmz-former ash basin.dwg(proposed gmz)

ENVIRONMENTAL CONSULTATION & REMEDIATION

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414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

2500' RADIUS POTABLE WELL MAP

POWERTON STATION
PEKIN, ILLINOIS

Scale: 1" = 800' | Date: March 10, 2022

KPRG Project No. 19520.1 | FIGURE 9-7

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. Groundwater Elevations - Midwest Generation, LLC, Powerton Station, Pekin, IL. Metal Cleaning Basin.

Well ID	Date	Top of Casing Elevation (ft above MSL)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft above MSL)
MW-14	2/22/2021	470.79	25.43	445.36
	4/7/2021	470.79	24.46	446.33
	5/10/2021	470.79	24.86	445.93
	6/2/2021	470.79	24.20	446.59
	6/28/2021	470.79	24.45	446.34
	7/19/2021	470.79	24.04	446.75
	8/23/2021	470.79	24.58	446.21
	9/30/2021	470.79	25.35	445.44
	10/25/2021	470.79	25.41	445.38
	11/29/2021	470.79	24.68	446.11
	12/30/2021	470.79	25.05	445.74
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
	6/2/2021	471.37	24.12	447.25
	6/28/2021	471.37	24.19	447.18
	7/19/2021	471.37	24.01	447.36
	8/23/2021	471.37	24.38	446.99
	9/30/2021	471.37	24.91	446.46
	10/25/2021	471.37	24.92	446.45
	11/29/2021	471.37	24.60	446.77
	12/30/2021	471.37	24.90	446.47
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
	2/22/2021	467.75	20.22	447.53
	4/7/2021	467.75	19.69	448.06
	5/10/2021	467.75	20.00	447.75
	6/2/2021	467.75	19.65	448.10
	6/28/2021	467.75	19.98	447.77
	7/19/2021	467.75	19.57	448.18
	8/23/2021	467.75	20.15	447.60
	9/30/2021	467.75	23.25	444.50
	10/28/2021	467.75	23.35	444.40
	11/29/2021	467.75	20.64	447.11
	12/30/2021	467.75	22.61	445.14
MW-20	3/12/2021	468.95	27.35	441.60
	4/7/2021	468.95	26.64	442.31
	5/10/2021	468.95	28.54	440.41
	6/2/2021	468.95	26.16	442.79
	6/28/2021	468.95	28.01	440.94
	7/19/2021	468.95	24.48	444.47
	8/23/2021	468.95	28.94	440.01
	9/30/2021	468.95	30.82	438.13
	10/25/2021	468.95	29.42	439.53
	11/29/2021	468.95	28.56	440.39
	12/30/2021	468.95	29.54	439.41
MW-21	3/12/2021	468.17	27.52	440.65
	4/7/2021	468.17	27.51	440.66
	5/10/2021	468.17	29.24	438.93
	6/2/2021	468.17	27.22	440.95
	6/28/2021	468.17	29.78	438.39
	7/19/2021	468.17	24.42	443.75
	8/23/2021	468.17	31.01	437.16
	9/30/2021	468.17	32.13	436.04
	10/25/2021	468.17	30.65	437.52
	11/29/2021	468.17	30.11	438.06
	12/30/2021	468.17	30.96	437.21

MSL - Mean Sea Level
TOC - Top of Casing

Table 9-3. Groundwater Flow Direction and Estimated Seepage Velocity/Flow Rate - Powerton Generation Station. Metal Cleaning Basin.

DATE	Screened Unit	Groundwater Flow Direction	K_{avg} (ft/sec)*	Average Hydraulic Gradient (ft/ft)	Porosity (unitless)**	Estimated Seepage Velocity (ft/day)
5/2021	Silt/clay	Westerly	3.280E-07	0.0276	0.4	0.0020
6/2021	Silt/clay	Westerly	3.280E-07	0.0288	0.4	0.0020
7/2021	Silt/clay	Westerly	3.280E-07	0.0157	0.4	0.0011
8/2021	Silt/clay	Westerly	3.280E-07	0.0350	0.4	0.0025
9/2021	Silt/clay	Westerly	3.280E-07	0.0285	0.4	0.0020
10/2021	Silt/clay	Westerly	3.280E-07	0.0234	0.4	0.0017
11/2021	Silt/clay	Westerly	3.280E-07	0.0230	0.4	0.0016
12/2021	Silt/clay	Westerly	3.280E-07	0.0237	0.4	0.0017

* K_{avg} - K values from re-evaluation of slug test data as part of groundwater modeling in support of Application for Construction Permit per Illinois State CCR Rule.
Average hydraulic conductivity for silt/clay unit (feet/second) from Groundwater, Freeze and Cherry, 1979.

** - Porosity estimates from Applied Hydrogeology, Fetter, 1980.

Table 9-4. Groundwater Analytical Results - Midwest Generation, LLC, Powerton Station, Pekin, IL. Metal Cleaning 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-15 (CL) up-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	< 0.0050	< 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	< 0.003	0.0044	0.053	< 0.001	< 0.0005	< 0.0050	< 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	0.10	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
	7/20/2021	1.5	190	180	0.49	6.80	440	1500	< 0.003	0.0027	0.057	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.028	< 0.0002	0.02	< 0.398	< 0.0025	< 0.002
	8/23/2021	1.6	200	180	0.52	6.76	440	1500	< 0.003	0.0019	0.052	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	0.026	< 0.0002	0.024	< 0.794	0.012	< 0.002
	10/1/2021	1.2	180	180	0.53	6.97	430	1400	< 0.003	0.0087	0.065	< 0.001	< 0.0005	< 0.0050	< 0.0010	< 0.0005	^1+ 0.028	< 0.0002	0.018	< 0.511	0.009	< 0.002
	11/29/2021	1.9	230	240	0.5	6.71	^- 450	1700	< 0.003	0.0031	0.074	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.024	< 0.0002	0.016	< 0.353	0.055	< 0.002
MW-17 (CL) up-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	< 0.003	0.088	0.10	< 0.001	0.0015	< 0.005	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
	4/8/2021	1.1	140	160	0.71	7.75	480	1200	< 0.003	0.0061	0.028	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.019	< 0.0002	0.057	< 0.485	< 0.0025	< 0.002
	5/12/2021	1.1	130	160	0.75	7.52	470	1100	< 0.003	0.0042	0.027	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.051	< 0.398	< 0.0025	< 0.002
	6/3/2021	0.4	150	96	0.74	7.27	500	1300	< 0.003	0.011	0.029	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.055	< 0.463	< 0.0025	< 0.002
	6/28/2021	B 1.1	150	150	0.69	7.34	500	1200	^+ < 0.003	0.018	0.034	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.018	< 0.0002	0.050	1.20	< 0.0025	< 0.002
	7/20/2021	0.94	180	150	0.67	7.31	450	1200	< 0.003	0.0074	0.035	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.029	< 0.0002	0.028	< 0.43	0.051	0.0031
	8/23/2021	0.93	140	150	0.7	7.37	470	1300	< 0.003	0.0083	0.029	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.043	< 0.55	< 0.0025	< 0.002
	10/1/2021	0.85	130	140	0.7	7.26	430	1100	< 0.003	0.0052	0.028	< 0.001	< 0.0005	< 0.005	< 0.001	0.00056	^1+ 0.022	< 0.0002	0.028	< 0.44	< 0.0025	< 0.002
	11/29/2021	0.97	140	150	0.72	7.3	^- 400	1100	< 0.003	0.0065	0.025	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.017	< 0.0002	0.038	< 0.388	< 0.0025	< 0.002
MW-14 (CL) down-gradient	4/8/2021	2.1	200	98	1.1	7.33	630	1600	< 0.003	0.0028	0.036	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.028	< 0.0002	0.035	< 0.605	0.029	0.0022
	5/12/2021	2.6	210	100	1.1	7.13	640	1700	< 0.003	0.0047	0.038	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.028	< 0.0002	0.034	< 0.43	0.0039	0.0028
	6/3/2021	2.1	200	26	1.0	6.79	590	1600	< 0.003	0.0025	0.036	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.025	< 0.0002	0.028	< 0.357	0.094	0.0025
	6/28/2021	B 2.0	210	93	0.99	6.90	570	1700	^+ < 0.003	0.0014	0.034	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.028	< 0.0002	0.03	0.758	0.034	0.0023
	7/20/2021	2.0	190	81	0.89	6.88	500	1700	< 0.003	0.0025	0.057	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.027	< 0.0002	0.021	< 0.434	< 0.0025	< 0.002
	8/23/2021	2.1	210	91	0.96	6.91	560	1800	< 0.003	0.0022	0.035	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.03	< 0.0002	0.031	0.515	0.01	0.0021
	10/1/2021	1.9	200	100	0.95	7.06	640	1700	< 0.003	0.0045	0.039	< 0.001	0.0005	< 0.005	< 0.001	0.00065	^1+ 0.034	< 0.0002	0.037	< 0.581	< 0.0025	0.002
	11/29/2021	2	180	94	1.1	7.01	^- 480	1400	< 0.003	0.0025	0.032	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	0.026	< 0.0002	0.033	< 0.442	0.01	< 0.002
MW-20 (CL) down-gradient	4/8/2021	2.2	310	150	0.20	7.18	850	2200	< 0.003	0.0027	0.19	< 0.001	< 0.0005	< 0.005	0.0015	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.673	< 0.0025	< 0.002
	5/12/2021	0.43	130	150	0.19	6.90	850	2200	< 0.003	0.019	0.21	< 0.001	< 0.0005	< 0.005	0.0039	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.79	< 0.0025	< 0.002
	6/3/2021	1.5	260	26	0.12	6.35	500	1500	< 0.003	< 0.001	0.085	< 0.001	< 0.0005	< 0.005	0.0039	< 0.0005	< 0.01	< 0.0002	< 0.005	0.708	< 0.0025	< 0.002
	6/28/2021	B 1.8	270	96	0.14	6.49	570	1800	^+ < 0.003	0.002	0.13	< 0.001	< 0.0005	< 0.005	0.0025	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.453	< 0.0025	< 0.002
	7/20/2021	1.5	230	64	0.13	6.43	440	1600	< 0.003	0.0025	0.1	< 0.001	< 0.0005	< 0.005	0.0022	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.484	< 0.0025	< 0.002
	8/23/2021	1.5	220	54	0.12	6.66	170	1400	< 0.003	0.0014	0.12	< 0.001	< 0.0005	< 0.005	0.0017	< 0.0005	< 0.01	< 0.0002	< 0.005	0.792	< 0.0025	< 0.002
	10/1/2021	1.7	210	80	0.13	6.74	180	1600	< 0.003	0.0029	0.13	< 0.001	< 0.0005	< 0.005	0.0016	< 0.0005	< ^1+ 0.01	< 0.0002	< 0.005	0.763	< 0.0025	< 0.002
	11/29/2021	1.7	250	120	0.16	6.73	^- 550	1900	< 0.003	0.0071	0.16	< 0.001	< 0.0005	< 0.005	0.0019	0.0024	< 0.01	< 0.0002	< 0.005	< 0.639	< 0.0025	< 0.002
MW-21 (CL) down-gradient	4/8/2021	0.48	140	34	0.25	7.08	26	770	< 0.003	0.025	0.34	< 0.001	< 0.0005	< 0.005	0.0042	< 0.0005	< 0.01	< 0.0002	< 0.005	1.18	< 0.0025	< 0.002
	5/12/2021	0.42	66	22	0.16	6.72	57	680	< 0.003	0.0023	0.19	< 0.001	< 0.0005	< 0.005	< 0.001	< 0.0005	< 0.01	< 0.0002	< 0.005	0.708	< 0.0025	< 0.002
	6/3/2021	0.39	130	23	0.17	6.58	41	690	< 0.003	0.0069	0.25	< 0.001	< 0.0005	< 0.005	0.002	< 0.0005	< 0.01	< 0.0002	< 0.005	1.01	< 0.0025	< 0.002
	6/28/2021	0.60	140	17	0.16	6.55	6.9	660	^+ < 0.003	0.025	0.35	< 0.001	< 0.0005	< 0.005	0.002	< 0.0005	< 0.01	< 0.0002	< 0.005	0.487	< 0.0025	< 0.002
	7/20/2021	0.38	130	28	0.15	6.49	32	650	< 0.003	0.017	0.35	< 0.001	< 0.0005	< 0.005	0.0083	0.001	< 0.01	< 0.0002	< 0.005	0.97	< 0.0025	< 0.002
	8/23/2021	0.66	130	29	0.17	6.66	< 5.0	550	< 0.003	0.022	0.32	< 0.001	< 0.0005	< 0.005	0.0016	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.588	< 0.0025	< 0.002
	10/8/2021	0.35	160	38	0.19	6.72	< 5.0	810	< 0.003	0.036	0.45	< 0.001	< 0.0005	0.0072	0.0072	0.0026	< ^1+ 0.01	< 0.0002	< 0.005	< 1.08	< 0.0025	< 0.002
	11/29/2021	0.66	130	30	0.18	6.55	< ^- 5.0	660	< 0.003	0.031	0.37	< 0.001	< 0.0005	< 0.005	0.0015	< 0.0005	< 0.01	< 0.0002	< 0.005	< 0.747	< 0.0025	< 0.002

Notes: All units are in mg/l except pH is in standard units.
NA - Not Analyzed
^+ - Continuing Calibration Verification is outsde acceptance limits, high biased.
B - Compound was found in the blank and sample

(CL) - Silty Clay Unit
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.

^- - Continuing Calibration Verification (CCV) is outside acceptance limits, low biased.
^1+ - Initial Calibration Verification (ICV) is outside acceptance limits, high biased.

Table 9-5. Groundwater Turbidity - Midwest Generation, LLC, Powerton Station, Pekin, IL. Metal Cleaning Basin.

Well	Date	Turbidity (NTU)
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
	11/29/2021	12.35
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
	11/30/2021	8.86
MW-14	2/24/2021	13.90
	4/8/2021	5.39
	5/12/2021	1.22
	6/3/2021	2.63
	6/28/2021	3.74
	7/20/2021	4.34
	8/23/2021	4.26
	10/1/2021	10.27
	11/29/2021	12.29
MW-20	3/12/2021	343.30
	4/8/2021	14.45
	5/12/2021	3.89
	6/3/2021	6.01
	6/28/2021	8.28
	7/20/2021	9.16
	8/23/2021	27.31
	10/1/2021	8.27
	11/29/2021	8.35
MW-21	3/12/2021	49.20
	4/8/2021	5.88
	5/12/2021	26.09
	6/3/2021	17.61
	6/28/2021	6.33
	7/20/2021	44.93
	8/23/2021	19.43
	10/8/2021	94.82
	11/29/2021	20.2

Table 9-6. Summary of Sample Bottles, Preservation Holding Time, and Analytical Methods. Midwest Generation, LLC, Powertton Generating Station MCB, 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

Table 9-7. Proposed Site-Specific Groundwater Protection Standards - Powerton Metal Cleaning Basin (MCB)

Upgradient Well(s)	Parameter	Section 845.600 Standards	Interwell Background Prediction Limit	**Proposed GWPS**
MW-15/MW-17 All Data Pooled	Antimony	0.006	0.003	**0.006**
MW-17 Last 8 Rounds	Arsenic	0.01	0.024	**0.024**
MW-15 All Data Pooled	Barium	2	0.116	**2**
MW-15/MW-17 All Data Pooled	Beryllium	0.004	0.0013	**0.004**
MW-15 All Data Pooled	Boron	2.0	2.70	**2.7**
MW-15 All Data Pooled	Cadmium	0.005	0.0041	**0.005**
MW-15 All Data Pooled	Chloride	200	255.1	**255.1**
MW-15/MW-17 All Data Pooled	Chromium	0.1	0.005	**0.1**
MW-15 All Data Pooled	Cobalt	0.006	0.0012	**0.006**
MW-15 All Data Pooled	Combined Radium 226 + 228 (pCi/L)	5.0	0.87	**5.0**
MW-15 All Data Pooled	Fluoride	4.0	0.642	**4.0**
MW-15 All Data Pooled	Lead	0.0075	0.0005	**0.0075**
MW-15 Last 8 Rounds	Lithium	0.04	0.039	**0.040**
MW-15/MW-17 All Data Pooled	Mercury	0.002	0.0002	**0.002**
MW-17 Last 8 Rounds	Molybdenum	0.10	0.084	**0.1**
MW-15 All Data Pooled	pH (standard units)	6.5-9.0	6.43-7.50	**6.43 - 9.0**
MW-15 All Data Pooled	Selenium	0.05	0.077	**0.077**
MW-15 Last 8 Rounds	Sulfate	400	733.9	**733.9**
MW-15 All Data Pooled	Thallium	0.002	0.002	**0.002**
MW-17 Last 8 Rounds	Total Dissolved Solids	1200	1477	**1477**
MW-17 Last 8 Rounds	Calcium	NE	200.6	**200.6**
MW-17 Last 8 Rounds	Turbidity	NE	55.15	**55.15**

All values are in mg/L (ppm) unless otherwise noted.
NE - Not Established
Bold - Site-specific Groundwater Protection Standard based on Section 845.600(a)(2)

ATTACHMENT 9-1
LOCAL WELL STRATIGRAPHY INFORMATION

ATTACHMENT 9-1 - Local Stratigraphy Data General Pekin, IL Area

ID	Well_Count	Well_ID	From	To	Original Logged Description	Grouped As
1	1	121792196100	0	2	top soil	topsoil
2		121792196100	2	27	fine sand	sand
3		121792196100	27	95	medium to coarse gravel	coarse sand and/or gravel
4		121792196100	95	95	fine sand at	sand
5	2	121790013100	0	28	sand and gravel, dry	coarse sand and/or gravel
6		121790013100	28	60	sand and gravel, water	coarse sand and/or gravel
7	3	121790013000	0	2	topsoil	topsoil
8		121790013000	2	35	coarse sand and gravel	coarse sand and/or gravel
9		121790013000	35	56	coarse sand, test 1m., 36 sec.	coarse sand and/or gravel
10		121790013000	56	70	medium sand, test 3m., 20 sec.	coarse sand and/or gravel
11		121790013000	70	70	shale at	shale
12	4	121790012900	0	4	topsoil	topsoil
13		121790012900	4	21	dry sand and gravel	coarse sand and/or gravel
14		121790012900	21	44	coarse sand and gravel 1m., 40 s.	coarse sand and/or gravel
15		121790012900	44	66	med coarse sand and gravel, 2m., 10s.	coarse sand and/or gravel
16		121790012900	66	74	medium sand and gravel, 2m. 20s.	coarse sand and/or gravel
17		121790012900	74	74	clay, white at	clay and silt
18	5	121790012800	0	2	cinders and brick	FILL
19		121790012800	2	14	sand, medium	coarse sand and/or gravel
20		121790012800	14	18	sand, coarse	coarse sand and/or gravel
21		121790012800	18	19	coal	coal
22		121790012800	19	20	sand	sand
23		121790012800	20	39	sand, coarse, and gravel, 3m	coarse sand and/or gravel
24		121790012800	39	48	sand, coal, and boulders, 9m	coarse sand and/or gravel
25		121790012800	48	50	clay and rock	silt and clay
26		121790012800	50	55	sand, coarse, 3m	coarse sand and/or gravel
27		121790012800	55	63	sand, coarse, 2m	coarse sand and/or gravel
28		121790012800	63	66	sand, medium, 5m	coarse sand and/or gravel
29		121790012800	66	76	sand, 3m, 10s	coarse sand and/or gravel
30		121790012800	76	76	shale at	shale
31	6	121790025600	0	3	clay	clay
32		121790025600	3	15	sand & gravel	coarse sand and/or gravel
33		121790025600	15	19	gravel, coarse	coarse sand and/or gravel
34		121790025600	19	27	sand and gravel	coarse sand and/or gravel
35		121790025600	27	29	clay	clay
36		121790025600	29	33	gravel and small stones	coarse sand and/or gravel
37		121790025600	33	35	gravel	coarse sand and/or gravel
38		121790025600	35	42	sand, coarse	coarse sand and/or gravel
39		121790025600	42	51	sand, coarse	coarse sand and/or gravel
40	7	121790013800	0	3	soil	Topsoil
41		121790013800	3	82	sand and gravel	coarse sand and/or gravel

42	8	121790013300	0	3	soil, black	Topsoil
43		121790013300	3	5	sand, soil	coarse sand and/or gravel
44		121790013300	5	80	sand and gravel	coarse sand and/or gravel
45	9	121790013200	0	14	gravel, sand and clay	clay, sand, gravel
46		121790013200	14	18	sand and clay	clay, sand
47		121790013200	18	24	sand and gravel	coarse sand and/or gravel
48		121790013200	24	35	gravel and sand	coarse sand and/or gravel
49		121790013200	35	45	gravel	coarse sand and/or gravel
50		121790013200	45	59	gravel and sand	coarse sand and/or gravel
51		121790013200	59	61	shale	shale
52	10	121790052800	0	1	brown fill sand-some rocks	topsoil
53		121790052800	1	3	black sandy dirt	sand
54		121790052800	3	7	yellow sand-medium	coarse sand and/or gravel
55		121790052800	7	15	gray sand-medium	coarse sand and/or gravel
56		121790052800	15	28	gray sand & gravel	coarse sand and/or gravel
57		121790052800	28	49	gray sand & gravel-very coarse	coarse sand and/or gravel
58		121790052800	49	49	blue shale at	shale
59	11	121790050100	0	3	sandy loam	loam
60		121790050100	3	47	dirty sand & gravel	coarse sand and/or gravel
61		121790050100	47	81	yellow sand, trace gravel	coarse sand and/or gravel
62	12	121790048800	0	3	topsoil	topsoil
63		121790048800	3	8	yellow sand	sand
64		121790048800	8	20	gray silty clay	Silt and Clay
65		121790048800	20	21	brown clay	clay
66		121790048800	21	116	brown fine to med sand & gravel	coarse sand and/or gravel
67		121790048800	116	120	med to crs gravel, some coarse sand	coarse sand and/or gravel
68		121790048800	120	121	gray shale	shale
69	13	121790047700	0	3	brown sandy clay	clay, sand
70		121790047700	3	10	yellow clay - very sandy	clay, sand
71		121790047700	10	40	brown sand - coarse & clean	coarse sand and/or gravel
72		121790047700	40	47	brown sand - fine	sand
73		121790047700	47	58	dirty sand & yellow clay	clay, sand
74		121790047700	58	73	brown sand - fine to coarse	sand
75		121790047700	73	78	yellow sand - fine	sand
76		121790047700	78	87	fine to coarse sand - some pebbles	coarse sand and/or gravel
77		121790047700	87	93	fine to crs water sand-some pebbles	coarse sand and/or gravel
78		121790047700	93	96	med to coarse sand - some gravel	coarse sand and/or gravel
79		121790047700	96	101	fine to med sand-some rocks	coarse sand and/or gravel
80		121790047700	101	114	fine red sand	sand
81		121790047700	114	120	fine to coarse brown sand	sand
82		121790047700	120	127	f to crs sand with some fine gravel	coarse sand and/or gravel
83		121790047700	127	127	fine sand at	sand

84	14	121790012700	0	4	topsoil	topsoil
85		121790012700	4	15	sand, gravel, and clay	clay, sand, gravel
86		121790012700	15	32	sand, gravel, and boulders	coarse sand and/or gravel
87		121790012700	32	33	coal	coal
88		121790012700	33	36	hardpan	hardpan
89		121790012700	36	38	boulders	coarse sand and/or gravel
90		121790012700	38	40	sand and gravel, 2m. 15 s.	coarse sand and/or gravel
91		121790012700	40	48	coarse sand and gravel 1m. 40s.	coarse sand and/or gravel
92		121790012700	48	56	sand and gravel, 2 m., 15 s.	coarse sand and/or gravel
93		121790012700	56	58	sand 3m. 25 s.	sand
94		121790012700	58	66	sand, fine 5m, 20s	sand
95		121790012700	66	71	sand, 3m., 5s.	sand
96		121790012700	71	76	sand, 3m., 40 s.	sand
97		121790012700	76	76	shale at	shale
98	15	121790012600	0	18	muck	topsoil
99		121790012600	18	28	gravel, coarse and boulders	coarse sand and/or gravel
100		121790012600	28	36	sand, fine	sand
101		121790012600	36	36	shale at	shale
102	16	121790012500	0	85	sand & gravel	coarse sand and/or gravel
103		121790012500	85	85	shale at	shale
104	17	121790058500	0	4	topsoil	topsoil
105		121790058500	4	71	sand & gravel	coarse sand and/or gravel
106	18	121792462600	0	21	cinders black soil	cinders
107		121792462600	21	26	black & brown clay	clay
108		121792462600	26	39	fine sand w/soft clay mixed	clay, sand
109		121792462600	39	41	large gravel & coarse sand	coarse sand and/or gravel
110		121792462600	41	52	coarse sand & some small gravel	coarse sand and/or gravel
111		121792462600	52	79	coarse sand w/streaks of small gvl	coarse sand and/or gravel
112		121792462600	79	98	fine to coarse sand w/some small gvl	sand
113		121792462600	98	99	fine silty sand	sand
114		121792462600	99	103	dk gray shale & hd dk color limestone	shale

115	19	121792456600	0	4	loam-sandy	Loam
116		121792456600	4	15	sand -yellow	sand
117		121792456600	15	53	sand & gravel	coarse sand and/or gravel
118		121792456600	53	83	sand & gravel-coarse	coarse sand and/or gravel
119	20	121790041500	0	85	Sand	sand
120	21	121790041300	0	2	cindres, fill	FILL
121		121790041300	2	35	fine to coarse sand & gravel	sand
122		121790041300	35	74	f to crs, sand, fine to crs gravel bldrs	sand
123		121790041300	74	80	f to crs sand	sand
124		121790041300	80	93	f to crs sand, medium gravel	sand
125	22	121792453000	0	3	topsoil	topsoil
126		121792453000	3	22	lt. med gravel	coarse sand and/or gravel
127		121792453000	22	44	med-large gravel	coarse sand and/or gravel
128		121792453000	44	45	shale bedrock	shale
129	23	121792323500	0	4	topsoil	topsoil
130		121792323500	4	12	fine silty clay	Silt and clay
131		121792323500	12	48	medium sand	coarse sand and/or gravel
132		121792323500	48	93	medium to coarse gravel	coarse sand and/or gravel
133		121792323500	93	93	shale at	shale
134	24	121792489200	0	21	sand	sand
135		121792489200	21	38	sand & gravel	coarse sand and/or gravel
136		121792489200	38	56	sand medium	coarse sand and/or gravel
137		121792489200	56	61	sand coarse	coarse sand and/or gravel
138		121792489200	61	63	sand & gravel	coarse sand and/or gravel
139		121792489200	63	63	shale below	shale
140	25	121792486200	0	15	fine sand	sand
141		121792486200	15	20	gritty sand	sand
142		121792486200	20	30	fine to medium sand	sand
143		121792486200	30	35	medium-coarse sand with light gravel	coarse sand and/or gravel
144		121792486200	35	40	fine to medium sand	sand
145		121792486200	40	45	clay	clay
146		121792486200	45	60	light to medium sand	sand
147		121792486200	60	65	medium to coarse gravel	coarse sand and/or gravel
148		121792486200	65	88	fine sand	sand
149		121792486200	88	93	fine to medium sand	sand
150		121792486200	93	103	fine sand	sand
151		121792486200	103	108	coarse sand with big gravel	coarse sand and/or gravel
152		121792486200	108	113	medium to coarse sand with gravel	coarse sand and/or gravel
153		121792486200	113	118	medium to coarse sand	coarse sand and/or gravel
154		121792486200	118	120	medium to big gravel	coarse sand and/or gravel
155	26	121792485000	0	70	Sand	sand
156	27	121792377600	0	9	loam	Loam
157		121792377600	9	15	gravel very coarse	coarse sand and/or gravel
158		121792377600	15	60	sand & gravel	coarse sand and/or gravel
159		121792377600	60	85	sand & finer gravel	coarse sand and/or gravel

160	28	121792444600	0	2	topsoil	topsoil
161		121792444600	2	14	sand	sand
162		121792444600	14	75	sand & gravel	coarse sand and/or gravel
163	29	121792326500	0	2	loam sandy	Loam
164		121792326500	2	9	clay yellow sandy	clay, sand
165		121792326500	9	42	sand & gravel - coarse	coarse sand and/or gravel
166		121792326500	42	72	coarse sand	coarse sand and/or gravel
167		121792326500	72	82	sand & gravel	coarse sand and/or gravel
168	30	121792481400	0	2	topsoil	topsoil
169		121792481400	2	29	sand	sand
170		121792481400	29	70	sand & gravel	coarse sand and/or gravel
171	31	121792478800	0	21	cinders, black soil	cinders
172		121792478800	21	26	black & brown clay	clay
173		121792478800	26	39	fine sand clay mixed	clay, sand
174		121792478800	39	46	coarse sand gravel (boulders)	coarse sand and/or gravel
175		121792478800	46	48	black peat	Organic
176		121792478800	48	79	coarse sand gravel	coarse sand and/or gravel
177		121792478800	79	99	medium sand gravel	coarse sand and/or gravel
178		121792478800	99	104	gray shale	shale
179	32	121792477400	0	3	topsoil sandy	topsoil
180		121792477400	3	52	sand	sand
181		121792477400	52	70	sand & gravel	coarse sand and/or gravel
182	33	121792474300	0	4	topsoil	topsoil
183		121792474300	4	23	sand	sand
184		121792474300	23	60	sand & gravel	coarse sand and/or gravel
185	34	121792484700	0	4	topsoil	topsoil
186		121792484700	4	28	fine to medium sand & gravel	sand
187		121792484700	28	88	coarse gravel & rocks	coarse sand and/or gravel
188	35	121792481600	0	6	cinders	cinders
189		121792481600	6	42	coarse sand & gravel	coarse sand and/or gravel
190		121792481600	42	50	brown silty sand & fine gravel	coarse sand and/or gravel
191		121792481600	50	66	coarse sand & gravel	coarse sand and/or gravel
192		121792481600	66	99	fine to coarse sand	sand
193		121792481600	99	102	fine to coarse sand & gravel	coarse sand and/or gravel
194		121792481600	102	103	dark gray shale	shale
195	36	121792478000	0	3	topsoil	topsoil
196		121792478000	3	26	sand	sand
197		121792478000	26	70	sand & gravel	coarse sand and/or gravel
198	37	121792467500	0	4	topsoil	topsoil
199		121792467500	4	10	red clay with light gravel	clay, sand, gravel
200		121792467500	10	14	tan sandy hardpan	hardpan
201		121792467500	14	24	light medium gray with coarse sand	coarse sand and/or gravel
202		121792467500	24	29	light gravel, coarse sand	coarse sand and/or gravel
203		121792467500	29	38	light tan clay, coarse sand	clay, sand
204		121792467500	38	71	medium coarse gravel	coarse sand and/or gravel
205		121792467500	71	72	medium sand with light gravel at	coarse sand and/or gravel

206	38	121792313900	0	4	loam	loam
207		121792313900	4	82	sand & gravel	coarse sand and/or gravel
208		121792313900	82	82	brown clay below	clay
209	39	121792534000	0	2	loam	loam
210		121792534000	2	12	sand - yellow, fine	sand
211		121792534000	12	60	sand & gravel - coarse	coarse sand and/or gravel
212		121792534000	60	67	sand	sand
213		121792534000	67	70	sand & gravel	coarse sand and/or gravel
214		121792534000	70	70	boulders or bedrock at	shale
215	40	121792539500	0	10	sand, gravel, cinders	coarse sand and/or gravel
216		121792539500	10	14	sand, gravel, clay	clay, sand, gravel
217		121792539500	14	26	organic clay	clay
218		121792539500	26	34	organic silt	Silt and clay
219		121792539500	34	45	sand and gravel	coarse sand and/or gravel
220	41	121792539400	0	10	clay and gravel	clay, sand, gravel
221		121792539400	10	14	clayey silt	Silt and clay
222		121792539400	14	18	cinders	cinders
223		121792539400	18	28	organic silt and clay	Silt and clay
224	42	121792509100	0	12	black sand, gravel & cement fill	FILL
225		121792509100	12	25	brown sand & small gravel	coarse sand and/or gravel
226		121792509100	25	27	gray clay with gravel	clay, sand, gravel
227		121792509100	27	104	coarse sand & gravel	coarse sand and/or gravel
228	43	121792497500	0	4	topsoil	topsoil
229		121792497500	4	18	sand	sand
230		121792497500	18	26	clay	clay
231		121792497500	26	86	sand & gravel	coarse sand and/or gravel
232	44	121792497400	0	4	black topsoil, rock	topsoil
233		121792497400	4	15	medium sand	sand
234		121792497400	15	45	medium sand - rocks	coarse sand and/or gravel
235	45	121792501800	0	2	topsoil	topsoil
236		121792501800	2	4	brown clay	clay
237		121792501800	4	73	medium sand & gravel	coarse sand and/or gravel
238		121792501800	73	73	shale at	shale
239	46	121792538900	0	10	cinders, gravel, clay	FILL
240		121792538900	10	18	cinders and sand	sand
241		121792538900	18	32	organic silt	Silt and clay
242		121792538900	32	34	silty clay, sand	clay, sand
243		121792538900	34	40	gravel	coarse sand and/or gravel
244	47	121792538800	0	10	gravel, sand, cinders	coarse sand and/or gravel
245		121792538800	10	16	clay and gravel	clay, sand, gravel
246		121792538800	16	20	silt and clay	Silt and clay
247		121792538800	20	26	organic silt	Silt and clay
248		121792538800	26	33	silty clay	Silt and clay
249		121792538800	33	40	sand and gravel	coarse sand and/or gravel

250	48	121792538700	0	1	topsoil	topsoil
251		121792538700	1	16	clay & silt	Silt and clay
252		121792538700	16	20	sand	sand
253		121792538700	20	34	gravel	coarse sand and/or gravel
254	49	121792492400	0	17	sand	sand
255		121792492400	17	20	gravel	coarse sand and/or gravel
256		121792492400	20	27	sand fine	sand
257		121792492400	27	60	sand & gravel coarse	coarse sand and/or gravel
258		121792492400	60	85	blue-green shale below 60'	shale
259	50	121792539300	0	2	topsoil	topsoil
260		121792539300	2	17	clay and silt with gravel	clay, sand, gravel
261		121792539300	17	31	sand and gravel	coarse sand and/or gravel
262	51	121792539200	0	10	gravel, sand, silt, clay fill	clay, sand, gravel
263		121792539200	10	25	cinders	cinders
264		121792539200	25	28	organic clay	clay
265		121792539200	28	30	organic silt	silt and clay
266	52	121792539100	0	10	cinders, gravel, clay	FILL
267		121792539100	10	20	cinders, gravel, sand	coarse sand and/or gravel
268		121792539100	20	24	fine sand	sand
269		121792539100	24	28	silt	silt and clay
270		121792539100	28	30	silty clay	silt and clay
271	53	121792539000	0	10	cinders, gravel, clay	FILL
272		121792539000	10	20	gravel and clay	clay, sand, gravel
273		121792539000	20	30	organic silt	silt and clay
274	54	121792565200	0	10	topsoil	topsoil
275		121792565200	10	16	fine sand	sand
276		121792565200	16	26	med to coarse sand & gravel	coarse sand and/or gravel
277		121792565200	26	39	super coarse gravel	coarse sand and/or gravel
278	55	121792564300	0	2	cinders	cinders
279		121792564300	2	7	black and dark gray peaty clay	clay
280		121792564300	7	38	brown sandy clay	clay
281		121792564300	38	85	coarse sand & gravel	coarse sand and/or gravel
282	56	121792560500	0	15	med sand light gravel	coarse sand and/or gravel
283		121792560500	15	25	med gravel w/ rocks	coarse sand and/or gravel
284		121792560500	25	35	med sand - med gravel w/ rocks	coarse sand and/or gravel
285		121792560500	35	37	med sand - med gravel	coarse sand and/or gravel
286	57	121792366700	0	2	topsoil	topsoil
287		121792366700	2	15	sand	sand
288		121792366700	15	39	big gravel	coarse sand and/or gravel
289		121792366700	39	100	sand & gravel	coarse sand and/or gravel
290	58	121792354800	0	3	(ML) silt, some clay, little sand	topsoil
291		121792354800	3	6	(SP) sand, little gravel	coarse sand and/or gravel
292		121792354800	6	14	(SW) sand, little gravel	coarse sand and/or gravel
293		121792354800	14	30	(SP) sand ltl gvl, SW sand some gvl @30'	coarse sand and/or gravel
294		121792354800	30	44	sand	sand

295	59	121792355100	0	3	(ML) silt, some clay, little sand	topsoil
296		121792355100	3	6	(SP) sand fine gravel little gravel	coarse sand and/or gravel
297		121792355100	6	14	(SW) sand, little gravel	coarse sand and/or gravel
298		121792355100	14	30	(SP) sand, little gravel	coarse sand and/or gravel
299		121792355100	30	65	(SW) sand, some gravel	coarse sand and/or gravel
300		121792355100	65	69	(SP) sand, little gravel	coarse sand and/or gravel
301		121792355100	69	77	(SW) sand, some gravel	coarse sand and/or gravel
302		121792355100	77	103	(SP) sand, little gravel	coarse sand and/or gravel
303	60	121792355000	0	3	(ML) silt, some clay, little sand	clay, sand
304		121792355000	3	6	(SP) sand fine gravel little gravel	coarse sand and/or gravel
305		121792355000	6	14	(SW) sand, little gravel	coarse sand and/or gravel
306		121792355000	14	30	(SP) sand ltl gvl, SW sand some gvl @30'	coarse sand and/or gravel
307		121792355000	30	44	sand	sand
308	61	121792354900	0	3	(ML) silt, some clay, little sand	clay, sand
309		121792354900	3	6	(SP) sand, little gravel	coarse sand and/or gravel
310		121792354900	6	14	(SW) sand, little gravel	coarse sand and/or gravel
311		121792354900	14	30	(SP) sand, little gravel	coarse sand and/or gravel
312		121792354900	30	30	(SW) sand, some gravel at 30'	coarse sand and/or gravel
313		121792354900	30	44	sand	sand
314	62	121792378900	0	3	black cinder and gravel fill	FILL
315		121792378900	3	4.5	black silty sand	sand
316		121792378900	4.5	6.5	brown clayey sand	clay, sand
317		121792378900	6.5	35	brown fine to coarse sand, little fine to medium gravel, wet at 29'	coarse sand and/or gravel
318	63	121792378800	0	1	black to brown gravel, fill	FILL
319		121792378800	1	3	brown silty sand fill	FILL
320		121792378800	3	5.5	black silty sand , trace clay, topsoil	topsoil
321		121792378800	5.5	7.5	brown silty fine to coarse sand	sand
322		121792378800	7.5	50	brown fine to coarse sand, little fine to medium gravel, more sandy below 36'	sand
323	64	121792378700	0	1.5	black silty sand fill	FILL
324		121792378700	1.5	4	black grading brown silty sand	sand
325		121792378700	4	5.5	tan fine sand, clean	sand
326		121792378700	5.5	8.5	brown silty sand, cobbles at 8.5'	sand
327		121792378700	8.5	17.5	brown fine to coarse sand, little fine to medium gravel, dry, clay seam at 10.5' to 11.5	coarse sand and/or gravel
328		121792378700	17.5	30	brown fine to coarse sand, trace of gravel, dry	coarse sand and/or gravel
329	65	121792379400	0	5.5	brown, stiff silt clay loam	loam
330		121792379400	5.5	14	brown, loose sandy loam	loam
331		121792379400	14	16.5	brown, medium silt clay loam	loam
332		121792379400	16.5	24	brown, loose, sand	sand
333		121792379400	24	61	brown, medium, sand and gravel	coarse sand and/or gravel
334		121792379400	61	65.5	light gray, hard, shale	shale

335	66	121792379300	0	4	brown stiff silt loam	loam
336		121792379300	4	14	brown and gray stiff, silt clay loam	loam
337		121792379300	14	14.5	brown and gray sand	sand
338		121792379300	14.5	19	dark gray, medium, wet silt clay loam	loam
339		121792379300	19	31.5	gray, loose, sand	sand
340		121792379300	31.5	58	brown, medium sand and gravel	coarse sand and/or gravel
341	67	121792379200	0	1.5	black grading brown clayey sand	clay, sand
342		121792379200	1.5	15	brown fine to coarse sand, little fine to medium gravel, dry	coarse sand and/or gravel
343	68	121792379100	0	1.5	black silty sand, fill, some gravel	clay, sand
344		121792379100	1.5	6	black grading down to brown silty sand	sand
345		121792379100	6	40	brown fine to coarse sand, little fine to medium gravel, water in 27.5'	coarse sand and/or gravel
346	69	121792379000	0	6.5	black silty sand disturbed, fill and topsoil, few sand seams 5'-6.5'	topsoil
347		121792379000	6.5	35	brown fine to coarse sand little fine to medium gravel, wet at 28'	coarse sand and/or gravel
348	70	121792361700	0	5	loam	loam
349		121792361700	5	14	sand & gravel	coarse sand and/or gravel
350		121792361700	14	34	sand & gravel - coarse	coarse sand and/or gravel
351		121792361700	34	39	gravel & rocks	coarse sand and/or gravel
352		121792361700	39	40	shale gray	shale
353	71	121792553800	0	8	cinders old burnt coal	FILL
354		121792553800	8	79	sand & gravel	coarse sand and/or gravel
355	72	121792552000	0	6	topsoil	topsoil
356		121792552000	6	32	sand & gravel-medium	coarse sand and/or gravel
357		121792552000	32	141	sand & gravel-coarse	coarse sand and/or gravel
358		121792552000	141	141	shale below	shale
359	73	121792538600	0	10	silty clay	silt and clay
360		121792538600	10	14	organic silt	silt and clay
361		121792538600	14	17	organic clay	clay
362		121792538600	17	21	silty clay	silt and clay
363		121792538600	21	29	sand & gravel	coarse sand and/or gravel
364	74	121792378600	0	1.5	black clayey silt topsoil	topsoil
365		121792378600	1.5	5.5	dark brown to brown clayey silt, more sandy with depth	clay, sand
366		121792378600	5.5	10	brown fine to coarse sand, trace of fine to medium gravel	coarse sand and/or gravel
367	75	121792356100	0	10	fill	FILL
368		121792356100	10	23	loam - soft	loam
369		121792356100	23	55	sand & gravel	coarse sand and/or gravel
370		121792356100	55	64	sand coarse fine gravel	coarse sand and/or gravel
371		121792356100	64	84	sand & gravel	coarse sand and/or gravel
372	76	121792365600	0	3	loam sandy	loam
373		121792365600	3	5	clay yellow sandy	clay, sand
374		121792365600	5	56	sand & gravel	coarse sand and/or gravel
375		121792365600	56	67	sand medium	coarse sand and/or gravel
376		121792365600	67	83	sand & gravel fine	coarse sand and/or gravel
377	77	121792538100	0	19	sand, gravel fill material	FILL
378		121792538100	19	31	coarse sand and fine gravel	coarse sand and/or gravel
379	78	121792373700	0	82	sand and gravel, red sand at bottom	coarse sand and/or gravel

380	79	121792373400	0	98	sand and gravel	coarse sand and/or gravel
381	80	121792333600	0	2	black dirt	topsoil
382		121792333600	2	9	brown sand	sand
383		121792333600	9	42	light to coarse gravel	coarse sand and/or gravel
384	81	121792538500	0	10	cinders, gravel, clay	FILL
385		121792538500	10	19	cinders	cinders
386		121792538500	19	26	silt and sand	sand
387		121792538500	26	29	clayey silt	silt and clay
388	82	121792538400	0	10	gravel, crushed rock, cinders	FILL
389		121792538400	10	17	cinders, sand, brick	Cinders
390		121792538400	17	19	clayey silt	silt and clay
391		121792538400	19	32	sand	sand
392	83	121792538300	0	1	topsoil	topsoil
393		121792538300	1	34	sand	sand
394	84	121792538200	0	2	topsoil	topsoil
395		121792538200	2	24	sand	sand
396		121792538200	24	34	gravel	coarse sand and/or gravel
397	85	121792439900	0	2	silty topsoil, little sand, trace clay & roots-medium dark brown	topsoil
398		121792439900	2	4	clayey silty fine sand, trace medium sand, rust brown-medium dense-moist	sand
399		121792439900	4	6	fine sand, trace gravel,medium coarse sand & silt-light brown-medium dense moist	sand
400		121792439900	6	8	fine to coarse sand, trace gravel & silt brown & slightly dark gray-medium densemoist	sand
401		121792439900	8	26.5	fine to coarse sand-moist @8' & saturated @19'-little gravel, trace silt-light brown & s	sand
402	86	121792439200	0	2	clayey, sandy. silty topsoil, trace roots, dark brown-loose-moist	topsoil
403		121792439200	2	4.4	sandy, silty & gravelly clay-brown-loosemoist	clay, sand
404		121792439200	4.4	6	clayey silty fine & coarse sand,trace gravel-brown & slightly gray-loose-moist to wet	sand
405		121792439200	6	13.5	gravelly, fine & coarse sand, trace siltbrown & slightly gray & dark gray-medium dense	coarse sand and/or gravel
406		121792439200	13.5	19	fine & medium sand, trace gravel-brown & slightly gray-loose-moist	sand
407		121792439200	19	26.5	fine & medium sand, trace gravel-brown, light gray & dark gray-dense-wet	sand
408	87	121792438800	0	2	silty sandy topsoil, trace roots-dark brown-moist	topsoil
409		121792438800	2	4	fine to coarse sand, little clay & gravel trace silt-brown & slight gray-medium dense-m	sand
410		121792438800	4	6	silty clayey sand, little topsoil, trace gravel-dark brown & slight gray-moist	topsoil
411		121792438800	6	9	fine to coarse sand, little gravel, trace silt-brown & slight gray-medium densemoist	sand
412		121792438800	9	14	silty clayey fine to coarse sand, brown & gray-medium dense-moist	clay, sand
413		121792438800	14	18	gravelly fine to medium sand, trace silt coarse sand & clay-brown-medium densemois	coarse sand and/or gravel
414		121792438800	18	26.5	gravelly fine to coarse sand, trace siltbrown & slight gray-extremely dense	coarse sand and/or gravel
415		121792438000	0	2	silty sandy topsoil-dark brown	topsoil
416		121792438000	2	6	gravelly, fine to medium sand, trace coarse sand & silt-light gray & slight gray-medium	coarse sand and/or gravel
417		121792438000	6	9	fine sand, trace silt & clay-dark brown loose, moist to wet	sand
418		121792438000	9	18	gravelly fine to coarse sand, trace silt, light brown & slight gray-medium dense to den	coarse sand and/or gravel
419		121792438000	18	23	coarse sand, trace fine to medium sand & fine gravel-brown to light gray & dark gray-	coarse sand and/or gravel
420		121792438000	23	45.5	gravelly fine to coarse sand, trace siltbrown & slight gray-medium dense to densesatu	coarse sand and/or gravel
421		121792438000	45.5	50.25	clayey shale, gray & rust brown-extremely dense	shale
422	88	121792430400	0	2	topsoil	topsoil
423		121792430400	2	9	sandy soil	topsoil
424		121792430400	9	17	sand	sand
425		121792430400	17	68	sand & gravel	coarse sand and/or gravel

426		121792437700	0	2.5	clay, silty, brown, some organic material	silt and clay
427		121792437700	2.5	4.5	sand, light yellow brown, very fine grained, silty, poorly graded, subangular	sand
428	89	121792437700	4.5	6.5	sand, brown, fine to medium grained, silty, some clay, sand grains subangular	sand
429		121792437700	6.5	15	sand & gravel, brown,well graded, sand, fine to medium grained, silty some coarse gr	coarse sand and/or gravel
430		121792437700	15	31.5	sand, light yellow brown very fine grained to fine grained, subrounded silty in upper p	sand
431		121792440300	0	2	sandy, silty topsoil, trace clay & rootsdark brown	topsoil
432		121792440300	2	4	clayey silty fine to medium sand, little gravel, trace coarse sand, rust brown & slightly	clay, sand
433		121792440300	4	6	fine to coarse sand, trace gravel & silt brown & slighty gray-loose to medium moist	sand
434		121792440300	6	9	fine to medium sand & gravel-trace siltbrown & slightly gray-medium dense to dense-	sand
435		121792440300	9	13	gravelly fine to coarse sand trace silt & shale-light brown, slight gray & dark gray-very	coarse sand and/or gravel
436	90	121792440300	13	18	fine to medium sand & gravel medium dense	coarse sand and/or gravel
437		121792440300	18	28	fine to coarse sand, trace gravel-brown & light gray-medium dense to dense-wetsatur	coarse sand and/or gravel
438		121792440300	28	36.5	Fine to medium sand, trace gravel & siltbrown & slight gray	sand
439		121792440300	36.5	43	fine sand, trace silt-brown-extremely dense-wet	sand
440		121792440300	43	54	fine to medium sand, gravelly @45'-trace silt-reddish brown & slightly gray-densesatu	coarse sand and/or gravel
441		121792440300	54	60	clayey shale-gray-weathered	shale
442		121792440300	60	70	clayey shale;medium dark gray	shale
443		121792440000	0	2	clayey sandy silty topsoil, trade rootsdark brown	topsoil
444		121792440000	2	4	silty sand, little clay & gravel-medium dark brown to light gray-medium densedesiccat	sand
445		121792440000	4	6	silty clay, trace gravel & sand-brown & slightly gray-hard	silt and clay
446		121792440000	6	8	silty clay, atrace sand-brown ato medium dark gray-very stiff	silt and clay
447	91	121792440000	8	13	silty fine to medium sand & gravel-brown & dark gray-dense to very dense moist	coarse sand and/or gravel
448		121792440000	13	18	gravelly fine to coarse sand, trace siltbrown & slightly gray-loose to medium dense-m	coarse sand and/or gravel
449		121792440000	18	28	fine to medium sand, trace gravel & siltbrown & slightly gray-medium dense to dense	sand
450		121792440000	28	35	fine sand, trace gravel & silt-brown & slightly gray - very dense to extremely dense-we	sand
451		121792440000	35	48.1	clayey shale-gray weathered-very dense	shale
452		121792343700	0	4	topsoil	topsoil
453	92	121792343700	4	37	sand	sand
454		121792343700	37	85	sand & gravel	coarse sand and/or gravel
455		121792341200	3	8	gravel brown	coarse sand and/or gravel
456	93	121792341200	8	40	gravel & big rocks	coarse sand and/or gravel
457		121792341200	40	42	gray clay & gravel	clay, sand, gravel
458		121792336400	0	2	topsoil	topsoil
459	94	121792336400	2	60	sand	sand
460		121792336400	60	70	sand & gravel	coarse sand and/or gravel
461		121792336600	0	4	black sandy topsoil	topsoil
462		121792336600	4	7	brown sandy clay	clay, sand
463		121792336600	7	35	brown sand - light gravel	coarse sand and/or gravel
464	95	121792336600	35	40	coarse brown sand light 3" gravel	coarse sand and/or gravel
465		121792336600	40	68	medium brown sand - light gravel	coarse sand and/or gravel
466		121792336600	68	110	medium brown sand - light coarse gravel	coarse sand and/or gravel
467		121792336600	110	112	gray clay	clay

468	96	121792347100	0	4	fill	Fill
469		121792347100	4	22	brown clay	clay
470		121792347100	22	44	sand & gravel	coarse sand and/or gravel
471		121792347100	44	47	gray clay	clay
472		121792347100	47	77	sand & gravel	coarse sand and/or gravel
473	97	121792517900	0	12	black sand, gravel & cement fill	Fill
474		121792517900	12	25	brown sand & small gravel	coarse sand and/or gravel
475		121792517900	25	27	gray clay with gravel	clay, sand, gravel
476		121792517900	27	104	coarse sand & gravel	coarse sand and/or gravel
477	98	121792516200	0	10	fine sand	sand
478		121792516200	10	25	medium gravel	coarse sand and/or gravel
479		121792516200	25	35	medium sand, light gravel	coarse sand and/or gravel
480		121792516200	35	50	fine sand, light gravel	coarse sand and/or gravel
481		121792516200	50	60	fine coarse sand	coarse sand and/or gravel
482		121792516200	60	65	fine sand, medium light gravel	coarse sand and/or gravel
483		121792516200	65	80	medium sand, light gravel	coarse sand and/or gravel
484		121792516200	80	95	medium fine sand, light gravel	coarse sand and/or gravel
485		121792516200	95	121	coarse sand medium gravel	coarse sand and/or gravel
486	99	121792515900	0	2	gravel	coarse sand and/or gravel
487		121792515900	2	4	loam	loam
488		121792515900	4	15	sand black, clay mix	clay, sand
489		121792515900	15	19	sand black, wood	sand
490		121792515900	19	26	clay black, gray mix	clay
491		121792515900	26	28	sand med to coarse loose	coarse sand and/or gravel
492		121792515900	28	35	sand fine to med	coarse sand and/or gravel
493		121792515900	35	40	sand med to coarse, some gravel	coarse sand and/or gravel
494		121792515900	40	48	sand fine to med, trace coarse	sand
495		121792515900	48	54	sand med to coarse	coarse sand and/or gravel
496		121792515900	54	59	sand coarse, fine gravel	coarse sand and/or gravel
497		121792515900	59	63	sand med to coarse	coarse sand and/or gravel
498		121792515900	63	66	sand med to crs, tr gry cl (backfilled)	coarse sand and/or gravel
499		121792515900	66	72	sand fine to med (backfilled)	sand
500		121792515900	72	72	gray shale at	shale
501	100	121792515800	0	9	fill	fill
502		121792515800	9	15	light brown clay	clay
503		121792515800	15	19	gray clay with gravel embedded	silt and clay
504		121792515800	19	21	coarse sand to coarse gravel	coarse sand and/or gravel
505		121792515800	21	32	sty brn med s to crs gvl (strk cl 22-23)	coarse sand and/or gravel
506		121792515800	32	52	med sand to coarse gvl (sty)	coarse sand and/or gravel
507		121792515800	52	93	fine sand to fine gravel	coarse sand and/or gravel
508		121792515800	93	100	soft and hard shale	shale
509	101	121792336500	0	4	topsoil	topsoil
510		121792336500	4	28	fine sand	sand
511		121792336500	28	54	medium sand	coarse sand and/or gravel
512		121792336500	54	103	medium gravel	coarse sand and/or gravel
513		121792336500	103	103	fine sand at	sand
514		121792520800	0	10	fine sand	sand

515	102	121792520800	10	15	light gravel with medium gravel	coarse sand and/or gravel
516		121792520800	15	20	medium gravel	coarse sand and/or gravel
517		121792520800	20	30	medium sand - light gravel	coarse sand and/or gravel
518		121792520800	30	35	light gravel	coarse sand and/or gravel
519		121792520800	35	38	medium sand - light gravel	coarse sand and/or gravel
520	103	121792520000	0	15	sandy black topsoil	topsoil
521		121792520000	15	50	sand & gravel	coarse sand and/or gravel
522		121792520000	50	68	gray clay	clay
523	104	121792519900	0	14	coarse sand & gravel	coarse sand and/or gravel
524		121792519900	14	56	coarse sand & gravel w/boulders	coarse sand and/or gravel
525		121792519900	56	58	shale	shale
526	105	121792577600	0	2	topsoil	topsoil
527		121792577600	2	42	fine to coarse gravel	coarse sand and/or gravel
528	106	121792312100	0	2	topsoil	topsoil
529		121792312100	2	8	fine sand	sand
530		121792312100	8	12	brown clay	clay
531		121792312100	12	25	fine sand	sand
532		121792312100	25	68	coarse sand	coarse sand and/or gravel
533		121792312100	68	73	fine gravel	coarse sand and/or gravel
534		121792312100	73	77	fine sand	sand
535		121792312100	77	103	fine gravel & medium gravel	coarse sand and/or gravel
536		121792312100	103	103	shale at	shale
537	107	121792200900	0	2	topsoil	topsoil
538		121792200900	2	20	coarse gravel	coarse sand and/or gravel
539		121792200900	20	47	medium to coarse gravel	coarse sand and/or gravel
540		121792200900	47	47	shale at	shale
541	108	121792104600	0	68	yellow sand	sand
542		121792104600	68	88	gray sand	sand
543	109	121792180900	0	5	top soil	topsoil
544		121792180900	5	43	sand	sand
545		121792180900	43	115	gravel	coarse sand and/or gravel
546	110	121792312000	0	2	topsoil	topsoil
547		121792312000	2	10	brown clay	clay
548		121792312000	10	25	fine sand	sand
549		121792312000	25	45	fine gravel	coarse sand and/or gravel
550		121792312000	45	83	medium gravel	coarse sand and/or gravel
551		121792312000	83	86	fine sand	sand
552		121792312000	86	108	medium to coarse gravel	coarse sand and/or gravel
553	111	121792311900	0	4	topsoil	topsoil
554		121792311900	4	28	fine sand	sand
555		121792311900	28	48	medium sand	coarse sand and/or gravel
556		121792311900	48	78	medium sand to coarse gravel	coarse sand and/or gravel
557		121792311900	78	106	medium gravel	coarse sand and/or gravel
558		121792311900	106	106	shale at	shale

559	112	121792311800	0	2	topsoil	topsoil
560		121792311800	2	12	brown clay	clay
561		121792311800	12	24	sand & gravel lenses	coarse sand and/or gravel
562		121792311800	24	55	sand & gravel	coarse sand and/or gravel
563		121792311800	55	60	gravel	coarse sand and/or gravel
564	113	121792307200	0	7	topsoil	topsoil
565		121792307200	7	87	sand	sand
566		121792307200	87	100	pea gravel	coarse sand and/or gravel
567	114	121792180200	0	2	top soil	topsoil
568		121792180200	2	13	fine sand	sand
569		121792180200	13	39	coarse gravel	coarse sand and/or gravel
570		121792180200	39	48	medium sand	coarse sand and/or gravel
571		121792180200	48	104	coarse gravel	coarse sand and/or gravel
572		121792180200	104	104	rocks	shale
573	115	121792179800	0	2	top soil	topsoil
574		121792179800	2	20	yellow fine sand	sand
575		121792179800	20	25	sand & gravel	coarse sand and/or gravel
576		121792179800	25	40	fine/medium sand	sand
577		121792179800	40	50	sand & gravel	coarse sand and/or gravel
578		121792179800	50	60	all fine sand	sand
579		121792179800	60	72	sand, pea gravel	coarse sand and/or gravel
580		121792179800	72	78	sand, stones	coarse sand and/or gravel
581		121792179800	78	79	shale	shale
582	116	121792179700	0	25	sand & gravel	coarse sand and/or gravel
583		121792179700	25	48	clay	clay
584		121792179700	48	67	rock	shale
585	117	121792261600	0	37	sand	sand
586	118	121792180800	0	4	top soil	topsoil
587		121792180800	4	40	sand	sand
588		121792180800	40	108	gravel	coarse sand and/or gravel
589	119	121792180700	0	10	sandy loam	loam
590		121792180700	10	48	sand & crs gvl	coarse sand and/or gravel
591		121792180700	48	50	coarse	coarse sand and/or gravel
592	120	121792180600	0	3	top soil	topsoil
593		121792180600	3	13	sand & gravel	coarse sand and/or gravel
594		121792180600	13	18	fine brown sand	sand
595		121792180600	18	28	brown sand & rocks	coarse sand and/or gravel
596		121792180600	28	31	fine/med brown sand	sand
597	121	121792180500	0	3	top soil	topsoil
598		121792180500	3	88	med sand to/crs gvl	coarse sand and/or gravel
599		121792180500	88	88	shale	shale

600	122	121792256700	0	10	dirty brown sand	sand
601		121792256700	10	16	brown sand, fine & clean	sand
602		121792256700	16	30	brown sand, fine-very coarse some gravel	coarse sand and/or gravel
603		121792256700	30	42	medium sand, coarse gravel	coarse sand and/or gravel
604		121792256700	42	53	fine red sand tr. med sand & few pebbles	sand
605		121792256700	53	56	red fine sand med-coarse sand w/pebbles	sand
606		121792256700	56	57	fine brown sand fine gravel w/rocks	sand
607		121792256700	57	61	fine brn sand, coarse sand w/fine gravel	coarse sand and/or gravel
608	123	121792091900	0	3	fill	fill
609		121792091900	3	9	fine to crs sand, some gravel	coarse sand and/or gravel
610		121792091900	9	22	fine sand to crs gravel	coarse sand and/or gravel
611		121792091900	22	28	fine sand to med gravel	coarse sand and/or gravel
612		121792091900	28	73	fine to crs sand with gvl seams	coarse sand and/or gravel
613		121792091900	73	81	fine sand to med gravel	coarse sand and/or gravel
614		121792091900	81	100	f to crs sand w/gravel seams	coarse sand and/or gravel
615		121792091900	100	105	fine sand to coarse gravel	coarse sand and/or gravel
616		121792090700	105	107	shale	shale
617	124	121792090700	0	6	sandy clay	clay, sand
618		121792090700	6	16	clay (yellow)	clay
619		121792090700	16	20	clay (blue-gravelly)	clay
620		121792090700	20	22	gravel & sand	coarse sand and/or gravel
621		121792090700	22	70	sand (brown-coarse)	coarse sand and/or gravel
622	125	121792088600	0	11	fine brown sand--dirty	sand
623		121792088600	11	29	fine to coarse brown sand-some rocks	sand
624		121792088600	29	32	coarse brown sand & gravel	coarse sand and/or gravel
625		121792088600	32	38	coarse brown water sand & gravel	coarse sand and/or gravel
626		121792088600	38	48	fine to coarse brown sand-some pebbles	coarse sand and/or gravel
627		121792088600	48	53	fine to med. sand-some pebbles	coarse sand and/or gravel
628		121792088600	53	54	brown & gray sand-some coal	sand
629		121792088600	54	54	cap rock & gray shale at	shale
630	126	121792261500	0	4	brown silt	silt and clay
631		121792261500	4	42	sand	sand
632	127	121792260000	0	4	silt & loam	loam
633		121792260000	4	40	sand	sand
634	128	121792259900	0	37	Sand	sand
635	129	121792259800	0	3	silt	silt and clay
636		121792259800	3	37	sand	sand
637	130	121792238000	0	2	top soil	topsoil
638		121792238000	2	25	fine sand	sand
639		121792238000	25	45	medium sand	coarse sand and/or gravel
640		121792238000	45	105	medium gravel	coarse sand and/or gravel
641		121792238000	105	105	rocks at	shale

642	131	121792237900	0	2	black & brown sandy topsoil	topsoil
643		121792237900	2	4	bricks & fill	fill
644		121792237900	4	7	black clayey sand	clay, sand
645		121792237900	7	16	sand & gravel	coarse sand and/or gravel
646		121792237900	16	23	coarse sand to small gravel	coarse sand and/or gravel
647		121792237900	23	45	coarse sand & gravel with boulders	coarse sand and/or gravel
648		121792237900	45	59	fine sand to coarse gravel with boulders	coarse sand and/or gravel
649		121792237900	59	95	f to crs s w/med to crs g layers & bldrs	coarse sand and/or gravel
650		121792237900	95	100	firm gray shale	shale
651	132	121792237800	0	16	fill	fill
652		121792237800	16	26	black & gray peaty clay with sand	clay, sand
653		121792237800	26	50	yellow & brown coarse sand & gravel	coarse sand and/or gravel
654		121792237800	50	61	fine sand & gravel	coarse sand and/or gravel
655		121792237800	61	83	fine sand, coarse gravel & boulders	coarse sand and/or gravel
656		121792237800	83	85	gray clay	clay
657	133	121792237700	0	4	parking lot gravel & fill	fill
658		121792237700	4	17	coarse s & g w/buff colored clay layers	dirty coarse sand and/or gravel
659		121792237700	17	47	yellow brown coarse s & g w/boulders	coarse sand and/or gravel
660		121792237700	47	81	f to med sd w/coarse gravel & sand	coarse sand and/or gravel
661		121792237700	81	85	firm gray shale	shale
662	134	121792246300	0	19	fine brown sand	sand
663		121792246300	19	52	brown sand & rock	coarse sand and/or gravel
664		121792246300	52	81	brown medium sand, not on shale	coarse sand and/or gravel
665	135	121792157500	0	7	top soil	topsoil
666		121792157500	7	42	fine/coarse gravel	coarse sand and/or gravel
667		121792157500	42	42	shale	shale
668	136	121792156800	0	105	sand & gravel	coarse sand and/or gravel
669		121792156800	105	108	black shale	shale
670	137	121792238100	0	4	top soil (black)	topsoil
671		121792238100	4	25	sand (brown) fine	sand
672		121792238100	25	39	sand (brown) medium	coarse sand and/or gravel

673	138	121792219300	0	3	top soil	topsoil
674		121792219300	3	5	clay	clay
675		121792219300	5	43	coarse sand & gravel	coarse sand and/or gravel
676		121792219300	43	49	blue clay	clay
677		121792219300	49	53	fine sand	sand
678		121792219300	53	80	coarse sand & gravel	coarse sand and/or gravel
679		121792219300	80	105	medium gravel	coarse sand and/or gravel
680		121792219300	105	136	fine to coarse sand	coarse sand and/or gravel
681		121792219300	136	136	shale at	shale
682	139	121792138700	0	3	sand and dirt	sand
683		121792138700	3	53	sand and gravel and rocks	coarse sand and/or gravel
684		121792138700	53	74	sand (brown) fine	sand
685		121792138700	74	84	sand (medium)	coarse sand and/or gravel
686		121792138700	84	88	sand, gravel and rocks	coarse sand and/or gravel
687	140	121792138600	0	5	topsoil	topsoil
688		121792138600	5	25	yellow fine sand	sand
689		121792138600	25	75	coarse gray sand	coarse sand and/or gravel
690	141	121792138000	0	3	topsoil	topsoil
691		121792138000	3	50	coarse gravel and rocks	coarse sand and/or gravel
692		121792138000	50	80	sand gravel and rocks	coarse sand and/or gravel
693		121792138000	80	108	rocks	shale
694	142	121792237600	0	1	top soil	topsoil
695		121792237600	1	10	brown sand	sand
696		121792237600	10	20	sand & gravel	coarse sand and/or gravel
697		121792237600	20	55	coarse gravel	coarse sand and/or gravel
698		121792237600	55	90	medium gravel & sand	coarse sand and/or gravel
699		121792237600	90	117	brown fine sand, some small gravel	sand
700		121792237600	117	118	coarse gravel	coarse sand and/or gravel
701		121792237600	118	120	gray shale	shale
702	143	121792154000	0	2	top soil	topsoil
703		121792154000	2	11	fine sand	sand
704		121792154000	11	99	medium/coarse gravel	coarse sand and/or gravel
705	144	121790072100	0	66	yellow sand	sand
706		121790072100	66	86	blue sand	sand
707	145	121790071600	0	4	black sandy loam	loam
708		121790071600	4	75	dirty yellow sand	sand
709		121790071600	75	112	sand trace gravel	coarse sand and/or gravel
710	146	121792285300	0	2	top soil	topsoil
711		121792285300	2	54	fine to coarse gravel	coarse sand and/or gravel
712		121792285300	54	60	clay	clay
713		121792285300	60	92	coarse sand to coarse gravel	coarse sand and/or gravel
714		121792285300	92	133	coarse sand to medium gravel	coarse sand and/or gravel
715		121792285300	133	133	shale at	shale

716	147	121792282400	0	2	top soil	topsoil
717		121792282400	2	13	fine sand	sand
718		121792282400	13	21	blue clay	clay
719		121792282400	21	62	fine to medium sand	sand
720		121792282400	62	107	fine to coarse sand & gravel	coarse sand and/or gravel
721		121792282400	107	107	fine sand at	sand
722	148	121792204800	0	13	misc. fill, gravel, cinders, bricks etc	fill
723		121792204800	13	17	black clayey gravel & sand	clay, sand, gravel
724		121792204800	17	25	black sand w/clay & other misc.	clay, sand, gravel
725		121792204800	25	50	loos crs sand to crs gravel & boulders	clay, sand, gravel
726		121792204800	50	60	med brn sand-crs gvl w/clay pckts & lyrs	coarse sand and/or gravel
727		121792204800	60	66	coarse sand to coarse gravel	coarse sand and/or gravel
728		121792204800	66	95	loose med s-sml gvl, occ bldrs & crs gvl	coarse sand and/or gravel
729		121792204800	95	96	dark gray lime	limestone
730		121792204800	96	100	dark gray shale	shale
731	149	121792197300	0	2	top soil	topsoil
732		121792197300	2	17	fine sand	sand
733		121792197300	17	42	coarse gravel	coarse sand and/or gravel
734		121792197300	42	61	medium sand	coarse sand and/or gravel
735		121792197300	61	85	coarse gravel	coarse sand and/or gravel
736	150	121792885900	0	16	sand (brown) fine	sand
737		121792885900	16	18	sand (brown) fine with rocks	sand
738		121792885900	18	26	sand (brown) medium	coarse sand and/or gravel
739		121792885900	26	30	sand (brown) medium with rocks	coarse sand and/or gravel
740		121792885900	30	40	sand (brown) medium	coarse sand and/or gravel
741		121792885900	40	71	sand (brown) medium with rocks	coarse sand and/or gravel
742	151	121792293000	0	4	topsoil	topsoil
743		121792293000	4	28	sand w/clay streaks	clay, sand
744		121792293000	28	58	medium sand	coarse sand and/or gravel
745		121792293000	58	105	big gravel	coarse sand and/or gravel
746	152	121790067100	0	6	fill	fill
747		121790067100	6	22	sand	sand
748		121790067100	22	25	silty clay	silt and clay
749		121790067100	25	100	sand & gravel	coarse sand and/or gravel
750		121790067100	100	100	hardpan at	shale
751	153	121792124200	0	4	brown sandy clay	clay, sand
752		121792124200	4	38	brown fine sand to crs gravel boulders	coarse sand and/or gravel
753		121792124200	38	62	brown fine sand to coarse gravel	coarse sand and/or gravel
754		121792124200	62	68	brown fine to coarse sand	coarse sand and/or gravel
755		121792124200	68	113	multi-colored medium to coarse sand	coarse sand and/or gravel

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	Water Content PL □---○---△ 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
							Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-2 3.5-5.0 12"R	3 3 5		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						Sand pack 18.0'-30.0'
			Brown coarse to medium sand, trace fine gravel, medium dense, saturated SW	SS-8 18.5-20.0 14"R	4 5 6		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 10 20 30 40 LL 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'
				SS-9 21.0-22.5 15"R	4 5 5		qu=NT
439.7	22.0	▽					
				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	Water Content PL 10 20 30 40 LL 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		Light brown coarse to fine sand, loose, dry FILL	SS-1 1.0-2.5 10"R	4 4 4		qu=NT
				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 10 20 30 40 LL 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	Water Content PL □---○---△ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
459.1	0.0		Dark brown silty clay topsoil				
458.6	0.5		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				
456.5	0.8		FILL				
			Light brown sand, medium to fine brown silty clay, fine gravel, dry	SS-1 1.0-2.5 10"R	6 3 4		
			FILL				
				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	SS-7 16.0-17.5 18"R	2 2 3		
			SP				
				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 □---○---△ LL (10 20 30 40 50) / 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 6 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
				SS-13 31.0-32.5 10"R	4 4 8		qu=NT
			Coarse to fine gravel, trace silt				
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	Water Content PL □---○---△ LL (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 LL 50 / 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			
							Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-2 3.5-5.0			
				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
444.2	17.0	▽		SS-7 16.0-17.5 14"R	2 3 3		
443.2	18.0		Olive gray and gray organic silt, trace clay, trace peat, low plasticity, wet OL				Sand pack 18.0'-28.0' qu=NT Set screen (slot 0.010") 19.0'-29.0'
				SS-8 18.5-20.0	2 2 1		

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 10 20 30 40 LL 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	Water Content PL □---○---△ 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			
							Bentonite seal 3.0'-32.0'. Stickup protective cover installed.
				SS-2 3.5-5.0			
				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
				SS-7 16.0-17.5 18"R	2 1 2		qu=0.5**tsf
			Moist				
			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	SS-11 26.0-27.5 18"R	2 2 2		qu=0.25**tsf
			OL				
			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	SS-13 31.0-32.5 18"R	2 4 3		qu=1.25**tsf
			OH				Sand pack 32.0'-45.0'
426.1	33.5		Gray clayey gravel, coarse sand, clay, silt, moist	SS-14 33.5-35.0 18"R	WOH 2 2		qu=NT
			GC				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
419.6	40.0			SS-16 38.5-40.0 10"R	2 4 7		

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 LL 60 / 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 10 20 30 40 LL 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	Water Content PL 10 20 30 40 LL 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		Light brown fine to medium sand, loose, well graded	SS-8 18.5-20.0 18"R	3 6 11		qu=NT

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 LL 50 / 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**
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-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	Water Content PL 10 20 30 40 LL 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	Water Content PL LL / Unconfined Compressive Strength (TSF) *	NOTES & TEST RESULTS
468.1	0.0		Cinders, gravel, sand, silt FILL				
				SS-1 1.0-2.5			
							Bentonite seal 3.0'-28.0'. Stickup protective cover installed.
				SS-2 3.5-5.0			
				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)	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
448.1	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
439.6	28.5		▽ 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	Water Content PL □---○---△ LL (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			
							Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-2 3.5-5.0			
				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						Sand pack 18.0'-35.0'
450.5	19.5		▽ 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		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 **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 10 20 30 40 LL 50 / Unconfined Compressive Strength (TSF) * 1 2 3 4 5	NOTES & TEST RESULTS
450.0	20.0		ML				
449.5	20.5		▽	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 □ ○ △ LL (10 20 30 40 50) / 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	Water Content PL–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			
							Bentonite seal 3.0'-18.0'. Stickup protective cover installed.
				SS-2 3.5-5.0			
				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		
				SS-7 16.0-17.5 16"R	2 3 3		
			Black cinders				
							Sand pack 18.0'-30.0'
448.2	19.5	▽		SS-8 18.5-20.0 18"R	3 3 1		
			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	20.0						
447.2	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 **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	Water Content PL 10 20 30 40 50 LL / 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**
▽

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	Water Content PL □ ○ △ LL (10 20 30 40 60) / 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**
▼

KPRG
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

KPRG Project No. 18311.21

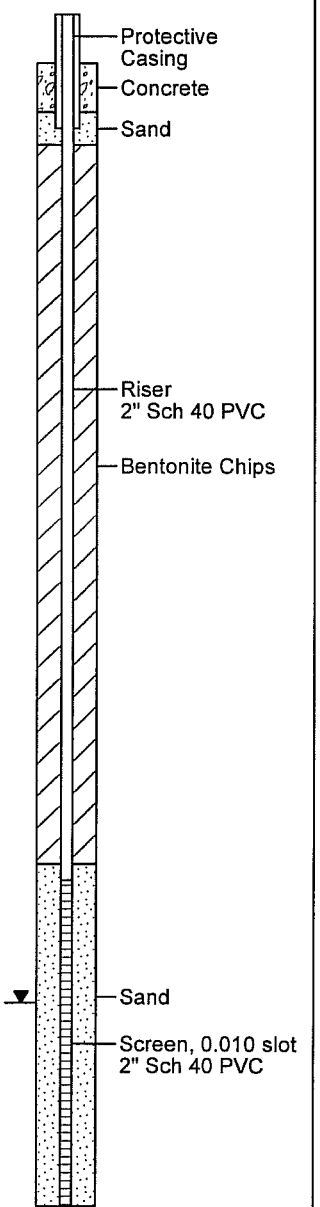
GEOLOGIC LOG OF MW-16

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	- Thin layer of fine grained sand	0	
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.

GEOLOGIC LOG OF MW-17

(Page 1 of 2)

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

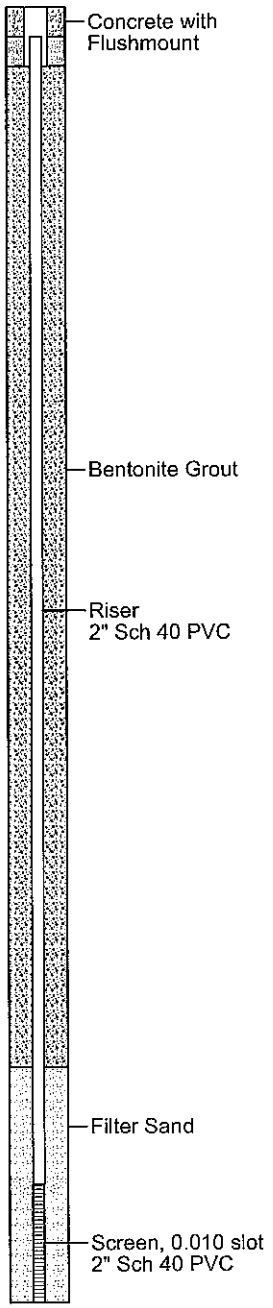
Project No. 15315.7

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:



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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	Well Diagram:
22	553				
23	552				
24	551				
25	550				Filter Sand
26	549	SILTY SAND, black and dark gray, fine to meduim, wet.			Screen, 0.010 slot 2" Sch 40 PVC
27	548	SILT and SAND, gray and black, wet.			
28	547				
29	546				
30	545				
31	544	End of Boring at 30 feet.			
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					

ENVIRONMENTAL CONSULTATION & REMEDIATION

XPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

GEOLOGIC LOG OF MW-18

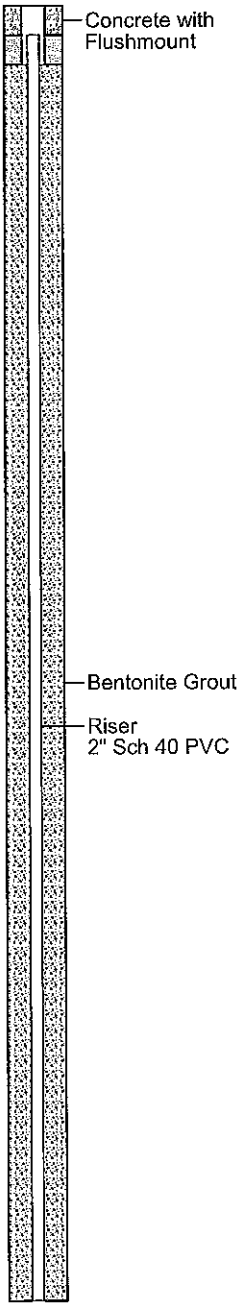
(Page 1 of 2)

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:



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KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, Illinois

Project No. 15315.7

GEOLOGIC LOG OF MW-18

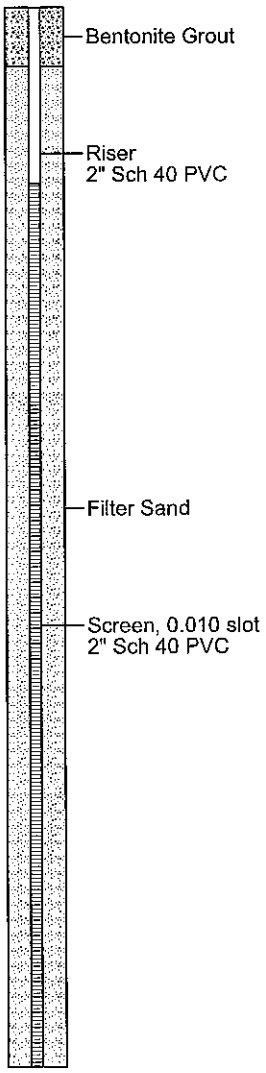
(Page 2 of 2)

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			
30	545	CLAY, gray, some black, moist.		
31	544			
32	543	CLAY, dark gray, trace organics, moist.		
33	542			
34	541			
35	540			
36	539			
37	538	CLAY, greenish gray, trace organics, moist.		
38	537			
39	536			
40	535	SILTY SAND, tan, some gravel, very moist.		
41	534	End of Boring at 40 feet.		
42	533			
43	532			
44				

Well Diagram:



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Midwest Generation, LLC
Powerton Station
Pekin, Illinois

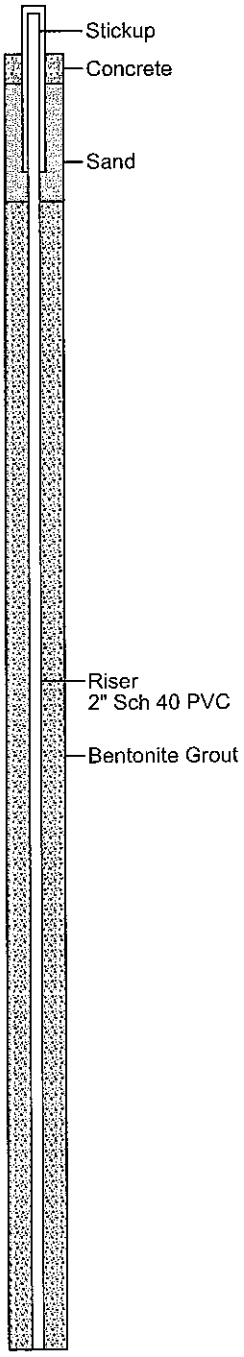
GEOLOGIC LOG OF MW-19

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
0	575	SILTY SAND, black, fine to coarse, occasional clayey layers slightly moist.		
1	574			
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:



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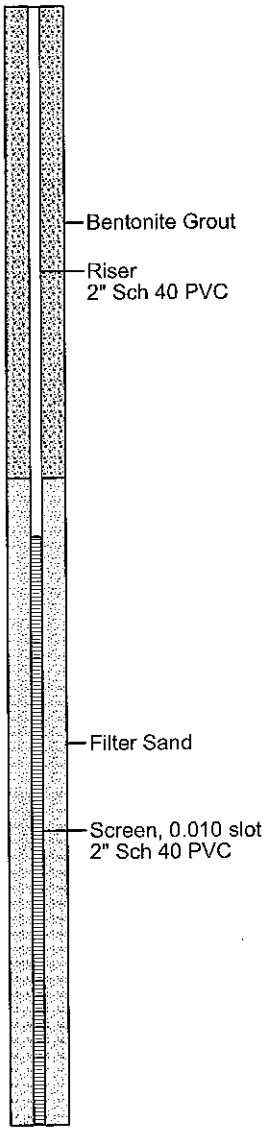
Midwest Generation, LLC
Powerton Station
Pekin, Illinois

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	Well Diagram:
22	553				
23	552				
24	551				
25	550				
26	549				
27	548				
28	547				
29	546	SAND, fine to medium, gray, trace gravel, moist.			
30	545	SAND, fine to medium, brown, very moist.			
31	544				
32	543				
33	542				
34	541				
35	540				
36	539				
37	538				
38	537				
39	536				
40	535				
41	534				
42	533	End of Boring at 41 feet.			
43	532				
44					



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GEOLOGIC LOG OF MW-20

Midwest Generation, LLC
Powerton Station
Pekin, IL

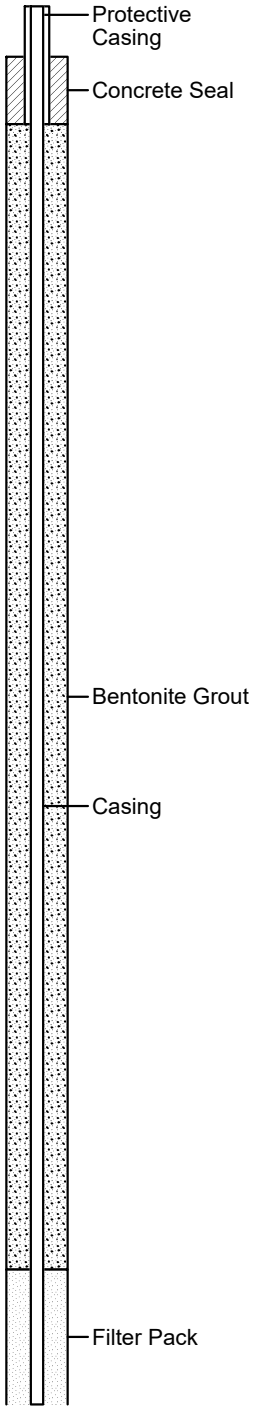
Project # 12313.5

Date Started	: 03/11/21
Date Completed	: 03/11/21
Drilling Method	: 8 1/4 HSA
Drill Rig	: Geoprobe
Driller Name/Co.	: Matt / Cabeno Env. Serv.

Boring Depth	: 30.0
Well Bottom Depth	: 30.0
Surface Elevation	: 466.43 ft. above MSL
Top of Casing Elev.	: 468.95 ft. above MSL
Groundwater Elev.	: 441.60 ft. above MSL
Riser Material	: 2 " Sch 40 PVC
Screen Material	: 2 " Sch 40 PVC, 0.01 slot
Coordinate N	:
Coordinate E	:
Logged By	: M. Dolan

Depth in Feet	Surf. Elev. 466.5	DESCRIPTION	Recovery (in.)	REMARKS
0	466	CLAY with SAND and GRAVEL, brown, dark brown, top soil, dry.	24	
5	461	SAND and GRAVEL, coarse, brown, tan, dry.	30	
10	456	CLAY, trace SAND and GRAVEL, brown, dark brown, dry.	36	
		CLAY, some SAND and GRAVEL, cinders and slag, dark brown, black, dry.		
15	451		48	
		CLAY, black, organic, stiff, dry.		
		SILTY CLAY with SAND and GRAVEL, black, gray, dry.		
20				

Well: MW-20
Elev.: 468.95



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KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, IL

Project # 12313.5

GEOLOGIC LOG OF MW-20

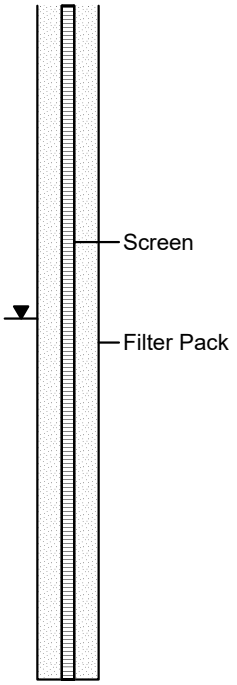
(Page 2 of 2)

Date Started	: 03/11/21
Date Completed	: 03/11/21
Drilling Method	: 8 1/4 HSA
Drill Rig	: Geoprobe
Driller Name/Co.	: Matt / Cabeno Env. Serv.

Boring Depth	: 30.0
Well Bottom Depth	: 30.0
Surface Elevation	: 466.43 ft. above MSL
Top of Casing Elev.	: 468.95 ft. above MSL
Groundwater Elev.	: 441.60 ft. above MSL
Riser Material	: 2 " Sch 40 PVC
Screen Material	: 2 " Sch 40 PVC, 0.01 slot
Coordinate N	:
Coordinate E	:
Logged By	: M. Dolan

Depth in Feet	Surf. Elev. 466.5	DESCRIPTION	Recovery (in.)	REMARKS
20	446	CLAYEY SILT, trace SAND and GRAVEL, black, gray, moist.	36	
25	441	SILT, trace SAND, organic with laminations, dark gray, black, wet.	42	
30	436	End of Boring at 30 feet.		
35	431			
40				

Well: MW-20
Elev.: 468.95



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ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

GEOLOGIC LOG OF MW-21

Midwest Generation, LLC
Powerton Station
Pekin, IL

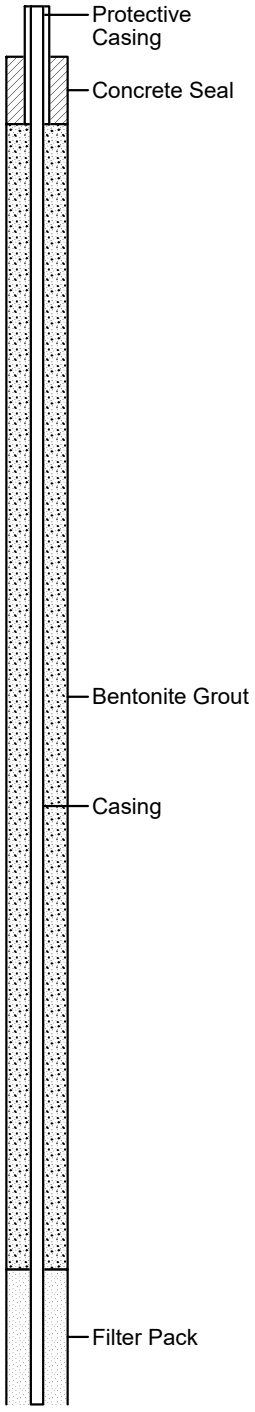
Project # 12313.5

Date Started	: 03/11/21
Date Completed	: 03/11/21
Drilling Method	: 8 1/4 HSA
Drill Rig	: Geoprobe
Driller Name/Co.	: Matt / Cabeno Env. Serv.

Boring Depth	: 35.0
Well Bottom Depth	: 30.0
Surface Elevation	: 465.71 ft. above MSL
Top of Casing Elev.	: 468.17 ft. above MSL
Groundwater Elev.	: 440.65 ft. above MSL
Riser Material	: 2 " Sch 40 PVC
Screen Material	: 2 " Sch 40 PVC, 0.01 slot
Coordinate N	:
Coordinate E	:
Logged By	: M. Dolan

Depth in Feet	Surf. Elev. 466	DESCRIPTION	Recovery (in.)	REMARKS
0	465.5	CLAY, black, dark brown, top soil, dry.		
		CLAY, dark brown, black cinders, dry.		
		SAND and GRAVEL, brown, black cinders, dry.	36	
		SAND and fine grained GRAVEL, brown, dry.		
5	460.5	CLAY with SAND and GRAVEL, black, dark brown, dry.	30	
10	455.5	SAND and GRAVEL, coarse, trace CLAY, brown, dry.	42	
		SILTY SAND, trace GRAVEL, brown, dry.		
15	450.5	CLAY, black, stiff, dry	42	
		SILT, trace SAND, black, gray, organic, moist		
20				

Well: MW-21
Elev.: 468.17



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ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG and Associates, Inc.

Midwest Generation, LLC
Powerton Station
Pekin, IL

Project # 12313.5

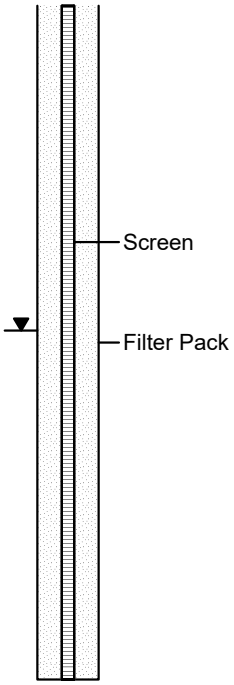
GEOLOGIC LOG OF MW-21

(Page 2 of 2)

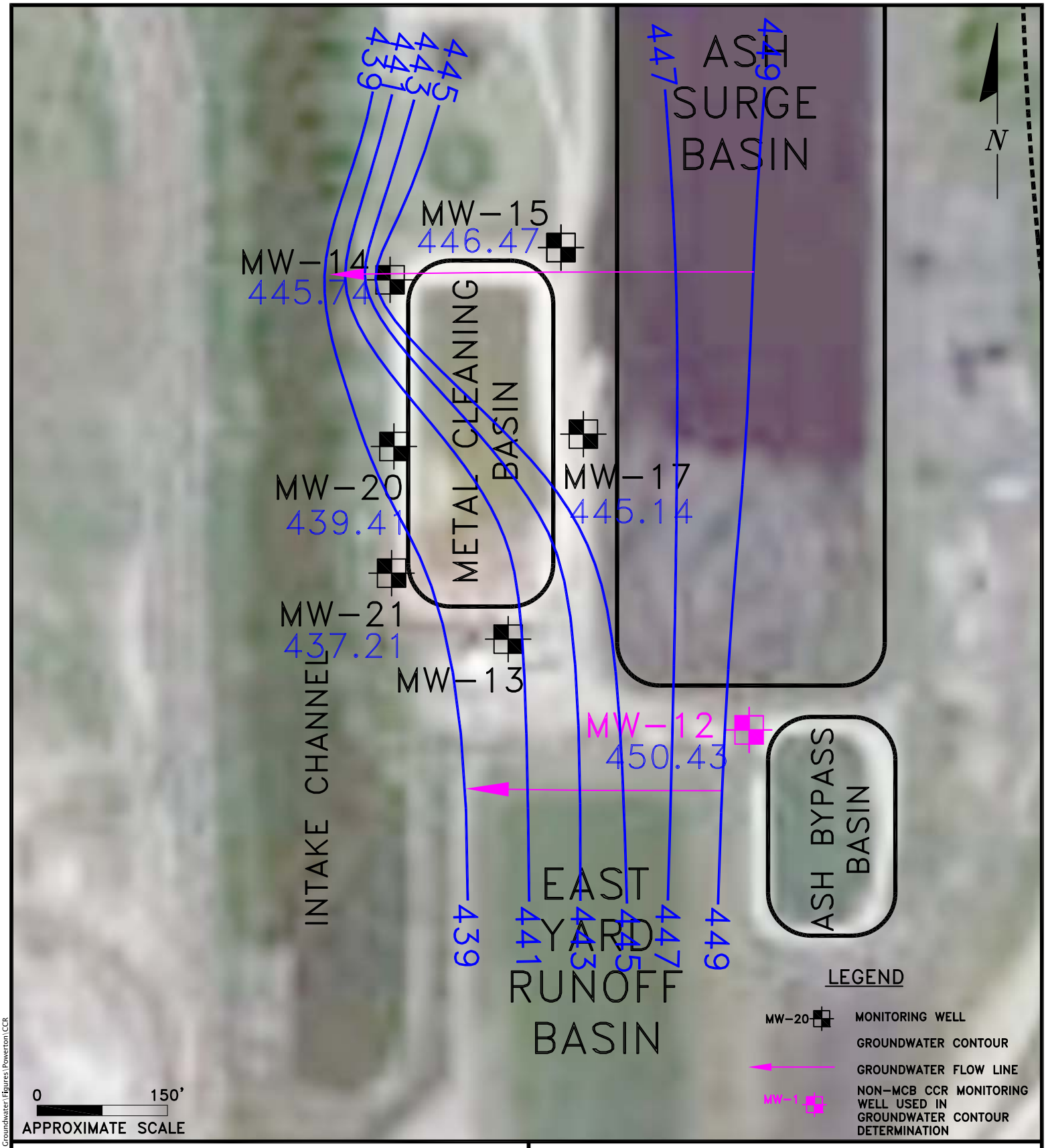
Date Started	: 03/11/21
Date Completed	: 03/11/21
Drilling Method	: 8 1/4 HSA
Drill Rig	: Geoprobe
Driller Name/Co.	: Matt / Cabeno Env. Serv.

Boring Depth	: 35.0
Well Bottom Depth	: 30.0
Surface Elevation	: 465.71 ft. above MSL
Top of Casing Elev.	: 468.17 ft. above MSL
Groundwater Elev.	: 440.65 ft. above MSL
Riser Material	: 2 " Sch 40 PVC
Screen Material	: 2 " Sch 40 PVC, 0.01 slot
Coordinate N	:
Coordinate E	:
Logged By	: M. Dolan

Depth in Feet	Surf. Elev. 466	DESCRIPTION	Recovery (in.)	REMARKS
20	445.5		60	
25	440.5		60	
30	435.5	SILT, trace very fine grained SAND, black, gray, organic, stiff, wet.	48	
35	430.5	CLAYEY SILT, trace very fine grained SAND, black, gray, organic, stiff, wet.		
40		End of Boring at 35 feet.		



ATTACHMENT 9-3
MONTHLY GROUNDWATER FLOW MAPS



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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

POTENTIOMETRIC MAP 05/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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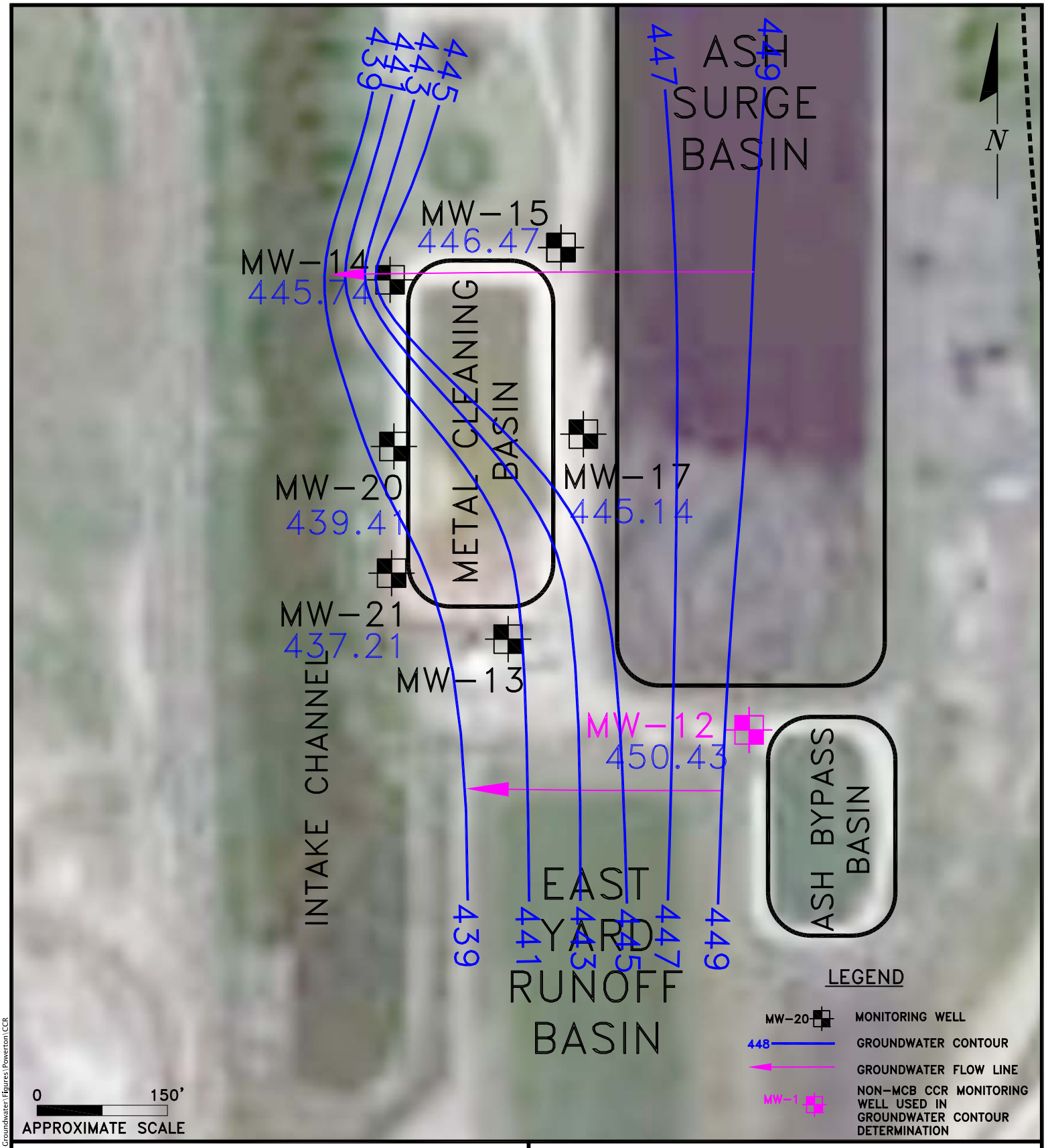

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POTENTIOMETRIC MAP 06/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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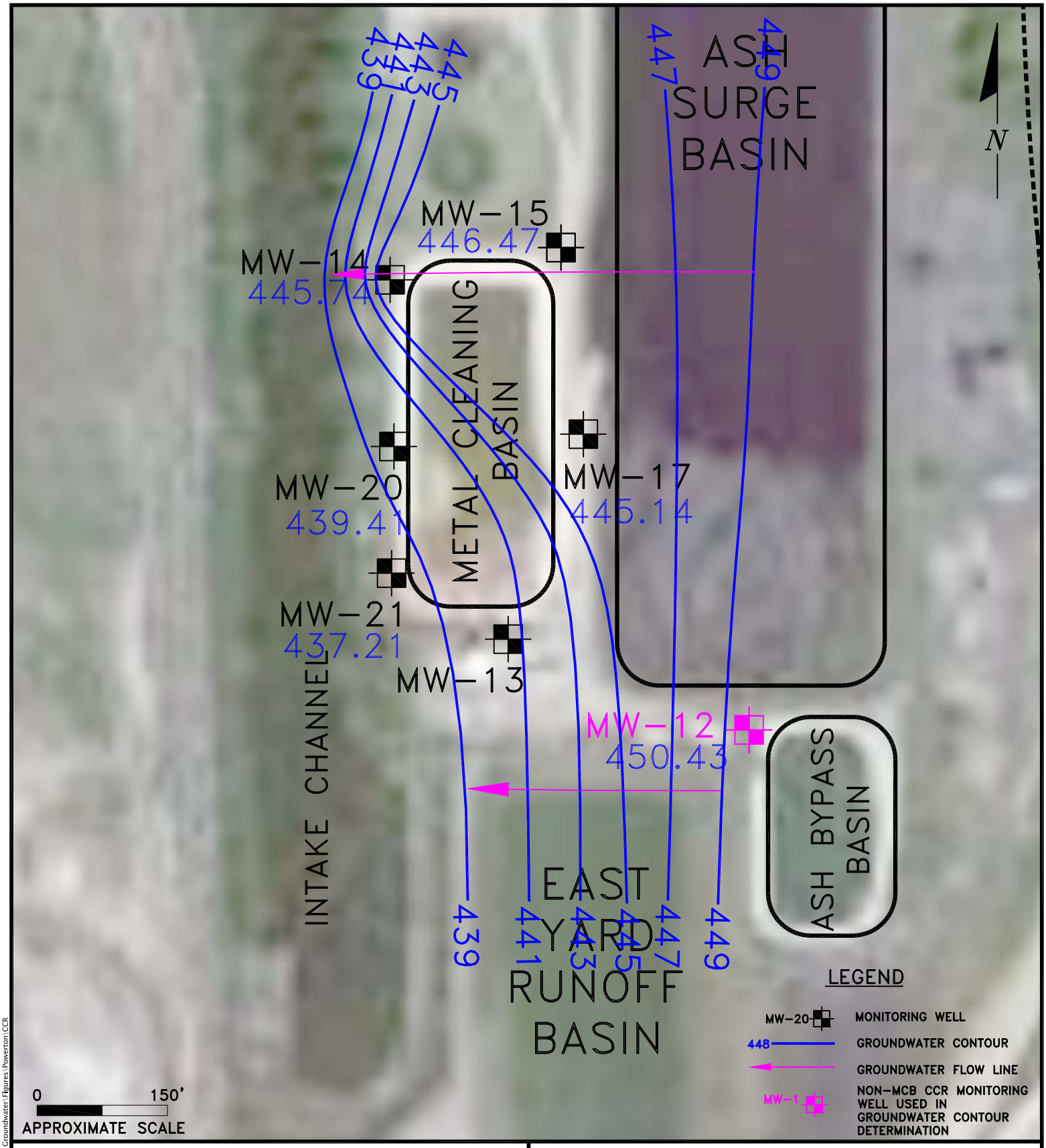

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POTENTIOMETRIC MAP 07/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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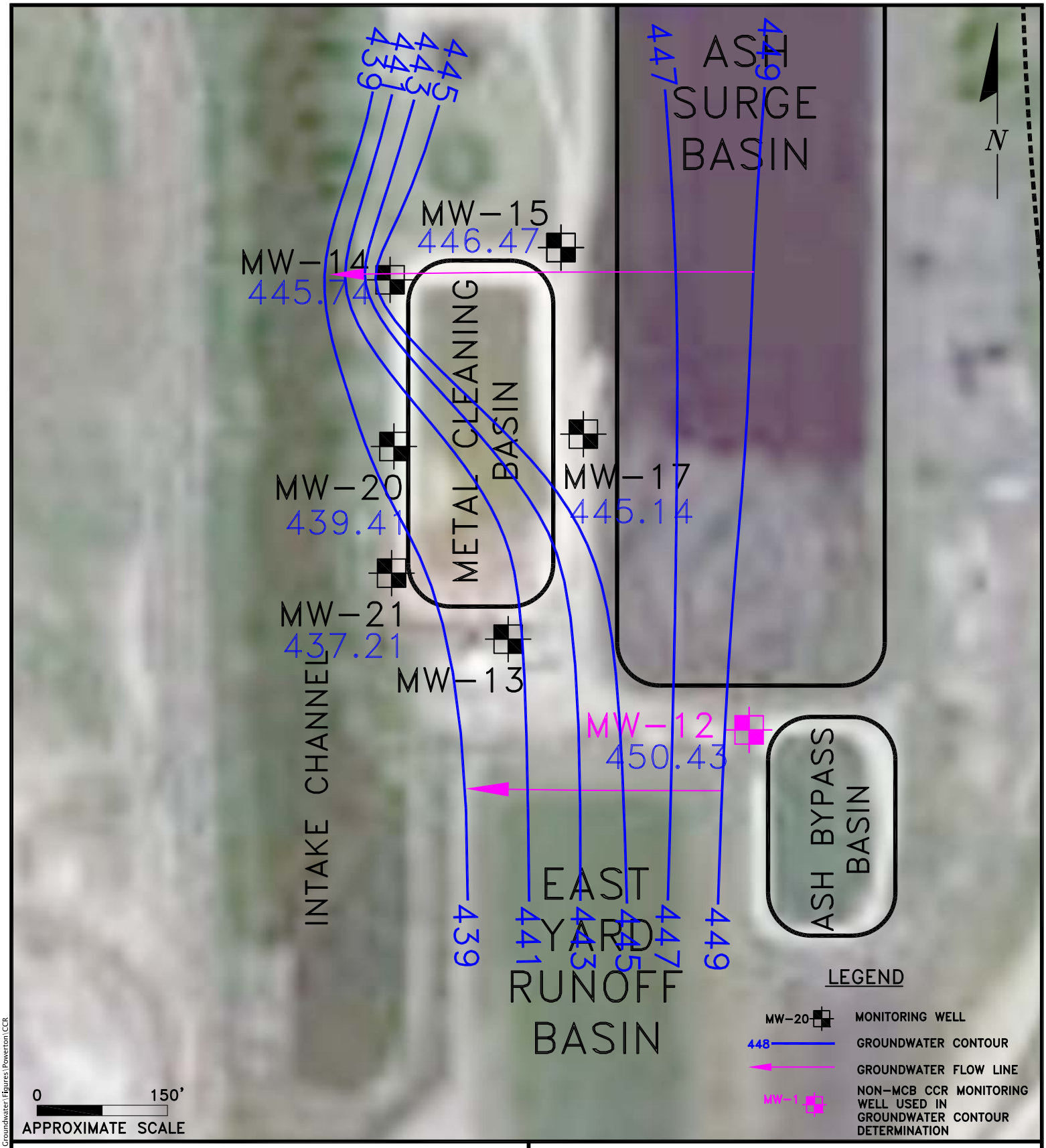

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POTENTIOMETRIC MAP 08/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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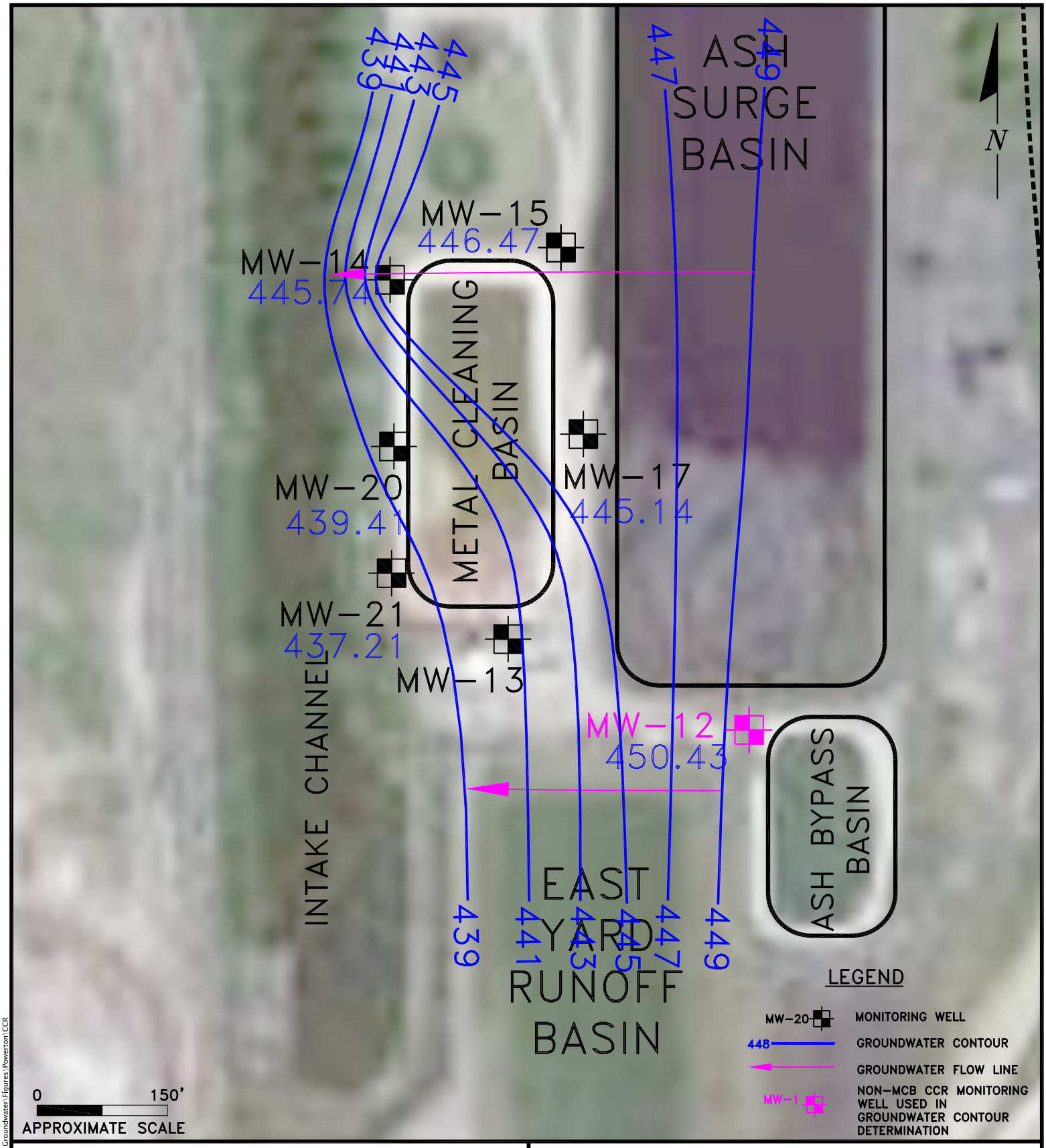

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POTENTIOMETRIC MAP 09/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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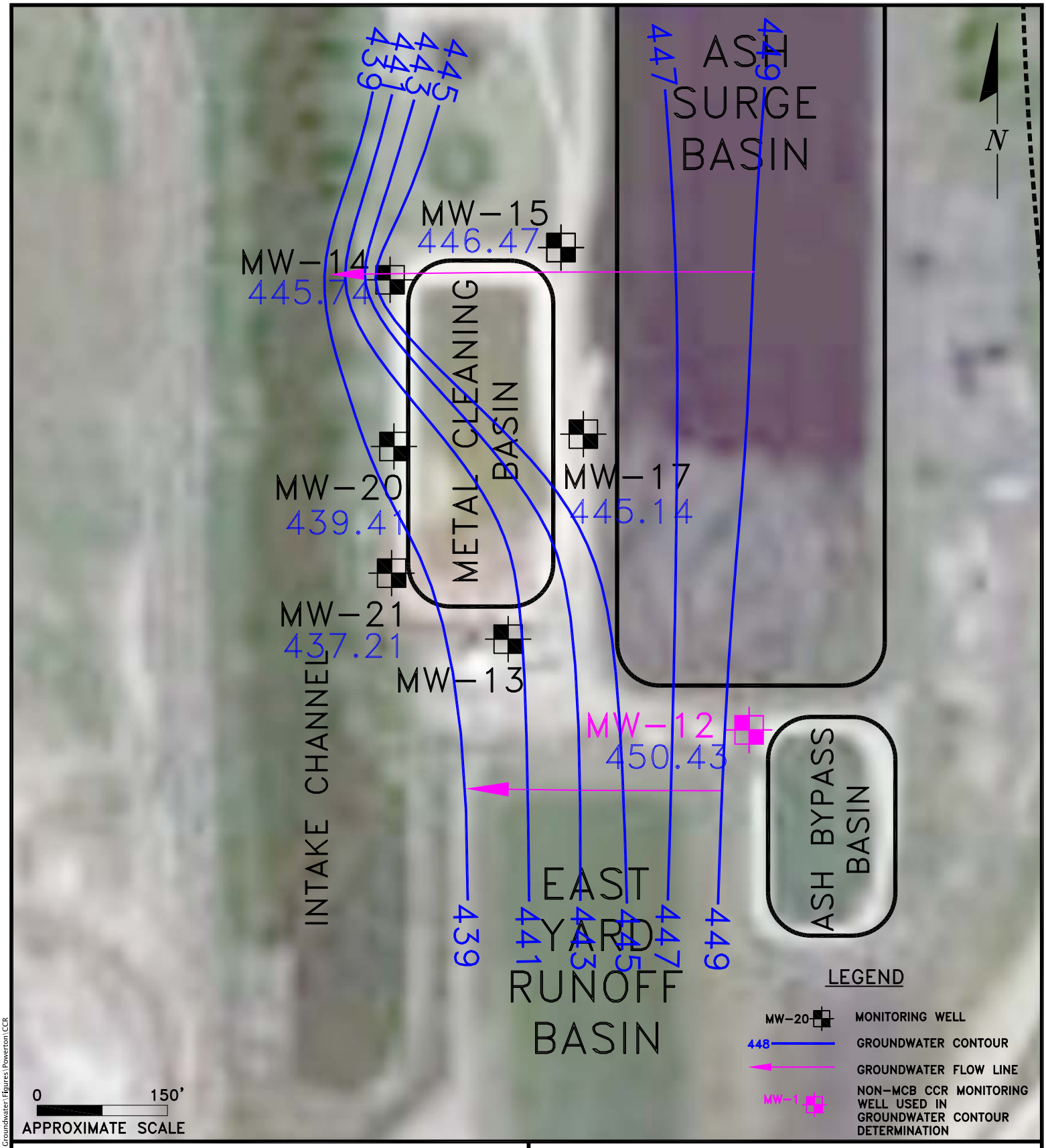

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POTENTIOMETRIC MAP 10/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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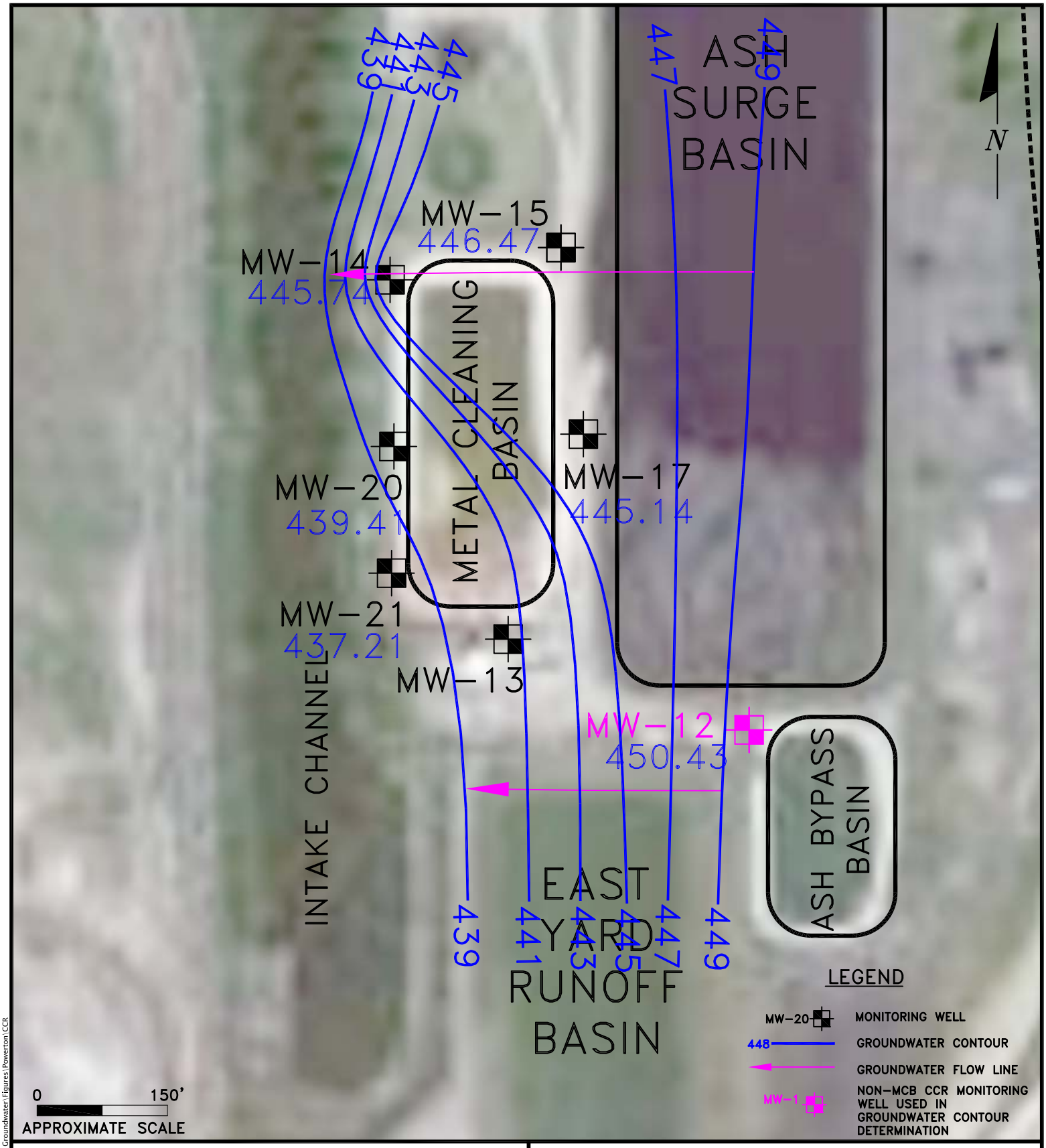

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POTENTIOMETRIC MAP 11/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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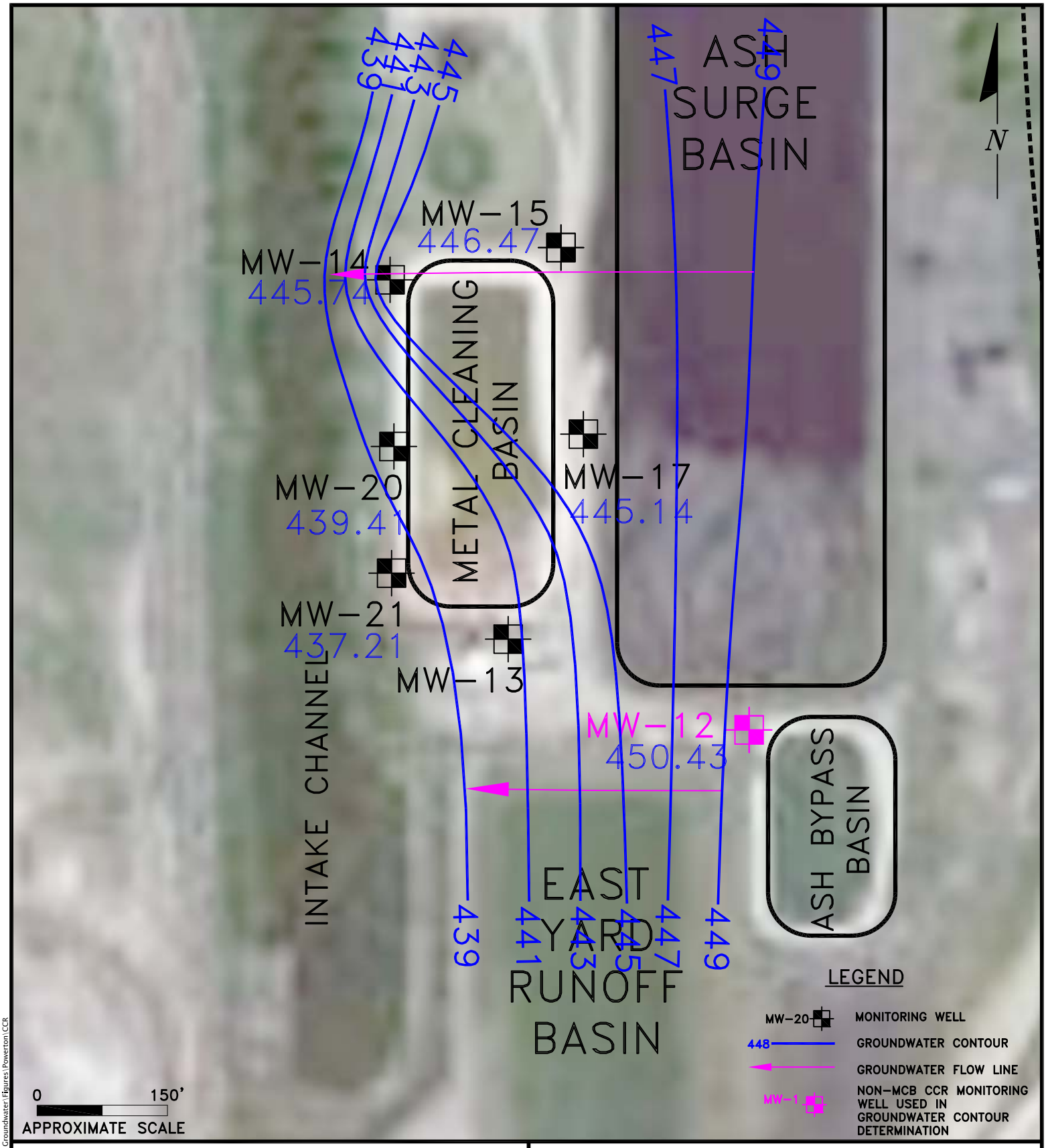

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POTENTIOMETRIC MAP 12/2021

POWERTON STATION METAL CLEANING BASIN
PEKIN, ILLINOIS

Scale: 1" = 150' | Date: January 20, 2022

KPRG Project No. 12313.5 | ATTACHMENT 9-3

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ATTACHMENT 9-4
HISTORICAL CCA GROUNDWATER DATA

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	
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	0.0048	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
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
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	0.45	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
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	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
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
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	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
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
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
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
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
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
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
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
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
Nitrogen/Nitrate, Nit	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
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	0.0016	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
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	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
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 Solic	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
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
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	7.46	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
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 *
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
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
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

Sample: MW-01	8/28/2014		10/29/2014		2/23/2015		5/11/2015		8/18/2015		11/16/2015		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	
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	0.0030	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	0.0036	0.003	ND	0.003	ND	0.003	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	0.001	0.0042	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.046	0.0025	0.049	0.0025	0.037	0.0025	0.038	0.0025	0.065	0.0025	0.054	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
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	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	0.16	0.050	0.075	0.050	0.059	0.050	0.087	0.050	0.30	0.050	0.94	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
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2.0	58	2.0	42	2.0	37	2.0	67	2.0	58	2.0	44	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
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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.15	0.10	0.18	0.10	0.17	0.10	0.23	0.10	0.16	0.10	0.18	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
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	0.1	ND	0.1	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	ND	0.0025	ND	0.0025	0.0043	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	0.0054	0.0025	ND	0.0025	ND	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	0.00020	ND	0.00020	ND F2	0.00020	ND	0.0002	ND	0.0002	0.00081	0.0002	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	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	1.5	0.10	4.4	0.10	4.1	0.10	2.6	0.10	0.27	0.10	4.3	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
Nitrogen/Nitrate, Nit	0.10	1.5	0.50	4.4	0.50	4.1	0.20	2.6	0.10	0.27	0.50	4.3	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
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	0.02	ND	0.02	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	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	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
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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	10	36	20	54	10	43	10	50	20	55	20	66	10	57	10	59	10	51	10	55	10	58	10	40	20	69	20	57	20	42	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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	350	10	410	10	470	10	450	10	650	10	510	10	460	10	500	10	620	10	480	10	500	10	470	10	440	10	660	10	500	10	530
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	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0016	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
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0053	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
pH	NA	7.25	NA	7.25	NA	6.93	NA	7.39	NA	6.89	NA	7.07	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
Temperature	NA	21.57	NA	17.15	NA	1.92	NA	14.01	NA	22.91	NA	13.85	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
Conductivity	NA	0.71	NA	0.92	NA	0.44	NA	0.65	NA	1.01	NA	0.68	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
Dissolved Oxygen	NA	0.94	NA	1.63	NA	9.99	NA	4.82	NA	2.51	NA	1.62	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
ORP	NA	21.5	NA	-3.6	NA	150.7	NA	53.6	NA	-15.3	NA	118.2	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

Sample: MW-01	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		8/24/2021		11/30/2021	
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
Antimony	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	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
Barium	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	0.0025	0.055	0.0025	0.062
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.24	0.05	0.29
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
Chloride	2	46	2	42	2	67	2	55	2	38	2	46	2	54	10	36	2	39	2	53	4	61	2	49	4	40	6	41
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
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
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
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	0.005	ND	0.005	0.0064 *	0.005	ND	0.005	ND	0.005	ND ^-	0.005	0.0051 *-
Fluoride	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	0.1	0.17	0.1	0.19
Iron	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	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
Manganese	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	0.0025	ND	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	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
Nitrogen/Nitrate	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	0.1	3.3	0.1	4.1
Nitrogen/Nitrate, Nit	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	0.5	3.3	0.5	4.1
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 ^1+	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
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0054	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0064
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
Sulfate	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	10	54	5	29 ^+ ^-
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
Total Dissolved Solic	10	370	10	530	10	470	10	410	10	580	10	380	10	410	10	500	30	440	10	420	10	430	10	380	10	490	10	440
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
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
Benzene	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	0.0005	ND	0.0005	ND
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.19	NA	7.14
Temperature	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	NA	18.50	NA	17.80
Conductivity	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	NA	0.85	NA	0.76
Dissolved Oxygen	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	NA	1.57	NA	4.73
ORP	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	NA	224.2	NA	165.6

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 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	
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	0.015	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
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
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	0.38	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
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	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
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
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	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
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	0.30	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
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
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	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
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
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
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
Nitrogen/Nitrate, Nit	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
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
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	0.0017	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
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	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
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 Solic	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
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	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
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	7.91	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
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 *
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
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
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

Sample: MW-02	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		5/1/2017		8/23/2017		11/7/2017		3/6/2018		5/15/2018	
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	0.0030	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	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	0.0015	0.0010	0.0016	0.0010	0.0017	0.0010	ND	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
Barium	0.0025	0.071	0.0025	0.067	0.0025	0.051	0.0025	0.055	0.0025	0.072	0.0025	0.066	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
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	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	1.1	0.050	0.078	0.050	0.082	0.050	0.11	0.050	0.41	0.050	0.50	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
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2.0	58 ^	2.0	44	2.0	54	10	92	2.0	51	2.0	45	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
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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	ND	0.002	ND
Cyanide	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	0.01	ND	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.19	0.10	0.22	0.10	0.17	0.10	0.22	0.10	0.22	0.10	0.18	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
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	0.1	ND	0.1	ND	0.1	ND
Lead	0.00050	ND	0.00050	0.0013	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.015	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	0.0025	ND	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 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
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	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	0.28	0.10	4.3	0.10	5.9	0.10	1.2	0.10	ND	0.10	3.2	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
Nitrogen/Nitrate, Nit	0.10	0.28	0.50	4.3	0.50	5.9	0.10	1.2	0.10	ND ^	0.20	3.2	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
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	0.02	ND	0.02	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	0.004	ND F1	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	0.00050	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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	20	76	20	49	10	57	10	41	10	53	20	77	20	73	10	54	10	39	10	53	10	50	25	60	20	57	25	83	20	45	20	57
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	460	10	440	10	510	10	490	10	540	10	480	10	440	10	470	10	370	10	470	10	510	10	500	10	420	10	530	10	490	10	500
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	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.001	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
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00055	0.0025	0.0042	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
pH	NA	7.01	NA	7.37	NA	8.13	NA	7.86	NA	7.28	NA	7.12	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
Temperature	NA	20.87	NA	17.43	NA	2.61	NA	12.12	NA	24.86	NA	13.93	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
Conductivity	NA	0.76	NA	0.78	NA	0.49	NA	0.66	NA	0.86	NA	0.64	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
Dissolved Oxygen	NA	0.46	NA	2.96	NA	11.55	NA	1.99	NA	1.52	NA	8.66	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
ORP	NA	35.9	NA	60.1	NA	113.1	NA	87.3	NA	-37.7	NA	112.9	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

Sample: MW-02	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		8/24/2021		11/30/2021	
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
Antimony	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	0.003	ND	0.003	ND
Arsenic	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	0.001	ND	0.001	ND
Barium	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	0.0025	0.075	0.0025	0.066
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.56	0.05	0.17
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
Chloride	2	55	2	42	2	51	2	51	2	49	2	46	2	55	10	47	2	42	2	43	4	44	2	50	4	47	6	42
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^-	0.005	ND *-
Fluoride	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	0.1	0.17	0.1	0.14
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
Lead	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	0.0005	ND	0.0005	ND
Manganese	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	0.0002	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
Nitrogen/Nitrate	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	0.1	7.3	0.1	4.5
Nitrogen/Nitrate, Nit	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	0.5	7.3	0.5	4.5
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 ^1+	0.02	ND	0.02	ND ^1+	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
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
Silver	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	0.0005	ND	0.0005	ND
Sulfate	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	10	54	5	36 ^+ ^-
Thallium	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	0.002	ND	0.002	ND
Total Dissolved Solic	10	560	10	480	10	400	10	440	10	420	10	420	10	380	10	390	30	450	10	340	10	540	10	300	10	410	10	420
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
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
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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.31	NA	7.39
Temperature	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	NA	18.30	NA	12.70
Conductivity	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	NA	0.85	NA	0.78
Dissolved Oxygen	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	NA	0.62	NA	5.75
ORP	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	NA	185.8	NA	106.4

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 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	
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	0.0057	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
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
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	0.75	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
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	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
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
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	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
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	0.3	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
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
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
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
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
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
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
Nitrogen/Nitrate, Nit	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
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	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
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	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
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 Solic	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
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	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
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	7.43	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
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
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
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
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

Sample: MW-03	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		5/1/2017		8/23/2017		11/7/2017		3/6/2018		5/15/2018	
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	0.0030	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	0.003	0.003	ND	0.003	ND	0.0030	ND
Arsenic	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	0.0010	0.0010	0.0017	0.0010	ND	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
Barium	0.0025	0.070	0.0025	0.063	0.0025	0.048	0.0025	0.045	0.0025	0.054	0.0025	0.061	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
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	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	0.37	0.050	0.14	0.050	0.32	0.050	0.086	0.050	0.34	0.050	0.30	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
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	79	2.0	47	2.0	47	2.0	48	2.0	45	2.0	43	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
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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	ND	0.002	ND
Cyanide	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	0.010	ND	0.010	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.25	0.10	0.25	0.10	0.23	0.10	0.22	0.10	0.30	0.10	0.29	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
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	0.1	ND	0.1	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.016	0.0025	0.0031	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	0.00020	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	0.0002	ND	0.0002	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	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	ND	0.10	2.4	0.10	2.0	0.10	2.7	0.10	ND	0.10	0.19	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
Nitrogen/Nitrate, Nit	0.10	ND	0.50	2.4	0.10	2.0	0.20	2.7	0.10	ND ^	0.10	0.19	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
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	0.02	ND	0.02	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	0.004	ND	0.004	ND	0.004	ND
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0046	0.0025	ND	0.0025	ND	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
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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	25	100	10	40	10	46	10	39	10	48	20	50	20	77	20	78	20	74	10	46	10	50	20	54	20	42	20	56	10	64	25	55
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	490	10	440	10	400	10	380	10	420	10	380	10	400	10	450	10	530	10	450	10	460	10	510	10	410	10	460	10	400	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	0.005	ND	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.002	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
BETX	0.0025	ND	0.0025	0.0012	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0054	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
pH	NA	6.97	NA	7.43	NA	7.75	NA	7.63	NA	7.63	NA	7.12	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
Temperature	NA	19.57	NA	19.36	NA	8.51	NA	10.39	NA	25.85	NA	19.09	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
Conductivity	NA	0.83	NA	0.79	NA	0.49	NA	0.53	NA	0.74	NA	0.60	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
Dissolved Oxygen	NA	0.48	NA	2.33	NA	3.65	NA	6.34	NA	3.10	NA	1.01	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
ORP	NA	45	NA	52	NA	102.3	NA	107.9	NA	-35.7	NA	92.5	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

Sample: MW-03	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		8/24/2021		11/30/2021	
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
Antimony	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	0.0030	ND	0.0030	ND
Arsenic	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	0.001	ND	0.001	ND
Barium	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	0.0025	0.068	0.0025	0.064
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.41	0.05	0.24
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
Chloride	2	67	2	44	2	56	2	48	2	51	2	50	2	53	10	49	2	47	2	44	4	53	4	49	4	45	6	47
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^-	0.005	ND *-
Fluoride	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	0.1	0.25	0.1	0.27
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
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
Manganese	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	0.0025	ND	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	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
Nitrogen/Nitrate	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	0.1	3.4	0.1	3.1
Nitrogen/Nitrate, Nit	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	0.5	3.4	0.5	3.1
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 ^1+	0.02	ND	0.02	ND ^1+	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
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	0.0032	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
Sulfate	20	53	5	29	25	27	5	39	5	15	5	32	5	71	5	34	5	43	25	59	25	54	5	40	5	31	5	24 ^+ ^-
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
Total Dissolved Solic	10	530	10	410	10	400	10	420	10	420	10	390	10	410	10	340	30	350	10	410	10	520	10	370	10	260	10	380
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
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
Benzene	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	0.0005	ND	0.0005	ND
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.15	NA	7.20
Temperature	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	NA	18.9	NA	16.5
Conductivity	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	NA	0.76	NA	0.69
Dissolved Oxygen	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	NA	1.39	NA	2.55
ORP	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	NA	190.1	NA	94.4

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 millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

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		7/31/2013		10/21/2013		3/5/2014		5/27/2014	
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	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	0.0010	ND	0.0010	ND	0.0010	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	0.0025	0.048	0.0025	0.062	0.0025	0.039	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
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	0.050	0.67	0.050	0.81	0.050	0.81	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
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	2.0	70	10	150	10	130	10	92
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	0.0050	ND	0.0050	ND	0.0050	ND^	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	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	0.0033	0.003	0.01	0.003	ND	0.003	ND	0.003	ND	0.010	ND	0.003	ND	0.0020	ND	0.0020	0.0024	0.0020	0.0025	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	0.3	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	0.10	0.31	0.10	0.21	0.10	0.29	0.10	0.23
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	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
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	0.0025	0.13	0.0025	0.27	0.0025	0.026	0.0025	0.029
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
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	0.0020	0.0023	0.0020	0.0039	0.0020	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	0.10	ND	0.10	0.50	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nit	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	0.50	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	0.0022	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	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
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	50	190	100	260	50	200	100	320
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 Solic	1,200	NP	680	17	620	17	470	17	580	17	520	17	660	17	600	17	800	26	720	26	640	10	350	10	670	10	980	10	780	10	980
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	7.27	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	NA	7.02	NA	7.00	NA	8.00	NA	7.04
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	NA	26.31	NA	16.83	NA	11.96	NA	17.48 *
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	NA	1.08	NA	1.15	NA	0.81	NA	1.20
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	NA	0.24	NA	0.53	NA	1.63	NA	2.01
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	NA	4.1	NA	-169.7	NA	-57	NA	13.7

Sample: MW-04	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		5/1/2017		8/28/2017		11/7/2017		3/6/2018		5/15/2018	
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	0.0030	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	0.003	ND	0.003	ND	0.003	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	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	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	0.0025	0.029	0.0025	0.026	0.0025	0.046	0.0025	0.057	0.0025	0.033
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.050	0.55	0.05	0.69	0.05	0.51	0.05	0.099	0.05	0.63
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	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	2.0	58	10	77	10	93	10	81	2	68
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	0.005	ND	0.005	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	0.001	ND	0.001	ND	0.001	ND
Copper	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	0.0020	ND	0.002	ND	0.002	ND	0.002	0.0023	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 H	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.10	0.19	0.1	0.29	0.1	0.21	0.1	0.26	0.1	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	0.1	ND	0.1	ND	0.1	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	ND	0.0025	0.46	0.0025	0.025	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	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	0.0002	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.0020	ND	0.002	0.0029	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	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	0.10	0.38	0.1	ND	0.1	1.5	0.1	4.2	0.1	ND
Nitrogen/Nitrate, Nit	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	0.10	0.38	0.1	ND	0.1	1.5	0.5	4.2	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	0.02	ND	0.02	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	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	0.0033	0.0025	ND	0.0025	ND	0.0025	ND ^	0.0025	0.0049	0.0025	0.0026	0.0025	ND	0.0025	0.0071	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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	260	100	390	25	100	20	120	10	47	25	75	20	74	20	65	20	61	10	30	20	68	25	67	25	80	50	120	10	50	25	100
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	880	10	1100	10	580	10	540	10	470	10	550	10	420	10	480	10	590	10	510	10	510	10	540	10	640	10	700	10	410	10	650
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 ^	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	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	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	0.0056	0.0025	0.00069	0.0025	0.0013	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00722	0.0025	0.0015	0.0025	0.00097
pH	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	NA	7.34	NA	7.13	NA	6.80	NA	7.19	NA	7.63
Temperature	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	NA	12.10	NA	20.80	NA	13.71	NA	7.31	NA	15.20
Conductivity	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	NA	0.61	NA	0.80	NA	0.71	NA	0.43	NA	0.56
Dissolved Oxygen	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	NA	5.49	NA	0.42	NA	5.10	NA	2.30	NA	8.73
ORP	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	NA	-4.5	NA	196.4	NA	-5.5	NA	-10.1	NA	5.0

Sample: MW-04	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		8/24/2021		11/30/2021	
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
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
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
Barium	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	0.0025	0.025	0.0025	0.036
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.67	0.05	0.43
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
Chloride	2	69	10	86	2	55	2	47	2	58	2	53	2	51	2	50	2	56	10	88	6	62	4	44	4	48	6	57
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND ^-	0.005	0.0051 *-
Fluoride	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	0.1	0.34	0.1	0.25
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
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
Manganese	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	0.0025	0.075	0.0025	0.034
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
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	0.0022	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	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	0.1	0.64	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	0.64	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 ^1+	0.02	ND	0.02	ND ^1+	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
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
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
Sulfate	20	50	50	100	50	59	5	36	5	15	5	66	5	71	5	54 ^	5	23	15	97	15	86	15	80	5	14	15	62 ^+ ^-
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
Total Dissolved Solic	10	460	10	710	10	450	10	380	10	520	10	440	10	390	10	380	30	420	10	530	10	560	10	430	10	290	10	560
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
Zinc	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	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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.12	NA	6.95
Temperature	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	NA	23.10	NA	15.50
Conductivity	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	NA	0.76	NA	0.95
Dissolved Oxygen	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	NA	1.74	NA	0.76
ORP	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	NA	170.5	NA	73.7

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 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		7/31/2013		10/21/2013		3/5/2014		5/27/2014	
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	0.0011	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	0.0010	ND	0.0010	ND	0.0010	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	0.0025	0.092	0.0025	0.088	0.0025	0.059	0.0025	0.052
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	0.95	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	0.050	0.64	0.050	0.83	0.050	0.70	0.050	0.76
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	150	25	120	10	89	25	160	25	140	10	82	50	100	50	150	25	170	50	110	10	92	10	150	10	170	10	120	10	80
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	0.0050	ND	0.0050	ND	0.0050	ND^	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	0.0010	0.0015	0.0010	0.0015	0.0010	ND	0.0010	ND
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	0.0020	ND	0.0020	0.0027	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	0.27	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	0.10	0.24	0.10	0.24	0.10	0.35	0.10	0.29
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	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
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	0.0025	0.29	0.0025	0.62	0.0025	0.077	0.0025	0.043
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
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	0.0020	0.0059	0.0020	0.0068	0.0020	0.0038	0.0020	0.0036
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	0.10	ND	0.10	0.34	0.10	0.74	0.10	2.2
Nitrogen/Nitrate, Nit	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	0.34	0.10	0.77	0.50	2.2
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	ND	0.020	ND	0.020	ND	0.020	0.033	0.020	0.026
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	0.0019	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	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
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	100	290	100	260	50	180	50	150
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 Solic	1,200	NP	740	17	680	17	640	17	890	17	820	17	590	17	700	17	890	26	840	26	790	10	990	10	1000	10	1100	10	840	10	640
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	7.24	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	NA	6.82	NA	6.89	NA	7.69	NA	7.01
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	NA	17.75	NA	14.79	NA	12.62	NA	20.54
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	NA	1.25	NA	1.33	NA	0.28	NA	1.01
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	NA	0.36	NA	0.32	NA	1.17	NA	0.53
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	NA	55.5	NA	-197	NA	-51	NA	-59.6

Sample: MW-05	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		5/1/2017		8/28/2017		11/7/2017		3/6/2018		5/15/2018	
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	0.0030	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	0.003	ND	0.003	ND	0.003	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	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	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	0.0025	0.055	0.0025	0.063	0.0025	0.057	0.0025	0.072	0.0025	0.057
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.050	0.68	0.05	0.57	0.05	0.45	0.05	0.34	0.05	0.56
Cadmium	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	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	0.00053	0.0005	ND
Chloride	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	10	92	10	120	10	110	10	110	10	90
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	0.005	ND	0.005	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	0.001	ND	0.001	ND	0.001	ND
Copper	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	0.0020	ND	0.002	ND	0.002	ND	0.002	0.0022	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 H	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.10	0.27	0.1	0.33	0.1	0.32	0.1	0.21	0.1	0.29
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	0.1	ND	0.1	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	0.024	0.0025	0.032	0.0025	ND	0.0025	0.77	0.0025	0.015
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	0.00021	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.0020	0.0022	0.002	0.0027	0.002	ND	0.002	0.0039	0.002	ND
Nitrogen/Nitrate	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	0.10	ND	0.1	ND	0.1	0.22	0.1	3.7	0.1	ND
Nitrogen/Nitrate, Nit	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	0.10	ND	0.1	ND	0.1	0.22	0.2	3.7	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	0.02	ND	0.02	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	0.004	ND	0.004	ND	0.004	ND
Selenium	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 ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0031	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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	200	50	310	20	110	50	150	50	250	50	180	25	130	25	140	50	160	25	94	50	130	50	180	50	230	50	140	20	64	50	230
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	870	10	910	10	570	10	730	10	860	10	810	10	550	10	690	10	800	10	630	10	720	10	720	10	880	10	690	10	570	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	0.005	ND ^	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	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	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	0.00278	0.0025	ND	0.0025	0.0011	0.0025	0.0006	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0021	0.0025	0.00092	0.0025	0.00073
pH	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	NA	7.60	NA	7.05	NA	6.87	NA	7.10	NA	7.70
Temperature	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	NA	12.43	NA	16.90	NA	13.03	NA	10.12	NA	16.71
Conductivity	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	NA	0.82	NA	1.06	NA	0.82	NA	0.63	NA	0.83
Dissolved Oxygen	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	NA	3.43	NA	0.49	NA	4.09	NA	1.68	NA	4.33
ORP	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	NA	-142.5	NA	232.2	NA	-9.6	NA	-43.3	NA	-9.7

Sample: MW-05	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		8/24/2021		11/30/2021	
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
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
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
Barium	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	0.0025	0.041	0.0025	0.048
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.51	0.05	0.58
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
Chloride	10	120	10	120	10	87	2	74	10	78	2	72	2	80	2	56	2	70	10	80	6	70	4	53	4	64	6	67
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
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
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
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	0.005	ND	0.005	ND	0.005	0.0069	0.005	ND	0.005	ND ^-	0.005	ND *-
Fluoride	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	0.1	0.31	0.1	0.31
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
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
Manganese	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	0.0025	0.031	0.0025	ND
Mercury	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	0.0002	ND	0.0002	ND
Nickel	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	0.002	0.0023	0.002	ND
Nitrogen/Nitrate	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	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	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 ^1+	0.02	ND	0.02	ND ^1+	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
Selenium	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	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
Sulfate	50	160	50	130	130	140	5	130	5	140	5	120	5	140	5	130 ^	25	92	15	110	25	110	15	100	25	100	15	100
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
Total Dissolved Solic	10	790	10	890	10	660	10	590	10	660	10	590	10	660	10	600	30	650	10	580	10	650	10	540	10	530	10	640
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
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
Benzene	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	0.0005	ND	0.0005	ND
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	6.84	NA	6.92
Temperature	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	NA	15.30	NA	14.40
Conductivity	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	NA	0.98	NA	1.06
Dissolved Oxygen	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	NA	0.22	NA	0.99
ORP	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	NA	220.9	NA	113.1

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 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		7/31/2013		10/23/2013		3/6/2014		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	0.0042	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	0.0010	0.0037	0.0010	0.0039	0.0010	0.0010	0.0010	0.20
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	0.0025	0.12	0.0025	0.11	0.0025	0.10	0.0025	0.54
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	0.5	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	0.050	0.62	0.050	0.51	0.050	0.34	0.050	0.35
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	200	50	160	50	210	50	150	50	150	50	200	50	190	50	240	50	200	10	99	10	200	10	210	10	230	10	230
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	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	0.0068
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	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	0.65	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	0.10	0.56	0.10	0.64	0.10	0.42	0.10	0.53
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	0.10	2.2	0.10	1.8	0.10	1.5	0.10	22
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	0.68	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	0.0025	0.70	0.0025	0.58	0.0025	0.68	0.013	8.0
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	0.0091	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	0.0020	ND	0.0020	0.0020	0.0020	ND	0.0020	0.0061
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	0.10	ND	0.10	0.16	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nit	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	0.16	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	0.0034	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	0.0025	ND	0.0025	0.0065	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	210	50	250	50	280	50	260	50	170	50	250	50	450	50	340	50	440	50	320	130	560	100	440	100	310	100	410	100	530
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 Solic	1,200	NP	950	17	990	17	1100	17	970	17	1000	17	1100	17	1300	17	1200	26	1200	26	1100	10	1400	10	1200	10	1100	10	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	0.0050	ND	0.0050	ND	0.0050	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	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	7.67	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	NA	7.37	NA	7.55	NA	8.21	NA	7.45
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	NA	24.20	NA	23.30	NA	10.06	NA	19.41 *
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	NA	1.71	NA	1.74	NA	1.01	NA	1.84
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	NA	0.14	NA	0.26	NA	1.24	NA	0.80
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	NA	-180.4	NA	-233.2	NA	-168.8	NA	-25.3

Sample: MW-06	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		5/2/2017		8/24/2017		11/8/2017		3/6/2018		5/18/2018	
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	0.0030	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	0.0030	ND	0.003	0.0033	0.003	ND	0.003	ND	0.003	ND
Arsenic	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	0.0010	ND	0.001	0.0016	0.001	0.0015	0.001	ND	0.001	ND
Barium	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	0.0025	0.077	0.0025	0.097	0.0025	0.098	0.0025	0.071	0.0025	0.072
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.050	0.36	0.05	0.36	0.05	0.3	0.05	0.3	0.05	0.39
Cadmium	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	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	230 ^	10	240	10	110	10	230	10	170	10	210	10	200	10	200 F1	10	210	10	180 F1	10	190	10	180	10	180	10	180	10	180	10	170
Chromium	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	0.0050	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND
Cobalt	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	0.0010	ND	0.001	ND	0.001	ND	0.001	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 F1	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
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 F1 F2	0.01	ND	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.10	0.31	0.1	0.62	0.1	0.6	0.1	0.36	0.1	0.37
Iron	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	0.10	ND	0.1	1.2	0.1	1.5	0.1	0.94	0.1	ND
Lead	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	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	0.086	0.0025	0.73	0.0025	0.95	0.0025	1.1	0.0025	0.48
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	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	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	0.10	0.19	0.1	ND	0.1	ND	0.1	0.11	0.1	0.22
Nitrogen/Nitrate, Nit	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	0.10	0.19	0.1	ND	0.1	ND	0.1	0.11	0.1	0.22
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	0.02	ND	0.02	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	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 F1	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 F1	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
Sulfate	100	300	100	380	100	360	100	350	100	400	100	490	100	390	250	500	100	380	100	470	100	390	100	420	100	340	100	410	100	350	100	460
Thallium	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	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	1300	10	1100	10	1100	10	1300	10	1400	10	1100	10	1100	10	1400	10	1200	10	1100	10	1000	10	1200	10	1100	10	1100	10	1000	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	0.005	ND	0.005	ND	0.005	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 F1	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
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	0.0005	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	0.0013	0.0025	0.00061	0.0025	0.00053	0.0025	0.00099	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00067	0.0025	0.0014	0.0025	ND
pH	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	NA	7.58	NA	7.38	NA	7.24	NA	7.42	NA	6.97
Temperature	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	NA	14.71	NA	22.90	NA	18.78	NA	8.80	NA	15.39
Conductivity	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	NA	1.26	NA	1.53	NA	1.43	NA	0.99	NA	1.18
Dissolved Oxygen	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	NA	2.84	NA	0.21	NA	1.56	NA	2.82	NA	8.16
ORP	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	NA	-79.2	NA	-102.3	NA	-141.4	NA	-83.1	NA	-33.8

Sample: MW-06	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		8/25/2021		11/30/2021	
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
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
Arsenic	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	0.001	0.0026	0.001	0.002
Barium	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	0.0025	0.065	0.0025	0.057
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.35	0.05	0.25
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
Chloride	10	190	10	170	10	170	10	180	10	160	10	150	10	150	10	140	10	140	10	140	10	130	10	130	10	140	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
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
Copper	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	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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND *-
Fluoride	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	0.1	0.49	0.1	0.48
Iron	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	0.1	0.94	0.1	0.89
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
Manganese	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	0.0025	0.65	0.0025	0.62
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
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
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	0.13 H	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	ND	0.1	ND
Nitrogen/Nitrite	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	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
Selenium	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	0.0025	0.0034	0.0025	0.0053
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
Sulfate	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	50	270	50	230 ^-
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
Total Dissolved Solic	10	1100	10	1100	10	1000	10	1100	10	970	10	920	10	830	10	1200	30	790	10	640	10	790	10	680	10	660	10	820
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
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
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
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	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
pH	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	NA	7.65	NA	7.61
Temperature	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	NA	20.50	NA	19.30
Conductivity	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	NA	1.37	NA	1.30
Dissolved Oxygen	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	NA	0.43	NA	0.53
ORP	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	NA	-77.1	NA	-173.4

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 millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

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, Nit	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 Solic	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		11/8/2017		3/6/2018		5/18/2018	
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	0.0030	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	0.003	ND	0.003	ND	0.003	ND
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	0.001	0.17	0.001	0.073	0.001	0.16 V
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	0.0025	0.49	0.0025	0.33	0.0025	0.5
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	0.001	ND	0.001	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	0.05	0.29	0.05	0.56	0.1	0.37
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	0.0005	ND	0.0005	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	10	160	10	170	10	150
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	0.005	ND	0.005	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	0.001	0.0056	0.001	0.0038	0.001	0.0061
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	0.002	ND	0.002	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	0.01	ND	0.01	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	0.1	0.41	0.1	0.46	0.1	0.41
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	0.1	16	0.1	5.5	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	0.0005	ND	0.0005	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	0.013	8.5	0.0025	3.9	0.005	6.6
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	0.0002	ND	0.0002	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	0.002	0.0058	0.002	0.0047	0.002	0.006
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	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	ND	0.1	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	0.02	ND	0.02	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	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	0.0026	0.0025	0.0029
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	0.0005	ND	0.0005	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	5	32	50	120	20	62
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	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	10	1200	10	1100	10	1300
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	0.005	ND	0.005	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	0.02	ND	0.02	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	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	0.00238	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0015	0.0025	0.002	0.0025	0.00077
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	NA	6.63	NA	7.01	NA	6.74
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	NA	15.76	NA	9.19	NA	17.83
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	NA	1.59	NA	1.13	NA	1.52
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	NA	4.41	NA	5.01	NA	7.09
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	NA	-69.3	NA	-33.4	NA	-61.4

Sample: MW-07	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		8/25/2021		11/30/2021	
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
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
Arsenic	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	0.001	0.13	0.001	0.14
Barium	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	0.0025	0.45	0.0025	0.46
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.51	0.05	0.54
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
Chloride	10	170	10	160	10	170	10	170	10	170	10	150	10	170	10	170	10	170	10	170	10	150	10	130	10	140	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
Cobalt	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	0.001	0.0043	0.001	0.0037
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
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	0.005	ND	0.005	ND	0.005	ND F1	0.005	0.0053	0.005	ND	0.005	0.0058 *-
Fluoride	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	0.1	0.44	0.1	0.48
Iron	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	0.1	17	0.1	16
Lead	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	0.0005	ND	0.0005	ND
Manganese	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	0.013	6.6	0.013	6.2
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
Nickel	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	0.002	0.0069	0.002	0.0048
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 H	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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
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
Selenium	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	0.0025	0.003	0.0025	0.0085
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
Sulfate	10	26	10	34	2	49	5	48	5	18	5	87	5	64	5	30	25	57	15	52	10	82	10	59	25	55	15	69 ^-
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
Total Dissolved Solic	10	1200	10	1300	10	1100	10	1100	10	1100	10	1100	10	1100	10	1100	60	1100	10	1000	10	1000	10	970	10	1100	10	1100
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
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
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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	6.55	NA	6.64
Temperature	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	NA	15.90	NA	19.80
Conductivity	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	NA	2.04	NA	1.96
Dissolved Oxygen	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	NA	0.18	NA	0.47
ORP	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	NA	-87.5	NA	-156.6

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 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, Nit	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 Solic	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		11/8/2017		3/7/2018		5/17/2018	
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	0.0030	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	0.003	ND	0.003	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	0.001	0.0016	0.001	0.0038	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	0.0025	0.11	0.0025	0.088	0.0025	0.055
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	0.001	ND	0.001	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	0.05	0.52	0.1	0.63	0.05	0.84
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	0.0005	ND	0.0005	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	10	280	10	250	10	180
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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	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	0.01	ND	0.01	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	0.1	0.43	0.1	0.46	0.1	0.39
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	0.1	0.7	0.1	0.71	0.1	0.2
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	0.0005	ND	0.0005	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	0.0025	0.33	0.0025	0.35	0.0025	0.16
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	0.0002	ND	0.0002	ND	0.0002	ND
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	0.002	ND	0.002	ND	0.002	ND
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	0.1	ND	0.1	0.14	0.1	0.17
Nitrogen/Nitrate, Nit	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	0.1	ND	0.1	0.14	0.1	0.17
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	0.02	ND	0.02	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	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	0.00050	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	0.0005	ND	0.0005	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	50	240	50	250	50	230
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	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	10	1100	10	1100	10	1100
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 ^	0.005	ND	0.005	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	0.02	ND	0.02	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	0.0005	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	0.0025	0.0013	0.0025	0.0017	0.0025	0.0013
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	NA	7.27	NA	7.17	NA	6.79
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	NA	14.04	NA	8.99	NA	18.33
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	NA	1.47	NA	1.22	NA	1.36
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	NA	1.83	NA	1.28	NA	3.53
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	NA	-81.1	NA	-92.1	NA	-36.6

Sample: MW-08	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		8/25/2021		12/1/2021	
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
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
Arsenic	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	0.001	ND	0.001	0.0013
Barium	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	0.0025	0.059	0.0025	0.091
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.61	0.05	0.55
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
Chloride	10	250	10	220	10	100	2	73	10	100	10	80	10	78	10	130	10	220	10	200	10	130	10	100	10	100	10	96
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	0.0054 *-
Fluoride	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	0.1	0.35	0.1	0.36
Iron	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	0.1	1.3	0.1	3.6
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
Manganese	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	0.0025	0.58	0.0025	0.59
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
Nickel	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	0.002	ND	0.002	ND
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	0.12	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	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
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
Selenium	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0053	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
Sulfate	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	50	100	15	66 ^-
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
Total Dissolved Solic	10	1100	10	1000	10	780	10	640	10	950	10	700	10	610	10	680	60	880	10	740	10	630	10	660	10	610	10	670
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
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
Benzene	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	0.0005	ND	0.0005	ND
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.28	NA	7.50
Temperature	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	NA	15.50	NA	14.30
Conductivity	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	NA	1.13	NA	1.08
Dissolved Oxygen	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	NA	0.20	NA	0.54
ORP	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	NA	-37.4	NA	-201.0

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 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, Nit	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 Solic	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		11/8/2017		3/7/2018		5/16/2018	
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	0.0030	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	0.003	ND	0.003	ND	0.003	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	0.001	0.0043	0.001	ND	0.001	ND	0.001	ND
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	0.0025	0.047	0.0025	0.055	0.0025	0.04
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	0.001	ND	0.001	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	0.05	3.4	1	4.1	1	4.1
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	0.0005	ND	0.0005	ND	0.0005	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	2	38	2	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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	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	0.01	ND	0.01	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	0.1	0.13	0.1	0.16	0.1	0.15
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	0.1	ND	0.1	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	0.0005	ND	0.0005	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	0.0025	0.16	0.0025	0.084	0.0025	0.085
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	0.0002	ND	0.0002	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	0.002	ND	0.002	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	0.1	2.1	0.1	6.6	0.1	10
Nitrogen/Nitrate, Nit	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	0.2	2.1	0.5	6.6	1	10
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	0.02	ND	0.02	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	0.004	ND	0.004	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	0.0025	ND	0.0025	0.0035	0.0025	0.0069
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	0.0005	ND	0.0005	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	50	170	50	200	50	210
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	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	10	620	10	690	10	780
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	0.005	ND	0.005	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	0.02	ND	0.02	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	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	0.00379	0.0025	0.00063	0.0025	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
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	NA	6.92	NA	6.95	NA	7.83
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	NA	14.50	NA	10.71	NA	16.88
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	NA	0.77	NA	0.65	NA	0.74
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	NA	2.43	NA	1.91	NA	2.48
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	NA	-51.7	NA	-43.0	NA	-20.5

Sample: MW-09	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		8/25/2021		12/1/2021	
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
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
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
Barium	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	0.0025	0.033	0.0025	0.036
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 ^1+	0.001	ND ^+	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.5	2.2	0.5	3.3
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
Chloride	2	36	2	39	2	37	2	39	2	36	2	32	2	38	2	35	2	34	2	33	2	32	2	32	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
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
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
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	0.005	ND	0.005	ND *	0.005	ND	0.005	ND	0.005	ND	0.005	ND *-
Fluoride	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	0.1	0.17	0.1	0.2
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
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
Manganese	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	0.0025	0.092	0.0025	0.052
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
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
Nitrogen/Nitrate	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	0.1	3.4	0.1	2.8
Nitrogen/Nitrate, Nit	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	0.5	3.4	0.5	2.8
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
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
Selenium	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	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
Sulfate	50	150	50	130	10	180	10	190	5	150	5	88	5	87	5	130 ^	25	120	15	64	25	80	25	120	25	130	25	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
Total Dissolved Solic	10	640	10	700	10	630	10	630	10	610	10	500	10	400	10	520	30	480	10	220	10	360	10	370	10	470	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 ^	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
Benzene	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	0.0005	ND	0.0005	ND
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.11	NA	7.22
Temperature	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	NA	13.50	NA	15.20
Conductivity	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	NA	0.84	NA	0.86
Dissolved Oxygen	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	NA	0.16	NA	0.48
ORP	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	NA	156.3	NA	7.2

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 millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-4. Table. CCA Groundwater Analytical Results - Midwest Generation LLC, Powerton Station, Pekin, IL

Sample: MW-10

Parameter	Standards	12/15/2010 DL	12/15/2010 Result	3/25/2011 DL	3/25/2011 Result	6/16/2011 DL	6/16/2011 Result	9/19/2011 DL	9/19/2011 Result	12/12/2011 DL	12/12/2011 Result	3/19/2012 DL	3/19/2012 Result	6/25/2012 DL	6/25/2012 Result	9/18/2012 DL	9/18/2012 Result	12/12/2012 DL	12/12/2012 Result	2/27/2013 DL	2/27/2013 Result	5/29/2013 DL	5/29/2013 Result	7/31/2013 DL	7/31/2013 Result	10/23/2013 DL	10/23/2013 Result	3/6/2014 DL	3/6/2014 Result	5/30/2014 DL	5/30/2014 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	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	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	0.0025	0.25
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	0.48	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	0.25	3.2
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	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	2.0	37
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^	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	0.0010	0.0012
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^	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	0.30	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	0.10	0.18
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	0.10	0.11
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	0.00050	ND
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	0.0025	1.6
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	0.015	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	0.0020	0.0038
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	0.10	2.1
Nitrogen/Nitrate, Nit	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	0.50	2.1
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	0.020	0.028
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	0.0042	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	0.0025	0.0073
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	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	50	140
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 Solic	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	10	630
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	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	7.04	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	NA	7.09
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	NA	18.61 *
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	NA	0.93
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	NA	3.29
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	NA	-39.0

Parameter	8/28/2014 DL	8/28/2014 Result	10/30/2014 DL	10/30/2014 Result	2/23/2015 DL	2/23/2015 Result	5/14/2015 DL	5/14/2015 Result	8/18/2015 DL	8/18/2015 Result	11/18/2015 DL	11/18/2015 Result	2/24/2016 DL	2/24/2016 Result	5/18/2016 DL	5/18/2016 Result	8/19/2016 DL	8/19/2016 Result	11/16/2016 DL	11/16/2016 Result	2/15/2017 DL	2/15/2017 Result	5/2/2017 DL	5/2/2017 Result	8/24/2017 DL	8/24/2017 Result	11/9/2017 DL	11/9/2017 Result	3/7/2018 DL	3/7/2018 Result	5/16/2018 DL	5/16/2018 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	0.0035	0.003	ND	0.003	ND	0.003	ND
Arsenic	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	0.001	0.0041	0.001	ND	0.001	ND	0.001	ND
Barium	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	0.0025	0.19	0.0025	0.2	0.0025	0.2	0.0025	0.17
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.05	0.33	0.05	0.34	0.05	0.45	0.05	0.41
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	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	2	50	2	49	2	42	2	45
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	0.005	ND	0.005	ND	0.005	ND
Cobalt	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	0.001	0.0019	0.001	0.0021	0.001	0.0015	0.001	0.0015
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	0.0021	0.0020	0.0022	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Cyanide	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	0.01	ND	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.1	0.18	0.1	0.17	0.1	0.21	0.1	0.19
Iron	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	0.1	ND	0.1	ND	0.1	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	0.00058	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	1.5	0.0025	1.7	0.0025	2	0.0025	1.4
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	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.002	0.0035	0.002	0.004	0.002	0.0044	0.002	0.0031
Nitrogen/Nitrate	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	0.1	1.9	0.1	2.9	0.1	2.3	0.1	1.1
Nitrogen/Nitrate, Nit	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	0.1	1.9	0.2	2.9	0.2	2.3	0.1	1.2
Nitrogen/Nitrite	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	0.02	0.047	0.02	0.034	0.02	ND	0.02	0.052
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	0.004	ND	0.004	ND	0.004	ND ^
Selenium	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	0.0025	0.0049	0.0025	0.0034	0.0025	0.0041	0.0025	0.0051
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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	25	110	25	95	10	46	10	50	20	64	20	110	20	88	20	67	20	59	10	62	10	43	20	44	10	50	20	50	25	55	25	67
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	590	10	550	10	530	10	530	10	550	10	500	10	540	10	580	10	600	10	480	10	470	10	640	10	500	10	470	10	520	10	490
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	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	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	0.0005	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	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	0.0025	ND	0.0025	0.0017	0.0025	0.00098	0.0025	ND
pH	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	NA	7.14	NA	6.78	NA	6.71	NA	7.64
Temperature	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	NA	15.50	NA	11.00	NA	8.66	NA	17.00
Conductivity	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	NA	0.63	NA	0.58	NA	0.51	NA	0.57
Dissolved Oxygen	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	NA	0.19	NA	3.69	NA	2.33	NA	3.34
ORP	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	NA	136.7	NA	-95.1	NA	-36.1	NA	-62.9

Parameter	8/8/2018 DL	8/8/2018 Result	10/30/2018 DL	10/30/2018 Result	2/26/2019 DL	2/26/2019 Result	5/1/2019 DL	5/1/2019 Result	8/27/2019 DL	8/27/2019 Result	11/12/2019 DL	11/12/2019 Result	2/25/2020 DL	2/25/2020 Result	4/28/2020 DL	4/28/2020 Result	8/11/2020 DL	8/11/2020 Result	12/8/2020 DL	12/8/2020 Result	2/23/2021 DL	2/23/2021 Result	5/11/2021 DL	5/11/2021 Result	8/24/2021 DL	8/24/2021 Result	11/30/2021 DL	11/30/2021 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
Arsenic	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	0.001	ND	0.001	ND
Barium	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	0.0025	0.18	0.0025	0.22
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	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	0.05	0.37	0.05	0.35
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
Chloride	2	57	2	54	2	49	2	48	2	50	2	44	2	47	2	40	2	42	2	45	4	42	10	56	4	53	6	47
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
Cobalt	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	0.001	0.0018	0.001	0.0018
Copper	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	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	0.005	ND	0.005	ND *	0.005	ND	0.005	ND	0.005	ND ^-	0.005	ND *-
Fluoride	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	0.1	0.2	0.1	0.19
Iron	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	0.1	ND	0.1	ND
Lead	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	0.0005	ND	0.0005	ND
Manganese	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	0.0025	1.6	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
Nickel	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	0.002	0.0043	0.002	0.003
Nitrogen/Nitrate	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	0.1	ND	0.1	0.62
Nitrogen/Nitrate, Nit	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	0.1	ND	0.1	0.64
Nitrogen/Nitrite	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	0.02	0.042	0.02	0.025
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
Selenium	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	0.0025	0.0052	0.0025	0.0091
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
Sulfate	20	44	20	48	2	37	5	32	5	32	5	49	5	63	5	67 ^	25	57	15	71	10	64	25	58	10	44	5	36 ^+ ^-
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
Total Dissolved Solic	10	460	10	550	10	500	10	470	10	420	10	530	10	520	10	460	30	480	10	450	10	430	10	530	10	280	10	530
Vanadium	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	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
Benzene	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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	6.87	NA	6.99
Temperature	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	NA	13.70	NA	10.90
Conductivity	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	NA	0.86	NA	0.87
Dissolved Oxygen	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	NA	0.15	NA	0.21
ORP	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	NA	195.3	NA	165.9

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 millisiemens/centimeters; Dissolved Oxygen mg/L milligrams/liter; Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-11

Parameter	Standards	12/16/2010 DL	12/16/2010 Result	2/15/2011 DL	2/15/2011 Result	6/16/2011 DL	6/16/2011 Result	9/19/2011 DL	9/19/2011 Result	12/12/2011 DL	12/12/2011 Result	3/19/2012 DL	3/19/2012 Result	6/25/2012 DL	6/25/2012 Result	9/18/2012 DL	9/18/2012 Result	12/12/2012 DL	12/12/2012 Result	2/27/2013 DL	2/27/2013 Result	5/30/2013 DL	5/30/2013 Result	7/30/2013 DL	7/30/2013 Result	10/22/2013 DL	10/22/2013 Result	3/4/2014 DL	3/4/2014 Result	5/29/2014 DL	5/29/2014 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	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	0.0010	0.036
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	0.0025	0.16
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	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	0.25	1.4
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	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	2.0	70
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	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	0.0010	0.0017
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	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	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	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	0.10	3.8
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	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	0.013	8.0
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	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	0.0020	ND
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	0.10	0.27
Nitrogen/Nitrate, Nit	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	0.10	0.27
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	0.0026	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	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	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	50	170
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	0.0020	ND
Total Dissolved Solic	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	10	660
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	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	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	7.88	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	NA	7.10
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	NA	19.35
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	NA	1.19
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	NA	0.32
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	NA	-126.2

Parameter	8/26/2014 DL	8/26/2014 Result	10/28/2014 DL	10/28/2014 Result	2/24/2015 DL	2/24/2015 Result	5/12/2015 DL	5/12/2015 Result	8/19/2015 DL	8/19/2015 Result	11/19/2015 DL	11/19/2015 Result	2/26/2016 DL	2/26/2016 Result	5/20/2016 DL	5/20/2016 Result	8/17/2016 DL	8/17/2016 Result	11/17/2016 DL	11/17/2016 Result	2/16/2017 DL	2/16/2017 Result	5/3/2017 DL	5/3/2017 Result	8/29/2017 DL	8/29/2017 Result	11/9/2017 DL	11/9/2017 Result	3/8/2018 DL	3/8/2018 Result	5/16/2018 DL	5/16/2018 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	0.003	ND	0.003	ND	0.003	ND
Arsenic	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	0.001	0.0016	0.001	0.0056	0.001	0.0036	0.001	0.0045
Barium	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	0.0025	0.043	0.0025	0.14	0.0025	0.11	0.0025	0.17
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.25	2.1	0.05	1.9	1	3.4	0.5	2.4
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	0.00059	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	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	10	86	2	70	2	41	10	86
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	0.005	ND	0.005	ND	0.005	ND
Cobalt	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	0.001	ND	0.001	0.0021	0.001	0.0011	0.001	0.0026
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	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.1	0.56	0.1	0.56	0.1	0.45	0.1	0.56
Iron	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	0.1	0.8	0.1	0.44	0.1	ND	0.1	0.12
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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	0.65	0.0025	3.7	0.0025	1.9	0.0025	4.9
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	0.00024	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.002	0.0028	0.002	0.003	0.002	ND	0.002	0.0038
Nitrogen/Nitrate	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	0.1	0.73	0.1	2.6	0.1	5.1	0.1	1.1
Nitrogen/Nitrate, Nit	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	0.1	0.73 F1 F2	0.2	2.6	0.5	5.2	0.1	1.1
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	0.02	ND	0.02	0.13	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	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	0.00050	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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	50	200	50	200	25	120	20	130	50	150	50	210	50	260	50	280	50	210	100	390	100	270	100	410	100	310	50	250	50	170	100	280
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	0.0038	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	860	10	790	10	700	10	710	10	750	10	630	10	890	10	950	10	920	10	1100	10	980	10	1300	10	1000	10	820	10	650	10	1100
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 ^	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	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	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	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	0.0025	ND	0.0025	ND	0.0025	0.0007	0.0025	0.00065
pH	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	NA	7.23	NA	6.96	NA	7.11	NA	7.89
Temperature	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	NA	17.20	NA	12.16	NA	9.18	NA	19.41
Conductivity	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	NA	1.18	NA	1.10	NA	0.66	NA	1.02
Dissolved Oxygen	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	NA	0.14	NA	3.21	NA	1.42	NA	1.86
ORP	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	NA	-49.5	NA	-76.5	NA	-83.8	NA	-52.7

Parameter	8/9/2018 DL	8/9/2018 Result	11/1/2018 DL	11/1/2018 Result	2/27/2019 DL	2/27/2019 Result	5/1/2019 DL	5/1/2019 Result	8/28/2019 DL	8/28/2019 Result	11/14/2019 DL	11/14/2019 Result	2/26/2020 DL	2/26/2020 Result	4/29/2020 DL	4/29/2020 Result	8/12/2020 DL	8/12/2020 Result	12/8/2020 DL	12/8/2020 Result	2/25/2021 DL	2/25/2021 Result	5/13/2021 DL	5/13/2021 Result	8/25/2021 DL	8/25/2021 Result	12/1/2021 DL	12/1/2021 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
Arsenic	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	0.001	0.015	0.001	0.0076
Barium	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	0.0025	0.15	0.0025	0.13
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 ^1+	0.001	ND ^+	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.05	0.85	0.25	0.99
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
Chloride	10	120	10	92	10	100	2	62	2	50	2	75	2	100	10	110	10	84	10	91	10	120	6	120	10	100	10	85
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
Cobalt	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	0.001	0.0018	0.001	0.0015
Copper	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	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	0.005	0.0056	0.005	ND *	0.005	ND	0.005	0.0053	0.005	ND	0.005	0.0060 *-
Fluoride	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	0.1	0.65	0.1	0.66
Iron	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	0.1	2.2	0.1	0.82
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
Manganese	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	0.0025	4.3	0.0025	3
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
Nickel	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	0.002	0.004	0.002	0.0025
Nitrogen/Nitrate	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	0.1	0.27	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	0.27	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
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
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
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
Sulfate	100	310	50	170	20	320	10	210	5	160	20	230	20	350	50	300	25	210	50	210	25	240	25	240	25	200	25	160 ^-
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
Total Dissolved Solic	10	1100	10	970	10	1100	10	740	10	710	10	880	10	1000	10	1100	30	750	10	780	10	890	10	830	10	770	10	790
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
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
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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.03	NA	7.17
Temperature	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	NA	17.40	NA	15.30
Conductivity	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	NA	1.46	NA	1.29
Dissolved Oxygen	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	NA	0.23	NA	0.51
ORP	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	NA	-57.0	NA	-125.0

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 millisiemens/centimeters; Dissolved Oxygen mg/L milligrams/liter; Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-12

Parameter	Standards	12/15/2010 DL	12/15/2010 Result	2/15/2011 DL	2/15/2011 Result	6/16/2011 DL	6/16/2011 Result	9/19/2011 DL	9/19/2011 Result	12/12/2011 DL	12/12/2011 Result	3/19/2012 DL	3/19/2012 Result	6/25/2012 DL	6/25/2012 Result	9/18/2012 DL	9/18/2012 Result	12/12/2012 DL	12/12/2012 Result	2/27/2013 DL	2/27/2013 Result	5/30/2013 DL	5/30/2013 Result	7/29/2013 DL	7/29/2013 Result	10/22/2013 DL	10/22/2013 Result	3/4/2014 DL	3/4/2014 Result	5/29/2014 DL	5/29/2014 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	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	0.0010	0.0017
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	0.0025	0.073
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	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	0.050	0.69
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	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	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^	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	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^	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	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	0.10	0.42
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	0.10	0.39
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	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	0.0025	0.65
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	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	0.0020	0.0026
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	0.10	ND
Nitrogen/Nitrate, Nit	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	0.0026	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	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	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	100	560
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	0.0020	ND
Total Dissolved Solic	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	10	1300 H
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	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	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	7.65	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	NA	7.14
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	NA	19.48
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	NA	1.73
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	NA	1.59
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	NA	-23.6

Parameter	8/26/2014 DL	8/26/2014 Result	10/28/2014 DL	10/28/2014 Result	2/24/2015 DL	2/24/2015 Result	5/12/2015 DL	5/12/2015 Result	8/19/2015 DL	8/19/2015 Result	11/19/2015 DL	11/19/2015 Result	2/26/2016 DL	2/26/2016 Result	5/20/2016 DL	5/20/2016 Result	8/18/2016 DL	8/18/2016 Result	11/18/2016 DL	11/18/2016 Result	2/16/2017 DL	2/16/2017 Result	5/3/2017 DL	5/3/2017 Result	8/29/2017 DL	8/29/2017 Result	11/10/2017 DL	11/10/2017 Result	3/8/2018 DL	3/8/2018 Result	5/16/2018 DL	5/16/2018 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	0.003	ND	0.003	ND	0.003	ND
Arsenic	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	0.001	0.0082	0.001	0.015	0.001	0.0026	0.001	0.0015
Barium	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	0.0025	0.12	0.0025	0.096	0.0025	0.065	0.0025	0.067
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	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.25	1.5	0.05	0.77	0.05	0.39	0.05	0.45
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	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	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	10	180	10	170	10	180	10	180
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	0.005	ND	0.005	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	0.0013	0.001	ND ^	0.001	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	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	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	0.1	0.53	0.1	0.51	0.1	0.5	0.1	0.48
Iron	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	0.1	1.1	0.1	2.2	0.1	1.1	0.1	1.1
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	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	2.7	0.0025	1.2	0.0025	0.098	0.0025	0.066
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	0.00026	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	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	0.002	0.0026	0.002	ND	0.002	ND	0.002	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	0.1	0.11	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	0.14	0.1	ND	0.1	ND	0.1	ND
Nitrogen/Nitrite	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	0.02	0.027	0.02	ND	0.02	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	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 F1	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	0.0005	ND ^	0.0005	ND	0.0005	ND
Sulfate	100	310	100	420	100	450	100	530	100	390	100	750	100	580	100	570	100	600	100	300	100	550	100	450	100	520	100	370	100	610	250	660
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	1100	10	1000	10	1300	10	1400	10	1300	10	1400	10	1300	10	1300	10	1700	10	1300	10	1200	10	1200	10	1400	10	1100	10	1300	10	1600
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 ^	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	ND
Benzene	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	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	0.0061	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00056	0.0025	0.0011	0.0025	0.00067
pH	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	NA	7.34	NA	7.38	NA	7.20	NA	8.12
Temperature	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	NA	17.30	NA	14.47	NA	9.07	NA	23.82
Conductivity	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	NA	1.48	NA	1.27	NA	1.13	NA	1.59
Dissolved Oxygen	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	NA	0.87	NA	1.33	NA	1.54	NA	4.53
ORP	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	NA	-59.0	NA	-96.9	NA	-23.0	NA	-38.9

Parameter	8/9/2018 DL	8/9/2018 Result	11/1/2018 DL	11/1/2018 Result	2/27/2019 DL	2/27/2019 Result	5/1/2019 DL	5/1/2019 Result	8/28/2019 DL	8/28/2019 Result	11/14/2019 DL	11/14/2019 Result	2/26/2020 DL	2/26/2020 Result	4/29/2020 DL	4/29/2020 Result	8/12/2020 DL	8/12/2020 Result	12/8/2020 DL	12/8/2020 Result	2/25/2021 DL	2/25/2021 Result	5/13/2021 DL	5/13/2021 Result	8/25/2021 DL	8/25/2021 Result	12/1/2021 DL	12/1/2021 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
Arsenic	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	0.001	0.0049	0.001	0.011
Barium	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	0.0025	0.036	0.0025	0.041
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 ^1+	0.001	ND ^+	0.001	ND	0.001	ND	0.001	ND
Boron	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	0.05	0.49	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
Chloride	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	10	130	10	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
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
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
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	0.005	ND	0.005	ND *	0.005	ND	0.005	ND	0.005	ND	0.005	ND *-
Fluoride	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	0.1	0.44	0.1	0.5
Iron	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	0.1	0.66	0.1	0.57
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
Manganese	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	0.0025	0.36	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
Nickel	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	0.002	0.0021	0.002	ND
Nitrogen/Nitrate	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	0.1	ND	0.1	ND
Nitrogen/Nitrate, Nit	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	0.1	ND	0.1	ND
Nitrogen/Nitrite	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	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
Selenium	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	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
Sulfate	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	50	220	25	180 ^-
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
Total Dissolved Solic	10	1200	10	1100	10	1000	10	1000	10	1200	10	1100	10	800	10	1000	60	1000	10	920	10	850	10	920	10	600	10	740
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
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
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
BETX	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	0.0025	ND	0.0025	ND
pH	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	NA	7.43	NA	7.38
Temperature	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	NA	14.10	NA	14.60
Conductivity	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	NA	1.30	NA	1.22
Dissolved Oxygen	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	NA	0.34	NA	0.51
ORP	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	NA	67.0	NA	-119.3

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 millisiemens/centimeters; Dissolved Oxygen mg/L milligrams/liter; Oxygen Reduction Potential (ORP) mV millivolts

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		7/30/2013		10/22/2013		3/4/2014		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	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	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	0.0010	0.029	0.0010	0.024	0.0010	0.028	0.0010	0.024
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	0.0025	0.23	0.0025	0.16	0.0025	0.21	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	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	0.050	3.8	0.050	3.5	0.050	2.9	0.25	3.5
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	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	10	190	10	180	10	190	10	180
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	0.0050	ND	0.0050	ND	0.0050	ND^	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	0.0010	ND	0.0010	ND	0.0010	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	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	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	0.10	0.39	0.10	0.39	0.10	0.36	0.10	0.35
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	0.10	1.6	0.10	0.29	0.10	1.8	0.10	0.74
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	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	0.0025	4.0	0.0025	2.8	0.0025	2.9	0.0025	3.4
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	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	0.0020	0.0027	0.0020	0.0024	0.0020	ND	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	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Nitrogen/Nitrate, Nit	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	0.0046	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	0.0025	0.0095	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	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	250	1000	250	690	250	660	250	630
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	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	10	2000	10	1700	10	1900	10	2100
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	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	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	7.68	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	NA	7.61	NA	7.81	NA	8.67	NA	7.73
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	NA	16.26	NA	12.38	NA	12.91	NA	23.09
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	NA	2.13	NA	1.83	NA	1.72	NA	2.63
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	NA	0.27	NA	0.94	NA	0.99	NA	0.93
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	NA	-171.2	NA	-189.1	NA	-190.9	NA	-44.7

Sample: MW-13	8/27/2014		10/29/2014		2/26/2015		5/13/2015		8/19/2015		11/19/2015		2/24/2016		5/19/2016		8/18/2016		11/17/2016		2/17/2017		5/4/2017		8/24/2017		11/9/2017		3/7/2018		5/16/2018	
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	0.0030	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	0.0060	ND	0.0030	ND	0.003	0.0034	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	0.031	0.0010	0.028	0.0010	0.028	0.0010	0.033	0.0010	0.030	0.0010	0.027	0.0010	0.027	0.0010	0.033	0.0010	0.027	0.0010	0.028	0.0050	0.024	0.0010	0.028	0.001	0.022	0.001	0.022	0.001	0.022	0.001	0.024
Barium	0.0025	0.21	0.0025	0.24	0.0025	0.24	0.0025	0.27	0.0025	0.25	0.0025	0.14	0.0025	0.23	0.0025	0.12	0.0025	0.23	0.0025	0.094	0.013	0.14	0.0025	0.075	0.0025	0.22	0.0025	0.17	0.0025	0.1	0.0025	0.16
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	0.0020	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	3.0	0.050	2.2	0.25	3.5	0.50	3.8	0.25	3.6	0.050	3.2	0.50	3.7	0.050	2.9	0.050	3.0	0.50	3.7	0.10	3.0	0.25	3.0	0.25	3	0.05	2.4	0.5	3.3	0.5	3.1
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	190	10	180	10	180	10	180	10	190	10	170 F1	10	180	10	170	10	180	10	160	10	170	10	170	10	170 F1	10	190	10	86	10	170
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.010	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	0.005	ND	0.005	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	0.0020	ND	0.0010	ND	0.001	ND	0.001	ND	0.001	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	0.0040	ND ^	0.0020	ND	0.002	ND	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.40	0.10	0.40	0.10	0.37	0.10	0.39	0.10	0.34	0.10	0.37	0.10	0.38	0.10	0.36	0.10	0.35	0.10	0.34	0.10	0.31	0.10	0.29	0.1	0.34	0.1	0.35	0.1	0.29	0.1	0.35
Iron	0.10	0.63	0.10	0.98	0.10	0.69	0.10	0.92	0.10	1.0	0.10	0.85	0.10	1.0	0.10	0.88	0.10	1.0	0.10	0.96	0.10	0.67	0.10	2.1	0.1	0.77	0.1	0.73	0.1	0.61	0.1	0.79
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	3.5	0.0025	3.8	0.0025	3.8	0.0025	3.9	0.025	4.7	0.0025	4.3	0.0025	4.5	0.0025	4.4	0.0025	4.9	0.0025	5.0	0.0025	4.5	0.025	5.2	0.0025	4.1	0.0025	3.6	0.0025	2.7	0.0025	4.3
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	ND	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	ND	0.0020	0.0020	0.0020	0.0040	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	0.0035	0.0020	ND	0.0020	ND	0.0020	ND	0.0040	ND	0.0020	0.0048	0.002	ND	0.002	ND	0.002	ND	0.002	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	0.25	0.1	ND	0.1	0.31	0.1	0.24	0.1	ND
Nitrogen/Nitrate, Nit	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	0.30	0.1	ND	0.1	0.31	0.1	0.24	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	0.047	0.02	ND	0.02	ND	0.02	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	0.004	ND	0.004	ND	0.004	ND ^
Selenium	0.0025	0.0047	0.0025	0.0045	0.0025	ND	0.0025	0.012	0.0025	0.0066	0.0025	0.0031	0.0025	0.0036	0.0025	0.011	0.0025	0.0043	0.0025	ND	0.0050	ND ^	0.0025	0.019	0.0025	0.0058	0.0025	0.004	0.0025	0.0046	0.0025	0.015
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	250	740	250	1400	250	1000	250	1100	250	1300	250	1700	500	1300	500	1200	500	1500	500	1700	500	1700	500	1800	500	1600	500	1500	100	340	500	1600
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	0.0040	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	2300	10	2200	10	2300	10	2600	10	2500	10	2400	10	2600	10	2800	10	3300	10	3400	10	3500	10	3500	13	3000	10	2800	10	1100	10	3400
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	0.005	ND	0.005	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	0.040	ND ^	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.001	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
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0033	0.0025	ND	0.0025	0.00069	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00086	0.0025	0.0015	0.0025	0.00086
pH	NA	7.82	NA	7.72	NA	8.20	NA	7.99	NA	8.03	NA	7.57	NA	7.67	NA	7.60	NA	7.53	NA	7.65	NA	7.87	NA	7.82	NA	7.78	NA	7.49	NA	7.37	NA	8.33
Temperature	NA	20.49	NA	13.90	NA	9.51	NA	16.67	NA	19.27	NA	12.62	NA	9.43	NA	17.47	NA	25.95	NA	20.32	NA	15.28	NA	11.67	NA	15.30	NA	12.33	NA	9.41	NA	20.13
Conductivity	NA	2.50	NA	3.41	NA	2.11	NA	2.78	NA	2.91	NA	2.36	NA	2.21	NA	2.81	NA	3.48	NA	3.12	NA	3.05	NA	2.68	NA	2.98	NA	2.53	NA	1.41	NA	2.78
Dissolved Oxygen	NA	0.34	NA	0.84	NA	1.60	NA	1.10	NA	1.20	NA	0.96	NA	1.56	NA	1.02	NA	1.79	NA	1.13	NA	1.76	NA	4.03	NA	0.82	NA	4.63	NA	2.70	NA	1.05
ORP	NA	-128.5	NA	-140.4	NA	-161.4	NA	-175.5	NA	-153.2	NA	-76.2	NA	-137.5	NA	-147.5	NA	-195.8	NA	-81.0	NA	-93.1	NA	-151.5	NA	-141.2	NA	-123.3	NA	-120.4	NA	-147.5

Sample: MW-13	8/9/2018		10/31/2018		2/28/2019		5/2/2019		8/28/2019		11/14/2019		2/26/2020		4/30/2020		8/11/2020		12/10/2020		2/24/2021		5/13/2021		8/23/2021		11/30/2021	
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
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
Arsenic	0.001	0.024	0.001	0.022	0.001	0.022	0.001	0.024	0.001	0.022	0.001	0.024	0.001	0.02	0.001	0.027	0.001	0.022	0.001	0.022	0.001	0.023	0.001	0.023	0.001	0.022	0.001	0.023
Barium	0.0025	0.26	0.0025	0.1	0.0025	0.17	0.0025	0.12	0.0025	0.14	0.0025	0.095	0.0025	0.1	0.0025	0.17	0.0025	0.14	0.0025	0.19	0.0025	0.18	0.0025	0.21	0.0025	0.17	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 ^1+	0.001	ND ^+	0.001	ND	0.001	ND	0.001	ND
Boron	0.5	3	0.05	2.7	0.05	2.4	0.25	3.2	0.25	2.7	0.5	2.9	0.5	2.5	0.05	2.8	0.5	3.1	0.25	1.4	0.25	2.8	0.5	3.2	0.5	2.8	0.5	2.6
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
Chloride	10	180	10	170	10	160	10	160	10	160	10	150	10	150	10	140	10	160	10	140	10	130	10	130	10	120	10	110
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND *-
Fluoride	0.1	0.34	0.1	0.35	0.1	0.35	0.1	0.34	0.1	0.3	0.1	0.35	0.1	0.36	0.1	0.39	0.1	0.34	0.1	0.41	0.1	0.38	0.1	0.38	0.1	0.36	0.1	0.36
Iron	0.1	0.67	0.1	0.72	0.1	0.76	0.1	0.64	0.1	0.93	0.1	0.79	0.1	1	0.1	0.91	0.1	1.3	0.1	1.3	0.1	1	0.1	0.87	0.1	1	0.1	0.8
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
Manganese	0.0025	3.7	0.0025	3.8	0.0025	3.9	0.0025	3.8	0.0025	4.1	0.0025	4.4	0.0025	4.1	0.0025	3.9	0.0025	4.8	0.0025	4.4	0.0025	4.1	0.0025	3.4	0.0025	3.9	0.0025	3.4
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
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	0.003	0.002	ND
Nitrogen/Nitrate	0.1	1.1	0.1	0.21	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/Nitrate, Nit	0.1	1.1	0.1	0.21	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
Perchlorate	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.008	ND	0.008	ND	0.008	ND	0.004	ND	0.004	ND	0.004	ND	0.004	ND	0.008	ND	0.008	ND	0.008	ND
Selenium	0.0025	0.0048	0.0025	0.01	0.0025	0.006	0.0025	ND	0.0025	ND	0.0025	0.017	0.0025	ND	0.0025	0.029	0.0025	0.0093	0.0025	ND	0.0025	0.011	0.0025	ND	0.0025	0.0084	0.0025	0.011
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
Sulfate	500	1300	500	950	1000	1700	40	1500	40	1700	50	1500	50	1300	50	1300 ^	250	1600	250	1300	250	1400	250	1500	250	1100	130	1000
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
Total Dissolved Solic	10	2900	13	3100	13	3000	10	2800	10	2800	10	2800	10	2500	10	2600	150	2700	10	2300	10	2500	10	2600	10	1900	10	2100
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
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
Benzene	0.0005	0.0015	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	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	0.0079	0.0025	0.00075	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	7.60	NA	8.29	NA	7.74	NA	7.71	NA	7.71	NA	8.11	NA	7.75	NA	7.66	NA	7.43	NA	7.62	NA	7.79	NA	7.86	NA	7.72	NA	7.79
Temperature	NA	18.37	NA	14.94	NA	12.50	NA	13.60	NA	13.90	NA	12.68	NA	13.20	NA	14.10	NA	14.80	NA	14.30	NA	14.00	NA	14.80	NA	15.60	NA	14.30
Conductivity	NA	2.80	NA	2.68	NA	3.69	NA	2.25	NA	0.23	NA	3.24	NA	0.53	NA	0.36	NA	3.47	NA	3.27	NA	2.75	NA	3.25	NA	3.20	NA	3.01
Dissolved Oxygen	NA	5.16	NA	5.01	NA	0.04	NA	0.18	NA	0.30	NA	8.63	NA	0.18	NA	0.19	NA	7.18	NA	1.91	NA	0.44	NA	0.24	NA	0.14	NA	0.20
ORP	NA	-167.4	NA	-132.7	NA	-153.9	NA	-176.9	NA	-171.5	NA	-123.8	NA	-232.8	NA	-226.3	NA	-180.5	NA	-218.5	NA	-182.0	NA	-160.2	NA	-149.0	NA	-133.3

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/cm² millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-14	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		2/27/2013		5/30/2013		7/30/2013		10/23/2013		3/4/2014		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	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	0.0030	ND
Arsenic	0.010	NP	0.024	NP	0.019	0.001	0.0084	0.001	0.005	0.001	0.0062	0.001	0.015	0.001	0.0033	0.001	0.0039	0.0050	0.0053	0.001	0.0066	0.0010	0.0023	0.0010	0.0016	0.0010	ND	0.0010	0.0016	0.0010	0.0011
Barium	2.0	NP	0.034	NP	0.034	0.001	0.036	0.001	0.04	0.001	0.041	0.001	0.04	0.001	0.045	0.001	0.045	0.0020	0.038	0.001	0.032	0.0025	0.053	0.0025	0.042	0.0025	0.050	0.0025	0.044	0.0025	0.033
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	0.0010	ND
Boron	2.0	NP	2	NP	1.9	0.01	1.9	0.01	1.9	0.01	1.8	0.01	1.9	0.01	1.9	0.01	1.8	2.0	ND	0.01	1.9	0.050	1.7	0.050	1.7	0.050	2.0	0.050	1.6	0.25	1.8
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	0.00060	0.00050	0.00086	0.00050	0.00062	0.00050	0.00053	0.00050	ND
Chloride	200.0	NP	160	NP	160	25	160	50	160	25	240	100	200	100	200	50	190	50	190	25	92	10	160	10	190	10	190	10	220	10	140
Chromium	0.1	NP	ND	NP	0.0046	0.004	0.0078	0.004	0.0049	0.004	0.0076	0.004	0.0096	0.004	0.0065	0.004	0.0057	0.0030	0.018	0.004	0.0095	0.0050	ND	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	0.0010	ND
Copper	0.65	NP	0.0037	NP	0.0035	0.003	0.0074	0.003	0.0071	0.003	0.0064	0.003	0.0055	0.003	0.025	0.003	0.0067	0.010	ND	0.003	0.003	0.0020	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	0.010	ND
Fluoride	4.0	NP	1.7	NP	1.6	0.25	1.1	0.25	1.3	0.25	1.4	0.25	0.88	0.25	1.1	0.25	1.0	0.25	1.2	0.25	0.29	0.10	1.1	0.10	1.1	0.10	0.95	0.10	0.96	0.10	0.95
Iron	5.0	NP	2.2	NP	0.94	0.010	0.36	0.010	0.30	0.010	0.71	0.010	2.0	0.010	0.12	0.010	0.77	0.010	0.012	0.01	0.02	0.10	ND	0.10	ND	0.10	0.39	0.10	1.2	0.10	0.60
Lead	0.0075	NP	ND	NP	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.0035	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	0.68	NP	0.81	0.001	0.29	0.001	0.36	0.001	0.57	0.001	0.84	0.001	0.067	0.001	0.63	0.0020	0.11	0.001	0.12	0.0025	0.72	0.0025	0.32	0.0025	1.2	0.0025	1.3	0.0025	0.34
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	0.00020	ND
Nickel	0.1	NP	0.015	NP	0.015	0.005	0.02	0.005	0.016	0.005	0.016	0.005	0.011	0.005	0.015	0.005	0.018	0.010	ND	0.005	0.0094	0.0020	0.0027	0.0020	0.0073	0.0020	0.0042	0.0020	0.0032	0.0020	0.0031
Nitrogen/Nitrate	10.0	NP	0.036	NP	ND	0.02	1.0	0.02	0.27	0.02	0.05	0.02	ND	0.02	0.33	0.02	0.31	0.02	0.32	0.2	3.5	0.10	ND	0.10	ND	0.10	0.16	0.10	ND	0.10	0.22
Nitrogen/Nitrate, Nit	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	0.18	0.10	ND	0.10	0.22
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	0.022	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	NP	0.0015	0.001	0.065	0.001	0.0035	0.001	0.003	0.001	0.0017	0.001	0.0037	0.001	0.022	0.0050	0.0055	0.001	0.15	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.020	0.0025	0.014
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	0.00050	ND
Sulfate	400.0	NP	960	NP	820	250	770	250	810	250	940	100	850	100	880	250	990	500	810	100	390	250	800	250	900	250	840	100	680	100	720
Thallium	0.002	NP	0.0019	NP	0.0018	0.001	0.0035	0.001	0.0039	0.001	0.0027	0.001	0.0016	0.001	0.0016	0.001	0.0034	0.0010	0.0025	0.001	0.0043	0.0020	0.0025	0.0020	0.0043	0.0020	0.0022	0.0020	0.0023	0.0020	0.0026
Total Dissolved Solic	1,200	NP	1800	NP	1700	17	1800	17	1900	17	2000	17	1800	17	1800	17	2200	26	1700	26	1300	10	2000	10	2100	10	2100	10	1900	10	1700
Vanadium	0.049	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.0080	0.010	0.005	0.007	0.0050	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	0.0084	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	7.55	NA	7.75	NA	7.27	NA	7.15	NA	7.08	NA	7.40	NA	6.05	NA	8.35	NA	7.13	NA	8.21	NA	7.03	NA	6.93	NA	7.11	NA	7.72	NA	6.99
Temperature	NA	NA	17.28	NA	14.52	NA	16.04	NA	17.94	NA	18.65	NA	16.54	NA	14.74	NA	15.10	NA	15.06	NA	14.50	NA	17.22	NA	16.52	NA	13.59	NA	12.83	NA	17.53
Conductivity	NA	NA	2.61	NA	2.42	NA	2.44	NA	2.60	NA	2.74	NA	2.07	NA	2.00	NA	2.92	NA	2.06	NA	1.72	NA	1.98	NA	2.17	NA	2.10	NA	1.74	NA	2.00
Dissolved Oxygen	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	2.00	NA	3.88	NA	0.72	NA	0.31	NA	0.51	NA	1.55	NA	0.42
ORP	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	80	NA	127	NA	5.9	NA	2.8	NA	-146.8	NA	-77.3	NA	-26.4

Sample: MW-14	8/28/2014		10/29/2014		2/26/2015		5/13/2015		8/19/2015		11/18/2015		2/24/2016		5/19/2016		8/18/2016		11/17/2016		2/17/2017		5/4/2017		8/29/2017		11/9/2017		3/7/2018		5/17/2018	
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	0.0030	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	0.0060	ND	0.0030	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	0.0052	0.0010	0.0063	0.0010	0.0011	0.0010	0.0017	0.0010	0.0020	0.0010	0.0023	0.0010	0.0024	0.0010	0.0027	0.0010	0.0013	0.0010	ND	0.0020	ND ^	0.0010	0.0012	0.001	0.0081	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.057	0.0025	0.045	0.0025	0.050	0.0025	0.042	0.0025	0.069	0.0025	0.053	0.0025	0.050	0.0025	0.050	0.0025	0.055	0.0025	0.065	0.013	0.070	0.0025	0.054	0.0025	0.16	0.0025	0.036	0.0025	0.041	0.0025	0.041
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	0.0020	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	1.9	0.50	2.2	0.25	2.2	0.25	1.7	0.050	1.9	0.050	2.5	0.050	2.3	0.050	2.2	0.050	1.5	0.25	1.8	0.10	2.3	0.25	2.5	0.25	2.2	0.05	1.9	0.5	2.4	0.25	1.5
Cadmium	0.00050	0.00052	0.00050	ND	0.00050	ND	0.00050	0.00056	0.00050	0.00070	0.00050	0.00051	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.00082	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	190	10	180	10	180	10	180	10	150	10	160	10	130	10	140	10	160	10	170	10	190	10	180	10	180	10	180	10	140	10	130
Chromium	0.0050	ND	0.0050	ND	0.0050	ND	0.010	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	0.005	ND	0.005	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	0.0020	ND	0.0010	0.0012	0.001	0.0023	0.001	ND	0.001	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	0.0040	ND ^	0.0020	ND	0.002	ND	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.91	0.10	0.94	0.10	0.76	0.10	0.98	0.10	1.1	0.10	1.1	0.10	1.1	0.10	1.0	0.10	0.96	0.10	0.96	0.10	0.86	0.10	0.81	0.1	1	0.1	0.96	0.1	1.1	0.1	0.96
Iron	0.10	4.6	0.10	5.3	0.10	0.17	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.18	0.10	2.0	0.10	3.0	0.1	0.73	0.1	0.2	0.1	ND	0.1	ND
Lead	0.00050	ND	0.00050	0.00078	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	1.8	0.0025	1.3	0.0025	0.15	0.0025	0.073	0.0025	0.32	0.0025	1.2	0.0025	0.070	0.0025	0.25	0.0025	0.26	0.0025	0.81	0.0025	1.8	0.0025	1.7	0.0025	4.7	0.0025	0.27	0.0025	0.42	0.0025	0.1
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	0.0002	0.00023	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	0.0033	0.0020	0.0030	0.0020	0.0045	0.0020	0.0036	0.0020	0.0043	0.0020	0.0030	0.0020	0.0035	0.0020	ND	0.0020	0.0029	0.0020	0.0038	0.0040	ND	0.0020	0.0055	0.002	0.0035	0.002	0.0021	0.002	0.002	0.002	ND
Nitrogen/Nitrate	0.10	ND	0.10	ND	0.10	0.24	0.10	2.4	0.10	ND	0.10	ND	0.10	ND	0.10	0.11	0.10	0.35	0.10	ND	0.10	ND	0.10	0.11	0.1	ND	0.1	0.14	0.1	0.65	0.1	1.1
Nitrogen/Nitrate, Nit	0.10	ND	0.10	ND	0.10	0.24	0.20	2.4	0.10	ND	0.10	ND	0.10	ND	0.10	0.11	0.10	0.35	0.10	ND	0.10	ND	0.10	0.11	0.1	ND	0.1	0.14	0.1	0.65	0.1	1.1
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	0.02	ND	0.02	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	0.004	ND	0.004	ND	0.004	ND ^
Selenium	0.0025	ND	0.0025	ND	0.0025	0.023	0.0025	0.042	0.0025	ND	0.0025	ND	0.0025	0.0035	0.0025	0.0076	0.0025	0.023	0.0025	ND ^	0.0050	ND ^	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.012	0.0025	0.021
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	250	1100	250	1300	250	850	250	1200	250	1000	500	1200	250	730	250	650	250	1000	250	1200	500	1500	500	1700	500	1300	500	1300	130	520	250	840
Thallium	0.0020	0.0023	0.0020	ND	0.0020	ND	0.0020	0.0044	0.0020	0.0065	0.0020	0.0033	0.0020	0.0043	0.0020	0.0028	0.0020	0.0041	0.0020	0.0048	0.0040	ND	0.0020	0.0028	0.002	ND	0.002	0.0024	0.002	0.003	0.002	0.0042
Total Dissolved Solic	10	2400	10	2200	10	2200	13	2700	10	2400	10	2300	10	1800	10	1800	10	2300	10	2900	10	3200	10	3600	10	2900	10	2700	10	1400	10	2100
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 ^	0.005	ND	0.005	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	0.040	ND ^	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Benzene	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	0.0021	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
BETX	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00069	0.0025	0.0061	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	0.00052	0.0025	ND
pH	NA	7.17	NA	7.31	NA	7.28	NA	7.04	NA	7.30	NA	7.03	NA	7.05	NA	7.03	NA	6.78	NA	6.80	NA	7.17	NA	7.23	NA	7.02	NA	6.81	NA	6.83	NA	6.78
Temperature	NA	20.10	NA	14.66	NA	6.67	NA	16.35	NA	21.01	NA	17.89	NA	10.84	NA	16.54	NA	22.91	NA	17.82	NA	15.94	NA	12.98	NA	17.10	NA	13.13	NA	8.07	NA	16.95
Conductivity	NA	2.83	NA	3.49	NA	1.89	NA	2.98	NA	2.90	NA	2.62	NA	1.81	NA	2.02	NA	2.53	NA	2.86	NA	3.22	NA	2.85	NA	2.72	NA	2.57	NA	2.23	NA	1.85
Dissolved Oxygen	NA	0.37	NA	0.66	NA	4.11	NA	1.03	NA	1.15	NA	0.59	NA	2.50	NA	2.16	NA	3.44	NA	1.49	NA	3.18	NA	4.79	NA	1.00	NA	3.81	NA	3.32	NA	4.00
ORP	NA	-41.2	NA	-105.4	NA	52.4	NA	9.8	NA	-30.6	NA	67.6	NA	-8.6	NA	-13.5	NA	-128.8	NA	5.1	NA	-4.9	NA	-64.1	NA	37.4	NA	-32.9	NA	-7.1	NA	86.0

Sample: MW-14	8/9/2018		10/31/2018		2/28/2019		5/2/2019		8/2//2019		11/14/2019		2/26/2020		4/30/2020		8/11/2020		12/10/2020		2/24/2021		5/12/2021		8/23/2021		11/29/2021	
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
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
Arsenic	0.001	0.0011	0.001	0.0013	0.001	0.0013	0.001	0.0019	0.001	0.0014	0.001	0.002	0.001	ND	0.001	ND ^	0.001	0.001	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.052	0.0025	0.047	0.0025	0.056	0.0025	0.053	0.0025	0.06	0.0025	0.049	0.0025	0.043	0.0025	0.04	0.0025	0.039	0.0025	0.039	0.0025	0.036	0.0025	0.033	0.0025	0.034	0.0025	0.031
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	0.25	1.6	0.05	1.6	0.05	1.5	0.25	2	0.25	1.8	0.25	2	0.25	2	0.05	2.2	0.5	2.4	0.25	1.1	0.25	2.2	0.25	2.1	0.25	1.9	0.25	1.5
Cadmium	0.0005	ND	0.0005	ND	0.0005	0.00083	0.0005	0.00071	0.0005	0.001	0.0005	0.00073	0.0005	0.00064	0.0005	0.00062	0.0005	0.00076	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	140	2	120	10	130	10	130	10	180	10	160	10	150	10	130	10	120	10	140	10	110	10	96	10	92	10	92
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
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
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
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	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	0.0057 *+
Fluoride	0.1	0.95	0.1	1.1	0.1	0.91	0.1	0.91	0.1	0.85	0.1	0.92	0.1	0.97	0.1	1	0.1	0.81	0.1	1.1	0.1	1.1	0.1	1	0.1	0.95	0.1	1
Iron	0.1	ND	0.1	ND	0.1	0.18	0.1	1.7	0.1	ND	0.1	0.42	0.1	0.83	0.1	0.35	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	0.37	0.1	0.71
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
Manganese	0.0025	0.11	0.0025	0.64	0.0025	0.89	0.0025	0.84	0.0025	0.26	0.0025	0.63	0.0025	0.75	0.0025	0.53	0.0025	0.59	0.0025	0.034	0.0025	ND	0.0025	0.86	0.0025	0.98	0.0025	0.7
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
Nickel	0.002	0.0025	0.002	0.0021	0.002	0.003	0.002	0.0031	0.002	0.0044	0.002	0.0034	0.002	0.0034	0.002	0.0031	0.002	0.0025	0.002	ND	0.002	ND	0.002	ND	0.002	0.0038	0.002	ND
Nitrogen/Nitrate	0.1	0.51	0.1	ND	0.1	0.51	0.1	1.2	0.1	ND	0.1	0.11	0.1	ND	0.1	1.5	0.1	ND	0.1	0.16	0.1	ND	0.1	ND	0.1	0.2	0.1	0.53
Nitrogen/Nitrate, Nit	0.1	0.51	0.1	ND	0.1	0.51	0.1	1.2	0.1	ND	0.1	0.11	0.1	ND ^	0.1	1.5	0.1	ND	0.1	0.16	0.1	ND	0.1	ND	0.1	0.2	0.1	0.53
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
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
Selenium	0.0025	0.011	0.0025	ND	0.0025	0.016	0.0025	0.019	0.0025	0.0036	0.0025	0.012	0.0025	0.007	0.0025	0.048	0.0025	0.0027	0.0025	ND	0.0025	ND	0.0025	0.0031	0.0025	0.011	0.0025	0.01
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
Sulfate	250	590	250	550	40	970	40	1100	40	990	50	990	50	980	50	790 ^	100	720	250	760	250	700	100	660	250	570	100	530
Thallium	0.002	0.0036	0.002	0.0033	0.002	0.0046	0.002	0.0036	0.002	0.0072	0.002	0.0038	0.002	0.0035	0.002	0.0036	0.002	0.0042	0.002	0.0021	0.002	ND	0.002	0.0021	0.002	0.0025	0.002	ND
Total Dissolved Solic	10	2000	10	1900	10	2200	10	2400	10	2300	10	2300	10	2200	10	2100	150	1700	10	1800	10	1800	10	1600	10	1500	10	1600
Vanadium	0.005	ND	0.005	ND	0.005	0.0054	0.005	ND	0.005	0.0059	0.005	0.0058	0.005	ND	0.005	ND ^	0.005	0.0051	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
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
BETX	0.0025	0.006	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	7.18	NA	7.48	NA	6.88	NA	6.86	NA	6.92	NA	7.33	NA	6.97	NA	6.82	NA	6.80	NA	6.73	NA	7.20	NA	7.13	NA	6.91	NA	7.01
Temperature	NA	20.77	NA	13.09	NA	13.60	NA	14.40	NA	15.70	NA	14.88	NA	14.80	NA	14.60	NA	16.00	NA	15.70	NA	15.20	NA	15.20	NA	16.10	NA	15.90
Conductivity	NA	2.15	NA	1.79	NA	3.58	NA	2.53	NA	0.26	NA	3.01	NA	2.54	NA	2.36	NA	0.78	NA	2.53	NA	2.07	NA	2.35	NA	2.46	NA	2.23
Dissolved Oxygen	NA	4.66	NA	4.70	NA	0.37	NA	0.39	NA	0.29	NA	0.48	NA	0.24	NA	0.27	NA	8.57	NA	1.73	NA	1.05	NA	0.15	NA	1.21	NA	0.58
ORP	NA	-25.6	NA	-3.7	NA	-18.4	NA	-72.3	NA	18.1	NA	-66.0	NA	-93.1	NA	-58.6	NA	60.6	NA	63.0	NA	-12.9	NA	70.3	NA	171.0	NA	122.7

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/cm² millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Sample: MW-15	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		7/30/2013		10/23/2013		3/6/2014		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	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	0.0030	ND
Arsenic	0.010	NP	0.0099	NP	0.0092	0.001	0.0064	0.001	0.0052	0.001	0.0053	0.001	0.011	0.001	0.0097	0.001	0.0061	0.0050	0.011	0.001	0.0078	0.0010	0.0037	0.0010	0.0046	0.0010	0.0066	0.0010	0.0072	0.0010	0.0019
Barium	2.0	NP	0.058	NP	0.052	0.001	0.061	0.001	0.11	0.001	0.057	0.001	0.06	0.001	0.063	0.001	0.075	0.0020	0.11	0.001	0.096	0.0025	0.11	0.0025	0.080	0.0025	0.12	0.0025	0.098	0.0025	0.068
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	0.0010	ND
Boron	2.0	NP	1.6	NP	1.4	0.01	1.5	0.01	1.6	0.01	1.3	0.02	1.2	0.01	1.2	0.01	1.4	2.0	ND	0.01	1.7	0.050	1.5	0.050	1.6	0.050	1.2	0.050	1.1	0.25	1.2
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	0.00050	ND
Chloride	200.0	NP	180	NP	190	25	190	50	170	25	210	100	180	100	200	50	200	50	220	50	200	10	210	10	220	10	210	10	240	10	220
Chromium	0.1	NP	0.0042	NP	0.0061	0.004	0.0092	0.004	0.0054	0.004	0.0091	0.004	0.0062	0.004	0.0062	0.004	0.0071	0.0030	0.012	0.004	0.0062	0.0050	ND	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	0.0010	ND
Copper	0.65	NP	ND	NP	ND	0.003	0.0039	0.003	0.005	0.003	0.0041	0.003	0.0037	0.003	0.0031	0.003	0.0039	0.010	ND	0.003	0.0036	0.0020	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	0.010	ND
Fluoride	4.0	NP	0.69	NP	0.75	0.25	0.60	0.25	0.73	0.25	0.76	0.25	0.77	0.25	0.75	0.25	0.79	0.25	0.95	0.25	0.29	0.10	0.65	0.10	0.78	0.10	0.71	0.10	0.78	0.10	0.65
Iron	5.0	NP	3.3	NP	2.4	0.010	2.1	0.010	0.70	0.010	2.1	0.010	2.6	0.010	2.1	0.010	1.1	0.010	1.9	0.01	1.5	0.10	0.83	0.10	1.3	0.10	1.1	0.10	2.0	0.10	0.37
Lead	0.0075	NP	ND	NP	ND	0.001	0.0012	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	0.56	NP	0.42	0.001	0.36	0.001	0.6	0.001	0.37	0.001	0.48	0.001	0.39	0.001	0.25	0.0020	0.51	0.001	0.35	0.0025	0.27	0.0025	0.30	0.0025	0.43	0.0025	0.59	0.0025	0.30
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	0.00020	ND
Nickel	0.1	NP	0.013	NP	0.011	0.005	0.012	0.005	0.015	0.005	0.01	0.005	0.011	0.005	0.011	0.005	0.01	0.010	ND	0.005	0.0079	0.0020	0.0072	0.0020	0.0063	0.0020	0.0052	0.0020	0.0034	0.0020	0.0047
Nitrogen/Nitrate	10.0	NP	0.03	NP	0.086	0.02	0.04	0.02	0.07	0.02	0.05	0.02	ND	0.02	0.07	0.02	0.12	0.02	0.12	0.02	0.02	0.10	ND	0.10	ND	0.10	0.22	0.10	ND	0.10	0.40
Nitrogen/Nitrate, Nit	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	0.22	0.10	ND	0.10	0.40
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	0.0042	NP	0.0079	0.001	0.017	0.001	0.004	0.001	0.002	0.001	0.004	0.001	0.0047	0.001	0.025	0.0050	ND	0.001	0.0024	0.0025	0.0065	0.0025	ND	0.0025	0.013	0.0025	ND	0.0025	0.033
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	0.00050	ND
Sulfate	400.0	NP	300	NP	220	100	270	100	650	50	250	100	180	100	140	50	200	50	320	50	280	250	570	100	460	100	420	100	260	100	390
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	0.0020	ND
Total Dissolved Solic	1,200	NP	1000	NP	1000	17	1100	17	1600	17	1000	17	890	17	840	17	1000	26	1100	26	1100	10	1700	10	1400	10	1400	10	1300	10	1300
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	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	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	7.43	NA	7.23	NA	7.06	NA	6.79	NA	6.89	NA	7.37	NA	6.84	NA	8.23	NA	7.30	NA	8.09	NA	6.71	NA	6.93	NA	7.18	NA	7.75	NA	6.89
Temperature	NA	NA	15.96	NA	15.59	NA	16.50	NA	17.95	NA	18.41	NA	13.38	NA	16.50	NA	15.20	NA	16.25	NA	13.30	NA	18.64	NA	16.91	NA	15.59	NA	14.71	NA	20.04
Conductivity	NA	NA	1.78	NA	1.66	NA	1.70	NA	2.23	NA	1.66	NA	1.25	NA	1.20	NA	1.51	NA	1.58	NA	1.00	NA	1.97	NA	1.62	NA	1.58	NA	1.29	NA	1.80
Dissolved Oxygen	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	0.09	NA	0.37	NA	0.40	NA	0.16	NA	0.28	NA	1.15	NA	0.65
ORP	NA	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	NM	NA	-90	NA	-87	NA	-9.3	NA	-48.3	NA	-180.6	NA	-141.6	NA	-8.6

Sample: MW-15	8/27/2014		10/28/2014		2/26/2015		5/14/2015		8/19/2015		11/18/2015		2/25/2016		5/19/2016		8/18/2016		11/17/2016		2/17/2017		5/4/2017		8/29/2017		11/10/2017		3/7/2018		5/17/2018	
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	0.0030	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	0.0060	ND	0.0030	ND	0.003	ND	0.003	ND	0.003	ND	0.003	ND
Arsenic	0.0010	0.0029	0.0010	0.0059	0.0010	0.0017	0.0010	0.0024	0.0010	0.0020	0.0010	0.0032	0.0010	0.0019	0.0010	0.0019	0.0010	0.0018	0.0010	0.0011	0.0050	ND	0.0010	0.0031	0.001	0.0012	0.001	0.0032	0.001	ND	0.001	0.0016
Barium	0.0025	0.14	0.0025	0.14	0.0025	0.10	0.0025	0.12	0.0025	0.070	0.0025	0.083	0.0025	0.059	0.0025	0.078	0.0025	0.045	0.0025	0.053	0.013	0.048	0.0025	0.042	0.0025	0.043	0.0025	0.043	0.0025	0.049	0.0025	0.05
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	0.0020	ND ^	0.0010	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	0.95	0.050	0.74	0.25	1.1	0.25	1.4	0.050	1.9	0.050	1.5	0.25	2.4	0.050	1.9	0.050	1.8	0.25	2.0	0.10	1.6	0.25	1.4	0.05	1.6	0.05	1.2 V	0.5	1.8	0.5	2.4
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	10	240	10	230	10	240	10	230	10	110	10	200	10	110	10	230	10	170	10	180	10	190 F1	10	170	10	190	10	180	10	180	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	0.005	ND	0.005	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	0.0020	ND	0.0010	ND	0.001	ND	0.001	ND ^	0.001	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	0.0040	ND ^	0.0020	ND	0.002	ND	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.67	0.10	0.71	0.10	0.64	0.10	0.47	0.10	0.57	0.10	0.52	0.10	0.63	0.10	0.52	0.10	0.56	0.10	0.53	0.10	0.49	0.10	0.55	0.1	0.52	0.1	0.62	0.1	0.52	0.1	0.52
Iron	0.10	0.78	0.10	2.1	0.10	0.28	0.10	0.44	0.10	0.17	0.10	1.8	0.10	0.11	0.10	0.64	0.10	0.81	0.10	0.22	0.10	0.66	0.10	1.4	0.1	ND	0.1	1.1	0.1	0.11	0.1	0.36
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	0.0025	0.95	0.0025	0.87	0.0025	0.40	0.0025	0.42	0.0025	0.18	0.0025	1.3	0.0025	0.095	0.0025	0.59	0.0025	0.52	0.0025	0.19	0.0025	0.43	0.0025	0.67	0.0025	0.03	0.0025	0.71	0.0025	0.51	0.0025	0.084
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	0.00022	0.0002	ND	0.0002	ND	0.0002	ND
Nickel	0.0020	0.0038	0.0020	0.0037	0.0020	0.0090	0.0020	0.010	0.0020	0.0057	0.0020	0.0082	0.0020	0.0076	0.0020	0.0089	0.0020	0.0055	0.0020	0.0063	0.0040	0.0050	0.0020	0.0051	0.002	0.0061	0.002	0.0039	0.002	0.0038	0.002	0.0068
Nitrogen/Nitrate	0.10	ND	0.10	ND	0.10	0.18	0.10	0.10	0.10	0.34	0.10	ND	0.10	2.0	0.10	ND	0.10	ND	0.10	0.17	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	0.66	0.1	2.9
Nitrogen/Nitrate, Nit	0.10	ND	0.10	ND^	0.10	0.18	0.10	0.10	0.10	0.34	0.10	ND	0.10	2.0	0.10	ND	0.10	ND	0.10	0.17	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	0.66	0.5	2.9
Nitrogen/Nitrite	0.020	0.046	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	0.02	ND	0.02	ND	0.02	ND
Perchlorate	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND F1	0.0040	ND	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 ^
Selenium	0.0025	ND	0.0025	0.0030	0.0025	0.068	0.0025	0.051	0.0025	0.013	0.0025	0.0080	0.0025	0.042	0.0025	0.015	0.0025	ND	0.0025	0.017	0.013	ND	0.0025	ND F1	0.0025	0.013	0.0025	0.0093	0.0025	0.049	0.0025	0.096
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	0.0010	ND	0.00050	ND	0.0005	ND	0.0005	ND ^	0.0005	ND	0.0005	ND
Sulfate	130	620	100	660	100	460	250	930	250	640	250	1500	250	670	500	1100	100	620	130	570	130	610	100	480	100	680	100	450	100	460	250	540
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	0.0040	ND	0.0020	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	1800	10	1600	10	1400	10	2500	10	1900	10	2400	10	1600	10	2800	10	1900	10	1900	10	1700	10	1500	10	1900	10	1500	10	1500	10	1900
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 ^	0.005	ND	0.005	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	0.040	ND ^	0.020	ND	0.02	ND	0.02	ND	0.02	ND	0.02	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	0.0005	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	0.00073	0.0025	ND	0.0025	0.00054	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.00068	0.0025	0.0012	0.0025	ND
pH	NA	7.45	NA	7.36	NA	7.53	NA	7.05	NA	7.07	NA	6.55	NA	6.84	NA	6.83	NA	6.96	NA	6.91	NA	7.24	NA	7.35	NA	6.87	NA	7.09	NA	6.89	NA	6.75
Temperature	NA	26.66	NA	17.05	NA	7.93	NA	15.57	NA	19.19	NA	15.04	NA	11.00	NA	18.10	NA	23.69	NA	18.29	NA	17.81	NA	14.56	NA	16.90	NA	11.37	NA	8.36	NA	19.90
Conductivity	NA	2.32	NA	2.26	NA	1.41	NA	2.67	NA	2.45	NA	2.55	NA	1.73	NA	2.89	NA	2.52	NA	2.05	NA	2.09	NA	1.74	NA	1.96	NA	1.57	NA	1.38	NA	1.91
Dissolved Oxygen	NA	0.57	NA	0.45	NA	1.36	NA	0.83	NA	1.51	NA	0.70	NA	1.36	NA	2.53	NA	1.76	NA	3.28	NA	2.30	NA	3.87	NA	0.69	NA	2.34	NA	1.90	NA	3.49
ORP	NA	-30.9	NA	-84.6	NA	-34.4	NA	-25.7	NA	-29.2	NA	31.9	NA	22.8	NA	-0.2	NA	-60.6	NA	-27.3	NA	20.3	NA	-74.4	NA	123.3	NA	-87.8	NA	-51.4	NA	9.5

Sample: MW-15	8/9/2018		10/31/2018		2/28/2019		5/2/2019		8/28/2019		11/14/2019		2/26/2020		4/29/2020		8/11/2020		12/8/2020		2/24/2021		5/12/2021		8/23/2021		11/29/2021	
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
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
Arsenic	0.001	ND	0.001	ND	0.001	0.0018	0.001	0.0025	0.001	ND	0.001	0.0017	0.001	0.0012	0.001	0.0026	0.001	ND	0.001	0.0025	0.001	0.001	0.001	0.0013	0.001	ND	0.001	0.0013
Barium	0.0025	0.044	0.0025	0.045	0.0025	0.058	0.0025	0.052	0.0025	0.055	0.0025	0.05	0.0025	0.057	0.0025	0.064	0.0025	0.084	0.0025	0.074	0.0025	0.057	0.0025	0.066	0.0025	0.053	0.0025	0.073
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 ^1+	0.001	ND ^+	0.001	ND	0.001	ND	0.001	ND
Boron	0.5	2.3	0.05	1.8	0.05	1.4	0.25	1.8	0.25	1.8	0.25	1.7	0.25	1.4	0.05	1.2	0.5	2.6	0.25	1.3	0.25	1.2	0.25	1.3	0.25	1.5	0.25	1.7
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
Chloride	10	200	10	170	10	190	10	210	10	170	10	160	10	160	10	190	10	210	10	200	10	160	10	180	10	190	20	250
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
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
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
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	0.005	ND	0.005	0.0052 *	0.005	ND	0.005	ND	0.005	0.0052	0.005	0.0063 *+
Fluoride	0.1	0.5	0.1	0.54	0.1	0.55	0.1	0.53	0.1	0.5	0.1	0.51	0.1	0.5	0.1	0.55	0.1	0.41	0.1	0.56	0.1	0.52	0.1	0.49	0.1	0.51	0.1	0.47
Iron	0.1	ND	0.1	ND	0.1	0.83	0.1	0.49	0.1	0.11	0.1	0.39	0.1	0.5	0.1	0.65	0.1	ND	0.1	2.7	0.1	0.43	0.1	0.65	0.1	0.35	0.1	0.6
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
Manganese	0.0025	0.11	0.0025	0.16	0.0025	0.69	0.0025	0.43	0.0025	0.17	0.0025	0.32	0.0025	0.63	0.0025	0.65	0.0025	0.063	0.0025	1.1	0.0025	0.45	0.0025	0.5	0.0025	0.29	0.0025	0.47
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
Nickel	0.002	0.0062	0.002	0.0048	0.002	0.0035	0.002	0.0048	0.002	0.0057	0.002	0.0043	0.002	0.0046	0.002	0.0044	0.002	0.0084	0.002	0.0049	0.002	0.0026	0.002	0.004	0.002	0.0063	0.002	0.0038
Nitrogen/Nitrate	0.1	2.7	0.1	0.36	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	1.6	0.1	0.12	0.1	0.13	0.1	ND	0.1	0.58	0.1	0.79
Nitrogen/Nitrate, Nit	0.2	2.7	0.1	0.36	0.1	ND	0.1	ND ^	0.1	ND	0.1	ND	0.1	ND ^	0.1	ND	0.1	1.6	0.1	0.12	0.1	0.13	0.1	ND	0.1	0.58	0.1	0.79
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
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
Selenium	0.0025	0.07	0.0025	0.014	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0046	0.0025	0.0031	0.0025	ND ^	0.0025	0.046	0.0025	0.0077	0.0025	0.025	0.0025	0.0058	0.0025	0.02	0.0025	0.071
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
Sulfate	100	490	100	200	20	330	20	450	40	420	20	340	20	360	50	360	100	700	100	550	50	440	50	470	50	440	100	480
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
Total Dissolved Solic	10	1600	10	1300	10	1300	10	1500	10	1400	10	1200	10	1200	10	1300	150	1800	10	1500	10	1300	10	1500	10	1400	10	1700
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
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
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
BETX	0.0025	0.0066	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	7.06	NA	7.54	NA	7.03	NA	6.89	NA	6.95	NA	7.24	NA	6.73	NA	6.90	NA	6.53	NA	7.04	NA	7.00	NA	6.97	NA	6.76	NA	6.71
Temperature	NA	20.75	NA	14.49	NA	14.20	NA	15.50	NA	16.30	NA	14.53	NA	15.00	NA	15.30	NA	16.00	NA	15.10	NA	15.60	NA	16.70	NA	16.40	NA	15.80
Conductivity	NA	1.98	NA	1.50	NA	1.98	NA	1.33	NA	0.23	NA	1.76	NA	1.67	NA	1.72	NA	2.62	NA	0.31	NA	1.67	NA	2.06	NA	2.25	NA	2.41
Dissolved Oxygen	NA	7.90	NA	8.52	NA	0.16	NA	0.29	NA	0.53	NA	1.06	NA	0.42	NA	0.22	NA	1.12	NA	0.64	NA	1.12	NA	1.41	NA	0.48	NA	0.77
ORP	NA	-49.3	NA	4.5	NA	-58.7	NA	-65.7	NA	1.6	NA	-39.1	NA	-48.8	NA	-81.5	NA	111.7	NA	-84.7	NA	-27.4	NA	-9.5	NA	93.7	NA	-41.9

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/cm² millisiemens/centimeters
Dissolved Oxygen mg/L milligrams/liter
Oxygen Reduction Potential (ORP) mV millivolts

Attachment 9-4. Table. CCA Groundwater Analytical Results - 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		12/12/2012		2/27/2013		5/29/2013		7/29/2013		10/22/2013		3/3/2014		5/30/2014	
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	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0050	ND	0.003	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND	0.0030	ND
Arsenic	0.010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0050	ND	0.001	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Barium	2.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	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
Beryllium	0.004	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0010	ND	0.001	ND	0.0010	ND ^	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Boron	2.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	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
Cadmium	0.005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0010	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Chloride	200.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	10	26	10	18	2.0	19	2.0	21	2.0	35	10	230	2.0	20
Chromium	0.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0030	0.0047	0.004	0.0052	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND
Cobalt	1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0030	ND	0.002	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	ND
Copper	0.65	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.010	ND	0.003	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND^	0.0020	ND
Cyanide	0.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0050	ND	0.005	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Fluoride	4.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.25	ND	0.25	ND	0.10	ND	0.10	0.11	0.10	0.11	0.10	ND	0.10	0.11
Iron	5.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.010	0.012	0.01	0.019	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Lead	0.0075	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0050	ND	0.001	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Manganese	0.15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0020	0.022	0.001	0.0053	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0035	0.0025	ND
Mercury	0.002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.00020	ND	0.0002	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND
Nickel	0.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.010	ND	0.005	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Nitrogen/Nitrate	10.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.50	18	0.5	23	0.10	20	0.10	13	0.10	19	0.10	16	0.10	21
Nitrogen/Nitrate, Nit	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NR	NR	NR	NR	2.5	20	2.5	13	1.0	19	2.0	16	2.5	21
Nitrogen/Nitrite	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NR	NR	NR	NR	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Perchlorate	0.0049	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NR	NR	NR	NR	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND	0.0040	ND
Selenium	0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0050	ND	0.001	0.0015	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND
Silver	0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.010	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
Sulfate	400.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	10	37	10	31	20	50	20	55	20	55	10	34	10	40
Thallium	0.002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0010	ND	0.001	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	ND
Total Dissolved Solic	1,200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26	520	26	420	10	460	10	440	10	540	10	800	10	390
Vanadium	0.049	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0080	ND	0.005	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND^	0.0050	ND
Zinc	5.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.020	ND	0.006	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND	0.020	ND
Benzene	0.005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.005	ND	0.005	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND	0.00050	ND
BETX	11.705	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	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	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	7.38	NA	8.31	NA	7.10	NA	7.18	NA	7.27	NA	7.85	NA	7.20
Temperature	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	12.84	NA	13.10	NA	15.29	NA	16.61	NA	12.74	NA	9.98	NA	17.83 *
Conductivity	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	0.61	NA	1.17	NA	0.60	NA	0.59	NA	0.63	NA	0.89	NA	0.88
Dissolved Oxygen	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	9.54	NA	8.53	NA	6.78	NA	4.91	NA	6.24	NA	6.50	NA	6.99
ORP	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	110	NA	-38	NA	70.2	NA	24.7	NA	-83.4	NA	315.3	NA	74.8

Date	8/26/2014		10/30/2014		2/24/2015		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		8/23/2017		11/9/2017		3/8/2018		5/17/2018	
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	0.0030	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	0.0031	0.003	ND	0.003	ND	0.003	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	0.001	0.004	0.001	ND	0.001	ND	0.001	ND
Barium	0.0025	0.035	0.0025	0.034	0.0025	0.038	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	0.0025	0.039	0.0025	0.045	0.0025	0.041	0.0025	0.041
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	0.001	ND	0.001	ND	0.001	ND
Boron	0.050	0.15	0.050	0.14	0.050	0.17	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	0.05	0.14	0.05	0.19	0.05	0.13	0.05	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	0.00050	ND	0.00050	ND	0.00050	ND	0.0005	ND	0.0005	ND	0.0005	ND	0.0005	ND
Chloride	2.0	25	2.0	24	2.0	24	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	2	22	2	29	2	28	2	23
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	0.005	ND	0.005	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	0.001	ND	0.001	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	0.002	ND	0.002	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	0.01	ND	0.01	ND	0.01	ND
Fluoride	0.10	0.11	0.10	0.10	0.10	0.10	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	0.1	ND	0.1	ND	0.1	ND	0.1	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	0.10	ND	0.10	ND	0.10	ND	0.1	ND	0.1	ND	0.1	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	0.0005	ND	0.0005	ND	0.0005	ND
Manganese	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	0.0025	ND	0.0025	0.0059	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.028	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	0.00020	ND	0.00020	ND	0.00020	ND	0.0002	ND	0.0002	ND	0.0002	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	0.002	ND	0.002	ND	0.002	ND
Nitrogen/Nitrate	0.10	22	0.10	28	0.10	28	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	0.1	22	0.1	24	0.1	26	0.1	25
Nitrogen/Nitrate, Nit	2.0	22	2.5	28	2.0	28	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	2	22	2	24	2	26	2	25
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	0.02	ND	0.02	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	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	0.00050	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	0.0005	ND	0.0005	ND	0.0005	ND
Sulfate	10	35	10	54	10	27	10	33	20	64	25	57	10	50	10	40	10	43	10	38	10	33	10	43	10	34	20	38	20	41	20	30
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	0.002	ND	0.002	ND	0.002	ND
Total Dissolved Solic	10	440	10	510	10	490	10	530	10	540	10	460	10	510	10	530	10	620	10	540	10	520	10	560	10	460	10	530	10	530	10	540
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	0.005	ND	0.005	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	0.02	ND	0.02	ND	0.02	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	0.0005	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	0.0011	0.0025	ND	0.0025	0.0018	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	ND	0.0025	0.0014	0.0025	0.0009
pH	NA	7.41	NA	7.30	NA	7.56	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	NA	7.44	NA	6.95	NA	6.93	NA	6.76
Temperature	NA	22.10	NA	13.09	NA	8.21	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	NA	16.10	NA	13.06	NA	6.81	NA	17.97
Conductivity	NA	0.75	NA	0.94	NA	0.57	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	NA	0.67	NA	0.66	NA	0.53	NA	0.67
Dissolved Oxygen	NA	6.84	NA	2.05	NA	8.44	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	NA	7.63	NA	8.10	NA	7.53	NA	8.80
ORP	NA	36.7	NA	-2.7	NA	95.6	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	NA	170.0	NA	-34.3	NA	-16.9	NA	12.8

Date	8/8/2018		10/31/2018		2/27/2019		5/2/2019		8/27/2019		11/14/2019		2/25/2020		4/27/2020		8/11/2020		12/10/2020		2/23/2021		5/10/2021		8/25/2021		11/30/2021	
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
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
Arsenic	0.001	ND	0.001	ND	0.001	ND	0.001	ND	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	0.001	ND	0.001	ND
Barium	0.0025	0.038	0.0025	0.041	0.0025	0.045	0.0025	0.039	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	0.0025	0.035	0.0025	0.043
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 ^1+	0.001	ND ^+	0.001	ND ^+	0.001	ND	0.001	ND
Boron	0.05	0.15	0.05	0.18	0.05	0.17	0.05	0.2	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	0.05	0.14	0.05	0.14
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
Chloride	2	23	2	24	2	25	2	22	2	31	2	26	2	26	2	18	2	21	2	23	2	24	2	25	2	20	2	23
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
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
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
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 F1 F2	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND *-
Fluoride	0.1	ND	0.1	ND	0.1	ND	0.1	ND	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	0.1	ND	0.1	ND
Iron	0.1	ND	0.1	ND	0.1	0.23	0.1	ND	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	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
Manganese	0.0025	ND	0.0025	ND	0.0025	0.014	0.0025	ND	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	0.0025	ND	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	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
Nitrogen/Nitrate	0.1	24	0.1	22	0.1	23	0.1	20	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	0.1	18	0.1	23
Nitrogen/Nitrate, Nit	2	24	2	22	2.5	23	2.5	20	2.5	12	2.5	19 ^	2.5	22	2	23	1	18	5	29	2	22	2.5	22	2.5	18	5	23
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 F1	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
Selenium	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	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
Sulfate	10	29	10	25	25	36	5	33	5	35	5	32	5	29	5	29	5	25	5	27	5	25	5	30	5	24	5	29 ^+ ^-
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
Total Dissolved Solic	10	470	10	590	10	520	10	550	10	470	10	480	10	440	10	500	30	400	10	390	10	500	10	210	10	380	10	530
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
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
Benzene	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	0.0005	ND	0.0005	ND
BETX	0.0025	0.00866	0.0025	0.0021	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	7.19	NA	7.85	NA	7.00	NA	6.94	NA	7.03	NA	7.29	NA	7.02	NA	6.94	NA	6.94	NA	7.44	NA	7.21	NA	7.20	NA	7.10	NA	6.98
Temperature	NA	18.67	NA	14.83	NA	12.30	NA	12.40	NA	14.20	NA	12.45	NA	12.30	NA	12.70	NA	13.60	NA	13.30	NA	12.70	NA	12.70	NA	14.30	NA	13.90
Conductivity	NA	0.67	NA	0.63	NA	0.89	NA	0.53	NA	0.79	NA	0.82	NA	0.29	NA	0.72	NA	0.81	NA	0.84	NA	0.64	NA	0.80	NA	0.77	NA	0.86
Dissolved Oxygen	NA	8.26	NA	8.59	NA	8.16	NA	6.89	NA	8.33	NA	8.72	NA	7.14	NA	7.20	NA	7.04	NA	5.21	NA	8.19	NA	8.64	NA	9.03	NA	8.84
ORP	NA	5.4	NA	2.4	NA	81.3	NA	75.8	NA	106.6	NA	-18.7	NA	28.9	NA	13.6	NA	135.3	NA	97.9	NA	58.8	NA	172.1	NA	211.5	NA	114.5

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 9-5
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 Generating Station Metal Cleaning Basin dated March 31, 2022, 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; 4) Illinois Environmental Protection Agency (IEPA) approved the overall initial hydrogeologic assessment as part of a larger study.

Certified by: _____

Date: 3/31/22

Joshua Davenport, P.E.
Professional Engineer Registration No.: 062-061945
KPRG and Associates, Inc.

ATTACHMENT 9-6
PROPOSED CCR COMPLIANCE STATISTICAL APPROACH AND CERTIFICATION

K P R G

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

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SECTION/DESCRIPTION **PAGE**

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^{TM} 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:

$$95\%\ Prediction\ Limit = \bar{x} + t_{1-0.05/m,n-1} s \sqrt{1+\frac{1}{n}}$$

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

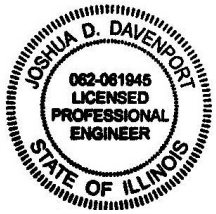
accordance with Section 845.650(d)(1) as well as meeting the requirements of Sections 845.660, 845.670 and 845.680.

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: 8/23/21



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 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

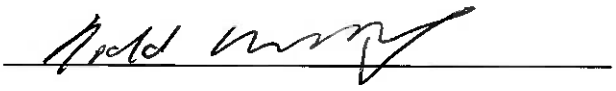
Table 1. Section 845.600 Groundwater Monitoring Parameter List

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: 

Title: Plant Manager

ATTACHMENT 11-2
PUBLIC MEETING GENERAL SUMMARY

Midwest Generation, LLC
Powerton Generating Station
Ash Surge Basin Retrofit and Metal Cleaning Basin Retrofit
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 retrofits of Powerton Generating Station's Ash Surge Basin and Metal Cleaning 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 two miles of the facility on March 23, 2023, which totaled 1,104 residential mailing addresses. The notice was also posted in 29 public locations within 10 miles of the facility boundary.

The public meetings for Powerton Generating Station's Ash Surge Basin and Metal Cleaning Basin were held on April 24, 2023 from 6:00 p.m. to 8:00 p.m. and on April 25, 2023 from 10:00 a.m. to 12:00 p.m. The meetings were held in person. Two members of the public attended the April 24th meeting. Seven members of the public, including one who attended the previous meeting, attended the April 25th meeting. 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 meeting. All attendees requested a copy of the meeting summary and transmittal of their email address to the Agency to be added to the Agency's listserv for the facility. All email addresses received will be transmitted to the Agency. After an introduction and approximate 30-minute presentation on the proposed retrofit construction plans, the public was given approximately 1.5 hours 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 Ash Surge Basin and Metal Cleaning Basin by removing the remaining material in the basin, retaining and decontaminating the existing geomembrane liner as an additional protective layer under the new composite liner system, and installing a new composite liner system and leachate collection and removal system.

SUMMARY OF ISSUES AND QUESTIONS RAISED DURING THE MEETING

Retrofit Design and Process

Questions were asked about the longevity of the retrofitted ponds. The HDPE geomembrane liner and geosynthetic clay liner materials proposed to be used in the retrofit plans are designed to meet the standards outlined by the U.S. Environmental Protection Agency and Illinois EPA in their respective CCR Rules. These liners are used in many environmental applications across the country and ongoing research estimates these geosynthetic materials, which will be covered, can last hundreds of years.

Questions were asked about the leachate collected after the retrofit and how it is treated. Leachate collected after the retrofit of the ponds will be collected, treated, and discharged via the Powerton Station's NPDES wastewater permit.

A question was asked about the retrofit timelines. The current plan is to retrofit the Metal Cleaning Basin first, followed by the Ash Surge Basin. While MWG will attempt to retrofit both the Ash Surge and Metal Cleaning Basins in parallel, construction cannot begin until permits are issued by the Illinois EPA, and limits on materials delivery and availability of contractors may prohibit this.

A question was asked about how the liner will be protected from damage during the decontamination and retrofit processes. There are two common methods that a contractor could use to remove material above the basins' existing liners: (1) traditional excavation and (2) hydro-excavation. Under a traditional excavation, the contractor could use front-end loaders, excavators, or other conventional excavation equipment with rubber-surfaced buckets, blades, etc. to protect the existing geomembrane liners as material is removed from the sideslopes and floors of the basins. Under a hydro-excavation, the contractor could use specialized equipment to apply pressurized water to break-up the existing materials and an industrial vacuum to remove the broken-up material, all while avoiding damage to the existing geomembrane liners. Ultimately, the means and methods used to decontaminate the basins' existing geomembrane liners will be determined by the contractor hired by MWG to retrofit the basins. Regardless of the actual means and methods implemented, the contractor will be responsible for taking all necessary precautions to avoid damaging the basins' existing geomembrane liners. In the rare instance where an existing liner is accidentally damaged, the contractor will be responsible for assessing the extent of the damage and patching the damaged area(s).

A question was asked about the size of the retrofitted basins. The footprints of the retrofitted basins will be the same as the current basins: the Ash Surge Basin is approximately 8.4 acres and the Metal Cleaning Basin approximately 2.3 acres in size. The overall footprints will not change.

A question was asked about ash handling during the retrofit process. Any ash that is removed from the pond during the retrofit construction process will be dewatered and sent off-site to a permitted landfill or beneficial use site.

A question was asked whether the material that underlies the current HDPE geomembrane liners of the ponds will be remediated during the retrofit process. The plan for retrofitting the Ash Surge and Metal Cleaning Basins 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 subgrade. The competency of the pond's existing HDPE geomembrane liners 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.

Groundwater Monitoring

Questions were asked about remediation plans for CCR constituents that may leak into groundwater. The Illinois CCR Rule outlines a corrective action process that would be implemented should groundwater monitoring identify a release of CCR constituents into groundwater. The process includes notification to the Illinois EPA, characterization of the nature and extent of the release, development of an assessment of corrective measures, public meetings, and submittal of a corrective action plan permit application. The corrective action plan must be approved by the Illinois EPA in the form of an issued permit. Once the permit is granted, corrective action would commence. Groundwater monitoring is conducted quarterly, as required by the Illinois CCR Rule.

Current Design

A question was asked about the separation distance between the groundwater and bottom of the ponds. The Metal Cleaning Basin's base is at least five feet above the upper limit of the site's uppermost aquifer. The Ash Surge Basin's base is within five feet of the upper limit of the site's uppermost aquifer, but there is no intermittent, recurring, or sustained hydraulic connection between any portion of the base of the Ash Surge Basin and the uppermost aquifer due to normal fluctuations in groundwater elevations. Therefore, both the Ash Surge Basin and Metal Cleaning Basin meet the Illinois CCR Rule's required separation between a CCR surface impoundment and the upper limit of the uppermost aquifer.

A question was asked about whether the sides of the ponds are lined. The sides of both ponds are currently lined with a 60-mil high density polyethylene (HDPE) liner and will also be lined with a composite liner system required by the Illinois CCR Rule once retrofitted.

Metal Cleaning Basin

A question was asked about an orange area visible on the overview map of the station slide and whether the color was indicative of acid mine drainage and high metals. The area in question was the south end of the Metal Cleaning Basin. Due to nature of the boiler wash water sluiced to the Metal Cleaning Basin, there are some metals in that wastewater; however, the water is treated via a wastewater treatment process to remove metals prior to discharge through the Station's NPDES permitted discharge. The clarifier solids are disposed in a permitted landfill or are beneficially reused.

A question was asked about beneficial use of ash in mine reclamation processes. The ash is sampled to ensure it meets the requirements and specifications of the end users.

Written Comments

The Central Illinois Heathy Community Alliance presented a letter addressed to MWG and Illinois EPA at the April 25th meeting, signed by Tracy Fox. With regard to the issues raised in that letter, MWG has no indication that soils beneath either basin are "damaged" and require remediation. Additionally, as stated above, ash that is removed from either basin during the retrofit process will be sent off-site to either a permitted landfill or beneficially reused. Midwest Generation, LLC is fully committed to complying with environmental laws and regulations.

Future

A question was asked about whether carbon capture sequestration was an option at the Powerton Station. MWG is not currently planning carbon capture sequestration at Powerton Station.

General concerns were raised about potential future impacts to the ponds due to climate change, such as groundwater level fluctuations and flooding, historic fill, and impacted soils under the basins. During the useful life of the impoundments and throughout the closure and post-closure care periods (if applicable), groundwater monitoring will continue, which includes monitoring and reporting the groundwater levels in the monitoring wells. Additionally, the impoundments will continue to be inspected by qualified staff and annually by a certified Professional Engineer. MWG has no evidence that groundwater levels around the impoundments at Powerton Station is rising, year-over-year.

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 Ash Surge Basin and the Metal Cleaning Basin 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.

Powerton Generating Station Public Meetings
Metal Cleaning Basin and Ash Surge Basin
April 24 & 25, 2023

Email Address	Name	General Summary	Listserv
annschreifels@gmail.com	Ann Schreifels	Yes	Yes
joblumen@yahoo.com	Joyce Blumenshine	Yes	Yes
bradley.wrighthulett@gmail.com	Bradley Wright-Hulett	Yes	Yes
jahchoices@gmail.com	Joyce Harat	Yes	Yes
moosersrus@yahoo.com	Jim & Bernie Humphrey	Yes	Yes