Disposal of Coal Combustion Residuals from Electric Utilities Rule

ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

PREFACE

Report Requirements

This report documents the status of the groundwater monitoring and corrective action program in place under the federal Coal Combustion Residuals (CCR) Rule. Containing data for the previous calendar year, it must be placed in the facility operating record by January 31 and posted publicly by March 2. It summarizes key actions completed, describes any challenges and how they were addressed, and projects key activities for the upcoming year. It must include a map or diagram depicting the CCR unit and all the wells in the monitoring network, identifying any that were decommissioned or installed in the previous year. In addition, it contains the monitoring data summary, a narrative discussing any transitions between detection monitoring and assessment monitoring and the reasons for those transitions.

What the Report Is

This report describes the first step in a phased, prescriptive process for monitoring groundwater near CCR storage facilities. It is a snap shot in time, showing how the data obtained during the report year compare to all the background data that have been obtained to date, and whether further monitoring for additional substances should be performed based on that comparison.

What the Report Is Not

The report does not make any determinations regarding potential environmental impact to or contamination of groundwater, and neither the raw data nor the initial statistical analysis should be independently or collectively interpreted in that way.

Report Methodology

Data comparison is done through a test to determine if monitoring results from wells adjacent to the CCR facility are statistically higher than background levels for that site. Therefore, as the data set increases over time, so does the confidence that any one result represents a statistically significant increase (SSI) over the background data. Groundwater moves slowly and both natural and man-made sources can impact groundwater. Therefore, the federal rule uses a phased approach with data verification steps in between. In this initial annual report, if a data result yields an SSI, the groundwater monitoring effort transitions from the detection program (measuring substances that move most rapidly in groundwater to identify a potential impact) to the assessment program (measuring substances that are of more concern including several that have regulatory standards).

2017 ANNUAL CCR GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

COAL COMBUSTION BYPRODUCT LANDFILL

Harrison Power Station
Harrison County, West Virginia

Prepared for:

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Tetra Tech Project No. 212C-SW-00069

January 2018

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TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This 2017 Annual Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of FirstEnergy (FE), for the Coal Combustion Byproduct Landfill (CCBL or "CCR unit") at the Harrison Power Station (hereinafter referred to as the "Station"). The Station is located in Monongalia County, West Virginia. The report was developed to comply with requirements of 40 CFR § 257.90(e).

1.1 BACKGROUND AND SITE CHARACTERISTICS

CCRs produced at the Station are placed in the facility's captive CCBL, which is located approximately 1.5 miles north of the Station. The landfill is an existing CCR unit that is regulated under West Virginia Department of Environmental Protection (WVDEP) Solid Waste/National Pollutant Discharge Elimination System (NPDES) Water Pollution Control Permit No. WV0075795. A WVDEP groundwater monitoring program for the landfill has been in effect since 1993. The landfill facility consists of three adjacent disposal areas, the Main Area (MA - approximately 150 acres), the Lower Area (LA - approximately 126 acres), and the Upper Area (UA - approximately 120 acres). Of this total, approximately 310 acres are currently permitted for landfill operations. Historically, landfilling operations have primarily been performed in the MA and LA disposal areas, with the UA disposal area more recently developed for use.

The MA disposal area, which has both unlined and lined portions, received CCR material from the station when the first units began operating in 1972, and was closed from 1979 (when disposal operations shifted over to the LA) until being reactivated in 2005. The LA disposal area is still active and also has both unlined (pre-1994) and lined portions, with the liner system consisting of a 24-inch thick engineered compacted clay liner underlain by a leachate detection zone and overlain with a leachate collection system. The MA and UA have been used for CCR material disposal since 2005 and 2011, respectively, with MA disposal being an overlay of the materials originally placed there, and UA disposal being in new, lined areas with the liner consisting of 4-inches of "enhanced" FGD by-product (amended with excess lime) that is underlain by a leachate detection zone and overlain with a leachate collection system. Stormwater runoff and leachate from the landfill discharge to a lined sedimentation pond, referred to as Sedimentation Pond No. 1.

Groundwater in the CCBL area occurs primarily within fractured bedrock and flow is controlled by a combination of topography and the bedrock structure (i.e., dip). The Lower Sewickley

sandstone has been identified as the uppermost aquifer for CCR Rule groundwater monitoring for the CCBL area. This aquifer overlies the Pittsburgh Coal which has been extensively deep-mined across the site. In some areas, localized mine subsidence-related fracturing likely serves as a drain for groundwater in the Lower Sewickley sandstone and other overlying rock units to migrate vertically into the abandoned mine workings, however, this is not believed to be significant on a large scale. Historic and recent groundwater level data indicate groundwater flow at the CCBL to be from west to east (approximating the dip of the Pittsburgh Coal), and that the flow exhibits little seasonal and temporal fluctuations. A representative set of water level data from the current reporting period (2017) were used for contouring groundwater flow patterns at the site as shown on Figure 2-1. A more detailed discussion of the site's geologic and hydrogeologic characteristics is provided in Section 2.0 of this report.

1.2 REGULATORY BASIS

As required by § 257.90(e), of the CCR Rule, Owners or Operators of existing CCR landfills and surface impoundments must prepare an Annual Groundwater Monitoring and Corrective Action Report no later than January 31, 2018 and annually thereafter. According to the subject section, "For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year."

This report has been developed to meet the general requirements above and the specific requirements of § 257.90(e)(1) through (5), which include:

> "(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit (see Figure 2-1);
>
> (2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken (see Section 2.1.1);
>
> (3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for

analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs (see Sections 2.1.3 and 2.1.5 and Table 3-1);

(4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels) (see Section 2.3); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98."

In addition, the Owner and Operator must place the report in the facility's operating record as required by § 257.105(h)(1), provide notification of the report's availability to the appropriate State Director within 30 days of placement in operating record as required by § 257.106(h)(1), and place the report on the facility's publically accessible website, also within 30 days of placing the report in the operating record.

1.3 OVERVIEW OF REPORT CONTENTS

Section 1.0 of this report provided an overview of the CCR unit characteristics, regulatory basis, and a summary of the requirements for CCR Annual Groundwater Monitoring and Corrective Action Reports. Section 2.0 summarizes the status of key actions pertaining to CCR groundwater monitoring completed during 2017 for the CCBL and plans for the upcoming year. Section 3.0 presents Detection Monitoring results and statistical evaluations from groundwater sampling events completed in 2017.

2.0 GENERAL INFORMATION

This section provides an overview of the status of the CCR groundwater monitoring program through 2017 and key activities planned for 2018.

2.1 STATUS OF THE GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM

During calendar years 2016 and 2017, the following key actions were completed with regard to the CCR groundwater monitoring program for the CCBL.

2.1.1 Establishing a CCR Groundwater Monitoring Well System

Tetra Tech was contracted by FirstEnergy to review existing groundwater monitoring system information and site hydrogeologic data for the CCBL to evaluate the suitability of the existing system, determine whether additional monitoring wells were needed, and to install and develop any new wells to establish a system that meets the applicable requirements and performance standards for groundwater monitoring under 40 CFR §257.91.

Upon completing this review, two additional groundwater monitoring wells were installed in June of 2016 to fill data gaps and to develop a network in compliance with CCR Rule requirements. The CCR monitoring well network consists of one upgradient (background) well (MW-5), and four downgradient wells (MW-17, -18, -19, and -20), as summarized in attached Table 2-1 and shown on attached Figure 2-1. A CCR Groundwater Monitoring System Evaluation Report (Tetra Tech, Inc., October, 2017), which discusses the basis for development of the monitoring well network and includes detailed information on the site geology, hydrogeology, and well completion records, was placed in the facility's operating record.

As required by § 257.91(f), the CCR groundwater monitoring well network was certified by a Professional Engineer to be in compliance with the applicable requirements of § 257.91. The subject certification was placed in both the facility's operating record and on the publically accessible website (http://ccrdocs.firstenergycorp.com/) on October 17, 2017.

2.1.2 Development of a Groundwater Monitoring Plan

On behalf of FE, Tetra Tech prepared a "Groundwater Monitoring Plan" to comply with applicable requirements of the CCR Rule. The document provides the sampling and analytical methodologies and procedures for collecting and reporting representative groundwater quality

data from CCR monitoring wells at the CCBL. As required by § 257.93(a), the document provides procedures and techniques for the following:

- Sample collection;
- Sample preservation and shipment;
- Analytical procedures;
- Chain-of-custody control; and
- Quality assurance (QA) and quality control (QC).

In addition, the document includes the statistical plan describing the process for evaluating groundwater monitoring data developed from the CCR sampling and analysis program [§ 257.93(f)].

2.1.3 Completion of Background Groundwater Sampling

To fulfill the applicable requirements of § 257.94(b), eight independent rounds of background groundwater samples for analyzing all Appendix III and IV parameters from each of the CCR monitoring wells were collected prior to October 17, 2017. The sampling events were conducted on the following dates:

Sampling Event	Dates
1	9/28 to 10/4/16
2	11/8 to 11/15/16
3	1/25 to 1/31/17
4	3/14 to 3/20/17
5	4/18 to 4/20/17
6	5/30 to 6/1/17
7	6/28 to 6/29/17
8	7/31 to 8/1/17

2.1.4 Selection of Statistical Methods

Based on the attributes of the data set from the eight rounds of background sampling, statistical methods were selected among the available methods referenced in § 257.93(f) which met the performance standards referenced in § 257.93(g). Data from the first eight rounds of groundwater analytical results collected at the upgradient and downgradient CCR network wells at the site were evaluated in terms of percent non-detects and data distributions to select the appropriate statistical method for each parameter to identify any Statistically Significant Increases (SSIs) over background concentrations [§ 257.93(h)].

As required by § 257.91(f)(6), the statistical method selection was certified by a Professional Engineer as currently appropriate for evaluating the groundwater monitoring data for the CCBL at the Harrison Power Station and as meeting the applicable requirements of § 257.93(f). The subject certification was placed in both the facility's operating record and on the publically accessible website on October 17, 2017.

2.1.5 Initial Detection Monitoring Sampling Event

In accordance with § 257.94, FirstEnergy collected the first round of Detection Monitoring samples from the upgradient and downgradient CCR groundwater monitoring wells from September 7 to September 12, 2017 as summarized in the table below. The samples were analyzed for Appendix III parameters, with the laboratory analyses completed in September 2017. Since these lab results were received in the third quarter of 2017 and a 90 day period is allowed by the CCR Rule for statistical evaluation which falls in the fourth quarter of 2017, the laboratory results were evaluated and Appendix III SSIs were identified as discussed in Section 3.0 of this report.

Monitoring Well	Location	Date Sampled	Purpose
MW-5	Upgradient/Background	9/7/17	Detection Monitoring
MW-17	Downgradient	9/12/17	Detection Monitoring
MW-18		---	Not Sampled – Insufficient Water
MW-19		9/12/17	Detection Monitoring
MW-20		9/7/17	Detection Monitoring

2.2 PROBLEMS ENCOUNTERED/RESOLVED

During the eight background sampling events and the initial Detection Monitoring sampling event, having sufficient recoverable volumes of groundwater from one of the pre-existing downgradient wells (MW-18) was found to be problematic as each subsequent sampling event occurred. This well has been part of the WVDEP groundwater monitoring program for several years and has historically been able to yield sufficient water, although it did require redevelopment in 2015 when its sampling volume yield decreased. It's believed that the combined WVDEP and CCR sampling frequencies required to obtain the eight background and initial Detection Monitoring samples in time to meet the CCR groundwater compliance milestone date of October 17, 2017 may have overstressed this well. It's also believed that this well remains viable for use in both the site's CCR and WVDEP groundwater monitoring systems as the required sampling frequency under

the CCR Rule (semi-annual) is now in effect. As such, and since the remaining CCR monitoring system still meets the minimum required number of downgradient wells, the water levels in MW-18 will be monitored on a quarterly basis during 2018. This additional water level data will be used to determine if MW-18 should again be redeveloped and if it will be viable to use as part of the site's CCR and WVDEP groundwater monitoring systems. If necessary, this additional water level data will also help establish the basis for preparing a demonstration - in accordance with § 257.94(d) - that the well must be sampled at a frequency between six months and one year in order to have recoverable groundwater volumes available. If such a demonstration needs to be prepared it will be placed in the landfill's operating record when complete, and included as part of the 2018 CCR Groundwater Monitoring and Corrective Action Report.

Other than the available groundwater sampling volumes for downgradient well MW-18 noted above, there were no other significant problems (e.g., quality control issues) encountered during 2017 with regard to the CCR groundwater monitoring program.

2.3 TRANSITION BETWEEN MONITORING PROGRAMS (IF ANY)

During 2016 and 2017, the eight rounds of background sampling for all Appendix III and IV parameters were conducted followed by initiation of Detection Monitoring with collection of the first Detection Monitoring samples in September 2017. Although there have been Appendix III SSIs identified (refer to Sections 2.1.5 and 3.0), there was no transition between monitoring programs during 2017 as the CCR Rule allows a 90 day period to either pursue an Alternate Source Demonstration (ASD) or initiate Assessment Monitoring. Since the SSI determinations were made late in the fourth quarter of 2017 this would fall late in the first quarter of 2018.

2.4 KEY ACTIVITIES PLANNED FOR THE UPCOMING YEAR

The following are the key CCR groundwater compliance activities planned for 2018:

- Decide whether or not an Alternate Source Determination will be performed [per § 257.94(e)(2)] to determine if a source other than the CCR unit may be causing the Appendix III SSIs.
- If an ASD is performed and indicates that an alternate source is responsible for all the SSIs identified, place the ASD in the landfill's operating record and continue with Detection Monitoring by conducting two semi-annual rounds of sampling and analysis for Appendix III constituents [per § 257.94(c)].
- If an ASD is not performed or if an ASD is performed and indicates that an alternate source is not responsible for all the SSIs identified, then initiate Assessment Monitoring for Appendix IV constituents [per § 257.94(e)(1)].

- Obtain quarterly water levels in MW-18 to determine if it should be redeveloped, if it's viable for use in the CCR groundwater monitoring system, and if it will require a sampling frequency of between six months and one year. Should it be determined that a demonstration for a modified sampling frequency is needed, it will be prepared in accordance with § 257.94(d).

3.0 DETECTION MONITORING INFORMATION

3.1 GROUNDWATER ANALYTICAL RESULTS SUMMARY

As presented above, the CCR groundwater sampling and analysis program implemented through the end of 2017 consists of the eight background sampling rounds conducted between September 2016 and August 2017 for all Appendix III and IV parameters, and the initial Detection Monitoring round of sampling conducted in September 2017 for all Appendix III parameters. Table 3-1 presents the analytical results for all these events. A statistical evaluation of the data set was performed using the approach and methods referenced in Section 2.1.4. The evaluation for the initial Detection Monitoring event used nine rounds of data for the Appendix III parameters in the upgradient (background) well and the September 2017 Appendix III data for the downgradient wells. These results are summarized in Table 3-2 and indicate there are SSIs for calcium, chloride, pH, sulfate and TDS in one or more well comparisons.

FirstEnergy is currently determining whether it may be appropriate to perform an ASD for the Appendix III parameters identified as having SSIs. As per the CCR Rule timeframe allowances (90 days), this determination will be made during the first quarter of 2018. In either case, the associated recordkeeping, notification, and reporting will be performed in accordance with the applicable requirements of 40 CFR §§ 257.94, 95, 105, 106, and 107.

TABLES

TABLE 2-1
CCR RULE GROUNDWATER MONITORING SYSTEM WELL SUMMARY
HARRISON CCB LANDFILL - 2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

Well	Year Installed	Formation Monitored	Ground Surface Elevation (ft MSL)	Total Well Depth (ft bgs)	Monitored Interval (ft bgs)	Monitored Interval (ft MSL)	Casing ID and Material
Upgradient (Background)							
MW-5	1993	Lower Sewickley SS	1283.98	208.5	148.5 – 208.5	1075.52 – 1135.52	4" - Sch. 40 PVC
Downgradient							
MW-17	1997	Lower Sewickley SS	1070.64	60.6	20.6 – 60.6	1010.04 – 1050.04	2" - Sch. 40 PVC
MW-18	1997	Lower Sewickley SS	1265.91	264.8	224.8 – 264.8	1001.11 – 1041.11	4" - Sch. 40 PVC
MW-19	2016	Lower Sewickley SS	1462.87	513.9	503.9 – 513.9	948.99 – 958.99	2.5" - Sch. 80 PVC
MW-20	2016	Lower Sewickley SS	1414.28	364.0	349.0 – 364.0	1050.30 – 1065.30	2.5" - Sch. 80 PVC

Notes: SS = sandstone MSL = mean sea level bgs = below ground surface ID = inside diameter PVC = polyvinyl chloride

TABLE 3-1
CCR RULE GROUNDWATER MONITORING ANALYTICAL RESULTS SUMMARY
HARRISON CCB LANDFILL - 2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

			APPENDIX III (all Chemical Constituents sampled as TOTAL RECOVERABLE)[1]							APPENDIX IV (all Chemical Constituents sampled as TOTAL RECOVERABLE)[1]														
SAMPLING EVENT NO.[2]	WELL ID[3]	SAMPLE DATE	BORON METALS MG/L	CALCIUM METALS MG/L	CHLORIDE MISC MG/L	FLUORIDE MISC MG/L	PH MISC S.U.	SULFATE MISC MG/L	TDS MISC MG/L	ANTIMONY METALS MG/L	ARSENIC METALS MG/L	BARIUM METALS MG/L	BERYLLIUM METALS MG/L	CADMIUM METALS MG/L	CHROMIUM METALS MG/L	COBALT METALS MG/L	LEAD METALS MG/L	LITHIUM METALS MG/L	MERCURY METALS MG/L	MOLYBDENUM METALS MG/L	SELENIUM METALS MG/L	THALLIUM METALS MG/L	RADIUM-226 RADIOCHEM PCI/L	RADIUM-228 RADIOCHEM PCI/L
1	MW-05 (D)	9/28/2016	0.0798 J	32	1.19	0.349	7.19	55.9	488	0.000175 U	0.00019 J	0.11238	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00117 J	0.01577 J	0.00007 J	0.000285 U	0.0011 U	0.000175 U	0.802	1.47 U
1	MW-05	9/28/2016	0.0963 J	31.8	1.18	0.346	7.2	55.7	480	0.00046 J	0.00015 U	0.11435	0.00022 U	0.00051 J	0.0003 U	0.000475 U	0.00163 J	0.01606 J	0.00008 J	0.000285 U	0.0011 U	0.00047 J	0.281 U	0.562 U
2	MW-05	11/8/2016	0.0821 J	35.7	1.12	0.356	6.96	57.1	472	0.000175 U	0.00015 U	0.13078	0.00022 U	0.000175 U	0.00038 J	0.000475 U	0.00052 U	0.01625 J	0.00004 U	0.00321 J	0.0011 U	0.000175 U	0.429 U	0.638 U
3	MW-05	1/25/2017	0.164 J	17.6	1.12	0.454	7.45	51.6	472	0.0009 U	0.00042 J	0.07249	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01636 J	0.00004 U	0.0064	0.0011 U	0.000175 U	0.284	0.293 U
4	MW-05 (D)	3/15/2017	0.175 J	10.9	1.19	1.47 J-	7.99	52.2	536	0.000175 U	0.0004 J	0.05813	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01332 J	0.00004 U	0.00097 J	0.0011 U	0.000175 U	0.0502 U	0.309 U
4	MW-05	3/15/2017	0.187 J	11.1	1.2	1.49 J-	8.16	52.2	544	0.000175 U	0.0003 J	0.0578	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01318 J	0.00004 U	0.00098 J	0.0011 U	0.000175 U	0.104 U	0.18 U
5	MW-05 (D)	4/19/2017	0.144 J	10.7	1.29	1.16	7.84	51.7	504	0.00017 U	0.001 U	0.06232	0.00022 U	0.00017 U	0.005 U	0.00047 U	0.00052 U	0.01375 J	0.00004 U	0.00113 J	0.0011 U	0.00017 U	0.135	-0.275 U
5	MW-05	4/19/2017	0.146 J	11.6	1.28	1.18	7.85	51.8	508	0.00017 U	0.001 U	0.05532	0.00027 J	0.00017 U	0.005 U	0.00047 U	0.00052 U	0.01394 J	0.00004 U	0.00115 J	0.0011 U	0.00017 U	0.233	-0.0812 U
6	MW-05	5/30/2017	0.394	9.95	1.11	1.69	8.02	51.5 J-	552	0.00017 U	0.00041	0.0505	0.00022 U	0.00017 U	0.0003 U	0.00047 U	0.00052 U	0.01206	0.00004 U	0.00089 J	0.0011 U	0.00017 U	0.0976	0.00249 U
7	MW-05	6/28/2017	0.148 J	11.4	1.38	1.36	8.09	52.2	492	0.00017 U	0.00015 U	0.09041	0.00022 U	0.00017 U	0.00045 U	0.00047 U	0.00052 U	0.01205 J	0.00004 U	0.00036 J	0.0011 U	0.00017 U	0.0924	-0.0734 U
8	MW-05	7/31/2017	0.0845 J	22.6	1.26	0.514	7.64	52.6	624	0.00017 U	0.00016 J	0.0712	0.00022 U	0.00017 U	0.00045 U	0.00047 U	0.00052 U	0.01498 J	0.00004 U	0.00051 J	0.0011 U	0.00017 U	0.159	0.433 U
9 (DM-1)	MW-05	9/7/2017	0.137 J	10.1	1	1.24 J-	7.8	50.5	576	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1	MW-17	10/3/2016	0.111 J	134 J	108 J-	0.042 J	6.73	105	608	0.000175 U	0.00119	0.07919	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01354 J	0.00007 J	0.0005 J	0.0011 U	0.000175 U	0.39	0.55 U
2	MW-17 (D)	11/14/2016	0.0953 J	147	115	0.045 J	6.72	121	708	0.000175 U	0.00871 J	0.1255	0.00022 U	0.00018 J	0.0003 U	0.000475 U	0.00062 J	0.01407 J	0.00004 U	0.00088 J	0.0011 U	0.00019 J	0.509 U	0.6 U
2	MW-17	11/14/2016	0.0988 J	149	114	0.044 J	6.68	117	704	0.000175 U	0.00031 J	0.08689	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01487 J	0.00004 U	0.00031 J	0.0011 U	0.000175 U	0.477 U	0.664
3	MW-17 (D)	1/25/2017	0.107 J	128	96.2	0.044 J	6.86	106	612	0.0009 U	0.00092 J	0.11062	0.00044 U	0.000175 U	0.0006 U	0.00095 U	0.00052 U	0.01462 J	0.00005 J	0.00087 J	0.0011 U	0.000175 U	0.0889 U	0.391 U
3	MW-17	1/25/2017	0.124 J	127	93.9	0.044 J	6.91	104	588	0.0009 U	0.00073 J	0.10779	0.00044 U	0.000175 U	0.0006 U	0.00095 U	0.00052 U	0.01428 J	0.00004 U	0.00085 J	0.0011 U	0.000175 U	0.29	0.634
4	MW-17	3/14/2017	0.079 J	126	92.4	0.053 J	7.03	106	604	0.0009 U	0.00076 J	0.1232	0.00022 U	0.0009 U	0.0003 U	0.000475 U	0.00052 U	0.01563 J	0.00004 U	0.00123 J	0.0011 U	0.0009 U	0.119 U	0.239 U
5	MW-17	4/18/2017	0.089 J	130	94.9	0.028 J	7.12	116	672	0.00017 U	0.001 U	0.11969	0.00022 U	0.00017 U	0.0003 U	0.00047 U	0.00052 U	0.01498 J	0.00004 U	0.00079 J	0.0011 U	0.00017 U	0.0916 U	0.0956 U
6	MW-17 (D)	5/31/2017	0.112 J	146	98.3	0.043 J	7.08	121	685	0.00017 U	0.0007	0.10698	0.00022 U	0.00017 U	0.0003 U	0.00047 U	0.00052 U	0.01359	0.00004 U	0.0006 J	0.0011 U	0.00017 U	0.112	-0.0857 U
6	MW-17	5/31/2017	0.144 J	147	98.9	0.041 J	6.9	122	680	0.00017 U	0.0009	0.10653	0.00022 U	0.00017 U	0.0003 U	0.00047 U	0.00052 U	0.01473	0.00004 U	0.00043 J	0.00146	0.00017 U	0.108 U	0.238 U
7	MW-17 (D)	6/28/2017	0.0833 J	141	102	0.047 J	6.85	126	708	0.00017 U	0.00128	0.09046	0.00022 U	0.00017 U	0.0034 J	0.00047 U	0.00052 U	0.01375 J	0.00004 U	0.00045 J	0.0011 U	0.00017 U	0.117	-0.101 U
7	MW-17	6/28/2017	0.0874 J	144	101	0.047 J	6.92	124	720	0.00017 U	0.00121	0.09214	0.00022 U	0.00017 U	0.01165	0.00047 U	0.00052 U	0.01172 J	0.00004 U	0.00045 J	0.0011 U	0.00017 U	0.0421 U	0.202 U
8	MW-17 (D)	8/1/2017	0.0511 J	130	101	0.053 J	6.97	112	652	0.00017 U	0.00075 J	0.09994	0.00022 U	0.00017 U	0.00045 U	0.00047 U	0.00052 U	0.01197 J	0.00004 U	0.00053 J	0.0011 U	0.00017 U	0.16	0.315 U
8	MW-17	8/1/2017	0.0591 J	135	99.6	0.052 J	7.03	112	644	0.0009 U	0.00086 J	0.10314	0.00022 U	0.00017 U	0.00045 U	0.00047 U	0.00052 U	0.01213 J	0.00004 U	0.00062 J	0.00116 J	0.00017 U	0.119	0.0241 U
9 (DM-1)	MW-17 (D)	9/12/2017	0.073 J	148	100	0.034 J	6.81	109	300 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9 (DM-1)	MW-17	9/12/2017	0.0687 J	140	100	0.041 J	6.61	112	688 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1	MW-18	10/3/2016	0.178 J	23.9 J	19.4 J-	0.234	6.84	0.805	987	0.00047 J	0.00399	0.39072	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01222 J	0.00008 J	0.00674	0.00111 J	0.000175 U	1.09	0.956
2	MW-18	11/15/2016	0.133 J	26.7	19.6	0.403	6.97	6.05	993	0.0009 U	0.00345	0.44903	0.00022 U	0.000175 U	0.0003 U	0.000475 U	0.00052 U	0.01299 J	0.00004 J	0.00706	0.0011 U	0.000175 U	1.47	1.44
3	MW-18	1/31/2017	0.15 J	16.8	25.9	0.412	6.94	5.63	1145	0.00026 J	0.00271	0.16973	0.00022 U	0.000175 U	0.00038 J	0.000475 U	0.00052 U	0.01531 J	0.012 U	0.00118 J	0.0011 U	0.000175 U	0.46	1
1	MW-19	10/4/2016	0.161 J	3.4 J	60.1	2.05	8.71	270	1012	0.00059 J	0.01965	0.03481	0.00022 U	0.000175 U	0.00094 J	0.00049 J	0.00099 J	0.005 U	0.00006 J	0.14953	0.0011 U	0.000175 U	0.551 U	1.02
2	MW-19	11/8/2016	0.145 J	3.71	60.8	1.86	8.61	232	968	0.00024 J	0.01776	0.03088 J	0.00022 U	0.000175 U	0.00145 J	0.000475 U	0.00058 J	0.005 U	0.00004 J	0.04266	0.0011 U	0.000175 U	0.67 U	1.16 U
4	MW-19	3/20/2017	0.159 J	7.82	72.1	2.19 J-	8.81	186	288	0.0009 U	0.01381	0.03176	0.00022 U	0.000175 U	0.005 U	0.0005 J	0.00107 J	0.005 U	0.00004 U	0.03596	0.0011 U	0.000175 U	0.102 U	0.166 U
5	MW-19	4/20/2017	0.175 J	7.2	61.9	1.86	8.55	159	852	0.00038 J	0.01089	0.04133	0.00022 U	0.00017 U	0.00331 J	0.00137 J	0.00119 J	0.005 U	0.00004 U	0.0315	0.0011 U	0.00017 U	0.102 U	0.135 U
6	MW-19	6/1/2017	0.178 J	2.65	78.1	2.12	8.67	187	956	0.00017 U	0.00046	0.09803	0.00044 U	0.00017 U	0.0006 U	0.00095 U	0.00052 U	0.01407	0.00004 U	0.00064 J	0.0022 U	0.00017 U	0.137 U	-0.121 U
7	MW-19	6/29/2017	0.136 J	3.66	74.9	1.72	7.94	186	824	0.00021 U	0.01411	0.02019	0.00022 U	0.00017 U	0.00045 U	0.00047 U	0.00052 U	0.005 U	0.00004 U	0.02947	0.0011 U	0.00017 U	0.0322 U	0.0358 U
8	MW-19	8/1/2017	0.14 J	2.28	84.5	2.14	9.01	177	884	0.0009 U	0.01325	0.01493	0.00022 U	0.00017 U	0.00082 J	0.00047 U	0.00065 J	0.005 U	0.00004 U	0.02986	0.0011 U	0.00017 U	0.1 U	0.458 U
9 (DM-1)	MW-19	9/12/2017	0.117 J	2.62	73.8	1.57 J-	7.5	154	792	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1	MW-20	10/4/2016	0.0597 J	15.4 J	15.8 J-	0.527	10.14	37.2	128	0.0006 J	0.00143	0.0661	0.00022 U	0.000175 U	0.0038 J	0.000475 U	0.00052 U	0.005 U	0.00005 J	0.03856	0.0011 U	0.000175 U	0.384 U	0.555 U
2	MW-20	11/10/2016	0.0573 J	14.8	19	0.668	10.38	128	356	0.0009 U	0.00242	0.07296	0.0003 J	0.00028 J	0.00426 J	0.000475 U	0.00052 U	0.005 U	0.00004 U	0.04404	0.0011 U	0.00033 J	0.469 U	0.623 U
3	MW-20	1/26/2017	0.095 J	20.6	59.2	1.09	11.88	612	2152	0.00151	0.01681	0.02664	0.00044 U	0.00022 J	0.00363 J	0.00095 U	0.00052 U	0.01 UJ	0.00004 U	0.21835	0.00623	0.000175 U	0.302	0.488 U
4	MW-20	3/16/2017	0.15 J	8.05	50.7	0.939	10.72	548	1016	0.0015 U	0.01517	0.02513	0.00088 U	0.000175 U	0.0012 U	0.0019 U	0.00062 J	0.02 U	0.00004 U	0.19552	0.00514	0.000175 U	0.0774 U	-0.198 U
5	MW-20	4/19/2017	0.183 J	25.4	143	0.688	10.94	1160	3548	0.00203	0.01844	0.04332	0.00044 U	0.00017 U	0.00283 J	0.00095 U	0.00052 U	0.01 U	0.00004 U	0.24889	0.00551	0.00017 U	-0.0167 U	-0.158 U
6	MW-20	5/31/2017	0.233	43.1	195	0.025 U	11.67	1370	3793	0.0017 U	0.01409	0.04789	0.00044 U	0.0002	0.00228	0.00095 U	0.00052 U	0.01 U	0.00004 U	0.20698	0.00858	0.00017 U	0.0942 U	0.244 U
7	MW-20	6/29/2017	0.141 J	46.5	214	0.615	11.68	1450	4110	0.00121 U	0.01455	0.08119	0.00022 U	0.00017 U	0.00275 J	0.00047 U	0.00052 U	0.00913 J	0.00004 U	0.25002	0.0077	0.00017 U	0.00105 U	0.0752 U
8	MW-20	7/31/2017	0.118 J	48.9	250	0.565	11.73	1640	4640	0.0023	0.01183	0.06706	0.00022 U	0.00018 J	0.00288 J	0.00047 U	0.00052 U	0.00952 J	0.00004 U	0.25692	0.00487 J	0.00017 U	0.0876	-0.00268 U
9 (DM-1)	MW-20	9/7/2017	0.131 J	51.1	351	0.113 J-	11.63	1790	5740	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES:
[1] Lab analyses were completed by Beta Lab and TestAmerica Laboratories, Inc., both of which are accredited/certified laboratories: Beta Lab ISO/IEC 17025 Cert No. 2490.01 (Exp. 11-30-18) and ISO/IEC 9001 Cert. No. 83761-IS7 (Exp. 01-16-21) and TestAmerica NELAP Identification Number: 02-00416, EPA Region: 3, Expiration Date: 04-30-18.
[2] Event Nos. 1 through 8 were background/baseline sampling events. Event No. 9 was the initial Detection Monitoring (DM-1) sampling event.
[3] Field duplicate samples that were taken for Quality Control purposes are noted with a (D).

DATA QUALIFER DEFINITIONS:
The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted method detection limit for sample and method.
J	The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the reporting limit).
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
R	The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample
UR	The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample.

TABLE 3-2
CCR RULE SUMMARY OF APPENDIX III SSI EVALUATIONS
HARRISON CCB LANDFILL - 2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

			Downgradient Wells			Statistically Significant Increase[e]		
Parameter[a]	Data Distribution for Upgradient Well MW-05	UPL[b,c]	MW-17	MW-19	MW-20	MW-17	MW-19	MW-20
Boron	Log-Normal	0.462	0.0709	0.117	0.131	No	No	No
Calcium	Log-Normal	54.643	144	2.62	51.1	Yes	No	No
Chloride	Normal	1.458	100	73.8	351	Yes	Yes	Yes
Fluoride	Normal	2.255	0.0375	1.57	0.113	No	No	No
pH[d]	Normal	8.651 (6.699)	6.70	7.50	11.63	No	No	Yes(UPL)[f]
Sulfate	Non-Parametric	57.10	110.5	154	1790	Yes	Yes	Yes
TDS	Normal	651.98	494	792	5740	No	Yes	Yes

NOTES:

[a] All units are mg/L, except pH (S.U.)

[b] Prediction Limits calculated using 5% alpha.

[c] Upper Prediction Limit used for all parameters, except pH where both upper and lower prediction limits were calculated.

[d] pH Lower Prediction Limit shown in parantheses, both used for comparison.

[e] No indicates that downgradient well was less than UPL for upgradient well.

[f] Well MW-20 has much higher pH than UPL and differs from other downgradient wells.

FIGURES

PGH P:\GIS\FIRST_ENERGY\MAPDOCS\HARRISONCO_PROPOSED_MW_MAY2017_CCR.MXD 01/26/18 SP

References:
1. Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (C2014 ESRI and its data suppliers).
2. Contours obtained from the West Virginia GIS Technical Center.
3. Approximate Waste Boundary line was obtained from FirstEnergy Drawing No. C89506725, Rev. 1, dated 1/25/2011.
4. Pre-Existing monitoring well locations and the approximate Parcel Boundary line were obtained from FirstEnergy Drawing No. C8950199, Rev. B, dated 1/9/2003.
5. Monitoring wells MW-19 and MW-20 were installed by Tetra Tech, Inc. in June 2016. As-built well locations were obtained by field survey performed by Tetra Tech, Inc. on 07/11/2016.

WELL NUMBER	NORTHING	EASTING
MW-5	330871.6	1731733.0
MW-17	328548.0	1736010.0
MW-18	329269.8	1736473.2
MW-19	330293.3	1736904.0
MW-20	331766.1	1735688.8

Coordinates are in NAD 1983 State Plane West Virginia North (feet)

N

Upper Area
Main Area
Lower Area
Harrison Power Station

MW20 (1058.73)
MW19 (1026.06)
MW-18 (1002.68)
MW-17 (1045.56)
MW-5 (1091.55)

1,000 0 1,000 Feet

Legend

- New Monitoring Well
- Pre-Existing Monitoring Well
- Approximate Waste Boundary
- Approximate Parcel Boundary
- Groundwater Elevation Contour
- (1091.70) Groundwater Elevation May 2017
- Topographic Contour (10-foot)

TETRA TECH

CCR RULE GROUNDWATER MONITORING SYSTEM
HARRISON POWER STATION
CCB LANDFILL

FIRSTENERGY CORPORATION
GREENSBURG, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/26/18
CHECKED BY: B. BAKER 01/26/18
APPROVED BY: B. BAKER 01/26/18

CONTRACT NUMBER: 212C-SW-00069

FIGURE NUMBER 2-1

REVISION 0