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Revision 3: March 13, 2023
Revision 2: May 24, 2021
Revision 1: April 17, 2019
Original: October 17, 2017
File No. 129778

SUBJECT: Lawrence Energy Center – Groundwater Monitoring System Certification
Existing 847 Landfill and inactive Area 2 Pond, Area 3 Pond, and Area 4 Pond
Evergy Kansas Central, Inc.

Evergy Kansas Central, Inc. (Evergy) operates the subject coal combustion residuals (CCR) management units referred to as the 847 Landfill (active), and Area 2 Pond (inactive), Area 3 Pond (inactive), and Area 4 Pond (inactive; collectively, inactive Ash Ponds) at the Lawrence Energy Center (LEC) located in Lawrence, Kansas. These CCR units are considered subject to the CCR Rule since they were either active or identified as inactive with a notification of intent to close as of the effective and/or applicable dates of the CCR Rule.

This document addresses the requirements of § 257.91 *Groundwater Monitoring Systems*, specifically § 257.91(f), of the U.S. Environmental Protection Agency's (USEPA) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, Code of Federal Regulations Title 40 (40 CFR) Part 257 (CCR Rule) effective October 19, 2015, and subsequent rulemaking revisions. In addition, this document revision provides narratives outlining the basis for the design and geospatial arrangements of the CCR well monitoring networks based on site-specific conditions, established hydrogeologic principles, and industry practice, with consideration for the geometry and physical characteristics of and material contents within the CCR unit(s) being monitored.

Evergy has determined, based upon Haley & Aldrich, Inc.'s recommendations, that a multi-unit groundwater monitoring system is preferred for the inactive Ash Ponds as allowed pursuant to §257.91(d). This multi-unit monitoring system is as capable of detecting monitored constituents passing the combined unit waste boundary as individual groundwater monitoring systems.

The single-unit groundwater monitoring system at the 847 Landfill and the multi-unit groundwater monitoring system at the inactive Ash Ponds have been designed to include at least a minimum of one upgradient and three downgradient monitoring wells pursuant to § 257.91(c). The design and construction information for the 847 Landfill monitoring well network was reviewed and approved by the Kansas Department of Health and Environment (KDHE) on July 5, 2016, per applicable Kansas solid waste rules. In 2020, Evergy submitted a revised sampling and analysis plan, which included the groundwater monitoring system design for both the 847 Landfill and Ash Ponds, to KDHE for review under KDHE permit 0847 and applicable Kansas solid waste rules. Finding that the monitoring systems and associated sampling plan were adequate to monitor the groundwater associated with these units, KDHE approved the updated sampling and analysis plan on September 4, 2020. Table 1 below presents

the wells in each of the groundwater monitoring systems as certified herein. This certification has been prepared based upon information available in the facility Operating Record pursuant to § 257.91(e)(1).

Table 1 – CCR Unit Groundwater Monitoring Well Networks

CCR UNIT	Upgradient Monitoring Wells		Downgradient Monitoring Wells				
847 Landfill	MW-32	MW-35	MW-31R	MW-33	MW-34		
inactive Ash Ponds	MW-37		MW-38	MW-39	MW-40	MW-K	MW-L

847 LANDFILL CCR MONITORING SYSTEM

The 847 Landfill monitoring network includes two upgradient and three downgradient monitoring wells. Prior to the certification of the current monitoring system, two upgradient monitoring wells were installed and sampled at the unit, which assisted in defining the groundwater flow direction and evaluating water quality in the uppermost aquifer. The number, spacing, and depths of monitoring wells was determined based upon site-specific technical information observed during drilling, installation, and testing of the monitoring wells, including stratigraphy, lithology, hydraulic conductivity, and porosity, along with site-specific data developed during previous characterization activities. The monitoring network was designed to monitor the Tonganoxie sandstone member of the Stranger Formation, which is a confined aquifer that constitutes the uppermost aquifer beneath the CCR unit and has a saturated thickness of approximately 97 to 161 feet based on observations made during drilling at 847 Landfill. The hydraulic conductivity of the uppermost aquifer was calculated using data generated from slug tests conducted after monitoring well installation and development and calculated between $1.1x10^{-3}$ centimeters per second (cm/sec) and $2.5x10^{-4}$ cm/sec. Based on slug test results, effective porosity of the uppermost aquifer is estimated to be 10 percent. The groundwater flow velocity was calculated to be approximately 1.4 feet per year (feet/year) toward the northeast. Groundwater flowing at this velocity and direction would be expected to convey impacted groundwater from beneath the unit and past the waste boundary within the monitoring timeframe. The monitoring wells have been constructed at locations on the northeast side of the unit that allow them to intercept representative groundwater flow paths passing beneath the unit, at the waste boundary. Upgradient monitoring well MW-35 is not used for groundwater contours as it is located near MW-32 but screened in a deeper section of the uppermost aquifer to monitor water quality at the base of the aquifer. The number and placement of monitoring wells at the 847 Landfill is appropriate based on the consistent groundwater flow direction and groundwater flow velocity to detect groundwater constituents present in representative groundwater flow paths within the uppermost aquifer and passing the waste boundary.

INACTIVE ASH PONDS CCR MONITORING SYSTEM

The inactive Ash Ponds multi-unit monitoring network as originally designed includes one upgradient and five downgradient monitoring wells. The number, spacing, and depths of monitoring wells was determined based upon site-specific technical information observed during drilling, installation, and testing of the monitoring wells, including stratigraphy, lithology, hydraulic conductivity, and porosity, along with site-specific data developed during previous characterization activities. The monitoring

network was designed to monitor the terrace deposits, which consists of reworked glacial till material that includes poorly sorted clay, sand, and gravel. The terrace deposits constitute the uppermost aquifer beneath the CCR unit and have a saturated thickness of approximately 21 to 38 feet based on observations made during drilling at the inactive Ash Ponds. The hydraulic conductivity of the uppermost aquifer was calculated using data generated from slug tests conducted on monitoring wells installed in the terrace deposits adjacent to the inactive Ash Ponds and was calculated between $1.5x10^{-3}$ to $4.2x10^{-3}$ cm/sec. Based on estimates for similar material, effective porosity of the terrace deposits is estimated to be 0.1 to 0.2 percent. The calculated groundwater flow velocity ranges from 11.6 to 182 feet/year to the north/northeast. Groundwater flowing at this velocity and direction would be expected to convey impacted groundwater from beneath the unit and past the waste boundary within the monitoring timeframe. The monitoring wells have been constructed at locations on the north and northeast sides of the unit that allow them to intercept representative groundwater flow paths passing beneath the unit, at the waste boundary. Two downgradient monitoring wells (MW-K and MW-L) were present at the Site prior to the installation of the remaining monitoring wells and were included in the monitoring network to provide additional downgradient water quality and potentiometric (groundwater elevation) observations. The number and placement of monitoring wells at the inactive Ash Ponds is appropriate based on the consistent groundwater flow direction and groundwater flow velocity to detect groundwater constituents present in representative groundwater flow paths within the uppermost aquifer and passing the waste boundary.

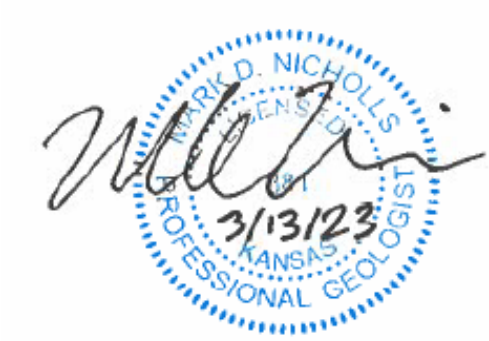
CERTIFICATION STATEMENT

Pursuant to 40 CFR Chapter I Subchapter I Part 257 Subpart D §257.91(f), I certify that the groundwater monitoring systems for the subject units have been designed and constructed to meet the requirements of § 257.91. The certification submitted is, to the best of my knowledge, accurate and complete.

Signed: _____
Certifying Engineer

Print Name: Steven F. Putrich, P.E.
Kansas License No.: PE24363
Title: Principal Consultant
Company: Haley & Aldrich, Inc.

Signed: _____
Professional Geologist



Print Name: Mark D. Nicholls, P.G.
Kansas License No.: 881
Title: Lead Hydrogeologist
Company: Haley & Aldrich, Inc.

Revision No.	Date	Notes
0	October 17, 2017	Original
1	April 17, 2019	Revised to include the inactive Ash Ponds in subject certification.
2	May 24, 2021	Provide additional information supporting the rationale for the originally certified CCR monitoring well networks at 847 Landfill and the inactive Ash Ponds.
3	March 13, 2023	Provide additional information supporting the performance standards for the CCR monitoring well networks in accordance with § 257.91(f) of the CCR Rule.