



322 LANDFILL WELL PLACEMENT/DEVELOPMENT PLAN

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Jared Morrison  
Director Environmental Services  
Evergy, Inc.

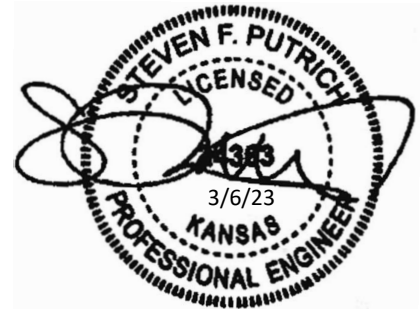
03/14/2023

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Date

322 LANDFILL WELL PLACEMENT/DEVELOPMENT PLAN  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

by  
Haley & Aldrich, Inc.  
Phoenix, Arizona



for  
Evergy Kansas Central, Inc.

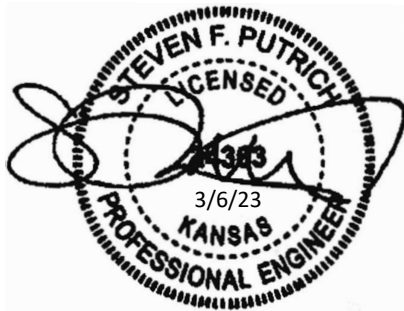


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# 1. Introduction

This document is the 322 Landfill Well Placement/Development Plan (Plan) prepared pursuant to Paragraph 10.f. of the Consent Agreement and Final Order (CAFO) between the U.S. Environmental Protection Agency (USEPA) and Evergy Kansas Central, Inc. (Evergy) In the Matter of Evergy Kansas Central, Inc.: Docket No. RCRA-07-2023-0001 dated November 7, 2022. Paragraph 10.f. of the CAFO requires that Evergy provide USEPA a plan for the installation of additional wells at the 322 Landfill.

## 1.1 BACKGROUND

Evergy Tecumseh Energy Center (TEC) is a closed coal fired power generation facility. Evergy operated a permitted solid waste disposal area referred to as the 322 Landfill. This landfill was permitted through the Bureau of Waste Management of the Kansas Department of Health and Environment (KDHE) under Permit No.322. Prior to, and during, plant decommissioning, the landfill received coal combustion residuals (CCR) and other permitted industrial waste streams. The 322 Landfill was closed in accordance with the CCR Rule and KDHE regulatory requirements. CCR Rule Closure of the unit was certified in accordance with Title 40 Code of Federal Regulations (40 CFR) § 257.102 on April 30, 2021. The unit is currently being managed in accordance with the post-closure care requirements.

Pursuant to Paragraph 10.f. of the CAFO, this Plan has been prepared for the installation of additional monitoring wells at the 322 Landfill. The items requested by USEPA in Paragraphs 10.f.i. through 10.f.v. of the CAFO are provided in the following sections.

### 1.1.1 Monitoring Network

Consistent with 40 CFR §§ 257.90 through 257.95, Evergy installed and certified a groundwater monitoring network for the 322 Landfill at TEC and collected eight rounds of groundwater samples for the analysis of Appendix III and Appendix IV baseline constituents. The groundwater monitoring network at the 322 Landfill includes one upgradient monitoring well (MW-4) and three downgradient monitoring wells (MW-1, MW-5, and MW-6); and one cross gradient well (MW-2) is used to monitor groundwater elevations for the purpose of establishing groundwater flow direction at each sampling event.

Monitoring well MW-4 was sited at a location considered to be representative of background groundwater conditions. Groundwater in the uppermost aquifer beneath the 322 Landfill consistently flows in a northeast direction. The downgradient monitoring wells were sited based on site-specific conditions at locations considered sufficient to detect groundwater constituents in the uppermost aquifer passing the waste boundary of the unit. The locations of the monitoring wells are shown on Figure 1, and well construction details are provided in Table 1.

## 1.2 PURPOSE AND SCOPE

This Plan addresses requirements set forth in Paragraph 10.f. of the CAFO and is consistent with requirements outlined in 40 CFR §§ 257.90(b)(1) and 257.91 for groundwater monitoring and system, and applicable requirements outlined in 40 CFR § 257.95(d). The specific requirements for this Plan listed in the CAFO are provided in Sections 2 through 4 of this Plan and are in bold italic font, followed by a narrative describing how each requirement has been met.

## 2. Groundwater Monitoring Well Installation

### 2.1 MONITORING WELL LOCATIONS

**Paragraph 10.f.i. of the CAFO requires:**

*"A discussion of how the proposed wells will comply with 40 CFR §§ 257.90(b)(1) and 257.91."*

In accordance with CAFO Paragraph 10.f.i., the installation of two (2) new monitoring wells at potential upgradient locations and four (4) new monitoring wells at downgradient or cross gradient locations at the TEC 322 Landfill is proposed to monitor groundwater quality passing the waste boundary of the 322 Landfill (Figure 2) pursuant to 40 CFR § 257.90(b)(1)(i) and the performance standard of 40 CFR § 257.91(a).

Pursuant to 40 CFR § 257.91(b), the number, spacing, and depths of proposed monitoring wells were determined based upon site-specific technical information obtained during drilling, installation, and testing of the original monitoring wells at the 322 Landfill, including stratigraphy, lithology, hydraulic conductivity, porosity, and site-specific data developed during previous characterization activities. The proposed wells include wells in known upgradient and downgradient locations, and additional wells that will further support characterization of the groundwater flow field. Several of the proposed wells may be cross gradient and may be monitored for piezometric observation only.

Based on existing groundwater elevation data, the groundwater flow direction is consistently toward the northeast, and the water bearing geologic formation nearest the natural ground surface at the 322 Landfill is composed of poorly sorted glacial till material that includes clay, sand, and gravel. The proposed monitoring wells will be installed to a depth of approximately 15 feet below ground surface and will be screened within the glacial till material directly above the shale confining unit that underlies the 322 Landfill (Figure 3). The proposed monitoring wells will be designed and installed in accordance with 40 CFR § 257.91(e).

As directed in 40 CFR § 257.91(c), following installation of the proposed monitoring wells to the current monitoring system, the 322 Landfill monitoring system will now include as many as three (3) upgradient monitoring wells and at least five (5) downgradient monitoring wells, which exceeds the minimum well requirements identified under the CCR Rule. Downgradient monitoring wells will be at a horizontal spacing of approximately 350 to 400 feet similar to the current spacing of downgradient monitoring wells MW-5 and MW-6. The additional wells, including cross gradient wells, will serve to demonstrate that the groundwater flow direction is consistently toward the northeast.

During previous drilling programs, shallow bedrock was observed, and dry formation conditions were encountered southwest of the 322 Landfill. One (1) additional upgradient monitoring well was installed in this area as part of the 322 Landfill groundwater monitoring system but was found to be dry and not in communication with the uppermost aquifer. If these conditions are found to extend along the western edge of the landfill, the proposed upgradient monitoring wells may not contain sufficient groundwater to collect groundwater samples.

The newly installed monitoring wells will be allowed to set for a minimum of 12 hours prior to well development. The wells will be developed by the swabbing, bailing, airlifting, and/or pumping methods. Development will be complete once the monitoring well is visibly clear and sediment free, turbidity is

reduced to less than 10 Nephelometric Turbidity Units (NTU) or has stabilized, and when pH, temperature, and conductivity have stabilized. Water level elevations will be measured with a decontaminated water level indicator during well development.

The proposed schedule for installation of the new 322 Landfill monitoring wells is provided in Table 2.

## 2.2 BASELINE SAMPLING

**Paragraph 10.f.ii. of the CAFO requires:**

*“A proposed sampling schedule to meet the requirements of 40 CFR § 257.90(b)(1)(iii).”*

A detection monitoring program will be initiated at the newly installed monitoring wells in accordance with 40 CFR § 257.90(b)(1)(iii) within 30 days of monitoring well development. The program will include a minimum of eight independent baseline groundwater samples collected from each new monitoring well and analyzed for the constituents listed in Appendix III and Appendix IV. The samples will be collected bi-monthly from the newly installed monitoring wells over a period of 16 months to ensure collection of data describing seasonal variability.

All samples will be analyzed by a laboratory certified by the State of Kansas. Data validation and usability assessment will be performed in accordance with guidance and requirements established in the documents titled *USEPA National Functional Guidelines for Inorganic Data Review (USEPA, 2020)*<sup>1</sup> and *the Evaluation of Radiochemical Data Usability (Paar, 1997)*.<sup>2</sup>

The baseline sampling schedule for the new 322 Landfill monitoring wells is provided in Table 2.

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<sup>1</sup> U.S. Environmental Protection Agency, 2020. National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001. January.

<sup>2</sup> Paar, J.G., 1997. Evaluation of Radiochemical Data Usability. April.

### 3. Assessment Monitoring Groundwater Sampling Program

#### 3.1 ASSESSMENT MONITORING

***Paragraph 10.f.iii. of the of the CAFO requires:***

*“A proposed schedule for incorporating the new wells into the assessment monitoring sampling program when viable.”*

The current assessment monitoring program includes sampling and analysis of Appendix III and Appendix IV constituents followed by statistical analysis in accordance with the sampling and analysis program (40 CFR § 257.90(b)(1)(ii) and (iv)). The annual assessment monitoring sampling event consists of all Appendix IV constituents pursuant to 40 CFR § 257.95(b). Upon completion of eight baseline sampling events at the newly installed 322 Landfill monitoring wells, the new monitoring wells will be included in the assessment monitoring program together with MW-1, MW-4, MW-5, and MW-6 and be certified as part of the network in accordance with 40 CFR § 257.91(f).

The schedule for incorporation of the new wells into the assessment monitoring program at 322 Landfill is provided in Table 2.

#### 3.2 SEMI-ANNUAL ASSESSMENT MONITORING SAMPLING

***Paragraph 10.f.iv. of the CAFO requires:***

*“A proposed sampling schedule for semi-annual assessment monitoring for any Appendix III and Appendix IV constituents identified in the annual assessment monitoring event pursuant to 40 CFR § 257.95(d).”*

In accordance with 40 CFR § 257.95(d)(1), assessment monitoring sampling will be completed at monitoring wells MW-1, MW-4, MW-5, and MW-6 on a semi-annual basis beginning within 90 days of obtaining validated results from the annual assessment monitoring sampling event. Upon completion of eight baseline sampling events at the new monitoring wells, the wells will be incorporated into the assessment monitoring program. The assessment monitoring sampling schedule is provided in Table 2.



## 4. Reporting

**Paragraph 10.f.v. of the CAFO requires:**

*“Identification of any potential updates and/or modifications to reports/notifications in Respondent’s operating record and on Respondent’s publicly available CCR compliance webpage and a schedule for making the updates and/or modifications.”*

In accordance with CAFO Paragraph 10.f.v., the following reports/notifications will be updated or modified to reflect the additional groundwater monitoring wells. The schedule for document updates is presented in Table 3:

- Groundwater System Certification – 40 CFR § 257.91(f)
- Sampling and Analysis Plan – 40 CFR § 257.90(b)(1)(ii) and 40 CFR § 257.93(a)

## **TABLES**

**TABLE 1**  
**MONITORING WELL CONSTRUCTION INFORMATION**  
EVERGY KANSAS CENTRAL, INC.  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

Location	Well Identification	Well Installation Date	Casing Diameter (inches)	Blank Casing Type	Screened Casing Type	Slot Size (inch)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Well Depth (feet bgs)	Depth to Water <sup>a</sup> (feet btoc)	Water Level Elevation (feet amsl)	Water Column Depth (feet)	Northing <sup>b</sup>	Easting <sup>b</sup>	Ground Surface Elevation (feet amsl) <sup>c</sup>	Top of Casing Elevation (feet amsl)
<b>322 Landfill</b>																
Downgradient	MW-1	6/7/1978	4	Schd 40 PVC	Schd 40 PVC	0.500	5.5	25.5	25.5	6.08	898.57	19.42	270840.4168	2004708.9116	902.65 <sup>c</sup>	904.65
	MW-2	7/8/2009	2	Schd 40 PVC	Schd 40 PVC	0.010	11.5	16.5	16.5	13.31	917.06	3.19	270802.1534	2004122.3714	928.37 <sup>c</sup>	930.37
	MW-5	4/8/2016	2	Schd 40 PVC	Schd 40 PVC	0.020	6	16	16	8.26	907.92	7.74	270381.5513	2004921.3410	913.3	916.18
	MW-6	4/8/2016	2	Schd 40 PVC	Schd 40 PVC	0.020	8.7	18.7	18.7	9.63	901.65	9.07	270804.2617	2004929.8163	908.04	911.28
Upgradient	MW-4	4/13/2012	2	Schd 40 PVC	Schd 40 PVC	0.020	7	12	12	6.32	930.16	5.68	268353.7298	2004187.4333	934.48 <sup>c</sup>	936.48

**Notes:**

Monitoring Well Used for Piezometric Observation Only

<sup>a</sup> Depth to water from groundwater elevation survey on September 9, 2022.

<sup>b</sup> Data Source: Westar Energy Tecumseh Energy Center, August 2016.

<sup>c</sup> Surface elevation estimated based on 2-foot casing stick up

amsl - above mean sea level

bgs - below ground surface

btoc - below top of casing

Schd 40 PVC - Schedule 40 polyvinyl chloride

**TABLE 2**  
**PROPOSED SCHEDULE FOR CONSENT AGREEMENT PARAGRAPH 10.f.**  
 EVERGY KANSAS CENTRAL, INC.  
 TECUMSEH ENERGY CENTER  
 TECUMSEH, KANSAS

Schedule Item <sup>1</sup>	CAFO Item	CCR Rule Regulation	Estimated Start Date
Install new wells	<i>Paragraph 10.f.i.</i>	<i>40 CFR § 257.90(b)(1)(i)</i> <i>40 CFR § 257.91</i>	Within 180 days of USEPA approval of this Plan <sup>2</sup>
Initiate baseline sampling of new wells	<i>Paragraph 10.f.ii.</i>	<i>40 CFR § 257.90(b)(1)(iii)</i>	Within 30 days of monitoring well development
Incorporation of new wells into network	<i>Paragraph 10.f.iii.</i>	<i>40 CFR § 257.90(b)(1)(iv)</i>	Within 30 days of obtaining validated results from eight independent baseline sampling events
Semi-annual assessment monitoring sampling	<i>Paragraph 10.f.iv.</i>	<i>40 CFR § 257.95(d)(1)</i>	Within 90 days of obtaining validated results from the annual assessment monitoring sampling event

**Notes:**

1. Proposed schedule address the requirements in Paragraph 10.f. of a consent agreement between the U.S. Environmental Protection Agency and Evergy dated November 7, 2022

2. 322 Well Placement / Development Plan (Plan)

CAFO = Consent Agreement and Final Order

CCR = Coal Combustion Residual

CFR = Code of Federal Regulation

SSL = statistically significant level

USEPA = U.S. Environmental Protection Agency

**TABLE 3**  
**PROPOSED SCHEDULE FOR REPORTING UPDATES / MODIFICATIONS**  
 EVERGY KANSAS CENTRAL, INC.  
 TECUMSEH ENERGY CENTER  
 TECUMSEH, KANSAS

Report Item <sup>1</sup>	CCR Rule Regulation	Estimated Completion Date
Groundwater System Certification	40 CFR § 257.91(f)	Within 60 days of incorporating new monitoring wells into the monitoring well network
Sampling and Analysis Plan	40 CFR § 257.90(b)(1)(ii) 40 CFR § 257.93(a)	Within 60 days of incorporating new monitoring wells into the monitoring well network

**Notes:**

1. Proposed schedule address the requirements in Paragraph 10.f.v. of a consent agreement between the U.S. Environmental Protection Agency (EPA) and Evergy dated November 7, 2022




CCR = Coal Combustion Residual

CFR = Code of Federal Regulation

## **FIGURES**

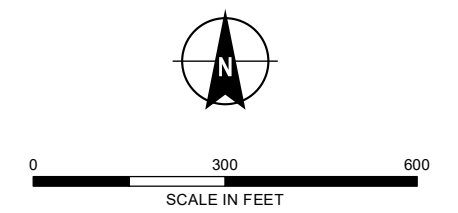


**LEGEND**

-  MONITORING WELL
-  PIEZOMETER OBSERVATION ONLY
-  322 LANDFILL BOUNDARY

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI, NOVEMBER 7, 2019



EVERGY KANSAS CENTRAL, INC.  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

**322 LANDFILL MONITORING  
WELL LOCATION MAP**









MARCH 2023



GIS FILE PATH: \\haleyaldrich\share\phx\_common\Projects\Weststart\Tecumseh Energy Center (TEC)\GIS\MXDs\2023\_01\12\2023\_0112\2023\_039\_0001\_322\_PROPOSED\_GROUNDWATER\_MONITORING\_WELLS.mxd — USER: khansen — LAST SAVED: 2/15/2023 3:56:07 PM

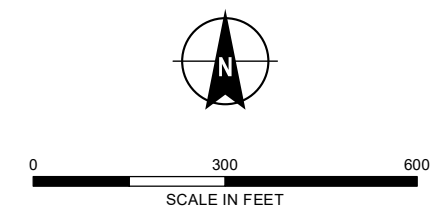


**LEGEND**

-  PROPOSED UPGRADIENT MONITORING WELL
-  PROPOSED DOWNGRADIENT MONITORING WELL
-  MONITORING WELL
-  PIEZOMETER OBSERVATION ONLY
-  GROUNDWATER FLOW DIRECTION
-  322 LANDFILL BOUNDARY

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI, NOVEMBER 7, 2019

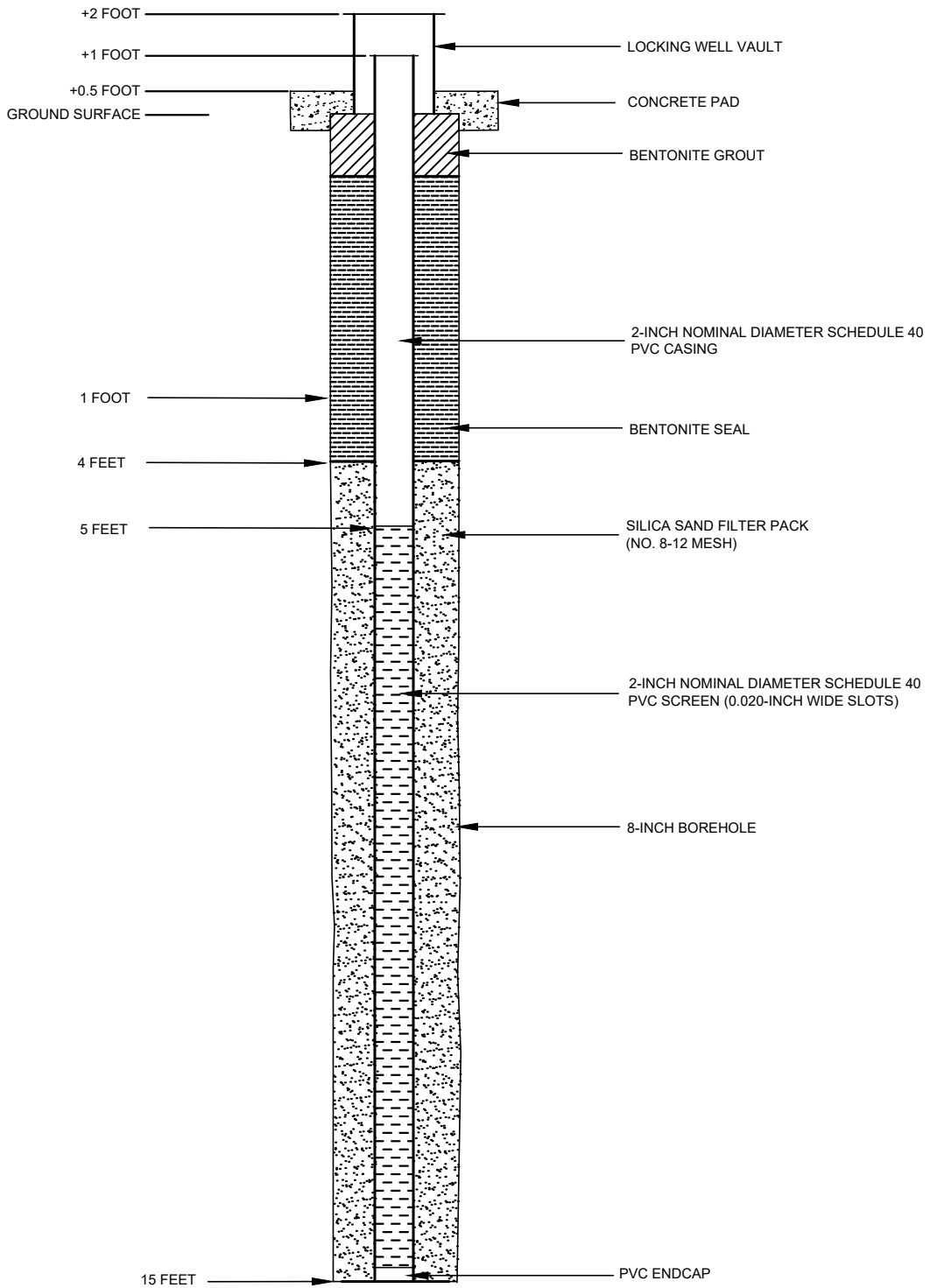


**HALEY ALDRICH** EVERGY KANSAS CENTRAL, INC.  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

**PROPOSED GROUNDWATER  
MONITORING WELLS**



G:\PROJECTS\WESTAR\TECUMSEH ENERGY CENTER (TEC)\CAD\PROPOSED MONITORING WELL DESIGN.DWG



EVERGY KANSAS CENTRAL, INC.  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

### PROPOSED MONITORING WELL DESIGN



NOT TO SCALE  
MARCH 2023

FIGURE 3