Location Restriction Demonstration Report
Fly Ash Landfill Area 2

Jeffrey Energy Center
25905 Jeffrey Rd.
St. Marys, Kansas

Prepared for:

Evergy Kansas Central, Inc.

SCS ENGINEERS

25221157.00 | October 2021

40 Shuman Blvd, Ste 216
Naperville, IL 60563

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1 INTRODUCTION AND PURPOSE

The Fly Ash Landfill Area 2 (Unit) is a landfill located at the Jeffrey Energy Center (JEC) in St Marys, Kansas. The first phase of the landfill was constructed between 2019-2020 for the purpose of disposing coal combustion residuals (CCR), although no CCR has been disposed in the landfill as of the date of this report. The Unit is permitted under Kansas Department of Health and Environment (KDHE) Bureau of Waste Management (BWM) (KDHE-BWM) Permit No. 359. The location of the Unit is provided in **Figure 1**.

The Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule (CCR Rule) 40 CFR 257.60 through 257.64 requires owner or operators of CCR units to demonstrate that the units are not located in certain restricted areas. This report demonstrates that the Unit is not located in any of those areas:

- with a base that is constructed less than 5 feet above the upper limit of the uppermost aquifer (40 CFR §257.60);
- in wetlands (40 CFR §257.61);
- within 200 feet of the outermost damage zone of a fault which has been displaced in Holocene time (40 CFR §257.62);
- within a seismic impact zone (40 CFR §257.63); and
- in an unstable area (40 CFR §257.64).

The applicable CCR Rule requirement for each of the above is listed in the respective section in italics, followed by an explanation of the review and determinations completed by SCS.

2 PLACEMENT ABOVE THE UPPERMOST AQUIFER (§257.60)

§257.60 (a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

The site-specific geology and hydrogeology at JEC have been evaluated and described by Burns & McDonnell (2009) and Haley & Aldrich (2017). JEC overlies a series of interbedded shale and limestone units:

1. Eskridge Shale
2. Beattie Limestone
3. Stearns Shale
4. Grenola Limestone
5. Roca Shale

The Grenola Limestone has been identified as the uppermost aquifer in these investigations, as defined in 40 CFR §257.53. The base of the landfill (lowest elevation of approximate elevation 1182 ft MSL) is greater than five feet above the Grenola limestone in all locations. A geologic cross section depicting the location of the Grenola Limestone along the approximate center of the landfill (running northeast to southwest) is shown on "Figure 8: Generalized Cross-Section F-F'", produced by Haley Aldrich, dated August 2021, provided in **Appendix A.1**.

Groundwater monitoring wells have been installed within the Grenola Limestone. The depth to the water within these wells is routinely monitored. It is noted that because the Grenola Limestone is a confined aquifer, the top of water elevation in wells is higher than the elevation of the aquifer. As part of developing this report, SCS reviewed all recorded top of water elevations between January 2019-March 2021. All elevations are at least five feet from to bottom of liner elevations of the Unit.

The landfill location complies with 40 CFR §257.60.

3 WETLANDS (§257.61)

§257.61 (a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section."

Wetlands are characterized as areas that have hydric soils, hydrophytic vegetation, and wetland hydrology. Hydric soils are saturated with water for portions of the year, and therefore become low in oxygen. Hydrophytic vegetation is a term to describe plants that require saturated soils or a high-water table to survive. Wetland hydrology generally refers to a high-water table where water is at or near the ground surface. None of these features existed at the Unit prior to construction:

- The Unit is located on a hillside location. Prior to landfill construction, the ground surface generally sloped to the southeast with an average slope of approximately eight percent.
- No topographic depressions were present in the Phase 1 development area.
- The surficial soil type prior to development of the area was wholly comprised of Clime-Sogn complex, 3-20% slopes, based on a review of the National Resources Conservation Service (NRCS) website, accessed Oct. 4, 2021. This soil type is not a hydric soil. It is described as a well-drained soil that has no frequency of ponding or flooding.
- A review of the National Wetlands Inventory does not show any areas likely to be a wetland within the proposed Unit boundary.
- A review of historic aerial imagery shows no evidence of ponding, darkened areas that may indicate saturated soils, or hydrophytic vegetation.
- The landfill is not located in a floodplain or proximate to a floodplain.

The Unit was inspected by a certified wetland scientist in October 2021. The evaluation included a desktop review and field analysis to determine if wetland indicators were present at the Unit. Based on the conclusions drawn in that inspection report, the Unit was not constructed on a wetland, is currently not disturbing a wetland, and is not contributing to the significant degradation of a wetland. The Wetland Evaluation, dated October 2021, can be found in **Appendix B**. Maps showing the National Wetlands Inventory and pre-development topography are included as **Figures 2 and 3**, respectively.

Based on the information presented, the landfill location complies with 40 CFR §257.61.

4 FAULT AREAS (§257.62)

***§257.62 (a)** New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.*

SCS compared the location of the Unit to the location of known faults that have displaced in the Holocene time, as identified in the United States Geologic Survey (USGS) Quaternary Faults and Folds Database for the United States. The nearest fault area is indicated on the Fault Areas Map is approximately 242 miles away, as shown on **Figure 4.** Therefore, the landfill location complies with 40 CFR §257.62.

5 SEISMIC IMPACT ZONES (§257.63)

***§257.63 (a)** New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.*

A "seismic impact zone" is defined in 40 CFR §257.53 as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years." The United States Geologic Society (USGS) has compiled seismic hazard maps that show the location of seismic impact zones.

The Unit is shown to be located outside of a seismic impact zone, as shown on **Figure 5**. The Unit falls within the 0.04 g to 0.06 g range of the map. Therefore, the landfill location complies with 40 CFR §257.63.

6 UNSTABLE AREAS (§257.64)

***§257.64 (a)** An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.*

SCS evaluated the location of the Unit for the presence of on-site or local unstable areas as defined in §257.53. Evaluations of the conditions listed in §257.64 (b)(1) through (3) were evaluated and are discussed below. Based on this review, SCS determined the Unit is not located within an unstable area as defined in §257.53. Therefore, the landfill location complies with 40 CFR §257.64.

***257.64 (b)** The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:*

6.1 UNSTABLE FACTORS CONSIDERED: DIFFERENTIAL SETTLING (§257.64(b)(1))

On-site or local soil conditions that may result in significant differential settling;

Significant differential settlement is unlikely in the geologic units under the Unit. The near surface geology of the site was characterized in the Phase II Site Investigation by Burns & McDonnell. In addition, groundwater monitoring wells have installed proximate to the Unit. The geology at each monitoring well location was recorded on boring logs that identify the observed geologic materials. Based on a review of this information, SCS finds that Unit is located on top of a thin layer of soil, which is underlain by interbedded shale and limestone bedrock (see Appendix A.1).

Based on this information and a review of the available a review of the geologic data provided in the hydrogeologic summary report (Burns & McDonnell, 2009) provided in Appendix A.2, SCS concludes that the underlying soils and bedrock on site will not experience significant differential settlement. This is further supported by the fact that no significant differential settlement has been recorded since the construction of the Unit.

6.2 UNSTABLE FACTORS CONSIDERED: GEOLOGIC/GEOMORPHOLOGIC FEATURES (§257.64(b)(2))

On-site or local geologic or geomorphologic features; and

SCS has evaluated published data and site-specific reports for the presence of on-site or local geologic and geomorphologic features such as karst terrain, steep slopes, and sinkholes. Documents and websites reviewed include:

- Haley & Aldrich (2021), CCR Groundwater Monitoring Network Description for the Jeffrey Energy Center.
- Burns & McDonnel (2009), Final Phase II Hydrogeologic Investigation and Bottom Ash Pond Characterization, Permit No. 359 Update, Jeffrey Energy Center, Westar Energy, Inc., Pottawatomie, Kansas.
- Blue Umbrella (2015), Central Kansas (Homeland Security Region I) Multi-Hazard, Multi-Jurisdictional Mitigation Plan.
- CCR Rule Annual Inspection Reports (2016-2020).

While the Unit is underlain by limestone, there are no known near surface karst terrain or sinkholes at the site or surrounding area. SCS reviewed published maps of regional sinkholes, springs, and karst topography and determined that no notable features have been located in the vicinity of JEC. No geologic or geomorphologic features have been observed during any annual inspection of any unit at JEC. SCS has conducted multiple site visits to JEC and have not observed terrain features or other local geologic or geomorphologic features that would result in an unstable condition.

6.3 UNSTABLE FACTORS CONSIDERED: HUMAN-MADE FEATURES OR EVENTS (§257.64(b)(3))

On-site or local human-made features or events (both surface and subsurface).

SCS has evaluated published data and site-specific reports for the presence of on-site or local human-made features or events (both surface and subsurface), such as surface and subsurface mining, extensive withdrawal of oil and gas, steep slopes, and sources of rapid groundwater drawdown, in strata that could feasibly impact the Unit. Documents and websites reviewed include:

- Kansas Geological Survey (2021), Interactive Water Wells Map
- Kansas Geological Survey (2021), Interactive Oil and Gas Map
- Kansas Geological Survey (2021), Pottawatomie County – Oil and Gas Production

Summary figures of human-made features and pertinent sections of documents reviewed are provided in **Appendix B.3**.

Based on this review, SCS determined that the site is not located within an area with on-site or local human-made features or events (both surface and subsurface) that could feasibly result in an unstable condition at the Unit.

7 REFERENCES

Fly Ash Landfill 2 Groundwater Potentiometric Elevation Contour Maps, January 2019 through March 2021, Haley and Aldrich, provided May 2021.

Final Phase II Hydrogeologic Investigation and Bottom Ash Pond Characterization, Permit No. 359 Update Jeffrey Energy Center Westar Energy, Inc. Pottawatomie County, Kansas; Burns & McDonnell Engineering Company, Inc. (2009).

CCR Groundwater Monitoring Network Description for the Jeffrey Energy Center; Haley & Aldrich, Inc. (2021).

Annual Inspection Reports for Jeffrey Energy Center Units, Aptim, 2016-2020.

Central Kansas (Homeland Security Region I) Multi-Hazard, Multi-Jurisdictional Mitigation Plan; Blue Umbrella (2015).

Kansas Geological Survey (2020), Interactive Water Wells Map, http://maps.kgs.ku.edu/wwc5/.

Kansas Geological Survey (2020), Interactive Oil and Gas Map, http://maps.kgs.ku.edu/oilgas/.

Kansas Geological Survey (2020), Pottawatomie County - Oil and Gas Production.

Wetland and Stream Delineation Report on Jeffrey Energy Center Pottawatomie County, Kansas, July 2018; Haley & Aldrich, Inc. (2018).

US Army Corps of Engineers, 1987 Corps of Engineers Wetland Delineation Manual, Environmental Laboratory, Vicksburg, MS.

US Fish and Wildlife Service 2018 National Wetlands Inventory

USGS Quaternary Fault and Fold Database, interactive fault map, https://earthquake.usgs.gov

USGS 2014 Earthquake Hazards Program: US Seismic Design Maps, 2014 Long-Term Model

8 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION (§§257.60(B), 257.61(B), 257.62(B), 257.63(B), 257.64(C))

The undersigned registered professional engineer is familiar with the requirements of the CCR Rule and has visited and examined the Unit and/or has supervised examination of the Unit and development of this report by appropriately qualified personnel. I hereby certify based on a review of available information and observations, that this report meets the requirements of paragraphs §§257.60(a), 257.61(a), 257.62(a), 257.63(a) and 257.64(a).

Professional Engineer: Company: Richard D. Southorn, P.E.

SCS Engineers

PE Registration State: Kansas

Registration Number: 25201

Professional Engineer Seal:

FIGURES

Figure 1 Unit Location Map

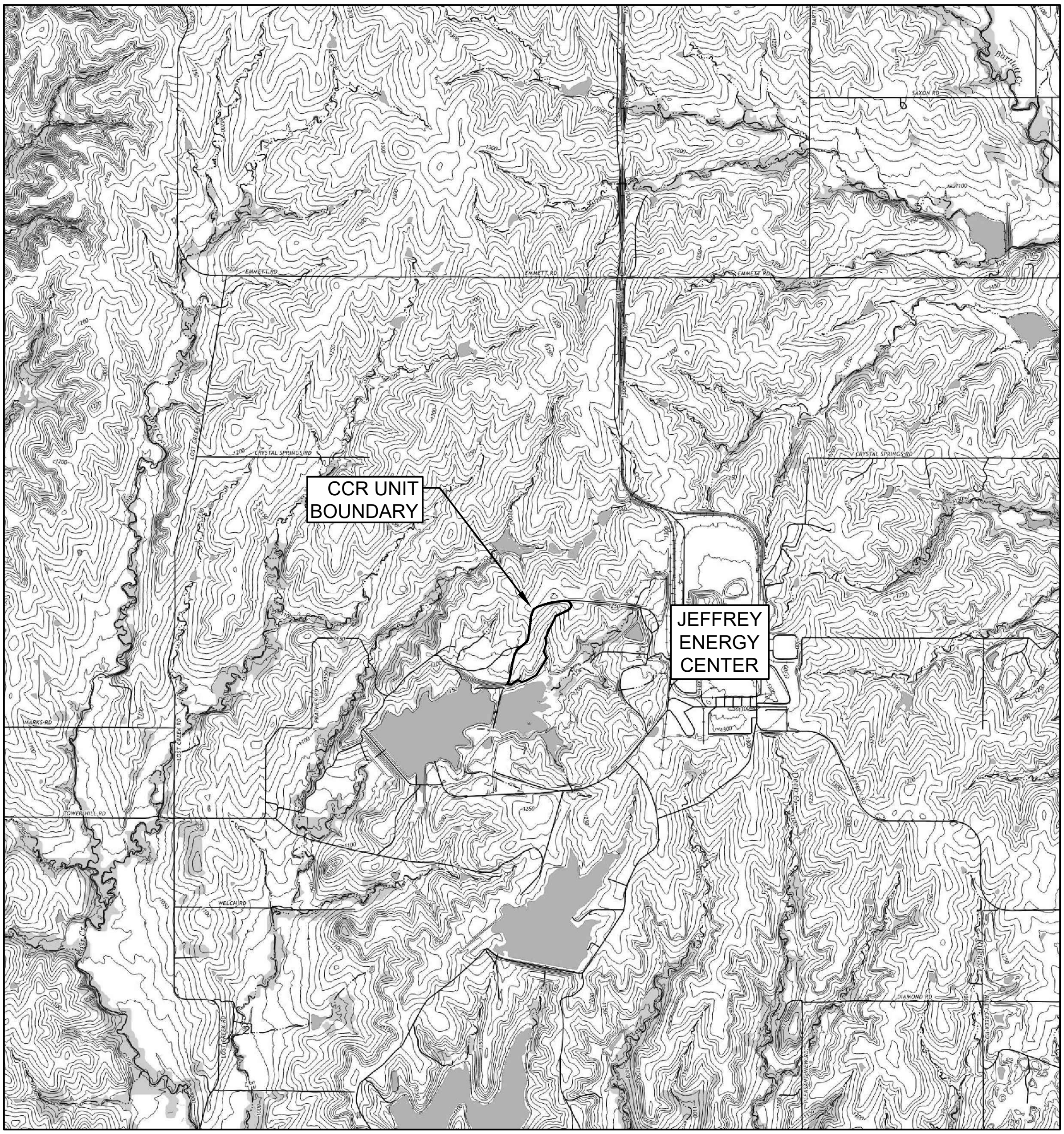
Figure 2 National Wetlands Inventory

Figure 3 Pre-Development Topography

Figure 4 Fault Areas

Figure 5 Horizontal Acceleration

N



5000 0 5000

SCALE: 1" = 5000'

NOTES:
1. TOPOGRAPHIC CONTOURS OBTAINED FROM USGS 7.5 MINUTE TOPOQUAD FOR EMMETT, KS AND LACLEDE, KS (2018).
2. THE LOCATION OF ALL BOUNDARIES AND FEATURES ARE APPROXIMATE.

CLIENT	SITE		
evergy		JEFFREY ENERGY CENTER ST. MARYS, KS	UNIT LOCATION MAP

				ENGINEER		
PROJECT NO.	25221157	DRAWN BY:	NV		SCS ENGINEERS 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563 PHONE: (331) 806-4300	FIGURE
DRAWN:	09/20/2021	CHECKED BY:	RDS			1 OF 5
REVISED:	10/15/2021	APPROVED BY:	RDS			

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N

LEGEND

CCR UNIT BOUNDARY

WETLAND DESCRIPTION

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

NOTES

1. WETLAND MAP OBTAINED FROM THE NATIONAL WETLANDS INVENTORY (NWI) DATABASE, ACCESSED 10-14-2021.
2. THE LOCATION OF ALL SHOWN BOUNDARIES AND FEATURES ARE APPROXIMATE.

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25221157	DRAWN BY:	NV
DRAWN:	09/20/2021	CHECKED BY:	RDS
REVISED:	10/15/2021	APPROVED BY:	

ENGINEER: SCS ENGINEERS
40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563
PHONE: (331) 806-4300

CLIENT: evergy

SITE: JEFFREY ENERGY CENTER
ST. MARYS, KS

NATIONAL WETLANDS INVENTORY

FIGURE
2 OF 5

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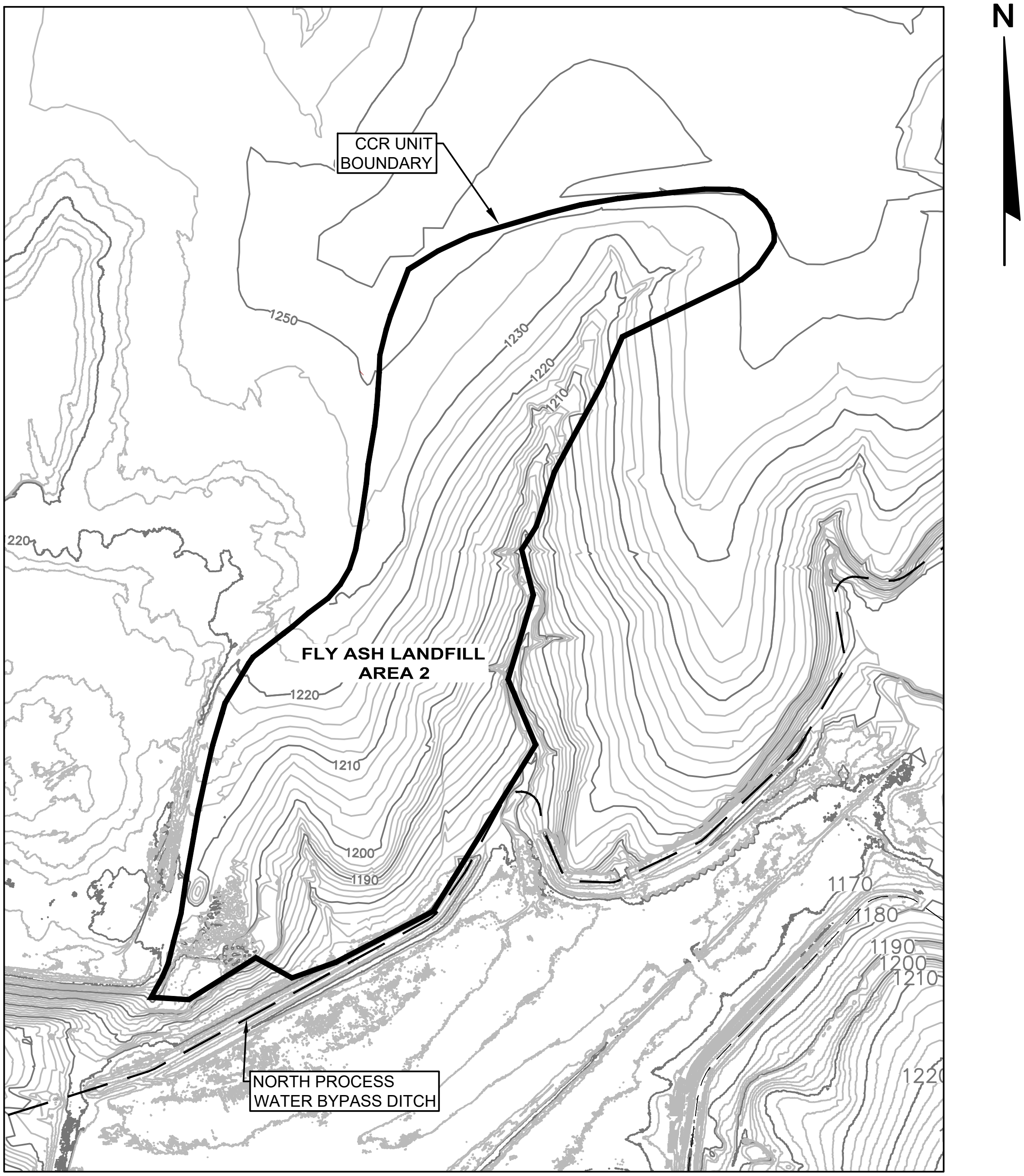

EXISTING SITE TOPOGRAPHY DEVELOPED BY PROFESSIONAL ENGINEERING CONSULTANTS (PEC) IN DECEMBER 2020

LEGEND

CCR UNIT BOUNDARY

1190 EXISTING CONOUR

500 0 500

SCALE: 1" = 500'

NOTE: THE LOCATION OF ALL BOUNDARIES AND FEATURES ARE APPROXIMATE.

CLIENT	evergy	SITE	JEFFREY ENERGY CENTER ST. MARYS, KS	PRE-DEVELOPMENT TOPOGRAPHY

PROJECT NO.	25221157	DRAWN BY:	NV	ENGINEER: SCS ENGINEERS 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563 PHONE: (331) 806-4300	FIGURE
DRAWN:	10/14/2021	CHECKED BY:	SJL		3 OF 5
REVISED:	10/15/2021	APPROVED BY:	RDS		

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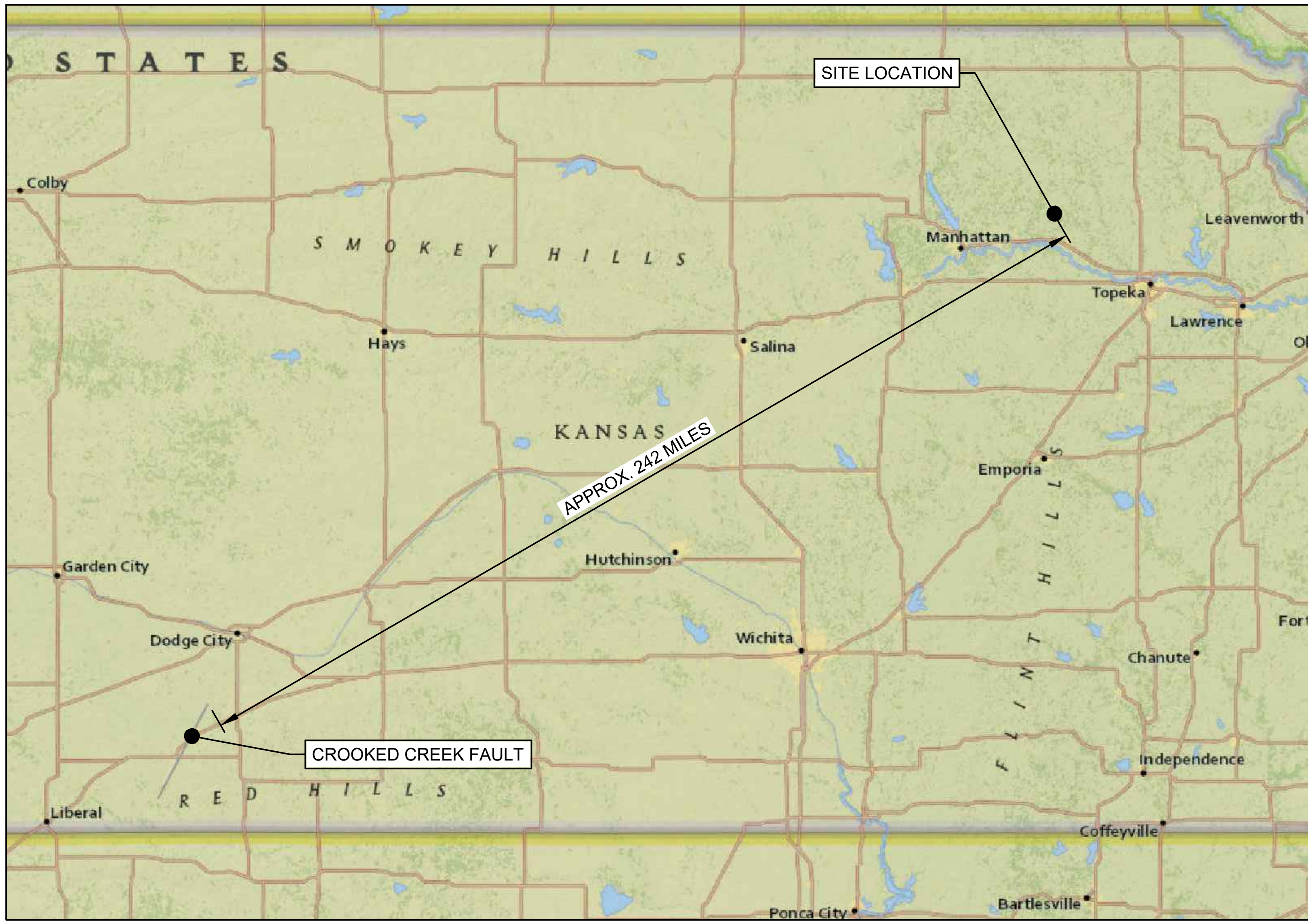
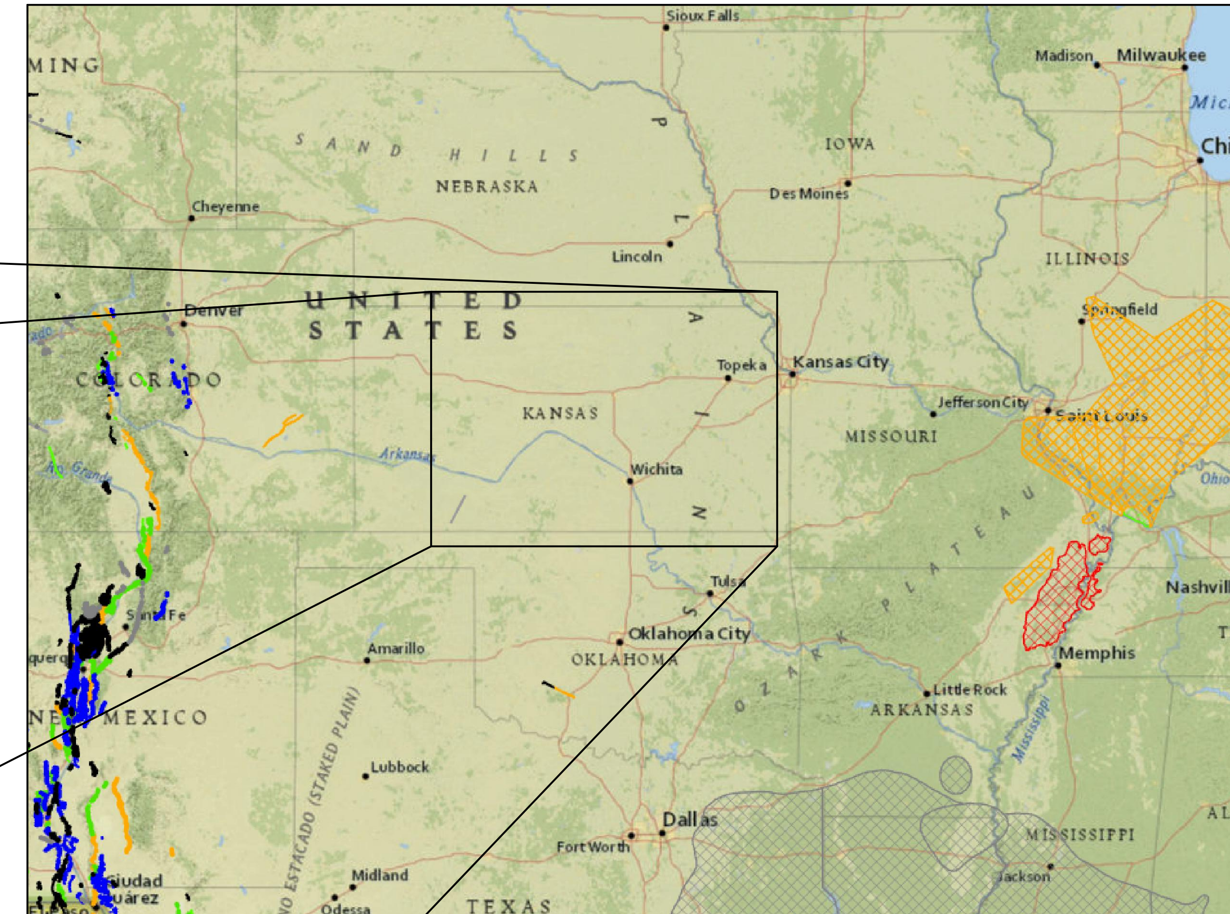
U.S. Geological Survey Quaternary Faults



40 MI 0 40 MI

SCALE: 1" = 40 MILES

National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



180 MI 0 180 MI

SCALE: 1" = 180 MILES

NOTES

1. THE LOCATION OF ALL SHOWN BOUNDARIES AND FEATURES ARE APPROXIMATE.

N

Fault Areas
- Class B
- historic
- late Quaternary
- latest Quaternary
- middle and late Quaternary

National Database
- Historic (< 150 years), well constrained location
- Historic (< 150 years), moderately constrained location
- Historic (< 150 years), inferred location
- Latest Quaternary (<15,000 years), well constrained location
- Latest Quaternary (<15,000 years), moderately constrained location
- Latest Quaternary (<15,000 years), inferred location
- Late Quaternary (< 130,000 years), well constrained location
- Late Quaternary (< 130,000 years), moderately contrained location
- Late Quaternary (< 130,000 years), inferred location

PROJECT NO.	25221157	DRAWN BY:	NV
DRAWN:	09/20/2021	CHECKED BY:	RDS
REVISED:	10/15/2021	APPROVED BY:	

ENGINEER: SCS ENGINEERS, 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563, PHONE: (331) 806-4300

CLIENT: evergy

SITE: JEFFREY ENERGY CENTER, ST. MARYS, KS

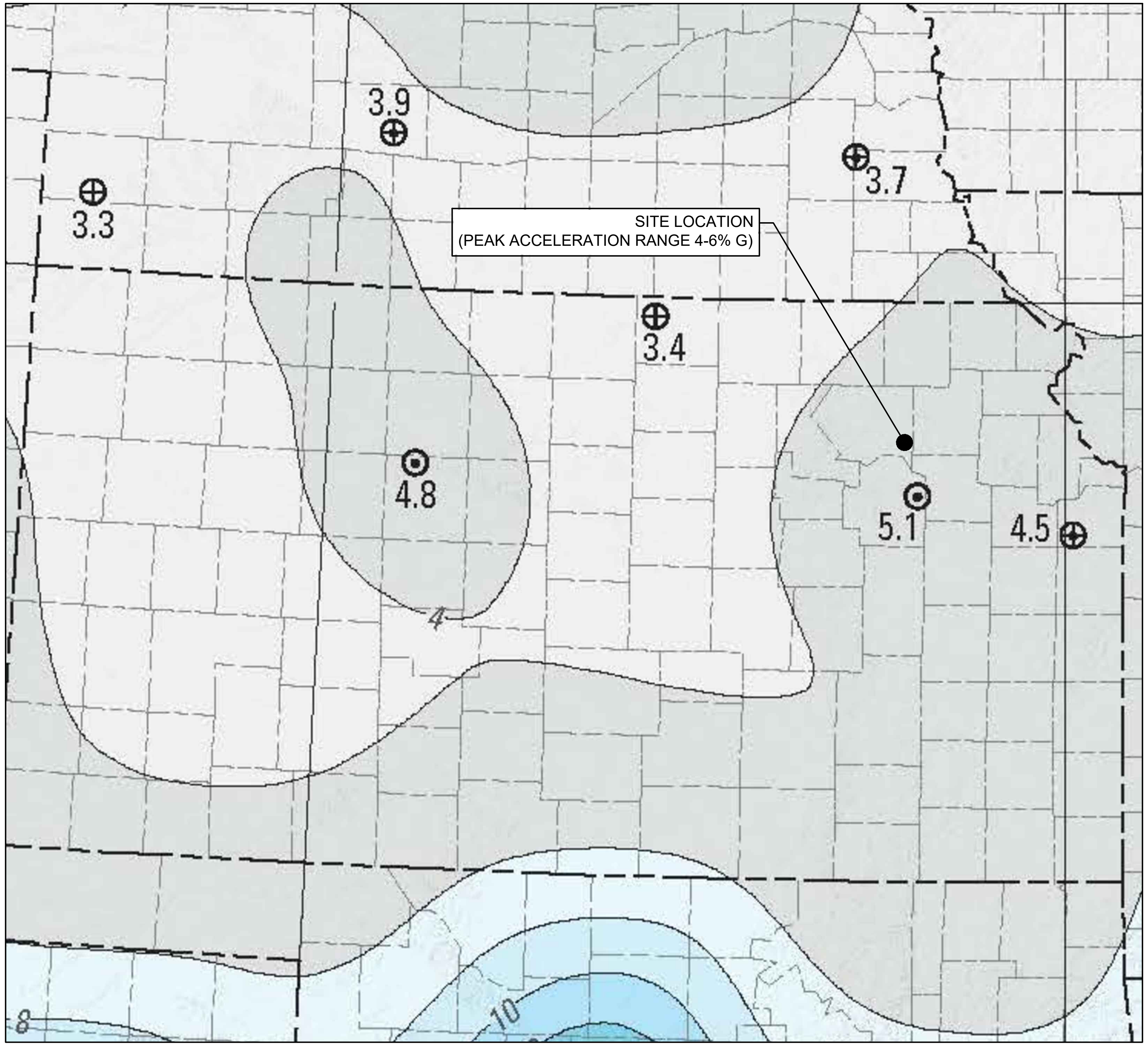
FAULT AREAS

FIGURE 4 OF 5

I:\25221157.00\Deliverables\Fly Ash Area 2 Location Restrictions\Fault Areas.dwg, 10/29/2021 1:45:13 PM

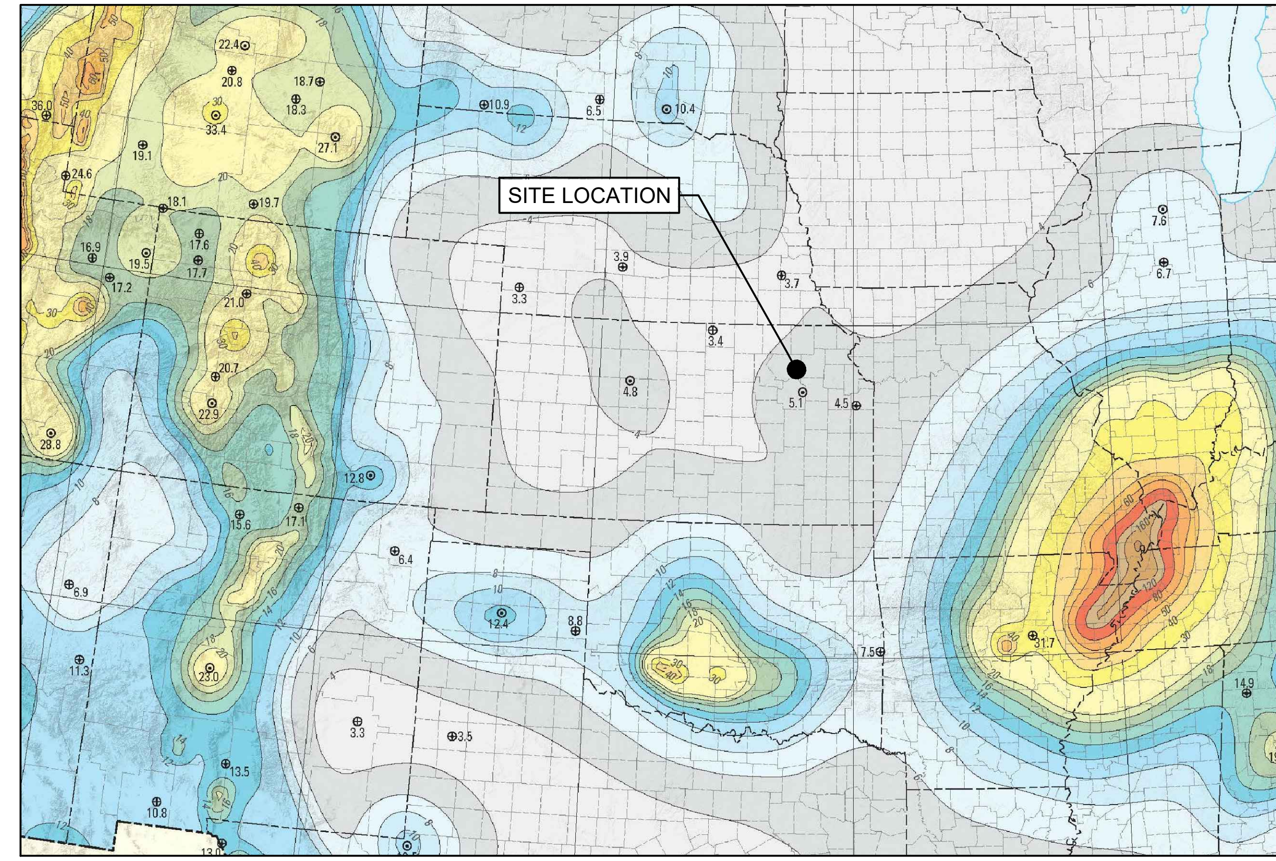
Seismic-Hazard Maps for the Conterminous United States, 2014

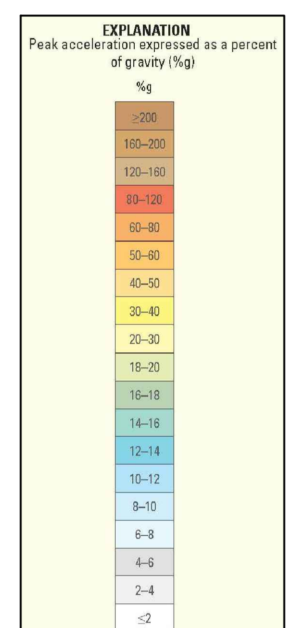
Peak Horizontal Acceleration with 2 Percent Probability of Exceedance in 50 Years

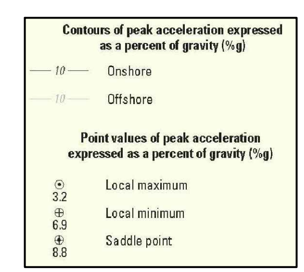


50 MI 0 50 MI

SCALE: 1" = 50 MILES







200 MI 0 200 MI

SCALE: 1" = 200 MILES

N

NOTES

1. SOURCE: USGS SEISMIC HAZARD MAPS, SCIENTIFIC INVESTIGATIONS MAP 3325 SHEET 2 OF 6. https://pubs.usgs.gov/sim/3325/pdf/sim3325_sheet2.pdf

2. THE LOCATION OF ALL BOUNDARIES AND FEATURES ARE APPROXIMATE.

PROJECT NO.	25221157	DRAWN BY:	NV	ENGINEER	SCS ENGINEERS 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563 PHONE: (331) 806-4300	CLIENT	evergy	SITE	JEFFREY ENERGY CENTER ST. MARYS, KS
DRAWN:	09/20/2021	CHECKED BY:	RDS						
REVISED:	10/15/2021	APPROVED BY:							

HORIZONTAL ACCELERATION

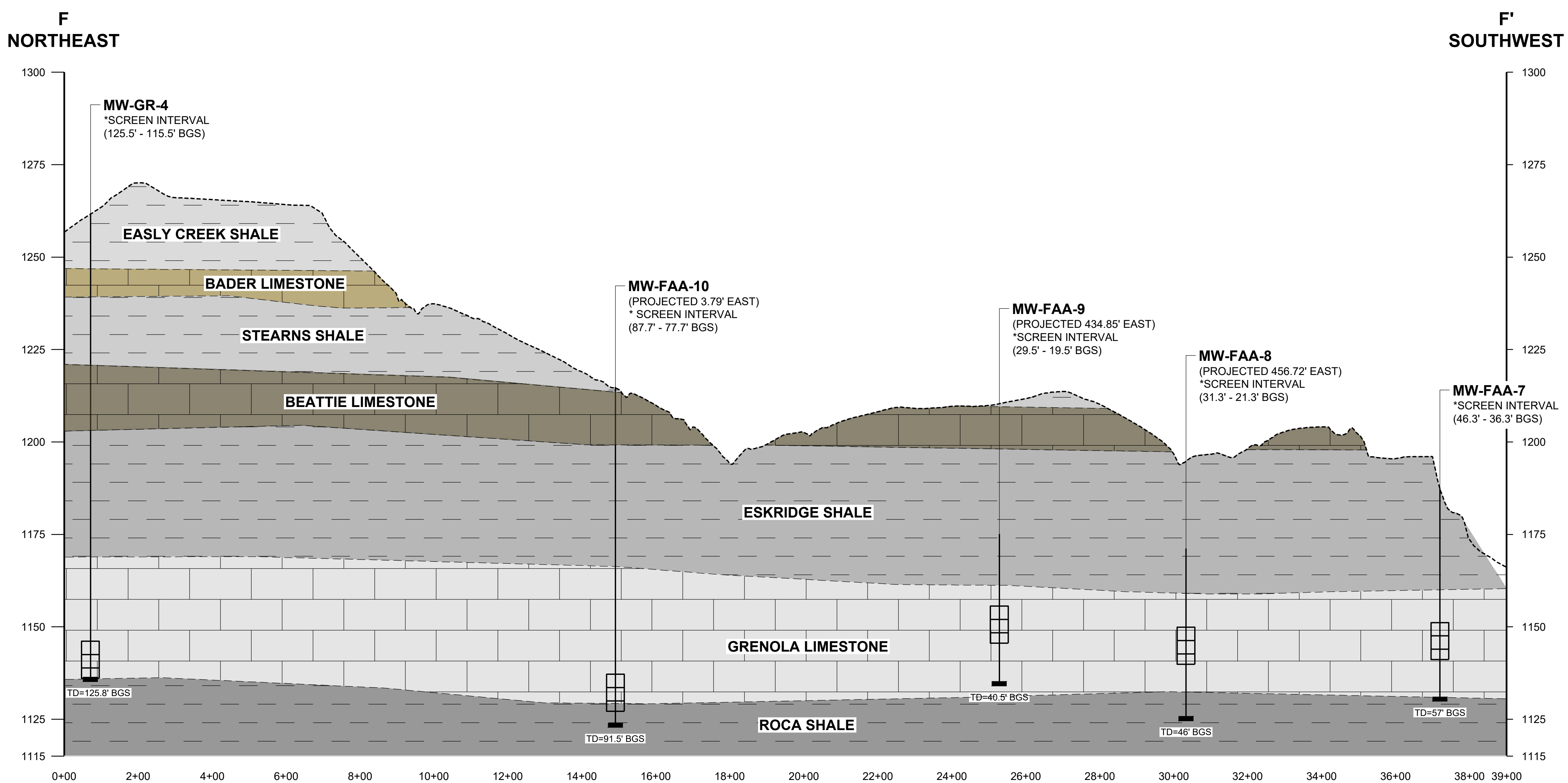
FIGURE 5 of 5

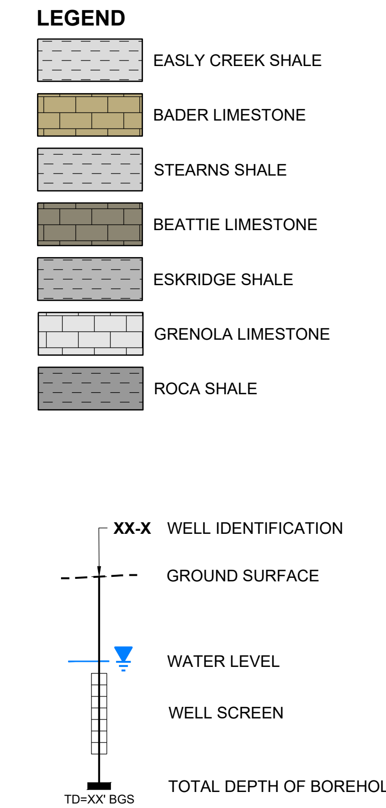
I:\25221157.00\Deliverables\Fly Ash Area 2 Location Restrictions\Seismic Hazard Map.dwg, 10/29/2021 1:59:10 PM

APPENDIX A.1

Geologic Cross Section

(Cross Section F-F', Haley and Aldrich, Inc. CCR Groundwater Monitoring Network Description, 2021)





NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

HORIZ. 0 350
VERT. 0 35
SCALE IN FEET

HALEY ALDRICH

ENERGY KANSAS CENTRAL, INC.
JEFFREY ENERGY CENTER - FGD LANDFILL
ST. MARYS, KANSAS

FLY ASH LANDFILL 2
GENERALIZED CROSS-SECTION F-F'

SCALE: AS SHOWN
AUGUST 2021

FIGURE 8

APPENDIX A.2

Phase II Hydrogeologic Investigation Text Excerpts

(Burns & McDonnell Engineering Company, Inc., 2009)

FINAL
Phase II Hydrogeologic Investigation
and
Bottom Ash Pond Characterization

Permit No. 359 Update
Jeffrey Energy Center
Westar Energy, Inc.
Pottawatomie County, Kansas

JANUARY 2008

Revised AUGUST 2009

Project Number 45702

Burns & McDonnell Engineering Company, Inc.
Engineers-Geologist-Scientists
Kansas City, Missouri

Range 12E are occurring based on an understanding, with KDHE and Westar Energy, that these areas will be legally defined and included in the permit update requested under the Special Conditions issued under Permit No. 359 on April 2, 2004. The permitted boundary depicted on Figure 1 is the approximate proposed boundary for the ongoing permit update. The permitted boundary is shown in relation to the JEC Power Plant on Figure 1.

1.5 SOILS, TOPOGRAPHY, AND SURFACE DRAINAGE

The JEC is covered with mostly silty clay loam, which has low to high plasticity (NRCS Soil Survey, 1987). The topsoil at the Permitted Landfill Site consists of terrace alluvium, glaciolacustrine deposits, and the Sandborn formation. The thickness varies over the JEC based on location in regards to hilltops and fill operations. The approximate thickness of topsoil is one to 16 feet below ground surface (bgs).

The natural highest soil elevation within the permitted landfill boundary, located along the northeast portion of the boundary, is approximately 1300 feet above msl. The lowest natural elevation within the permitted landfill boundary, located along the southwest portion of the boundary, is approximately 1100 feet above msl (See Figure 1).

Several small streams have their headwaters on the slopes surrounding the JEC property. Those to the north and east are tributaries of Bartlett and Cross Creeks, while those to the south merge to form Deep Creek, and streams to the west join either Lost Creek or Vermillion Creek. The tributaries within the permitted landfill boundary join with Lost Creek. At lower elevations around the streams, the grades are uniform with generally well developed alluvial flood plains and meanders. The upper elevations of the streams are generally youthful with small benches across limestone and deep V-shaped valleys incised into the shales and glacial deposits.

1.6 CLIMATE

The coldest month occurs in January where the average daily temperature is 32.2 degrees Fahrenheit (°F) and the warmest month occurs in July where the average daily temperature is 77.6 °F. Based on the precipitation record in Wamego, Kansas, for the years of 1951-1976, two years in ten will experience annual precipitation less than 16.45 inches. The average total annual precipitation is 33 inches, and of this, approximately 23.8 inches, or about 72 percent, of the annual precipitation falls during the period April through September. The average annual snowfall is 21.5 inches. The heaviest 24-hour rainfall event was 6.93 inches at Wamego on

1.7.2 Site Geology

Permian shale makes up approximately 70 percent of the stratigraphy below the JEC. The remainder of the stratigraphy consists of limestone beds and topsoil. In the area of the Permitted Landfill Site (shown in Figure 3) the following formations in the stratigraphic column (from youngest to oldest) were encountered during drilling: Blue Rapids shale, Crouse limestone, Easly Creek shale, Bader limestone, Stearns shale, Beattie limestone, Eskridge shale, Grenola limestone, Roca shale, Red Eagle limestone, Johnson shale, Foraker limestone, an the Janesville shale.

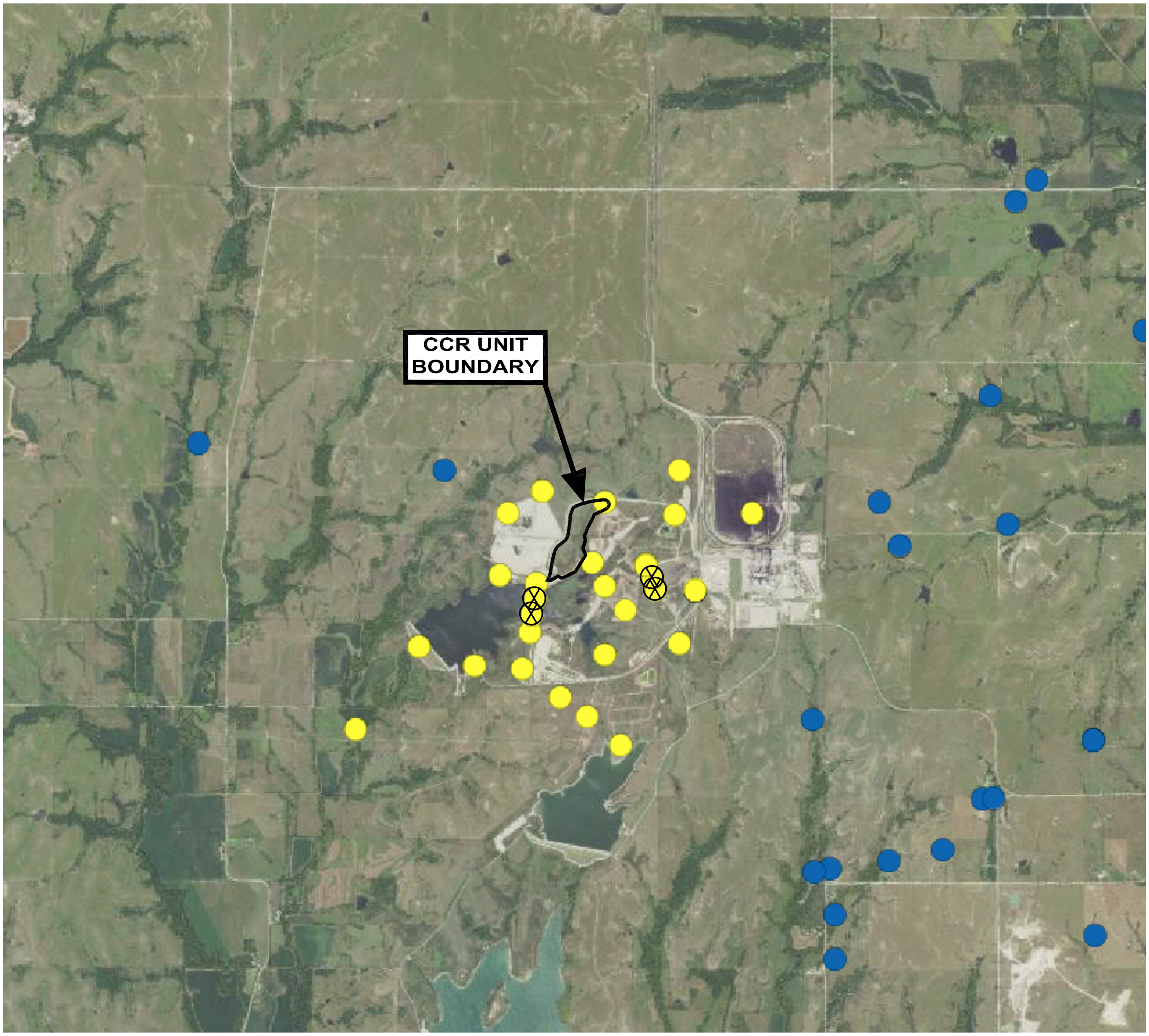
The shale formations are generally known to be medium to moderately hard, thin to very thin bedded, calcareous, widely jointed shale (Scott, Glenn R., 1959 and Shannon and Wilson, 1974). The limestone formations are generally known to be divided into alternating limestone and shale members. The limestone members can generally be described as hard, slightly weathered, sometimes exhibiting vugs and fracturing. The limestone formations become more massive with increasing depth and age. The limestone members are fairly individual in weathering pattern, with some members exhibiting blocky features while others have cavernous or cellular characteristics (Shannon and Wilson, 1974).

1.7.3 Regional Hydrogeology

Regionally, the groundwater occurs in the bedrock strata, but the shale units are so impermeable that there is little or no movement of groundwater. Some of the limestone units transmit small quantities of water that discharge in many small springs in the valleys of the intermittent creeks. The numerous small springs in the stream valleys discharge from 0.1 gallons per minute (gpm) to 10 gpm (Shannon and Wilson, 1974). Local recharge to the limestone aquifers is likely to come from snow drifts or other local concentrations of infiltrations. The low permeability of the limestone and shales in the region makes it difficult to identify a horizontally continuous saturated unit. Regionally, groundwater is supplied through alluvial and glacial outwash materials underlying the plains of the main valley floors of Vermillion Creek (five miles west of the JEC) and the Kansas River, located seven miles south of the JEC (Shannon and Wilson, 1974). Eleven domestic wells are within a three mile radius of the permitted landfill site and listed with the Kansas Geological Survey (KGS). All eleven wells are located upgradient from the permitted landfill site, within Sections 19 and 30, Township 9 South, Range 10 East. The wells range in estimated yield from 20 to 70 gpm and the depths range from 58 feet to 110 feet below ground surface (bgs). The majority of the wells are screened through alluvium and a few

APPENDIX A.3

Human Made Features



LEGEND

- OTHER
- DOMESTIC WELLS
- GEOTHERMAL WELLS
- MONITORING/REMEDIATION/ ENGINEERING
- REQUIRES WATER RIGHTS
- TEST WELLS
- PLUGGED WELL

N

NOTES

1. SOURCE: KANSAS GEOLOGICAL SURVEY, INTERACTIVE WATER WELL MAP. https://maps.kgs.ku.edu/wwc5/
2. THE LOCATION OF ALL SHOWN FEATURES AND BOUNDARIES ARE APPROXIMATE.

1 MI 0 1 MI

SCALE: 1" = 1 MILE

CLIENT	evergy	SITE	JEFFREY ENERGY CENTER ST. MARYS, KS	WATER WELLS NEAR FLY ASH LANDFILL AREA 2

				ENGINEER		
PROJECT NO.	25221157	DRAWN BY:	NV		SCS ENGINEERS 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563 PHONE: (331) 806-4300	FIGURE
DRAWN:	09/16/21	CHECKED BY:	RDS			1 OF 3
REVISED:	10/15/21	APPROVED BY:				

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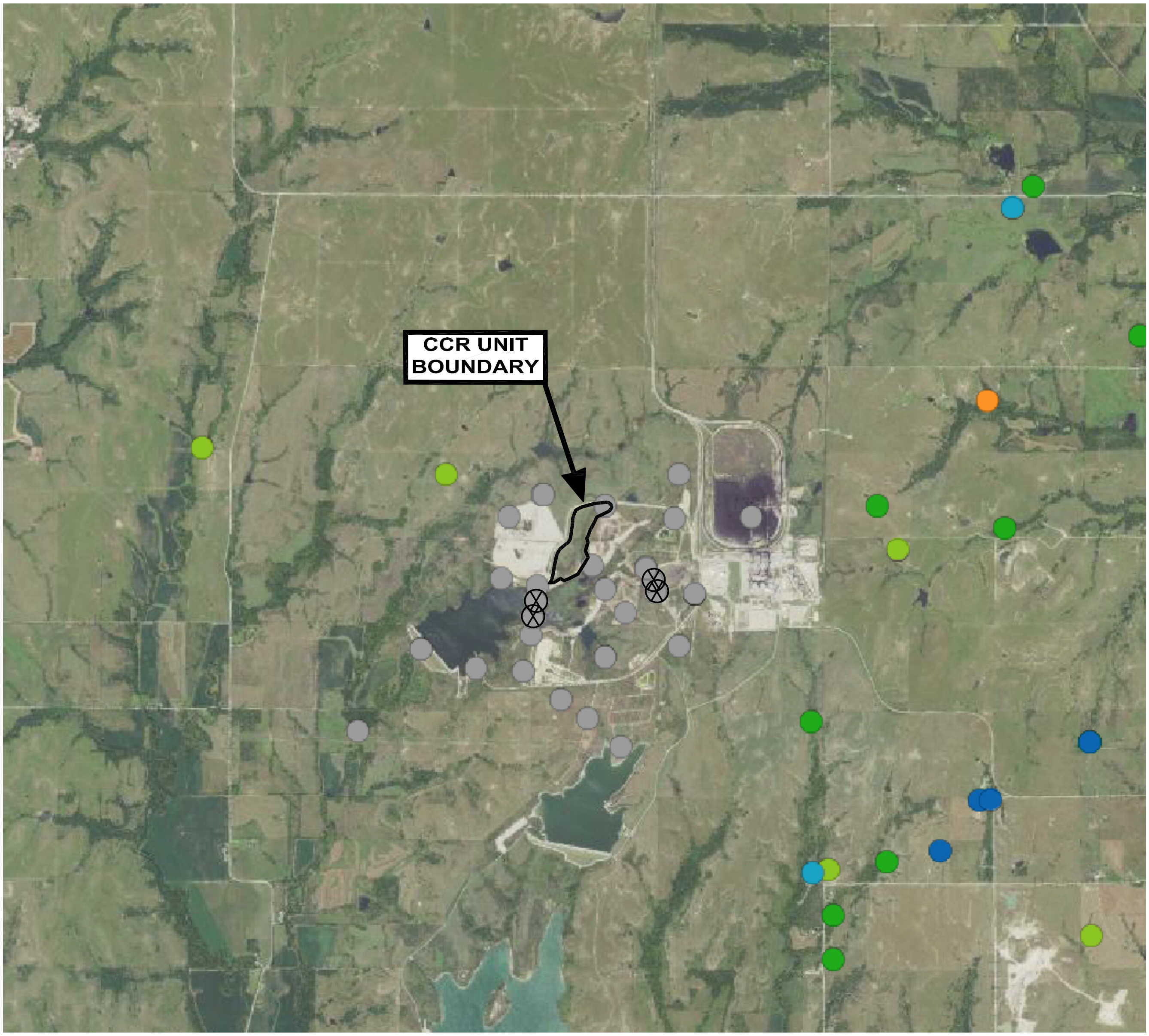

LEGEND

●	NO DATA
●	0 TO 2 GPM
●	2.1 TO 5 GPM
●	5.1 TO 20 GPM
●	20.1 TO 100 GPM
●	100.1 TO 500 GPM
●	500.1 TO 1,000 GPM
●	>1,000 GPM
⨂	PLUGGED WELL

N

NOTES

1. SOURCE: KANSAS GEOLOGICAL SURVEY, INTERACTIVE WATER WELL MAP.
   https://maps.kgs.ku.edu/wwc5/

2. THE LOCATION OF ALL SHOWN BOUNDARIES AND FEATURES ARE APPROXIMATE.

1 MI 0 1 MI

SCALE: 1" = 1 MILE

CLIENT	evergy	SITE	JEFFREY ENERGY CENTER ST. MARYS, KS	WATER WELLS YIELDS NEAR FLY ASH LANDFILL AREA 2

				ENGINEER		
PROJECT NO.	25221157	DRAWN BY:	NV		SCS ENGINEERS 40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563 PHONE: (331) 806-4300	FIGURE
DRAWN:	09/16/21	CHECKED BY:	RDS			
REVISED:	10/15/21	APPROVED BY:				2 OF 3

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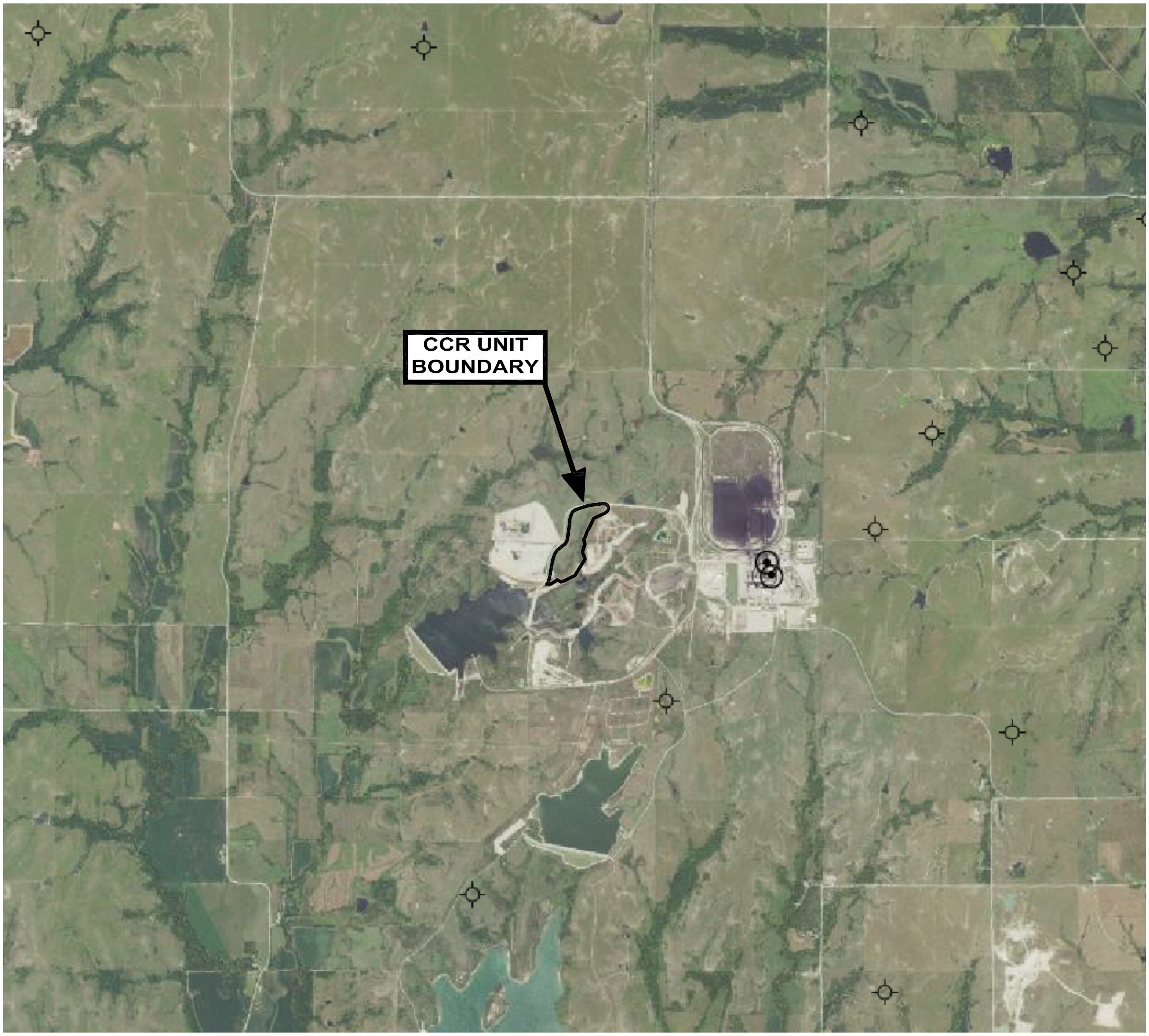

LEGEND

- Coal Bed Methane
- Coal Bed Methane, Plugged-Abandoned
- Dry and Abandoned
- Enhanced Oil Recovery
- Enhanced Oil Recovery, Plugged-Abandoned
- Gas
- Gas, Plugged-Abandoned
- Injection
- Injection, Plugged-Abandoned
- Intent
- Location
- Oil and Gas
- Oil and Gas, Plugged-Abandoned
- Oil
- Oil, Plugged-Abandoned
- Other
- Other, Plugged-Abandoned
- Salt Water Disposal
- Salt Water Disposal, Plugged-Abandoned

N

NOTES

1. SOURCE: KANSAS GEOLOGICAL SURVEY, INTERACTIVE OIL AND GAS MAP. https://maps.kgs.ku.edu/oilgas/
2. THE LOCATION OF ALL SHOWN BOUNDARIES AND FEATURES ARE APPROXIMATE.

1 MI 0 1 MI

SCALE: 1" = 1 MILE

CLIENT	SITE		
evergy	JEFFREY ENERGY CENTER ST. MARYS, KS		OIL AND GAS WELLS NEAR FLY ASH LANDFILL AREA 2

				ENGINEER	FIGURE
PROJECT NO.	25221157	DRAWN BY:	NV	SCS ENGINEERS	FIGURE
DRAWN:	09/16/21	CHECKED BY:	RDS	40 SHUMAN BLVD STE 216, NAPERVILLE, IL 60563	3 OF 3
REVISED:	10/15/21	APPROVED BY:		PHONE: (331) 806-4300	

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Pottawatomie County--Oil and Gas Production

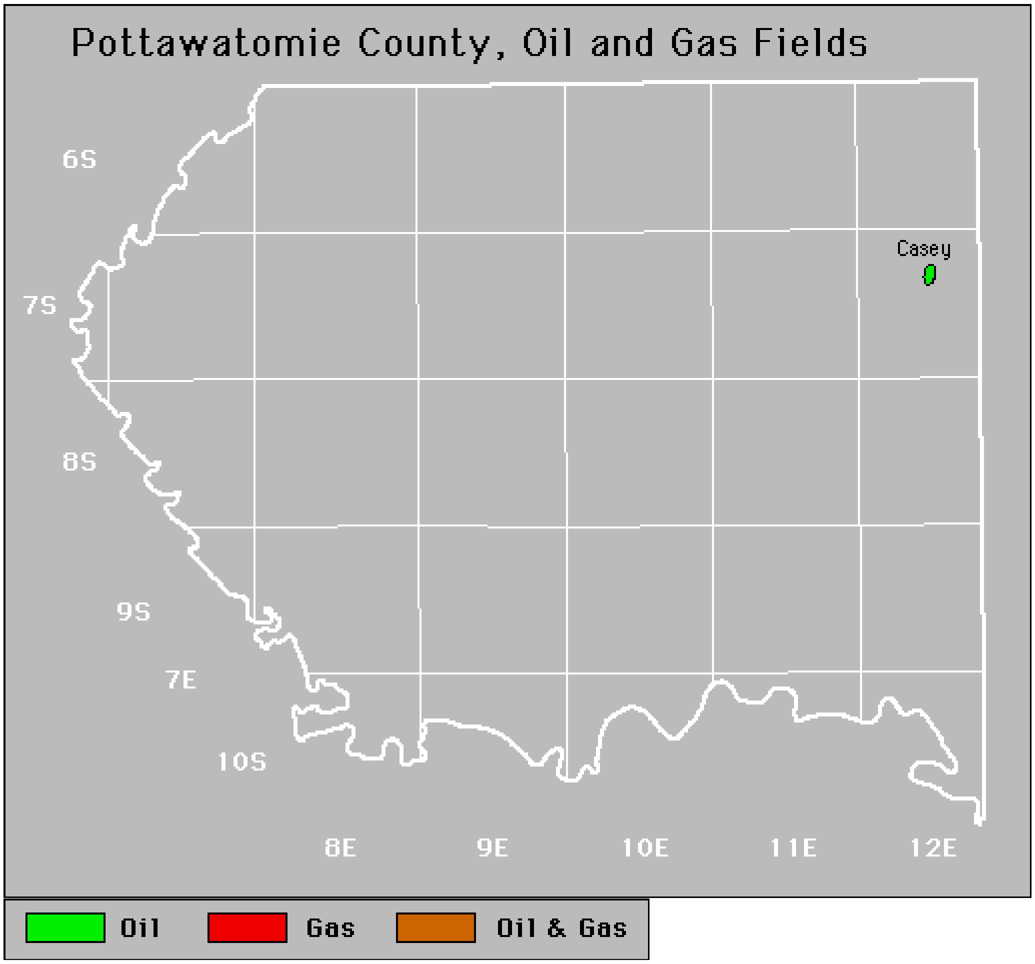
Production

Year	Oil			Gas		
	Production (bbls)	Wells	Cumulative (bbls)	Production (mcf)	Wells	Cumulative (mcf)
1995	-	-	147,274	-	-	0
1996	126	3	147,400	-	-	0
1997	74	3	147,474	-	-	0
1998	1,561	3	149,035	-	-	0
1999	2,655	6	151,690	-	-	0
2000	3,174	3	154,864	-	-	0
2001	3,165	3	158,029	-	-	0
2002	3,670	3	161,699	-	-	0
2003	3,169	3	164,868	-	-	0
2004	3,382	3	168,250	-	-	0
2005	1,735	3	169,985	-	-	0
2006	2,354	3	172,339	-	-	0
2007	1,129	4	173,468	-	-	0
2008	1,693	3	175,161	-	-	0
2009	1,564	3	176,725	-	-	0
2010	958	3	177,683	-	-	0
2011	1,233	3	178,916	-	-	0
2012	4,139	4	183,055	-	-	0
2013	1,947	4	185,002	-	-	0
2014	1,265	4	186,267	-	-	0
2015	472	4	186,739	-	-	0

Updated through 12-2015.
Note: bbls is barrels; mcf is 1000 cubic feet.

View interactive Flash chart of production

County Map



Fields

Also available is a text file containing field summary data for all fields in this county.

Active
Casey
Forest City Coal Gas Area
Noxie

No Abandoned fields.

Kansas Geological Survey
Comments to webadmin@kgs.ku.edu
URL=http://www.kgs.ku.edu/PRS/County/nop/pottawatomie.html
Data from Kansas Dept. of Revenue files monthly.

APPENDIX B

Wetlands Evaluation

JEC Fly Ash Landfill 2 Wetland Analysis, for Location Restriction Determination
Pam Tennison-Rindt

Introduction

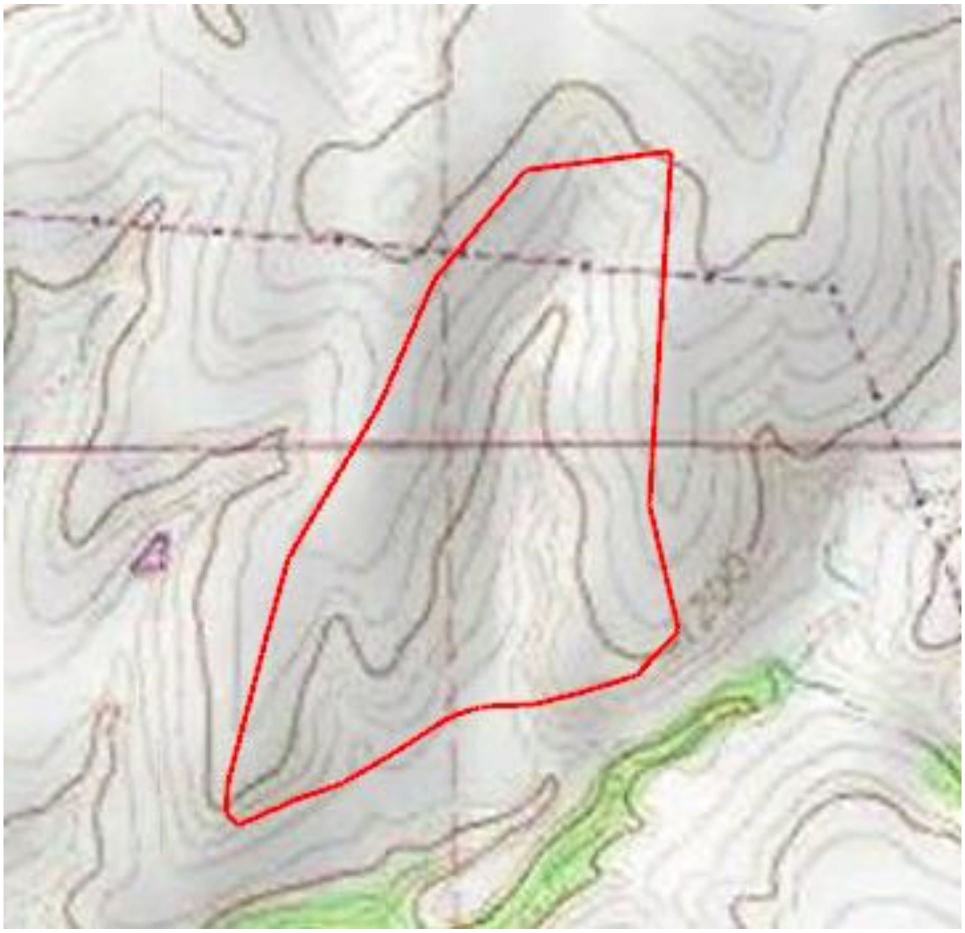
The JEC FLY Ash Landfill 2 was analyzed utilizing both wetland desktop sources and by a field visit to the site on October 8, 2021. The area was observed and analyzed within the area depicted on the aerial and topographical imagery below. The analysis was conducted by Pam Tennison-Rindt, a Professional Wetland Scientist since April of 2012. The purpose of the field visit, subsequent analysis and report is to determine if the JEC Fly Ash Landfill 2, hereafter referred to as "landfill" is located in, or is causing to, or contributing to the significant degradation of wetlands.

Desktop wetland analysis sources were the National Wetland Inventory (NWI) maps, NRCS Soil Survey Maps, USGS topographical maps, Kansas Floodplain Viewer Maps, and Google Earth aerial imagery. Field analysis methods utilized both the The Corps of Engineers Wetland Delineation Manual (1987) and the Corps of Engineers Great Plains Regional Supplement methods to determine if wetlands were present within the landfill boundary.

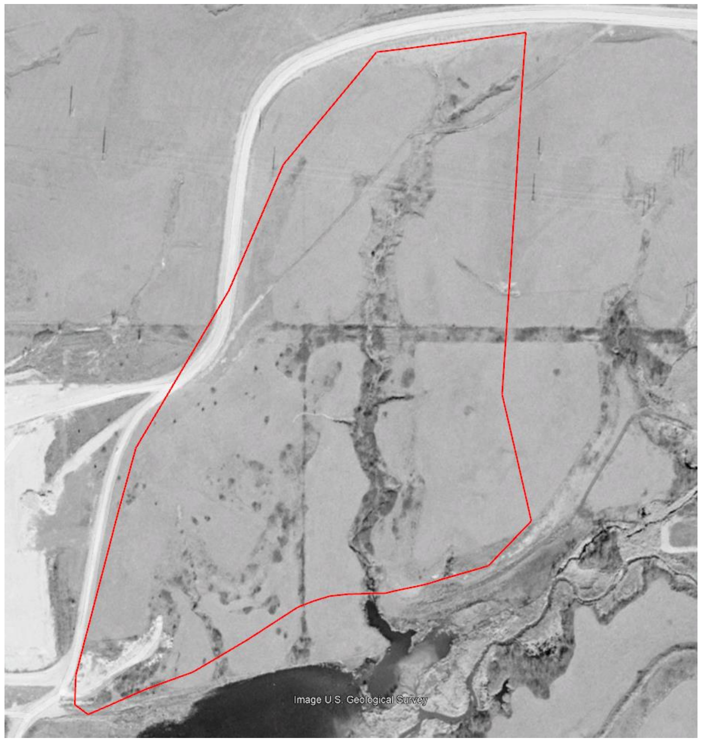
JEC Fly Ash Landfill 2 Desktop Analysis Discussion

The NWI map indicates no wetlands exist at the landfill. In addition, the area is outside the mapped 100-year floodplain, a less favorable environment for wetlands to develop. The USGS Topo indicates steep slopes as well, which provides for a well-drained area also not conducive to wetland development.

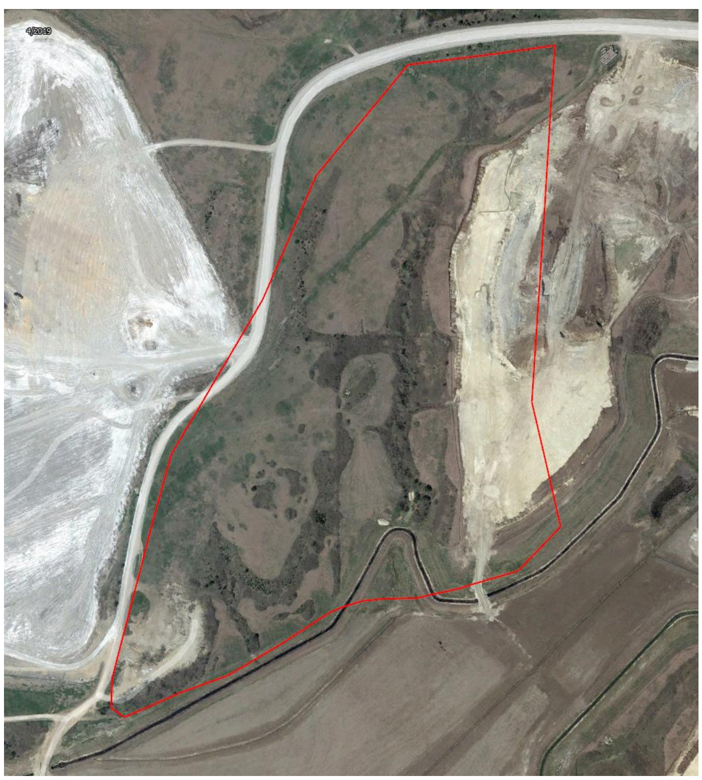
NRCS Soil Survey indicates soils within the area are #4590 Clime-Sogn complex, 3-20 percent slope. Clime comprises 60%, Sogn 25%. Other minor component soils in this series mentioned are Martin 5%, Labette 5%, Rock outcrops 5%, and Aquolls at 1% which is the drainage in the central low point of the landfill. Clime soils are described as well drained and Sogn is described as somewhat excessively drained. The depth to water table is more that 80 inches, and frequency of flooding and ponding is none for both of these soils. Therefore, this site is again generally described as a well-drained site by the NRCS Soil Survey. Most notably the NRCS Soil Survey states the Hydric soil rating of 99% of the soils on site are non-hydric. Aquolls which make up 1% of the area, are the only soil listed as hydric, these soils are restricted to the central drainage channel and will not be undisturbed in order to maintain a central drainage pathway. As expected, the NRCS soils are not mapped hydric, as would have developed where more inundated conditions occurred.



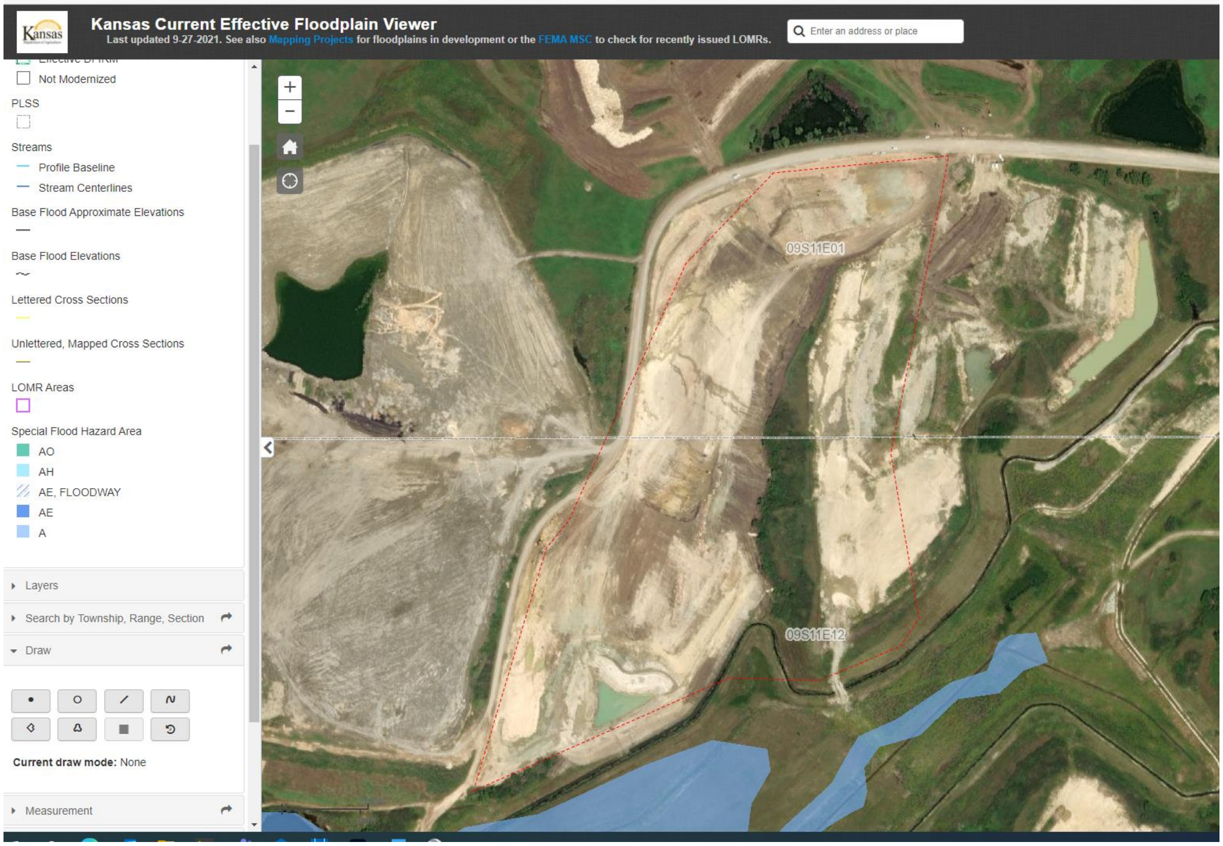
Earth Point USGS Topo



2/15/2002 Google Earth Image



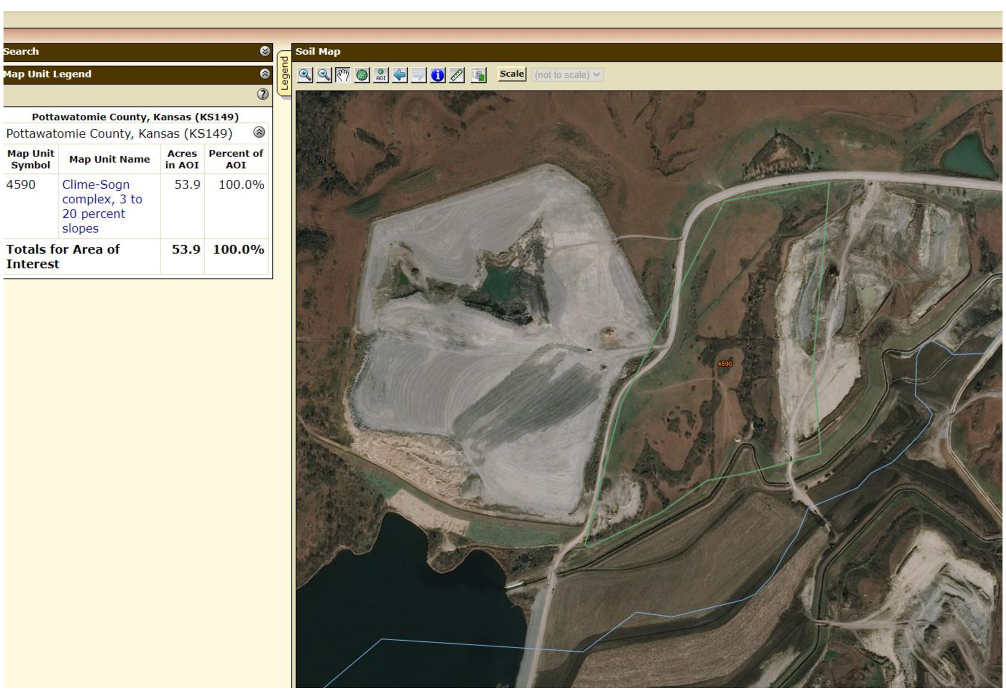
4/13/2019 Google Earth Image



Kansas Floodplain Viewer, 9/27/2021 image

National Wetlands Inventory (NWI) Map

Approximate drainage area boundary of drainage
within the landfill, 68 acres



USDA NRCS Soil Survey

JEC Fly Ash Landfill 2 Desktop Analysis Discussion

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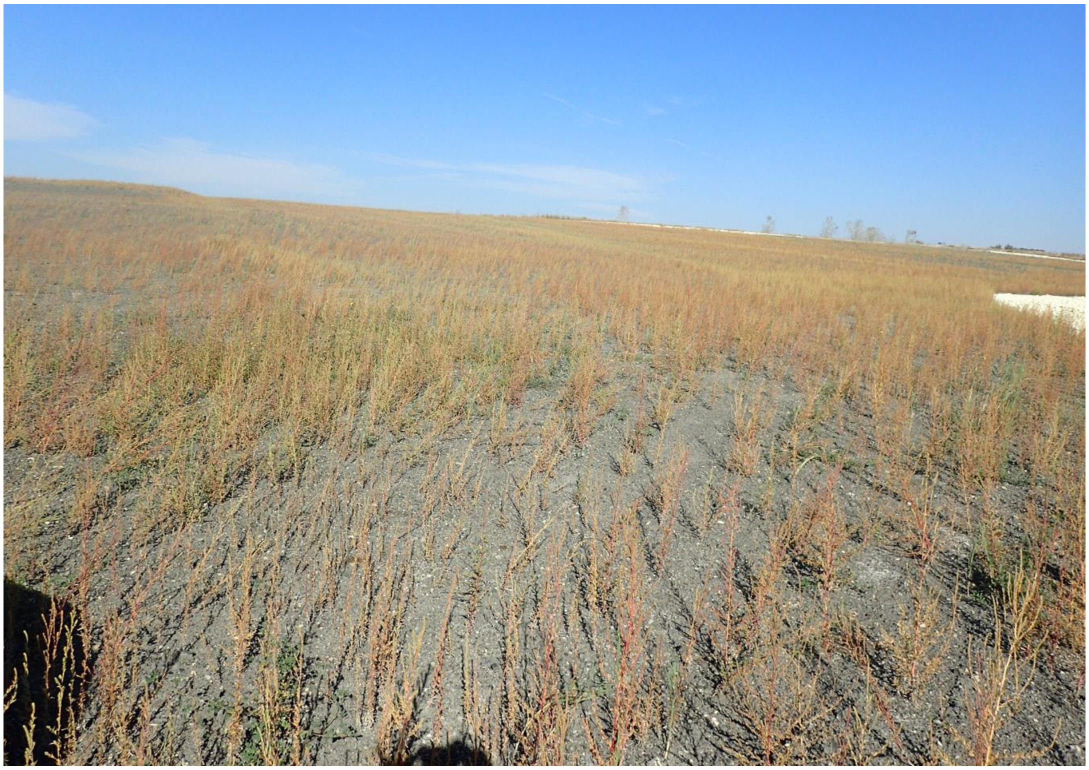
NRCS Soil Survey indicates soils within the area are #4590 Clime-Sogn complex, 3-20 percent slope. Clime comprises 60%, Sogn 25%. Other minor component soils in this series mentioned are Martin 5%, Labette 5%, Rock outcrops 5%, and Aquolls at 1% which is the drainage in the central low point of the landfill. Clime soils are described as well drained and Sogn is described as somewhat excessively drained. The depth to water table is more that 80 inches, and frequency of flooding and ponding is none for both of these soils. Therefore, this site is again generally described as a well-drained site by the NRCS Soil Survey. Most notably the NRCS Soil Survey states the Hydric soil rating of 99% of the soils on site are non-hydric. Aquolls which make up 1% of the area, are the only soil listed as hydric, these soils are restricted to the central drainage channel and will not be undisturbed in order to maintain a central drainage pathway. As expected, the NRCS soils are not mapped hydric, as would have developed where more inundated conditions occurred.

JEC Fly Ash Landfill 2 Field Analysis

The October 8, 2021 field visit purpose to observe the three requirements of a wetland were the objective. Wetlands must have hydrophytic vegetation, wetland hydrology, and hydric soil present to be considered a wetland. This must be determined utilizing the Corps of Engineer method of determining as previously mentioned in the introduction. Hydrology indicators include indicators such as the presence of surface water, drift deposits, water marks on trees, water-stained leaves, and water within the upper 12". Other secondary indicators (2 required) are surface cracks, drainage patterns, crayfish burrows and a sparsely vegetated concave surface. Not all wetland indicators were listed, see attached Wetland Determination Data Form for full list.

The upland sloped area of was first observed. These areas were well drained, with no wetland vegetation or hydrology. The primary, dominant vegetation was Pigweed, *Amaranthus palmeri. This species has a wetland indicator of FACU,* a Facultative upland plan, therefore is most likely not found in wetlands of the Great Plains Region. Hydrology indicators were absent, there was no surface water, saturation within the upper 12", water marks sediment deposits, drift lines



Upland slope area of landfill, Sampling Pt A, Pigweed, *Amaranthus palmeri* dominant

The drainage channel was walked to observed if it contained wetlands. No observable hydrology indicators noted. No drift lines, no visible wet soils even within the lowest point of the channel, and no drift lines either. However no soil pit was dug to check for saturation within the upper 12 inches, though it is doubtful there was any water within the upper 12 inches. Vegetation within the lowest portions did contain some hydrophytic vegetation such as knotweed and willows, however they were sparse and not dominant, and only in a few locations within the low point of the channel of approximately 10' width. None of those areas seemed to have any ponding or wet soils or any hydrology indicators. However, it is still recommended to not to fill this channel to maintain a conduit for drainage of water.

In addition, it was found that the drainage did not lead to any wetlands offsite, thus there is degradation of any wetlands occurring. I saw no evidence of sediment or high flows leaving the drainage. Therefore, there is no significant degradation of wetland occurring.

Summary

In summary, using my best professional judgement as a wetland scientist, this JEC Fly Ash 2 Landfill was not constructed on a wetland, and is currently not disturbing a wetland. Only a few pockets of wetlands may occur within the very middle drainage of approximate 10’ width a currently undisturbed area. However, these areas are not currently impacted, and are not planned on being impacted as preserving the drainage is necessary. Furthermore, the landfill is not contributing to the significant degradation of a wetland.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: JEC Fly Ash 2 landfill City/County: Pot. Sampling Date: 10/8/21

Applicant/Owner: Pam Tennison-Rindt / Evergy State: KS Sampling Point: wetland slope A

Investigator(s): Pam Tennison-Rindt Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ✓ Slope (%): 10

Subregion (LRR): ______ Lat: 39° 17' 15" Long: 96° 8' 13" Datum: ______

Soil Map Unit Name: Clime-Sogn NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ______ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Amaranthus palmeri	50		FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	50		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 0 (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

SOIL

Sampling Point: A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR I, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes ______ No X

Remarks: No soil pit was dug, Fly ash, dry

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ____________

Water Table Present? Yes ______ No ✓ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: