Location Restrictions
SCPC
Sioux Energy Center

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LOCATION RESTRICTIONS - SIOUX ENERGY CENTER

I. Introduction

Ameren Missouri has evaluated the Sioux Energy Center's ("Sioux") SCPC active surface impoundment in accordance with location restrictions set forth below:

§257.60, Placement Above the Uppermost Aquifer;
§257.61, Wetlands;
§257.62, Fault Areas;
§257.63, Seismic Impact Zones; and
§257.64, Unstable Areas.

II. Background

A. Active Surface Impoundments

Sioux currently utilizes three (3) surface impoundments for the management of process waters along with bottom and fly ash, and gypsum from the facility's flue gas desulfurization system (FGD). Such impoundments occupy approximately 149 acres and are identified as follows: SCPA (Bottom Ash Pond); SCPB (Fly Ash Pond); and SCPC (Cell 1). The facility also uses a Recycle Pond to manage stormwater and discharge waters from SCPC, but such impoundment does not collect or manage CCR and is not subject to 40 CFR §257 requirements.

SCPC was placed into service in 2010, and receives process water used to sluice gypsum. The impoundment stores gypsum and discharges decant water into the Recycle Pond. Water collected in the Recycle Pond is returned to the plant for reuse. The impoundment is formed by a compacted earth fill ring dam that is capped by 2 feet of impervious clay and HDPE liner. SCPC is regulated as a dam by the MDNR and subject to Missouri Solid Waste regulations and requirements.

III. Location Restrictions

A. Placement Above the Uppermost Aquifer – 40 CFR §257.60

Existing CCR surface impoundments 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 that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Sioux is about twelve miles west-northwest from the confluence of the Mississippi and Missouri rivers in an alluvial setting of water-deposited soils in the floodplains. The stratigraphy at the site is comprised of alluvium with a thin, underlying residual/colluvial unit immediately on top of bedrock.

The typical total soil thickness is about one hundred to one hundred twenty feet. The uppermost alluvium is comprised of clays and silts interbedded or intermixed with fine to medium sand. Beneath the fine grained soils are fine to coarse sands with occasional interlayering silt and fine gravel fragments. Construction activities have removed much of the uppermost flood basin deposits at the locations of the CCR units.

SCPC is permitted as a Utility Waste Landfill in the State of Missouri that is a operated as a surface impoundment with a composite liner consisting of an 80-mil HDPE liner over 24 inches of compacted clay. The base of SCPC is not 5 feet above the upper limit of the uppermost aquifer and does not meet the requirements of 40 CFR §257.60.

1. Engineering Certification – Placement Above the Uppermost Aquifer

The existing CCR surface impoundment SCPC at the Sioux Energy Center was evaluated to determine if it was constructed with a base that located no less than 5 feet above the upper limit of the uppermost aquifer, or if it can be demonstrated that there will not be 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) to meet the requirements of §257.60, Placement Above the Uppermost Aquifer for Existing CCR Surface Impoundments.

CCR Unit	Meets requirements of 40 CFR §257.60
SCPC (Gypsum Pond Cell 1)	No

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B. **Wetlands – 40 CFR §257.61**

Existing CCR surface impoundments must not be located in wetlands as defined in §232.2, unless the owner or operator demonstrates that the CCR unit meets the requirements of §257.61(a)(1) through (5).

The existing CCR units at Sioux where evaluated to determine whether jurisdictional wetlands were located in proximity to each CCR unit and that the operation of the CCR Unit will not cause or contribute to significant wetland degradation. Engineering and biological assessments performed in 2016 and 2018, along with weekly inspections and effluent limitations contained in the facility's water operating permit confirm that CCR Units at Sioux are not causing or contributing to significant degradation of the wetlands adjacent to the CCR units. The CCR Units located closest to wetlands (SCPA and SCPB) are scheduled to undergo closure once a wastewater treatment facility has been constructed and placed into service.

The original design of SCPC avoided wetlands identified in a jurisdictional determination completed by the United States Army Corps of Engineers (USACE). As a result, the USACE St. Louis District issued a “No Department of the Army Permit Required” letter to Ameren on December 30, 2005.

Water in SCPC discharges into the Recycle Pond and is then pumped back to the SEC for reuse in a closed loop system. There is no NPDES outfall for SCPC.

Sioux also has a Dust Control Plan to minimize CCR from becoming airborne and potentially causing or contributing to significant degradation of surrounding wetlands. The Dust Control Plan includes controls for managing fugitive dusts originating from CCR units, roads and other CCR management and material handling activities from becoming airborne. The primary controls used to minimize fugitive dust include system design, maintenance programs, traffic control, watering, and covering and handling procedures for the CCR materials.

The SCPC is incised with an earthen embankment circling the perimeter of the CCR unit. Reitz & Jens’ 2016 Structural Integrity Criteria & Hydrologic/Hydraulic Capacity Assessment of Sioux determined that SCPC meets or exceeds the minimum stability factors of safety specified in 40 CFR Part §257.73(e)(1), Safety Factor Assessment. The perimeter embankment is also maintained with riprap or vegetative slopes to prevent erosion of exterior embankment material. The perimeter embankment is designed and maintained to prevent catastrophic release, migration of CCR, and/or erosion of embankment material from potentially causing or contributing to significant degradation of surrounding wetlands. In the remote chance that the earthen embankment circling the perimeter of the SCPC were to fail it could impact adjacent wetlands. However, the associated environmental impacts would be minimal.

Ameren also completed a comprehensive evaluation of surface and groundwater data that demonstrates that there are no adverse impacts resulting from coal ash management practices at Sioux on human health or the environment[1].

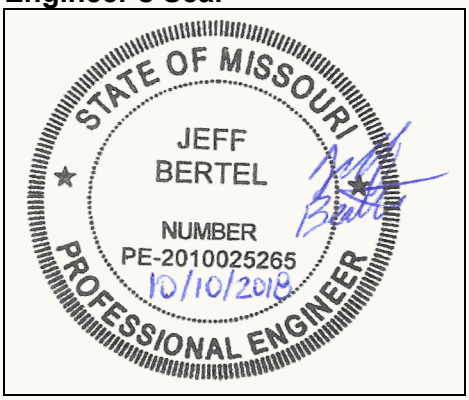
[1] Haley and Aldrich, Inc. (2018). “Human and Ecological Assessment of the Sioux Energy Center, Ameren Missouri.” File No. 130182-004, Boston, MA.

1. Engineering Certification – Wetlands

Existing CCR surface impoundments must not be located in wetlands as defined in §232.2, unless the owner or operator demonstrates that the CCR unit meets the requirements of §257.61(a)(1) through (5). An assessment of the active CCR surface impoundment SCPC (Gypsum Pond Cell 1) at the Sioux Energy Center was conducted and used to prepare a demonstration that the CCR unit meets the requirements of 40 CFR §257.61.

CCR Unit	Meets requirements of 40 CFR §257.61
SCPC (Gypsum Pond Cell 1)	Yes

Engineer's Seal



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C. **Fault Areas – 40 CFR §257.62**

Existing CCR surface impoundments 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. A fault is defined in §257.53 as a fracture or zone of fractures which strata on one side have been displaced with respect to the other side.

The SCPC surface impoundment is not located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time. The closest fault is the Cap au Gres, which is located about 1.6 miles north of the Sioux. The Cap au Gres fault has not undergone any displacements in Holocene time.

1. Engineering Certification – Fault Areas

Existing CCR surface impoundments 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. An assessment of the active CCR surface impoundment SCPC (Gypsum Pond Cell 1) at the Sioux Energy Center was conducted to prepare a demonstration that the CCR unit meets the requirements of 40 CFR §257.62.

CCR Unit	Meets requirements of 40 CFR §257.62
SCPC (Gypsum Pond Cell 1)	Yes

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D. **Seismic Impact Zones – 40 CFR §257.63**

Existing CCR surface impoundments must not be located in seismic impact zones unless the owner or operator demonstrates 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.

The seismic acceleration determined for the SCPC was based upon the USGS 2014 seismic hazard maps for a Peak Horizontal Ground Acceleration (PHGA) for seismic loading event with a 2% probability of exceedance in 50 years. The PHGA was factored for the seismic site class in accordance with ASCE 7 “Minimum Design Loads for Buildings and Other Structures, International Building Code” to obtain a site specific PHGA of 0.262g. Based on this finding, Sioux is located in a seismic impact zone.

The SCPC was evaluated under seismic loading to determine if the CCR unit design is adequate to prevent harmful release of CCR, leachate, and contaminants both during and after the design seismic event. In order to demonstrate the adequacy of the design we evaluated both liquefaction potential and slope stability.

Our analyses estimated probable maximum deformations as the result of seismic acceleration or liquefaction induced settlement. The magnitude of deformation has the potential to require immediate response as detailed in this CCR unit’s Operation & Maintenance Manual. However, it is not expected that these deformations will cause a catastrophic release of CCR. The SCPC design is adequate to prevent harmful release of CCR, leachate, and contaminants both during and after the design seismic event.

1. Engineering Certification – Seismic Impact Zones

Existing CCR surface impoundments 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. An assessment of the active CCR surface impoundment SCPC (Gypsum Pond Cell 1) at the Sioux Energy Center was conducted to prepare a demonstration that the CCR unit meets the requirements of 40 CFR §257.63.

CCR Unit	Meets requirements of 40 CFR §257.63
SCPC (Gypsum Pond Cell 1)	Yes

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E. **Unstable Areas - 40 CFR §257.64**

Existing CCR surface impoundments must not be located in an unstable area unless the owner or operator demonstrates 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.

Sioux is located in an alluvial plain between the Mississippi and Missouri Rivers. The subsurface conditions include a heterogeneous deposit of alluvial soils. The uppermost bedrock underlying the thick alluvium, at a depth of about 115 feet, is limestone and dolomite of the Mississippian-age Salem Formation. Outcrops of the Salem Formation exist in the bluffs on the north side of the Mississippi River. The Salem Formation is reported to be 60 feet thick, and is underlain by the Warsaw Formation which principally consists of shale and finely-crystalline dolomitic mudstone.

The CCR units at Sioux were evaluated to determine if they were located in an unstable area using data from existing geotechnical investigations and relevant information including maps showing regional bedrock geology, karst features, mines and other potential unstable features. There are no known springs, caves, sinkholes or rock outcrops within the alluvial plain. No other potentially significant geologic or geomorphic features have been identified at Sioux. No significant on-site or local human-made features or events, either surface or subsurface are in evidence at Sioux within the footprints of the CCR units.

The global stability and settlement of the CCR units were evaluated during design or after construction based on the as-built conditions. These evaluations show that the CCR units are not susceptible to significant differential settling or mass movement.

1. Engineer's Certification – Unstable Areas

Existing CCR surface impoundments must not be located in an unstable area unless the owner or operator demonstrates 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. An assessment of the active CCR surface impoundment SCPC (Gypsum Pond Cell 1) at the Sioux Energy Center was conducted to prepare a demonstration that the CCR unit meets the requirements of 40 CFR §257.64.

CCR Unit	Meets requirements of 40 CFR §257.63
SCPC (Gypsum Pond Cell 1)	Yes

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