Location Restrictions
RCPA
Rush Island Energy Center

Contents

LOCATION RESTRICTIONS – RUSH ISLAND ENERGY CENTER

I. Introduction

Ameren Missouri has evaluated the Rush Island Energy Center's ("Rush Island") RCPA 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

Rush Island is located in southern Jefferson County, Missouri. The plant is south of the City of Festus and north of the City of Bloomsdale on the west bank of the Mississippi River at river mile 140. There is one active surface impoundment at Rush Island identified as RCPA. RCPA was created as part of the original construction of the Rush facility in 1976 and has an approximate area of 114 acres. RCPA is used to store and manage CCR and process waters prior to discharge through Outfall #002 of NPDES permit number MO-0000043. The CCR stored within the surface impoundment includes both bottom and fly ash. RCPA is surrounded by a ring dam or embankment that is regulated by the Missouri Department of Natural Resources (MDNR) as a registered dam. RCPA operates under Missouri's dam safety Operating Permit MO-40179.

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.

The RCPA is located in the Mississippi River floodplain approximately 400 feet west of the Mississippi River. The floodplain extends to approximately 500 feet west of RCPA, where bedrock uplands rise to more than 350 feet above the floodplain. Rush Island is primarily comprised of alluvium. The alluvial soils generally consist of an upper stratum of clays and silts underlain by fine to coarse poorly graded sand. Some gravel exists in the lower part of the sand stratum. Silt and clay lenses are also present in the sand formation. Ordovician limestone bedrock of the lower Plattin Group exists beneath the alluvium.

The uppermost aquifer at Rush Island occurs within the Mississippi River alluvium. Groundwater level monitoring was conducted in 2013 and 2014 on at least a monthly basis as part of a detailed site investigation. The monitoring showed that water level fluctuations closely mimic fluctuations in the Mississippi River stage.

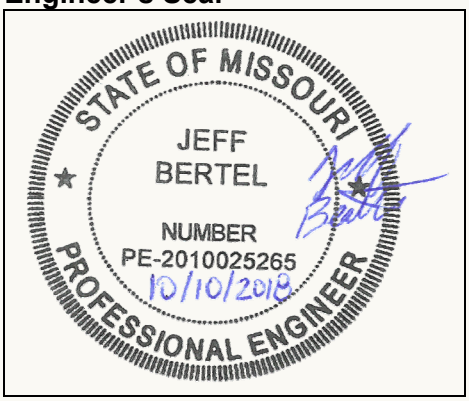
The base of RCPA is not 5 feet above the upper limit of the uppermost aquifer and does not meet the requirements of 40 CFR §257.60.

1. Engineering Certification – Placement Above the Uppermost Aquifer

The existing CCR surface impoundment RCPA at the Rush Island Energy Center was evaluated to determine if it was constructed with a base that is 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 40 CFR §257.60, Placement Above the Uppermost Aquifer for Existing CCR Surface Impoundments.

CCR Unit	Meets requirements of 40 CFR §257.60
RCPA (Ash Pond)	No

Engineer's Seal



Jeff Bertel, P.E.
License: PE-2010025265, MO

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 unit at Rush Island was evaluated to determine whether jurisdictional wetlands were located in proximity to the 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 the CCR Unit at Rush Island is not causing or contributing to significant degradation of the wetlands adjacent to the CCR unit. RCPA is scheduled to undergo closure in 2020.

The proximity of wetlands to the RCPA has been identified on aerial imagery by the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory[1] (NWI) Mapper. The NWI identifies wetlands to the east, west and south of the RCPA.

Water from RCPA discharges on the west side of the CCR unit through Outfall 002 of Ameren's Missouri State Operating and National Pollutant Discharge Elimination System (NPDES) permit (MO-0000043) for Rush Island. The NPDES permit is administered by the Missouri Department of Natural Resources (MDNR). Discharges through Outfall 002 are monitored and subject to the effluent limitations stipulated in the NPDES permit.

Rush Island 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.

[1] *The National Wetland Inventory is not dispositive on whether regulated wetlands exist at any particular location. According to Corps of Engineers' Guidance: "Since not all delineated areas on NWI maps are wetlands under Department of Army jurisdiction, NWI maps should not be used as the sole basis for determining whether wetland vegetation is present." 1987 Manual, at page 48. The Corps later states: "The optimum use of NWI maps is to plan field review (i.e., how wet, big, or diverse is the area?) and to assist during field review, particularly by showing the approximate areal extent of the wetland and its association with other communities." Id.*

The RCPA is incised with an earthen embankment circling the perimeter of the CCR unit. In 2016, Reitz & Jens performed a Structural Integrity Criteria & Hydrologic/Hydraulic Capacity Assessment of Rush Island and determined that RCPA meets or exceeds the minimum stability factors of safety specified in 40 CFR §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 RCPA were to fail it could impact adjacent wetlands. However, the associated environmental impacts would be minimal.

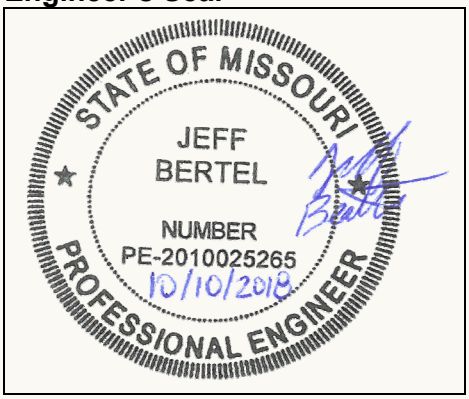
Ameren also completed a comprehensive evaluation of surface and groundwater data that demonstrates that there are no adverse impacts resulting from coal ash management practices at Rush Island on human health or the environment[2].

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 RCPA (Ash Pond) at the Rush Island Energy Center was conducted and used to prepare a demonstration that the CCR unit meets the requirements of 40 CFR Part §257.61.

CCR Unit	Meets requirements of 40 CFR §257.61
RCPA (Ash Pond)	Yes

Engineer's Seal



Jeff Bertel, P.E.
License: PE-2010025265, MO

[2] Haley and Aldrich, Inc. (2018). "Human Health and Ecological Assessment of the Rush Island Energy Center, Ameren Missouri." File No. 130182-004, Boston, MA.

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.

RCPA is not located within 200 feet of the outermost damage zone of a mapped fault that has had displacement in Holocene time. The closest mapped fault is the Selma Fault, which is located about 4 miles northwest of the RCPA. The Selma Fault is a system of splintered faults. The west end and the northeast segments were defined by offset beds. The southern segment to the east is documented by outcrops of tilted blocks near the end. Small reverse faults and tight folds in the Cotter Dolomite in the roadcut on Interstate 55 indicate a compressional origin for the faults, which is consistent with the folding in the area[3]. There is no literature indicating that these faults are currently active or have been active during Holocene time.

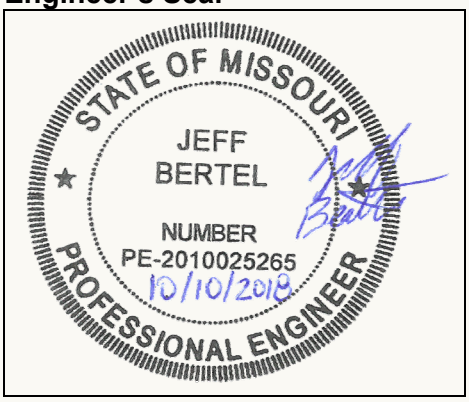
[3] Baker, H.W. and J.R. Palmer. (2001). "Bedrock Geology Map of the Selma 7.5' Quadrangle, Jefferson and Ste. Genevieve Counties, Missouri." OFM-01-392-GS. Missouri Department of Natural Resources, Division of Geology and Land Survey.

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 RCPA (Ash Pond) at the Rush Island 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
RCPA (Ash Pond)	Yes

Engineer's Seal



Jeff Bertel, P.E.
License: PE-2010025265, MO

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 RCPA 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 0.372g. Based on this finding, Rush Island is located in a seismic impact zone.

The RCPA 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.

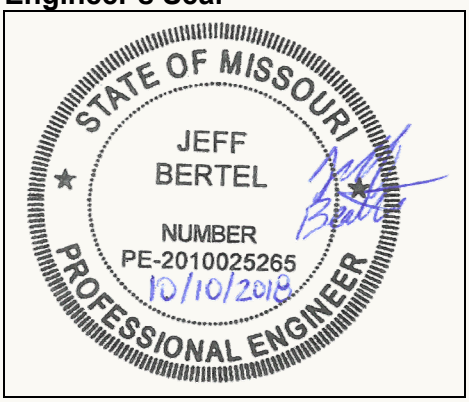
Our analyses determined that there is an acceptable factor of safety for the post-earthquake load case and estimated probable maximum deformations as the result of seismic acceleration or liquefaction induced settlement. The magnitude of deformation has the potential to require immediate response as 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 RCPA 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 RCPA (Ash Pond) at the Rush Island 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
RCPA (Ash Pond)	Yes

Engineer's Seal



Jeff Bertel, P.E.
License: PE-2010025265, MO

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.

Rush Island is located in an alluvial plain adjacent to the Mississippi River. The alluvium generally consists of an upper stratum of clays and silts underlain by fine to coarse poorly graded sand. Some gravel exists in the lower part of the sand stratum. Silt and clay lenses are also present in the sand formation. The alluvium is up to 130 feet thick, and underlain by Ordovician-age bedrock. Borings drilled below the top of bedrock during a detailed site investigation at Rush Island encountered limestone of the lower Plattin Group and the uppermost part of the underlying Joachim dolomite.

The CCR unit at Rush Island was evaluated to determine if it is 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 Rush Island. No significant on-site or local human-made features or events, either surface or subsurface are in evidence at Rush Island within the footprints of the CCR unit.

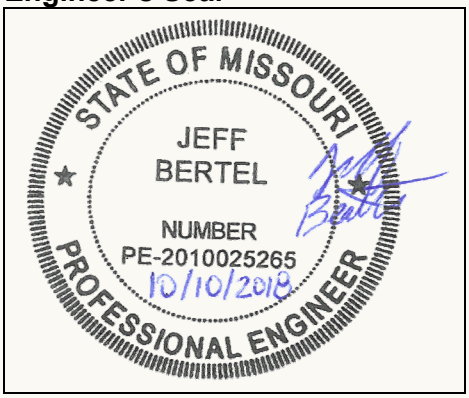
The global stability and settlement of RCPA was evaluated based on the as-built conditions. The evaluation shows that RCPA is not susceptible to significant differential settling or mass movement.

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 active CCR surface impoundment RCPA (Ash Pond) at the Rush Island 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 §257.64
RCPA (Ash Pond)	Yes

Engineer's Seal



Jeff Bertel, P.E.
License: PE-2010025265, MO