

**CLOSURE PLAN
OPPD NEBRASKA CITY GENERATING STATION
FOSSIL FUEL COMBUSTION ASH DISPOSAL AREA**

NC2 ASH DISPOSAL AREA

Prepared for:

**OMAHA PUBLIC POWER DISTRICT
NEBRASKA CITY GENERATING STATION
OTOE COUNTY, NEBRASKA**

REVISED: October 2016

**CLOSURE PLAN
NC2 ASH DISPOSAL AREA**

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Professional Engineer Certification

“I hereby certify that this Closure Plan for the NC2 Ash Disposal Area at the Omaha Public Power District Nebraska City Station meets the requirements of the Coal Combustion Residual Rule 40 CFR 257.102(b). I am a duly licensed Professional Engineer under the laws of the State of Nebraska.”

Print Name: Bradley J. Sojka
Signature: *Bradley J. Sojka*
Date: 10/13/16
License #: E-15436



My license renewal date is December 31, 2016.

Section 1.0 Site Identification

1.1 Introduction

On April 17, 2015 the U.S. Environmental Protection Agency (EPA) published the final rule for the regulation and management of coal combustion residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). The rule – effective on October 19, 2015 – applies to electric utilities and independent power producers that fall within NAICS code 221112, and the facility produces or stores CCR materials in impoundments or landfills. This regulation applies to Omaha Public Power District's (OPPD's) Nebraska City Generating Station.

OPPD has a two-unit (Unit 1 and Unit 2) fossil fuel-fired generating plant at the Nebraska City Station (Station) southeast of Nebraska City, Nebraska. This Station has two existing CCR landfills that are permitted under the current NDEQ Title 132 regulations for fossil fuel combustion ash disposal area (the NC1 Ash Disposal Area and NC2 Ash Disposal Area). The NC2 Ash Disposal Area is a lined 40.7 Acre lined landfill, with available capacity for approximately 3,936,000 cubic yards of fossil fuel combustion ash. NC2 Ash Disposal Area will continue to receive CCR for disposal both before and after October 19, 2015.

This Closure Plan, prepared in accordance with Nebraska Department of Environmental Quality (NDEQ) Title 132, Chapter 4 and updated to comply with the federal CCR rule requirements, provides a description of the final cover system, closure activities, schedules, and features incorporated into the closure of the NC2 Ash Disposal Area. This Closure Plan must be amended whenever there is a change in the operation of the CCR landfill that would substantially affect the written closure plan or before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan. OPPD will not implement modifications to the design or operations of the NC2 Ash Disposal Area that would result in modifications to this Closure Plan without prior approval from NDEQ.

1.2 Facility Identification

Facility: NC2 Ash Disposal Area

Location: Station property covers portions of Sections 30 and 31, Township 8 North, Range 15 East, and Sections 25 and 36, Township 8 North, Range 14 East in Otoe County, Nebraska, containing 1,600 acres more or less. The NC2 Ash Disposal Area is approximately 40.7 acres in S ½, SE ¼, Section 25, Township 8 North, Range 14 East. The Station property is approximately 5.5 miles southeast of Nebraska City, Nebraska, along the west shore of the Missouri River.

Owner Contact Address: Omaha Public Power District
Environmental Services
444 South 16th Street
Omaha, Nebraska 68102-2247

NDEQ Permit No: NE0204421

1.3 Maximum Inventory of CCR

The Station was commissioned in 1979 with Unit 1. A second generating unit was constructed and commissioned for commercial operation in May 2009. Fossil fuel combustion ash from Unit 2 has been placed within Cell 1 of the NC2 Ash Disposal Area. In the future, fossil fuel combustion ash generated from both Units 1 and 2 will be placed in the NC2 Ash Disposal Area.

The NC2 Ash Disposal Area is approximately 40.7 acres, with available capacity for approximately 3,936,000 cubic yards of fossil fuel combustion ash. This excludes the liner and final cover. As of the July 2013 topographic survey, approximately 858,400 cubic yards of airspace was consumed; thus 3,077,600 cubic yards of permitted airspace remain for ash disposal. NC2 Ash Disposal Area is anticipated to fully resume operations in year 2019.

For site life calculations, 100 percent of the fly ash produced from Unit 2 is assumed to be disposed in the NC2 Ash Disposal Area, except for the period of time when Unit 2 ash is disposed in the permitted NC1 Ash Disposal Area. Additionally, 100 percent of the fly ash and 25 percent of the bottom ash generated from Unit 1 are assumed to be disposed annually, beginning in year 2019. All of Unit 2 bottom ash is projected to be diverted to beneficial use. Based on compaction of the disposed ash to 97 percent of maximum dry density, and the placement of ash from both Units 1 and 2, the NC2 Ash Disposal Area remaining life expectancy is projected to be approximately 8.5 years, from year 2019 to year 2027. Site life calculations and phasing are included in the Phase Site Development Plan (Permit – Appendix B). The actual disposal area life is dependent upon Nebraska City Station operations, amount of ash marketed for beneficial uses, and viability of bottom ash markets.

1.4 Largest Area Requiring Final Cover

The cell 1 closure project in 2015 has installed final cover over approximately 14.4 acres of NC2 Ash Disposal Area. Therefore, the largest area ever requiring final cover will be approximately 23.6 acres

1.5 Site Life

The remaining life of the NC2 Ash Disposal Area was determined based on the design volume (available disposal Capacity), projected ash generated from the NC1 and NC2, no reuse of NC1 or NC2 fly ash, 25% reuse of NC1 and 100% reuse of NC2 bottom ash, and an estimated average in-place density. The remaining disposal area is estimated to be approximately 8.5 years starting in early 2019 when OPPD will transition from filling the NC1 landfill.

1.6 Notification

The NC2 Ash Disposal Area will be used for the disposal of CCR only from OPPD's Nebraska City Station. There will be no other users of the facility to be notified at the final closure.

OPPD will provide NDEQ formal written notice of its intent to close the NC2 Ash Disposal Area at least 180 days prior to date of final receipt of CCR in accordance with NDEQ Title 132 Chapter 4 005.04. OPPD will provide NDEQ notice of phased closure construction activities at least 30 days prior to start of construction, including the following:

- Projected date of the last receipt of waste (for final closure)
- Projected date of initiation of phased or final closure
- Proposed construction schedule
- Date of installation of final cover system

The NDEQ also requires notification of the actual date of initiation of final closure and the actual date of completion of installation of the final cover system.

In accordance with the CCR rule requirements, the following closure-related notifications will be provided to the Director of NDEQ:

- Notification that Closure Plan is available and posted to the CCR website, and any amendment thereof
- Notification of intent to close, including certification by qualified professional engineer for the design of the final cover system
- Notification of completion of closure, including certification by qualified professional engineer
- Notification that deed notation has been recorded

1.7 Schedule of Activities

Within 30 days after the closure date, the closure plan shall be implemented. Closure activities will be completed in accordance with the closure plan within 6 months after closure date, depending on timing of the construction season or an extension has been received from NDEQ. OPPD will notify NDEQ of the date of the initiation of final closure and the date of installation of the final cover system.

The post-closure plan will be implemented immediately after final closure is complete.

1.8 Final Closure Certifications and Reports

OPPD will prepare, directly or through a contract, the documentation of closure in accordance with NDEQ Title 132, Chapter 4. Documentation of closure will include certification by a professional engineer registered in the State of Nebraska verifying that closure has been completed in accordance with this or any subsequently updated Closure Plan. Documentation of closure will also include construction quality assurance documentation for each phased closure submitted to NDEQ.

Certifications required by the federal CCR rule are included with the notifications described under Section 1.6 above.

When the NC2 Ash Disposal Area completes final closure, a survey and plat (prepared by a licensed surveyor in the State of Nebraska and meeting the minimum standards of property boundary surveys) will be submitted to NDEQ. The survey plat will include the name of the property owner as it appears on the property deed, a legal description of the site, description of the CCR accepted, location of the CCR, approximate depth of fill, and location and description of groundwater management systems, which are to be maintained.

1.9 Registration on Deed

Pursuant to NDEQ, within 90 days following the NC2 Ash Disposal Area completion of installation of the final cover system for final closure, a notation will be recorded on the deed to the Station property or other instrument that is normally examined during a title search with the Otoe County Registrar of Deeds. A final plat will be filed with the Otoe County Registrar prepared by a registered land surveyor licensed in the State of Nebraska. OPPD will provide documentation of the deed notation to NDEQ to show that such notation has been recorded, and a copy of this record and documentation will be placed in the operating record.

The notation on the deed will in perpetuity notify any potential purchaser of the property that:

- 1) A closed fossil fuel combustion ash disposal area exists on the property (the land has been used as a CCR landfill);
- 2) The type, depth, and location of CCR on the property is identified (as necessary) as well as the existence of any monitoring systems; and
- 3) Its use is restricted under the CCR rule post-closure care requirements of 40 CFR 257.104(d)(1)(iii) and may be restricted under NDEQ Title 132, Chapter 4 to protect the monitoring system or any other components of the containment system.

Section 2.0 Closure Plan

The purpose of this Closure Plan is to describe the steps necessary to close the NC2 Ash Disposal Area at any point during its active life and identify the final cover system, as required by the CCR rule to minimize the post-closure infiltration of liquids into the CCR, minimize the potential for adverse environmental impact, and minimize the need for further maintenance during the post-closure period. The closure of the NC2 Ash Disposal Area involves site preparation and grading, construction of the final cover system, and if not previously installed, construction of facilities for post-closure monitoring, maintenance, and care. The primary closure activities include adjusting site grades (both top and side slopes) if necessary, installing the final soil cover system with terraces and letdown structures, and installing vegetation. OPPD plans to close the disposal area in phases after areas are filled to final grades and as funds are budgeted. Permit drawings 2 through 5 are included with the NDEQ Title 132 Permit Drawings (Appendix G) show the site development.

Installation of final cover for the NC2 Ash Disposal Area can begin when a phase reaches final elevation. Phase 1 (side slope closure to elevation 940) has had a 2-foot final soil cover installed in accordance with current NDEQ Title 132 regulations. All future phases will be closed in accordance with this updated Closure Plan and the requirements of the federal CCR rule. The discussion below applies to the closure phases and final closure. Closure activities at the NC2 Ash Disposal Area can include the following components:

- Final cover construction
- Storm water/drainage system
- Leachate management system
- Groundwater monitoring system
- Access controls
- On-site structures and roadways

The following description of activities is generally applicable to various closure alternatives (phased, premature, and final).

2.1 Final Cover System Design

The federal CCR rule requires the final cover system to meet the requirements in 40 CFR 257.102(d)(3) with a minimum 18-inch infiltration layer and 6-inch erosion layer. The infiltration layer will consist of compacted clay soils. The permeability of the infiltration layer must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less. The erosion layer will support the cover vegetation. The Permit Drawings (Permit – Appendix I) illustrate the final profile of the landfill capping system and proposed final grades.

2.1.1 Infiltration Layer

Federal CCR regulations require the infiltration layer to be comprised of a minimum of 18 inches of earthen material that has a permeability less than or equal to the permeability of any bottom

liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec whichever is less. The NC2 Ash Disposal Area utilizes a composite liner constructed of a 2 ft. compacted clay overlain by a 60-mil high density polyethylene (HDPE) geomembrane and geotextile fabric layer. Based on historic subsurface investigations (1975) and boring logs of monitoring wells installed in the immediate vicinity (see Hydrogeologic Investigations Report, Permit – Appendix L), the soils extending from the ground surface up to six feet deep are classified under the Unified Soils Classification System as ML (sandy silt) or SM (silty sand) with coarser grain material below. These soils are anticipated to be more permeable than 10^{-5} cm/sec. As a result, the infiltration layer for the NC2 Ash Disposal Area is anticipated to be constructed to a permeability less than or equal to 1×10^{-5} cm/sec.

The primary purpose of the infiltration layer is to prevent downward movement of moisture into the CCR. Soils for final cover infiltration layer will be obtained from off-site borrow sources. Factors considered in soil selection include: percentage of fines; Plastic Index (based on Atterberg Limits-ASTM D4318); and percent gravel and stones. The infiltration layer construction will include successive horizontal lifts of suitable soils compacted to a minimum percent of Standard Proctor density to be determined with the source testing of soils. Horizontal lifts will not exceed six inches in compacted thickness. The final construction specification will reflect these considerations of soil properties, preparation and compaction.

The sideslopes of the NC2 Ash Disposal Area will be graded to no steeper than 3 horizontal to 1 vertical (3:1). The top surface of the disposal area will be graded and maintained at a minimum 2 percent and maximum 10 percent slope. The slopes and grades are generally designed to provide sheet flow drainage of storm water.

2.1.2 Erosion Layer

Federal CCR regulations require the erosion layer to be comprised of a minimum of 6 inches of earthen material that is capable of sustaining native plant growth. Soils for the final cover erosion layer will be obtained from one or more of the following sources:

- On-site borrow source
- Off-site borrow source
- NC2 clarifier sediment (as soil amendment)

The erosion layer may be further amended with compost and/or fertilizer, when necessary. This erosion layer serves several purposes including: 1) to allow run-off of major storm events while inhibiting erosion; 2) to support vegetation which will not extend into the infiltration layer; 3) to reduce long-term maintenance by supporting diverse species of grasses, which reproduce voluntarily, and are low maintenance; and 4) to encourage evapo-transpiration as a means of controlling liquid migration to the infiltration layer.

Factors to be considered in erosion layer soil selection include agricultural properties (e.g., pH, sodium absorption ratio, nutrient levels [nitrogen, potassium, and phosphate]). The final construction specification will reflect these considerations of soil agricultural properties, discing, treatment, and methods of installation of grasses.

2.1.3 Final Cover Erosion Control Features

The final cover includes slopes, grades, terraces, letdown structures, and diversion berms designed to promote rapid surface water run-off (to minimize infiltration) and without creating excessive erosion.

- Terraces will be constructed of compacted clay soils during final closure as depicted in the Permit Drawings, Sheet 11 (Permit – Appendix G). Terraces will be constructed approximately every 30 vertical feet to minimize erosion rills and soil loss. A typical series of terraces is shown on Sheet 11 (Permit – Appendix G). Terraces will typically discharge into letdown structures.
- Letdown structures will convey stormwater runoff collected from the terraces and diversion berm to the perimeter drainage channels. Each letdown structure will be constructed of materials which will prevent erosion due to anticipated velocities of runoff during a storm event. A typical letdown structure is depicted in Permit Drawings, Sheet 11 (Permit – Appendix G).
- Diversion berms will be constructed near the grade break transition from the shallow slope on top of the CCR landfill to the 3:1 side slope to terminate sheet flow and direct stormwater to the letdown structures. The diversion berm detail is depicted on Sheet 11 (Permit – Appendix G).

The combination of soil types and grasses (in addition to slopes, grades, terraces and berms) have been selected to control the rate of erosion such that maximum soil loss does not exceed the excessive erosion rate of 5 tons per acre per year as required by NDEQ. Based on the final closure elevations, contours and structures shown in the Permit Drawings (Permit – Appendix I), the Revised Universal Soil Loss Equation (RUSLE2) predicts first year soil loss for conservation planning under new vegetative growth conditions at 4.8 tons per acre for the NC2 Ash Disposal Area. Under established grass conditions, second year and beyond, the predicted soil loss for conservation planning is 0.74 tons per acre per year (see new calculations in Permit – Appendix J). This is equivalent to a loss of cover thickness of approximately 0.026 inches in the first year and 0.004 inches per year over the remaining post-closure period, using a soil density of 100 pounds per cubic foot and soil loss for conservation planning. This equates to approximately 0.04 inches of total soil loss over a 30-year post-closure period (post-closure period of 30 years required by federal CCR rule). Final cover soil loss (RUSLE2) calculations are included in Appendix J-10.

2.1.4 Cover Vegetation

The erosion layer will be treated with appropriate soil supplements, if necessary, in preparation for the planting of perennial grasses. Appropriate vegetative cover will be established and maintained as soon as practical after final grading.

The seedbed for initial planting should be tilled with a disc to approximately 3 inches and the soil should be adjusted with a cultipacker before seeding to achieve a firm smooth seedbed or utilize a drill that will compact the soil correctly for prairie grasses.

Permanent seeding will be used to provide a long-term, low maintenance vegetative cover. Based on the Cell 1 cap construction, grassing is anticipated to include a mixture of wheat grass, switchgrass, bluestem, and grama. Seed mixtures historically used and anticipated in the future are included in Table 1, below. Final seed mixture and application rates will be confirmed, and if appropriate, modified for each specific phase of capping.

All permanent seed shall be certified seed that meets published US Department of Agriculture, Federal Seed Act standards and bears an official “Certified Seed” label. Legume seed should be inoculated with the inoculant appropriate for the species.

**Table 1
Capping System Vegetative Cover**

GRASSES	Pounds of PLS PER ACRE
Canada wildrye-Mandan, Nebraska native	24
Western Wheatgrass-Flintlock, Barton	24
Slender Wheatgrass	18
Indiangrass-Oto, NE-54, Holt	18
Switchgrass-Pathfinder, Blackwell, Trailblazer	10
Big Bluestem-Pawnee, Roundtree, Bonanza	18
Little Bluestem – Aldous, Blaze, Camper, Nebraska native	15
Sideoats grama-Butte, El Reno, Trailway	24
Oats/Wheat (wheat in the fall)	24
Cover Crop (oats or wheat), when used in temporary grassing; 100 PLS rates will be used when used as an exclusive stabilization method.	

PLS = Pure Live Seed

The final construction specifications will require the contractor to sample and analyze the soils used for final cover erosion layer to obtain recommendations on the type and amount of nutrients to add to the cover soil and for the seed application rates. Fertilizer and other soil amendments will be applied at the rate defined by the test recommendations. Fertilizer and other soil amendments shall be incorporated into the top 4 to 6 inches for permanent closure. Mulch products may include Hydro-mulch, peat moss, hay, or straw. Other materials may also be considered. Hydro-mulch shall be applied in accordance with manufacturer’s recommendations. Where hay or straw are utilized they shall be applied at a minimum rate of 4,000 pounds per acre. Hay and straw mulching shall be placed loose and immediately following spreading it will be anchored using a rolling coultter, wheatland packer or similar mulch crimper having wheels with V-shaped edges to force the mulch into the soil surface. Other methods of installation or anchoring may be considered if they can assure that the mulch is applied and anchored in a manner as to remain in place.

2.1.5 Construction Quality Assurance

Construction of the final cover shall be in accordance with requirements of the Construction Quality Assurance (CQA) Plan (Permit – Appendix F). OPPD will submit CQA documentation including a topographical survey showing final contours and a certification signed by an independent professional engineer registered in the State of Nebraska verifying that closure was completed in accordance with the approved closure plan and in accordance with the CQA Plan.

2.2 Erosion Controls

Permanent erosion control features are described under the final cover system. Run-off will be returned to natural drainage.

For disturbances of more than 1 acre, silt fences or other erosion control measures will be installed, as necessary. Temporary erosion controls will consist of silt fence, filter sox, staked hay bales or other erosion control measures. These will only be utilized on the landfill area or where stormwater is likely to discharge from the disposal area.

2.3 Storm Water/Drainage System

Drainage structures such as ditches, culverts, and discharge structures will have been constructed prior to closure. The final closure includes slopes, grades, terraces, and letdown structures designed to promote rapid surface water run-off (to minimize infiltration) and without creating excessive erosion. Permanent drainage structures and ditches are designed to accommodate a 25-year, 24-hour storm event, as identified in the site drainage calculations (Permit – Appendices J-11 through J-18).

2.4 Leachate Management System

All leachate management facilities will be in place at the time of final closure, and no additional facilities will be required. The compacted ash and overall capping system will reduce leachate production as determined by HELP model runs (Permit-Appendix J-5)

2.5 Groundwater Monitoring System

All installed monitoring wells at the time of final closure are anticipated to remain in use for the groundwater level measurements, detection monitoring program, and/or assessment monitoring. The wells are protected with bollards or other protection features from potential vehicular damage. The groundwater monitoring system is described in the Groundwater Sampling and Analysis Plan (Permit – Appendix C).

2.6 Access Control

The Station facilities are surrounded by a combination of barbed wire fence and chain link fence, with a security gate at the entrance. Access onto the Station site is through the gate, either with

security personnel during administrative office hours or key card after hours. The power plant is staffed at all times. Unauthorized personnel will not be allowed on-site.

2.7 On-Site Structures and Roadways

Ash silos and other structures may remain at the final closure of the NC2 Ash Disposal Area for future ash operations at an alternative disposal area. Maintenance equipment required during the post-closure period may remain on-site. Plant facility buildings will continue to function for ongoing Station operations.

The final disposal area site configuration will incorporate the roadways to access the groundwater monitoring wells, surface water facilities, and other appropriate areas.