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# **Coal Combustion Residual Landfill Closure Plan**

**Basin Electric Power Cooperative  
Leland Olds Station**

**October 2016**

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## Purpose

The purpose of this document is to demonstrate compliance with 40 CFR §257.102 (Criteria for conducting the closure or retrofit of CCR units) which requires the owner or operator of a Coal Combustion Residual (CCR) unit to prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the unit consistent with recognized and generally accepted good engineering practices.

## Introduction

Leland Olds Station (LOS) is a lignite coal-fired power plant consisting of two units that generate about 669 megawatts (MW) combined. The power plant, owned and operated by Basin Electric Power Cooperative (Basin Electric), is located approximately four miles southeast of Stanton in Mercer County, North Dakota. Unit 1 went online in 1966 and Unit 2 went online in 1975. CCRs from LOS are disposed at the Glenharold Mine Landfill, regulated as special waste landfill 0143 by the North Dakota Department of Health (NDDoH).

The Glenharold Mine Landfill was first permitted for the disposal of CCRs in 1992, with disposal beginning at the facility in late 1992. The landfill is located in an upland area, approximately four miles south and west of the LOS plant site. The landfill was developed in spoils left by the surface mining of the Hagel Lignite Bed in the late 1960s and early 1970s. Partial sequential closure of the landfill has been conducted as areas of the landfill are filled and brought to final grade. To date, approximately 34.44 acres of the 68.09 acre CCR landfill footprint have been closed using an engineered cover system approved by the NDDoH.

## Closure Narrative

Once CCRs have reached final elevation in the landfill, a two-foot thick clay-rich barrier layer will be constructed over the waste to minimize infiltration potential. Clay-rich materials suitable for use as a low permeability barrier layer have been identified onsite during previous geotechnical investigations. The barrier layer would be moisture-conditioned and compacted to achieve permeabilities of  $1 \times 10^{-7}$  cm/sec or less. Construction Quality Assurance/Quality Control (QA/QC) methodologies consistent the NDDoH guidelines would be utilized so that the final

cover is constructed to meet the requirements set forth in the CCR Rule and in NDDoH rules and guidance. After the barrier layer has been constructed, an additional two feet of cover materials will be placed over filled areas. Final cover slopes of approximately 3 to 15 percent are consistent with the NDDoH rules and guidance, promoting run-off without being subject to excessive erosion.

Previous reclamation efforts at the Glenharold Mine on orphan spoils have shown that careful soil preparation and seed mix selection can be utilized to establish a diverse, effective vegetative cover despite the lack of high quality soil materials. Once the final cover material has been placed, it will be chisel-plowed to a depth of six to eight inches. Fertilizer will then be broadcast and chisel-plowed to a depth of two to three inches. Closed areas will be seeded with shallow-rooted native vegetation. After seeding has been completed, the area will be mulched and crimped at a rate of 3 tons/acre. The closed landfill will not be used for cultivated crops, heavy grazing or any other use which might disturb the protective vegetative and soil cover.

## Final Cover System Design and Performance

The cover system will be constructed, from bottom to top, of a barrier layer consisting of a minimum of 24 inches of compacted clay-rich soil with a hydraulic conductivity of  $1 \times 10^{-7}$  cm/second or less overlain by a minimum of 24 inches of uncompacted material to serve as a vegetation growth medium and rooting zone. Total thickness of the cover system will be a minimum of 48 inches. In addition to the basic description of the final cover system, the CCR Rule requires the closure plan to address both performance and design standards for closure of the CCR unit.

CCR Rule design standards require a low permeability barrier layer (infiltration layer) with a permeability less than or equal to the bottom liner system or natural subsoils present, or a permeability of no greater than  $1 \times 10^{-5}$  cm/sec, whichever is less. The design standards also require that the infiltration layer have a minimum thickness of 18 inches and the infiltration layer be overlain by an erosion layer capable of sustaining native plant growth with a minimum thickness of six inches. The landfill was constructed with two-foot thick compacted soil bottom liner with a permeability no greater than  $1 \times 10^{-7}$  cm/sec. The permeability of the cover system barrier (infiltration layer) is no greater than  $1 \times 10^{-7}$  cm/sec, which is less than or equal to the low

permeability bottom liner. Accordingly, the cover system meets the design criteria for permeability.

The final cover system is designed with an infiltration layer thickness of 24 inches which is greater than the minimum requirement of 18 inches. The erosion layer has a minimum thickness of 24 inches, much greater than the minimum required thickness of six inches. As such, the cover system meets the minimum thickness design criteria for both the infiltration layer and for the erosion layer.

Performance standards include ensuring the CCR unit closure system controls, minimizes or eliminates, to the maximum extent feasible, post-closure infiltration of liquids into the waste; precludes the probability of impoundment of water, sediment, or slurry; addresses slope stability; minimizes the need for further maintenance; and that closure be completed in a time consistent with recognized and generally accepted good engineering practices.

The various components of the cover system work synergistically to meet CCR Rule performance standards. Infiltration is minimized by using a combination of slope to promote run-off, shallow-rooted native vegetation to enhance evapotranspiration, and a low permeability barrier layer to further limit infiltration. The closed landfill will be sloped to promote run-off thus limiting the probability of impounding liquids, slurry or sediment. The relatively gentle slopes (3 to 15 percent) and native vegetation on the cover system contributes to structural stability and helps minimize the need for future maintenance. The pozzolanic properties of the CCRs also promote structural stability and reduce the likelihood of settling and subsidence. Consistent with NDDoH rules and guidance and generally accepted good engineering practices, the cover system will be constructed in phases as areas are filled to grade (partial sequential closure).

## CCR Inventory and Maximum Closure Are Estimates

The maximum inventory or CCR ever on-site (design capacity) during the active life of the CCR unit is estimated to be 3,741,000 cubic yards. The largest area of the CCR unit ever requiring final cover at any time during the CCR unit's life is estimated to be 33.65 acres, reflecting current conditions at the site.

## Closure Schedule

As of October of 2015, the CCR unit had a remaining volume of 1,277,166 cubic yards, which equates to 2.55 years of remaining capacity. The remaining life of the facility (filled to maximum capacity in 2018) may vary depending on factors such as ash content of coal, diversion of CCRs for beneficial use, and electrical generation rates, among others. A planned future lateral expansion, to be constructed in accordance with the requirements of NDDoH and the CCR rule, would increase the useful life of the facility. The schedule for CCR unit closure will be updated as necessary once plans for the lateral expansion are completed.

## Recordkeeping and Reporting

A copy of this document will be placed into the facility's operating record in accordance with 40 CFR §257.105 (Recordkeeping Requirements) and will be posted to Basin Electric Power Cooperative's CCR Web site in accordance with 40 CFR §257.107 (Publicly accessible internet site requirements). Notification will be sent to the relevant State Director in accordance with 40 CFR §257.106 (Notification Requirements).

## Certification Statement

I certify that the design of the final cover system meets the requirements of 40 CFR §257.102 as specified in the *Standards of Coal Combustion Residuals in Landfills and Impoundments*.



Kevin L. Solie, North Dakota PE-9488

October 14, 2016

