



# Inflow Design Flood Control System Plan

## *Scrubber Ponds*

### *Lewis & Clark Station*

Prepared for  
Montana-Dakota Utilities Co.

November 2018

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## Certification

I hereby certify that this Inflow Design Flood Control System Plan at the Lewis & Clark Station, Sidney, Montana, meet the requirements of the Coal Combustion Residual Rule 40 CFR 257 Subp. D, § 257.82 Hydrologic and hydraulic capacity requirements for CCR surface impoundments.

Revision	Date	Summary of Revisions
0	October 17, 2016	Initial Plan
1	November 20, 2018	Retrofit Plan

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Paul T. Swenson  
Barr Engineering Co.  
MT Registration Number 12805PE

Dated this 28th day of November, 2018

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## 1.0 Introduction

Montana-Dakota Utilities Co. (MDU) operates the Lewis & Clark Station (Lewis & Clark), a coal-fired steam-electric generating plant, near Sidney, Montana. Operation of the plant results in production of coal combustion residuals (CCR) that must be managed in accordance with the requirements of 40 CFR 257 Subpart D, Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (CCR Rule).

The CCR Rule, § 257.82 Hydrologic and hydraulic capacity requirements for CCR surface impoundments, establishes design criteria for management of surface water inflow into CCR surface impoundments. The Scrubber Ponds that receive flue gas desulfurization solids and other CCR materials at Lewis & Clark Station are defined by the CCR Rule to be existing surface impoundments, and therefore a plan is required for these impoundments to satisfy the rule.

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## 2.0 Description of Lewis & Clark Station CCR Units

CCR from plant operations is slurried to the Scrubber Ponds. Each of the Scrubber Ponds has an area of approximately 2.09 acres. A berm has been constructed within each of the Scrubber Ponds to separate each into a CCR solids settling cell with an area of approximately 1.52 acres, and an effluent polishing cell with an area of approximately 0.57 acres. Water from the effluent polishing cells is returned back to the plant for reuse or discharged through a Montana Pollutant Discharge Elimination System (MPDES) permitted outfall.

See Figures 1 and 2 for the site layout and locations of the Scrubber Ponds.

## 3.0 Inflow Design Flood Control System Plan

This section describes the hydrologic modeling and plan development for the Inflow Design Flood Control System Plan for the Scrubber Ponds.

CCR Rule § 257.82(a) requires that “the owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.” Paragraph (a)(3) defines the storm event that the inflow design flood control system must accommodate. The Scrubber Ponds were previously determined to have a low hazard potential classification (Hazard Potential Classification, Lewis & Clark Station, Barr Engineering Co., August 2016, revised November 2018). Under the rule, surface impoundments with a low hazard potential classification must have an inflow design flood control system that will accommodate a 100-year flood (design flood event). For the Scrubber Ponds, this design requirement was determined to be represented by run-off from the 100-year, 24-hour rainstorm.

The Scrubber Ponds have no tributary area outside of the limits of their containment dikes. Therefore, the only inflow flood flowage that the system must accommodate is direct precipitation.

### 3.1.1 Model Inputs

Hydrologic modeling of the site for the Inflow Design Flood Control System Plan was performed with HydroCAD 10.00 software. The input data and results of the modeling are described in this section. Detailed model inputs and results are provided in Appendix B-1.

Rainfall data for the site was acquired from the National Oceanic and Atmospheric Administration (NOAA), Technical Paper No. 40 (TP-40). The 100-year, 24-hour map from TP-40, showing the depth of rainfall in the vicinity of Lewis & Clark Station is provided in Appendix B-2. The 100-year, 24-hour rainfall depth identified for the Lewis & Clark Station location is shown in Table 1.

**Table 1 Scrubber Ponds Design Storm Event Rainfall Data**

Storm Event	Rainfall
100 year, 24-hour	4.3 inches

The Scrubber Ponds are nearly identical in area and storage capacity, so one hydrologic model was completed, and it is considered representative of conditions in each Scrubber Pond. A weir in the separation berm provides unrestricted conveyance during high flow from the settling cell to the effluent polishing cell. During these conditions, the cells act as a single pond, and so the settling cell and polishing cell areas were evaluated as one subwatershed area (S2), as shown on Figure 3.

The settling cell was assumed to be at maximum CCR solids storage capacity for the model. Since CCR solids are slurried to the Scrubber Ponds, and because the slurry pipe spigot is located on the northeast side of the Scrubber Ponds, the CCR solids form a delta that slopes toward the effluent polishing cell of

the Scrubber Pond. Surface water draining over the weir in the separation berm accumulates in the effluent polishing pond until it is pumped back to the generating plant or to a MPDES permitted outfall. The Scrubber Pond storage capacity was modeled assuming the settling cell was filled with water to the weir elevation.

Since either Scrubber Pond may be in use and nearing capacity at any given time, the model was used to determine what the maximum operating elevation of the water in the effluent polishing cell can be while still providing a freeboard of approximately one foot after the design flood event.

### 3.1.2 Model Results

Modeled run-off for the design storm event is summarized in Table 2.

**Table 2 Modeled Scrubber Ponds Watershed Run-off**

Scrubber Pond Subwatershed	Area	Run-off Volume*
Subwatershed 2S (CCR solids settling cell and effluent polishing cell)	2.09 acres	0.63 acre-feet

\* Run-off volumes rounded to the nearest hundredth acre-foot

The hydrologic modeling results of the Scrubber Pond area are summarized in Table 3.

**Table 3 Scrubber Ponds Hydrologic Modeling Results**

Effluent Polishing Cell Condition	Storage Area Maximum Water Elevation
Maximum operating level	Elevation 1930.50 feet
100-year, 24-hour	Elevation 1931.00 feet
Minimum perimeter dike (spillway)	Elevation 1932.00 feet

The total run-off volume for the design event can be stored in the Scrubber Pond, assuming that the Scrubber Pond is maintained with a maximum operating level no higher than the elevation identified in the Table 3. Storage of the design flood event will result in freeboard of approximately one foot.



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## 4.0 Conclusion

As demonstrated by the topographic map shown on Figure 2, potential run-on around the Scrubber Ponds drains away from the Scrubber Ponds. The hydrologic model and the analysis presented in this document demonstrate that the Scrubber Ponds are adequately designed to properly manage the 100-year, 24-hour inflow flood.