CCR Rule Report:

Initial Inflow Design Flood Control System Plan

GMF Recycle Pond
Coffeen Power Station
Montgomery County, Illinois

Submitted to Illinois Power Generating Company
October 2016

HANSON
Engineering | Planning | Allied Services

1. Introduction

The GMF Recycle Pond at the Coffeen Power Station is located in the NW 1/4 of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian in Montgomery County, Illinois, approximately 1.5 miles south of Coffeen, Illinois.

The GMF Recycle Pond is lined with a 60-mil, high-density polyethylene (HDPE) geomembrane, has a maximum embankment height of 16 feet and has a maximum impounding capacity of 243 acre-feet (measured at the top elevation 629 feet). There is an additional 99 acre-feet of incised storage.

The owner or operator of the CCR surface impoundment must obtain a certification from a qualified professional engineer stating that the inflow design flood control system plan meets the requirements of 40 CFR 257.82.

2. Initial Inflow Design Flood Control System Plan

40 CFR 257.82(a)
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.

40 CFR 257.82(a)(1)
The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.

40 CFR 257.82(a)(2)
The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.

40 CFR 257.82(a)(3)
The inflow design flood is:

i. For a high hazard potential CCR surface impoundment, as determined under 257.73(a)(2) or 257.74(a)(2), the probable maximum flood;
ii. For a significant hazard potential CCR surface impoundment, as determined under 257.73(a)(2) or 257.74(a)(2), the 1,000-year flood;
iii. For a low hazard potential CCR surface impoundment, as determined under 257.73(a)(2) or 257.74(a)(2), the 100-year flood; or
iv. For an incised CCR surface impoundment, the 25-year flood.

40 CFR 257.82(b)
Discharge from the CCR unit must be handled in accordance with the surface water requirements under 257.3-3.

At this time, as determined under 40 CFR 257.73(a)(2) by Stantec in 2016, the GMF Recycle Pond has a significant hazard potential. The inflow design flood for a significant hazard potential is the 1,000-year flood. However, the GMF Recycle Pond was designed to meet state agency criteria above and beyond the 1,000-year flood requirements for a significant hazard potential CCR surface impoundment per 40 CFR 257.73(a)(2)(ii).

2.1 Initial Inflow Design Flood Control Systems

The U.S. Army Corps of Engineers, Hydrologic Engineer Center's Hydrologic Modeling System (HEC-HMS) was used to analyze runoff during various storm events. The runoff rates computed by the model are dependent on the watershed drainage area, precipitation amounts, precipitation distribution, unit hydrograph methodology and rainfall loss rates on the ground. The GMF Recycle Pond has a total watershed drainage area of approximately 57.5 acres, including the GMF Pond, the GMF Recycle Pond and the transfer channel connecting the two. However, it is important to note that the design of the spillway system is based on the capacity required for a possible future expansion of the gypsum management facility (GMF) to include an additional gypsum storage cell. Therefore, a total watershed drainage area of 77.3 acres was used in the design computations and modeling, which is more conservative.

Based on the hazard potential assessment, the required regulatory 1,000-year flood event was estimated to be 9.1 inches in 24 hours, using NOAA Atlas 14. Consequently, the GMF Recycle Pond was designed to accommodate a precipitation event much larger than required. Frequency precipitation values and distributions were obtained from the Illinois State Water Survey (ISWS) Circular 172 "Frequency Distributions of Heavy Rainstorms in Illinois" and Circular 173 "Time Distributions of Heavy Rainstorms in Illinois." The probable maximum precipitation was estimated to be 34 inches, based on NOAA Hydrometeorological Report No. 51. The Soil Conservation Service (SCS) Dimensionless Unit Hydrograph was used to establish the runoff unit hydrograph and the SCS Curve Number Method was used to establish the loss rate. Based on Chapter 7, Hydrologic Soil Groups, of Part 630 of the USDA/NRCS National Engineering Handbook, gypsum was categorized as hydrologic soil group C. In accordance with USDA/NRCS TR-55, Urban Hydrology for Small Watersheds, a curve number of 91 was assigned to the gypsum to define the loss rate, and a lag time of 7 minutes was computed to develop the runoff unit hydrograph.

The HEC-HMS generated rainfall runoff hydrographs for the GMF watershed were routed through the GMF Pond and transfer channel using the unsteady flow module of the U.S. Army Corps of Engineers, Hydrologic Engineer Center's River Analysis System (HEC-RAS). The time-variable pool elevation of the GMF Recycle Pond, as generated by HEC-HMS, was used as the downstream control in the HEC-RAS models. Because the pool elevation of the GMF Recycle Pond is dependent on the inflow from the GMF Pond, the HEC-HMS models must be run both before and after the HEC-RAS models.

The CulvertMaster software package was used to determine the depth of flow and outlet velocity in the outlet conduit from the GMF Recycle Pond emergency spillway. This information was then used in the design of the riprap stilling basin for energy dissipation.

Table 1 identifies the computed water surface elevation results for the GMF Recycle Pond, assuming that the stop logs were installed up to elevation 625.0 feet in the transfer channel and that the starting pool elevation in the GMF Recycle Pond is at elevation 624.0 feet (the spillway control elevation). Note that these are conservative estimates, because the stop log portion of the spillway was never constructed. Consequently, the actual water surface in the GMF Pond is assumed to be no greater than 623.0 feet, and the water surface in the GMF Recycle Pond can be assumed to be no higher than 622.0 feet.

Table 1: Peak Water Surface Elevations and Freeboard

	100-Year Peak Discharge (cfs)	PMF Peak Discharge (cfs)	100-Year Peak WSEL (ft.)	PMF Peak WSEL (ft.)	Top of Embankment (ft.)
GMF Recycle Pond	95.8	586.9	624.6	627.4	629.0

In all cases, maximum wave runup is less than the calculated freeboard; therefore, water will not overtop the GMF Recycle Pond embankment for all storm events up to and including the Probable Maximum Flood. Based on this evaluation, the GMF Recycle Pond meets the requirements in 40 CFR 257.82(a).

2.2 Discharge from the CCR Unit

40 CFR 257.82(b) provides that the discharge from the CCR unit must be handled in accordance with the surface water requirements under 40 CFR 257.3-3, which states the following:

(a) For purposes of section 4004(a) of the Act, a facility shall not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) under section 402 of the Clean Water Act, as amended.

(b) For purposes of section 4004(a) of the Act, a facility shall not cause a discharge of dredged material or fill material to waters of the United States that is in violation of the requirements under section 404 of the Clean Water Act, as amended.

(c) A facility or practice shall not cause non-point source pollution of waters of the United States that violates applicable legal requirements implementing an areawide or Statewide water quality management plan that has been approved by the Administrator under section 208 of the Clean Water Act, as amended.

(d) Definitions of the terms Discharge of dredged material, Point source, Pollutant, Waters of the United States, and Wetlands can be found in the Clean Water Act, as amended, 33 U.S.C. 1251 et seq., and implementing regulations, specifically 33 CFR part 323 (42 FR 37122, July 19, 1977).

The Coffeen GMF is operated as a closed loop, in which the only discharge is water returned to the plant for operational use. The normal pool in the GMF Recycle Pond is normally maintained at a lower water level in order to prevent discharges over the spillway. The pump house decant was designed to allow the operator to control the water level in the GMF Recycle Pond. If the GMF Pond is operated at a normal pool water surface elevation at or below 623.0 feet and the GMF Recycle Pond subsequently operated at a normal pool water surface elevation at or below 616.0 feet, the run-off from a PMF will be absorbed without discharge from the system. Therefore, discharge into waters of the United States is not expected, and the GMF Recycle Pond meets the requirements in 40 CFR 257.82(b).

3. Certification Statement

COFFEEN POWER STATION - GMF RECYCLE POND
ILLINOIS POWER GENERATING COMPANY
INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN CERTIFICATION

As a Qualified Professional Engineer as defined by 40 CFR 257 Subpart D, I certify that I have personally examined and am familiar with the design information referenced below, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete.

The **Coffeen Power Station GMF Recycle Pond** Initial Inflow Design Flood Control System Plan, as supported by the Coffeen Power Station GMF Recycle Pond Documentation Report in the operating record was conducted in accordance with the requirements set forth by 40 CFR 257.82 as published on April 17, 2015.

Steven M. Bishoff, P.E.
Hanson Professional Services Inc.
1525 South Sixth Street
Springfield, IL 62703-2886
(217) 788-2450
Registration No. 062-040449

Seal:

Signature: _____ Date: 10-13-2016