

Initial Hazard Potential Classification Assessment Report Inactive CCR Surface Impoundment



City of Ames Steam Electric Plant

Ames Municipal Electric System
502 Carroll Avenue
Ames, Iowa 50010



April 16, 2018

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April 16, 2018
File No. 27217425.00

Mr. Brian Trower
Assistant Director – Electric Services
Ames Municipal Electric System
502 Carroll Avenue
Ames, Iowa 50010

Subject: Initial Hazard Potential Classification Assessment Report
Inactive Coal Combustion Residuals (CCR) Surface Impoundment

Dear Mr. Trower:

SCS Engineers has prepared the Initial Hazard Potential Classification Assessment Report for the Inactive CCR Surface Impoundment for the City of Ames Steam Electric Plant in accordance with the requirements set forth in §257.73(a)(2) of the CCR Rule (40 CFR 257.50-107). SCS believes the appropriate hazard classification for the City of Ames Steam Electric Plant's CCR Surface Impoundment is LOW.

If you have any questions regarding this document, please contact the undersigned.

Sincerely,



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PE CERTIFICATION

Certification Statement 40 CFR §257.73(a)(2)(ii) – Initial Hazard Potential Classification Assessment

This Initial Hazard Potential Classification Assessment Report for the City of Ames Steam Electric Plant's CCR Inactive Surface Impoundment was prepared by SCS Engineers. The document and Certification are based on and limited to information that SCS has relied on from the City of Ames and others, but not independently verified, by SCS.

	I, Christine L. Collier, hereby certify that this Initial Hazard Potential Classification Assessment meets the requirements of §257.73(a)(2)(i) and that it was prepared by me or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.
	_____ (signature) (date)
	Christine L. Collier (printed or typed name)
	License number <u>17963</u>
	My license renewal date is <u>December 31, 2019</u> .
Pages or sheets covered by this seal: Entire Document	

1 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency issued the final version of the federal Coal Combustion Residuals (CCR) Rule to regulate the disposal of CCR materials generated from the combustion of coal at electric utilities and independent power producers. Inactive power plant ash impoundments containing CCR are regulated under Section 257.100 of the Code of Federal Regulations (CFR) 40 Part 257.

The City of Ames (COA) Steam Electric Plant is subject to the CCR Rule and in accordance with the rule must document the Initial Hazard Potential Classification Assessment as specified in Section §257.73 of the rule. This document provides the Initial Hazard Potential Classification Assessment and documentation for the existing COA CCR Surface Impoundment.

The Initial Hazard Potential Classification Assessment must document the hazard potential classification of the Ash Impoundment as either a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment, or a low hazard potential CCR surface impoundment as required by 40 CFR §257.73(a)(2). The basis for the hazard potential classification must also be documented.

2 BRIEF DESCRIPTION OF IMPOUNDMENT

The City of Ames Steam Electric Plant is located at 200 East 5th Street, in Ames, Iowa. The City of Ames Steam Electric Plant disposed their CCR materials in a single CCR surface impoundment located approximately 3,000 feet northeast of the generating station in Section 1, Township 83 North, Range 24 West. The approximately 9.6 acre CCR impoundment is located adjacent to and to the east of the COA Water Treatment Plant's Lime Pond. The CCR surface impoundment is approximately 900 feet in length in the east-west direction and a maximum of 675 feet in length in the north-south direction. Based on the 2017 aerial image obtained from the COA and the parcel information found on the City of Ames Beacon™ geographic information system (GIS) site, the area to the north and immediate northeast of the impoundment is privately-owned crop land, to the northeast beyond the privately owned crop land is the COA South River Valley Park, to the east (ranging from 450 to 950 feet) is the South Skunk River, to the south is COA property and the railroad embankment for the Union Pacific Railroad, and to the west is the lime pond.

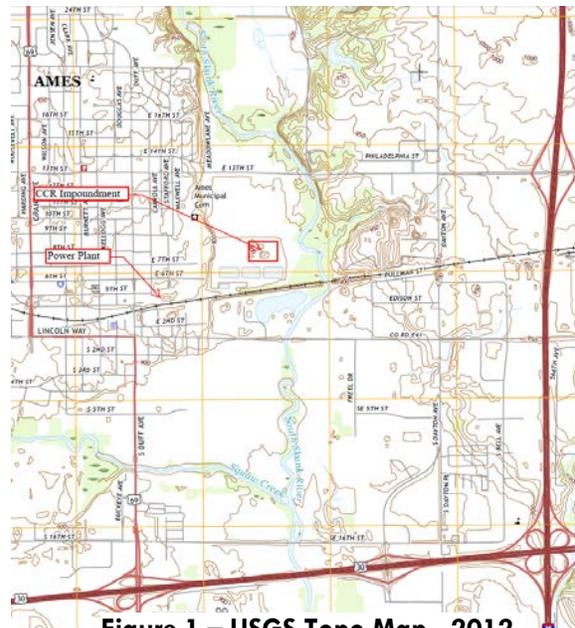


Figure 1 – USGS Topo Map - 2012

The CCR impoundment was designed by Lutz, Daily & Brain Consulting Engineers in 1980 and was used for disposal of CCR until October 19, 2015. The embankments for the impoundment were constructed of clay soils obtained from an adjacent borrow area and from within the impoundment footprint. The bottom and interior side slopes of the impoundment were lined with a 3-foot thick impervious liner with a permeability ranging between 7.3×10^{-9} and 4×10^{-10} centimeters per second (cm/sec). Construction of the CCR surface impoundment was overseen by Lutz, Daily & Brain personnel. Density and permeability testing during construction was performed by Patzig Testing Laboratories Co., Inc.

The design plans indicated the top of the impoundment liner is city datum elevation EL 59 (EL 882.5 MSL)¹, the top of the impoundment embankments is city datum EL 74 (EL 897.5 MSL) and the ground surface elevation around the impoundment ranged from EL 64 to 62 (EL 887.5 to 885.5 MSL). The maximum depth from the crest of the embankment to the base of the impoundment is 15 feet. The maximum height of the embankment (12 feet) occurs in the southeast corner of the impoundment where the ground surface is city datum EL is 62.

The approximately 9.6 acre CCR impoundment is located adjacent to the COA Water Treatment Plant's Lime Pond (~10 acres), that was constructed at the same time as the CCR impoundment. The CCR surface impoundment and lime pond are separated by an engineered embankment that was part of the original construction and the two units are not hydraulically connected. The berm between the two impoundments has a crest width of approximately 15 feet or greater and 3 horizontal to 1 vertical (3:1) side slopes on both sides of the centerline. The interior height of the berm is 15 feet on the CCR side and 19 feet on the lime pond side. Two non-CCR impoundments (clear water basins) are located to the south of the CCR surface impoundment.

2.1 SIZE CLASSIFICATIONS

Based on the United States Army Corps of Engineers (USACOE) Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106, the CCR surface impoundment with an exterior embankment maximum height of 12 feet and storage of approximately 129.9 acre-feet, the size classification of the COA CCR impoundment is "Small." Size classification is determined by either storage or height, whichever is larger. In this case, either one falls within the "Small" classification.

Table 1 - USACOE Size Classification		
Category	Storage (Ac-Ft)	Height (Ft)
Small	<1,000	<40
Intermediate	1,000 to <50,000	40 to <100
Large	>50,000	>100
COA CCR Impoundment	129.9 Maximum	Exterior 12 feet

¹City Datum = 823.55 MSL

2.2 IMPOUNDMENT DIMENSIONS

Based on the available published information, the approximate ash impoundment dimensions are summarized in the following table. SCS Engineers (SCS) reviewed the Dewberry information included in the table at a cursory level and found it to be accurate for this level of review.

Table 2 - Impoundment Size	
Measurement	Quantity/Measurement
Surface Area	9.6 acres
Dam Height	
Inside	15 feet
Outside	12 feet
Size Classification	Small

2.3 IMPOUNDMENT OPERATIONS

Placement of CCR into the impoundment ceased before October 19, 2015. The surface impoundment continues to be operated by the COA to dispose of non-CCR ash from the burning of refuse derived fuel (RDF) in the power plant's boilers. The RDF ash is transported (sluiced) from the power plant and is discharged into the primary ash basin to allow time for the ash to settle out to clarify the water. Water from the impoundment ultimately flows into a structure with stop-logs connecting the impoundment with the first of two clear water ponds. After passing through the two clear water basins, the water enters the pump house at the southwest corner of the second clear water basin where it is pumped back to the power plant for reuse as ash transport (sluice) water. The pump house has two pumps rated at 1,350 gallons per minute (gpm) to pump the water back to the power plant. There are times in order to best manage the water balance of the pond system that it becomes necessary to discharge a portion of the clean return water into the field lying to the south of the pump house and clear water basins.

2.4 PLAN APPROACH

This Hazard Potential Classification Assessment was completed using the April 2004 Federal Emergency Management Agency (FEMA) "Federal Guidelines for Dam Safety: Hazard Potential Classification Systems for Dams". As part of the Hazard Potential Classification Assessment, SCS completed the following tasks.

1. Reviewed available site information and history pertaining to the CCR Surface Impoundment and surrounding facilities and infrastructure.
2. Visited the site to validate information and data gathered during site information review noted above and to potentially identify additional infrastructure or receptors that may be impacted.

3. Completed an assessment of the CCR surface impoundment utilizing guidance from the “Federal Guidelines for Dam Safety: Hazard Potential Classification Systems for Dams – April 2004” published by the Federal Emergency Management Agency (FEMA).

3 ANALYSIS

3.1 RELEASE SCENARIOS

The CCR Impoundment has safely operated for approximately 36 years. The annual inspection in December 2017 indicated the CCR impoundment embankments are performing as designed, with no signs of embankment erosion or embankment or foundation seeps that could lead to a slope failure. The stability assessment determined the embankments to have an adequate factor of safety for both slope stability and liquefaction potential under both static and seismic loadings as documented in the Initial Safety Factor Assessment (SCS Engineers, April 2018).

Overtopping of the impoundment embankment is possible, but unlikely as the impoundment is operated with approximately 3 to 5 feet of freeboard. In the event both water pumps returning water to the plant were to fail during a 1-hour 1-square mile probable maximum precipitation (PMP) event (18 inches of rainfall)², the rainwater could be safely stored in the impoundment without overtopping.

In the unlikely event that an embankment failure were to occur, it would most likely result from erosion of the east or north embankment for the impoundment during an extreme flooding event on the South Skunk River. Such erosion would take significant time, and would not occur without warning, given the operational history of the site and frequent unit inspections; therefore SCS does not consider a catastrophic failure of the impoundment a likely release scenario.

The most likely release scenario is that a portion of the south embankment would be eroded by river flooding, causing a breach failure of the impoundment embankment and release of water and ash across city property to the South Skunk River. The location of the failure would have an effect on the volume of ash and water released before the breach could be repaired.

² “Application of Probable Maximum Precipitation Estimates – United States East of the 105th Meridian”; NOAA Hydrometeorological Report No. 52; Department of Commerce; Washington, DC; August 1982.

In August 2010 flooding of the South Skunk River occurred following a 5 day period when 9.6 inches of rain fell in the Ames area. The flood probability was estimated by the USGS³ to be <0.2 percent event (greater than a 500-year storm event). The peak flood level at the East 13th Street bridge over the South Skunk River was approximately El 895 (NGVD29). The crest of the embankment is El 897.5 MSL. The ground surface on the north and east side of the CCR impoundment is at El 887.5 to 885.5 feet MSL, resulting in water with an approximate depth of 7.5 to 9.5 feet flowing along the north and east sides of the embankment slopes. The inundation map for the 2010 flood is shown to the right. Despite the August 2010 flooding being the largest event recorded by the USGS since 1944⁴, the berms were not damaged.



Figure 2, Inundation Map³

3.2 DOWNSTREAM ENVIRONMENT

The City of Ames Steam Electric Plant’s CCR Surface Impoundment is located along the western portion of the South Skunk River flood plain in the eastern portion of the City of Ames. The downstream environment is located within the alluvial flood plain of the South Skunk River, which is subject to natural flooding on a periodic basis. The downstream environment is summarized in the Table 4 and is shown on the aerial photograph below.

Table 4 – Downstream Environment	
Potential Receptor	Approximate Distance From Impoundment
Distance to Nearest House	3,100 feet (Located ~4 feet above the valley)
Distance to Nearest Road	3,400 feet (E. Lincoln Way)
Distance to Nearest Body of Water	500 feet (South Skunk Creek)
Distance to Nearest Town	0.0 Miles (Ames, IA) 10.2 Miles (Cambridge, IA)

³ “Flood of August 11-16, 2010, in the South Skunk River Basin, Central and Southeast Iowa”; By Kimberlee K. Barnes and David A. Eash; U.S. Geological Survey; Reston, Virginia; 2012.



Figure 3 – Aerial Photograph

3.3 BREACH ANALYSIS

While SCS considers a catastrophic failure unlikely, SCS evaluated the impact of a rapid release at the site. For a failure in the eastern part of the impoundment, where a mixture of ash and water is present, the volume of water available for transport of ash is larger than would likely occur during a failure of other areas. The most likely release scenario from a rapid failure of the embankment would result in the flowing of water and ash into the South Skunk River, most likely over a period of 2 to 6 hours. Assuming one half of the volume of CCR and water in the impoundment (2.8 million cubic feet [cu. ft.])⁴ were to be released over a 6 hour period, the flow rate into the flood waters would average 131 cubic feet per second (cfs), which would be less than 1% (0.9%) of the 2010 flood discharge at Riverside Drive (14,800 cfs)⁵. In this scenario, the release would cause a

⁴ City of Ames calculation provided to Dewberry Consultants, Inc. via email on 9/11/12,

⁵ Flood of August 11–16, 2010, in the South Skunk River Basin, Central and Southeast Iowa"; By Kimberlee K. Barnes and David A. Eash; U.S. Geological Survey; Reston, Virginia; 2012 [Figure 10, Page 23]

momentary rise in the river elevation and the impact to the river would be a layer of inert ash along the bank and an addition of water to the river which would be absorbed quickly by the flood waters. No environmental damage beyond the cleanup of the ash or property damage to third parties should result.

The low flow discharge in the river ranges from 29 to 43 cfs per the USGS report. The estimated embankment failure discharge rate of 131 cfs would likely be contained within the river channel. The discharge would result in a rise in the river during the duration of the release and the impact to the river would be a layer of inert ash along the bank and an addition of water to the river which would be passed downstream with no expected flooding. No environmental damage, beyond the cleanup of the ash, or property damage to third parties should result.

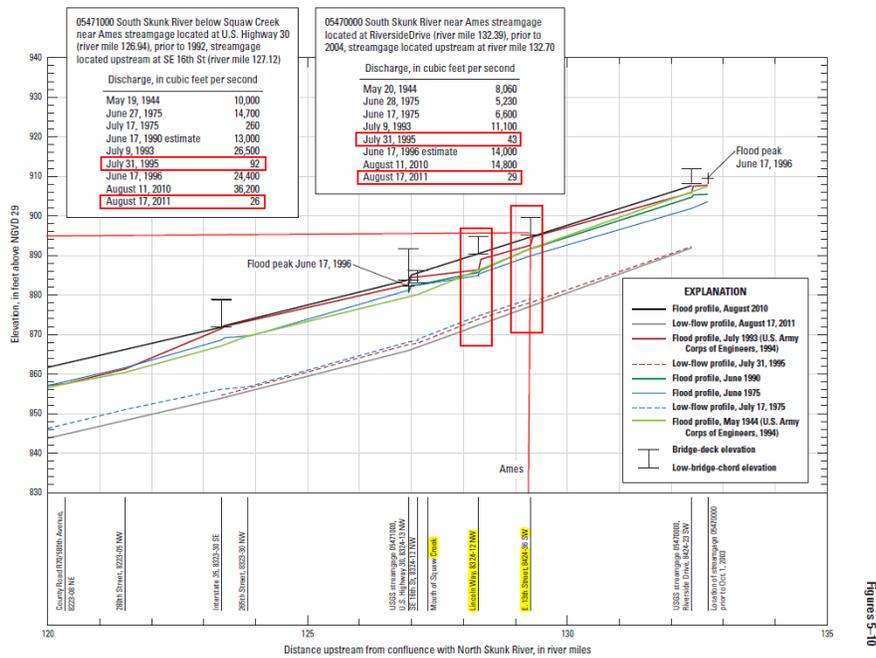


Figure 10. Profile of the August 11-16, 2010, flood for the South Skunk River, river miles 120 to 133.

Figures 5-10
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4 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The 2004 Federal guidelines for dam safety classification system focus on the loss of human life and economic and environmental losses resulting from a dam (ash impoundment) failure. The following table summarizes the Initial Hazard Classification System.

	Loss of Human Life	Economic, Environmental Losses
Low	None	Low and generally limited to the owner
Significant	None	Yes
High	Probable, one or more	Yes

SCS' assessment of the City of Ames Steam Electric Plant's CCR Surface Impoundment is that a catastrophic failure of the impoundment dikes is unlikely. In the event of a catastrophic failure, the loss of human life is highly unlikely and the economic and environmental impact of a failure is generally limited to COA property. Based on this assessment, SCS believes the appropriate hazard classification for the City of Ames Steam Electric Plant's CCR Surface Impoundment is LOW. The table below summarizes the hazard assessment of the City of Ames Steam Electric Plant's CCR Surface Impoundment.

Table 6 – COA CCR Impoundment Dam Safety Hazard Classification		
	Loss of Human Life	Economic, Environmental Losses
Low	X	X
Significant		
High		

5 REVISIONS, RECORDKEEPING, AND REPORTING

The Hazard Assessment Report is required to be updated every five years, from the date of placement of the previous assessment into the operating record as required by §257.105(f)(10). The initial and subsequent reports must be certified by a qualified professional engineer stating that the Hazard Assessment meets the requirements of §257.73(a)(2).

The COA will place this initial Hazard Assessment Report in the CCR Operating Record and on the COA's CCR Rule Compliance Data and Information website by April 17, 2018. The COA will notify the Iowa Department of Natural Resources (IDNR) that this report has been completed and placed in the facility's operating record and on the COA CCR Rule Compliance Data and Information website. Further, the COA will notify the IDNR of subsequent updates to the Hazard Assessment Report.