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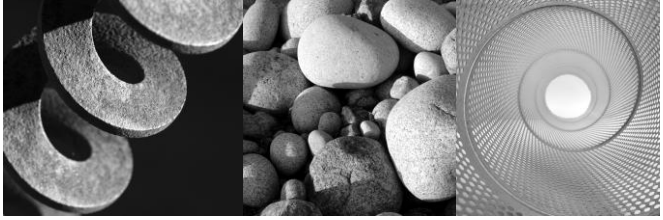

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Specific Site Assessment for Coal Combustion Waste Impoundments at Minnkota Power Cooperative Milton R. Young Station

Center, North Dakota

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
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Washington, DC 20460

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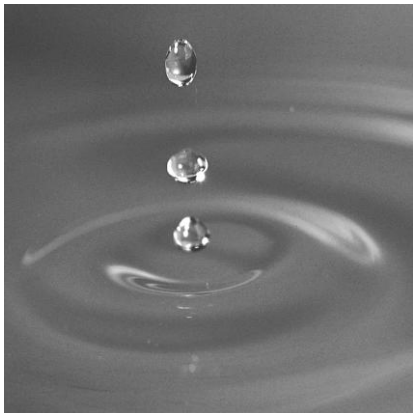

Ken Hardesty, P.E.
Senior Project Engineer

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List of Acronyms

CCW	coal combustion waste
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Committee
FGD	flue gas desulfurization
GEI	GEI Consultants, Inc.
HDPE	high density polyethylene
IDF	inflow design flood
MW	megawatts
NDDH	North Dakota Department of Health
PMF	probable maximum flood
PMP	probable maximum precipitation
RCP	reinforced concrete pipe
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey

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1.0 Introduction

1.1 Purpose

This report presents the results of a specific site assessment of the dam safety of coal combustion waste (CCW) impoundments at the Milton R. Young Station located southeast of Center, North Dakota. The Milton R. Young Station is operated by Minnkota Power Cooperative (Minnkota). Unit 1 is owned by Minnkota, and Unit 2 is owned by Square Butte Electric Cooperative. The specific site assessment was performed on October 20, 2010.

Minnkota's CERCLA 104e response dated March 17, 2009 (Appendix C) listed the CCW impoundments at the Milton R. Young Power Station as the Alternate Bottom Ash Pond, 30-Year Pond Cell 2, and the Horseshoe Pit Evaporation Pond. During our site visit in October 2010, we inspected the Alternate Bottom Ash Pond, 30-year Pond Cell 1 (Cell 1), 30-Year Pond Cell 2 (Cell 2), and the Horseshoe Pit Evaporation Pond. Additionally, we briefly walked around the Butterfly Pond.

We determined that in accordance with our understanding of the EPA directive, the Horseshoe Pit Evaporation Pond was not included in the scope of the site assessment because the Horseshoe Pit Evaporation Pond does not receive sluiced ash. The Horseshoe Pit Evaporation Pond receives leachate from the nearby CCW landfill. We discuss our reasoning for not including the Horseshoe Evaporation Pond as a CCW impoundment in Section 2.3 of this report.

We determined that Cell 1 does meet the requirements for a CCW impoundment because at the time of the site assessment the impoundment was not completely dewatered, capped or officially closed. At the time of the site assessment, Cell 1 was still open to precipitation events and other potential failure modes. We discuss Cell 1 in Section 2.2 and in other pertinent sections of the final report.

The CCW impoundments assessed in this report are Cell 1, Cell 2, and the Alternate Bottom Ash Pond. The CCW produced at the Milton R. Young Station is primarily fly ash and flue gas desulfurization (FGD) sludge.

The specific site assessment was performed with reference to Federal Emergency Management Agency (FEMA) guidelines for dam safety, which includes other federal agency guidelines and regulations (such as U.S. Army Corps of Engineers [USACE] and U.S. Bureau of Reclamation [USBR]) for specific issues, and defaults to state requirements were not specifically addressed by federal guidance or if the state requirements were more stringent.

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1.2 Scope of Work

The scope of work between GEI Consultants, Inc. (GEI) and the U.S. Environmental Protection Agency (EPA) for the specific site assessment is summarized in the following tasks:

1. Acquire and review existing reports and drawings relating to the safety of the project provided by the EPA and Owners.
2. Conduct detailed physical inspections of the project facilities. Document observed conditions on Field Assessment Check Lists provided by EPA for each management unit being assessed.
3. Review and evaluate stability analyses of the project's coal combustion waste impoundment structures.
4. Review the appropriateness of the inflow design flood (IDF), and adequacy of ability to store or safely pass the inflow design flood, provision for any spillways, including considering the hazard potential in light of conditions observed during the inspections or to the downstream channel.
5. Review existing dam safety performance monitoring programs and recommend additional monitoring, if required.
6. Review existing geologic assessments for the projects.
7. Submit draft and final reports.

1.3 Authorization

GEI performed the coal combustion waste impoundment assessment as a contractor to the EPA. This work was authorized by EPA under Contract No. EP09W001698, Order No. EP-B10S-00018 between EPA and GEI, dated September 23, 2010.

1.4 Project Personnel

The scope of work for this task order was completed by the following personnel from GEI:

Ken Hardesty, P.E.	Senior Project Engineer/Task Leader
Gillian M. Hinchliff	Project Engineer
Nick Miller, P.E.	Project Water Resources Engineer
Stephen G. Brown, P.E.	Project Manager

The Program Manager for the EPA was Stephen Hoffman.

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1.5 Limitation of Liability

This report summarizes the assessment of dam safety of Cell 1, Cell 2, and the Alternate Bottom Ash Pond coal combustion waste impoundments at Milton R. Young Station, Center, North Dakota. The purpose of each assessment is to evaluate the structural integrity of the impoundments and provide summaries and recommendations based on the available information and on engineering judgment. GEI used a professional standard of practice to review, analyze, and apply pertinent data. No warrantees, express or implied, are provided by GEI. Reuse of this report for any other purpose, in part or in whole, is at the sole risk of the user.

1.6 Project Datum

Horizontal datum on the drawings is based on survey control provided by KBM, Inc. Topography is based on photogrammetric methods from aerial photographs taken on September 27, 1983, July 29, 1991, and September 24, 2004. The project vertical datum is unknown.

1.7 Prior Inspections

Cell 1 and Cell 2 are permitted by the North Dakota Department of Health (NDDH) – Division of Waste Management, and are typically inspected by the Division of Waste Management at least once per year. Inspection reports from 2004 through 2007 were provided to us for our review. The inspection reports are mostly for environmental purposes and do not appear to address dam safety concerns. The Alternate Bottom Ash Pond is permitted by the NDDH – Division of Water Quality, and is typically inspected by the Division of Water Quality at least once per year. Inspection reports from 2007 through 2010 were provided to us for our review.

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2.0 Description of Project Facilities

2.1 General

Milton R. Young Station is a coal-fired power plant consisting of two units that generate about 700 megawatts (MW) combined. Unit 1 is owned and operated by Minnkota and went online in 1970. Unit 2 is owned by Square Butte Electric Cooperative and operated by Minnkota. Unit 2 went online in 1977. The power plant is located approximately 5 miles southeast of Center in Oliver County, North Dakota (see Figure 1). The Cell 1 and Cell 2 impoundments are located adjacent to and south of the plant, and the Alternate Bottom Ash Pond impoundment is located adjacent to and west of the plant. The CCW impoundments assessed in this report include Cell 1, Cell 2, and the Alternate Bottom Ash Pond (see Figure 2).

2.2 Impoundment Dams and Reservoirs

The embankment dams of the three CCW impoundments have not been previously assigned a hazard potential by a state or federal agency. Based on the geometry of the impoundments and the facilities downstream, recommended hazard potential classifications for the impoundments have been developed in Section 4.0 of this report. The basic dimensions and geometry of the CCW impoundments are summarized in Table 2-1.

The Alternate Bottom Ash Pond was commissioned in 1986 and covers approximately 2.4 acres with a storage capacity of 87 acre-feet. The Alternate Bottom Ash Pond temporarily holds sluiced bottom ash when Unit 2 is in a scheduled major outage or in the event of a disruption in the normal bottom ash dewatering system. The Alternate Bottom Ash Pond is used for approximately 2 to 3 months every 3 years during a scheduled major outage for Unit 2. During our site visit on October 20, 2010, Unit 2 was in outage and the Alternate Bottom Ash Pond was being used.

Cell 1, Cell 2 and the future Cell 3 (currently under construction) are permitted under the same NDDH permit. The design and construction for Cells 1, 2 and 3 are similar and combine a deep excavated pit with a perimeter embankment dike. The ponds are excavated to a depth of about 50 feet to expose the Hagel coal formation. The coal formation is approximately 8 to 10 feet thick. When the formation is exposed, the coal is mined, and the pond construction continues. Each pond is designed for a 10-year life span at the end of which the pond is full of CCW. The full pond is dewatered and capped as a dry landfill. Water is returned to the plant for reuse in the scrubber system.

Cell 1 was commissioned in 1997, and Cell 2 was commissioned in 2005 and expanded in accordance with design plans in 2007 and 2008. Cell 1 is currently being dewatered into Cell 2, and interior grades are being raised to final design grades for capping.

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Cell 1 and Cell 2 store fly ash, boiler slag, and flue gas emission control residuals. The Alternate Bottom Ash Pond temporarily stores bottom ash, which is then dewatered and hauled to a landfill.

The embankments of the ponds were constructed from on-site, native soils consisting of sands, silts and clays. The liner design for Cells 1 and 2 includes a minimum 10-foot thick clay liner from the base of the ponds to an elevation just above the Hagel Coal Bed. Above the Hagel Coal Bed, the interior slopes of Cell 1 and Cell 2 have a 4-foot thick clay liner covered with a 5-foot thick random clay layer, geotextile for erosion control and a layer of bottom ash. The Alternate Bottom Ash Pond has a minimum 15-foot thick clay liner covered with a bottom ash/concrete mix liner for erosion control. The dam embankments have crests varying from 15 to 75 feet wide and side slopes varying from 2H:1V to 4.5H:1V.

Table 2-1: Summary Information for Impoundment Dam Parameters

Parameter	Value		
Dam	Alternate Bottom Ash Pond	Cell 1	Cell 2
Estimated Maximum Height (ft)	31[1]	~100[3]	~90[3]
Estimated Perimeter Length (ft)	1,600	4,830[5]	4,760
Crest Width (ft)	~15	40-75	17.25-75
Lowest Crest Elevation (ft)	1960	2100	2086
Design Side Slopes Upstream/Downstream (H:V)	2:1/2:1	2.5:1/4.5:1	2.5:1/2.5-4.5:1[6]
Estimated Freeboard (ft) at time of site visit	9.5[2]	0[4]	14.5
Storage Capacity (ac-ft)	87	1,178[3]	1,252
Surface Area (acres)	2.4	30[5]	27

1. Maximum Height of the Alternate Bottom Ash Pond was estimated from the approximate bottom elevation of the Cooling Water Canal. The Cooling Water Canal water level elevation is approximately El. 1934.9, and plant personnel indicated the canal is approximately 6 feet deep.
2. Pond water level elevation and freeboard estimated based on observed conditions and design drawings.
3. Maximum heights of Cell 1 and Cell 2 and storage capacity of Cell 1 were estimated from a maximum crest El. 2100 and the profiles of existing ground shown on design drawing G5 and G6 prepared by Barr Engineering Co., dated February 1994.
4. Cell 1 is currently being filled with dry ash hauled to the pond to raise grades for final cover. A capping plan has been approved for Cell 1. Any water in the pond is maintained with two feet of freeboard.
5. Surface area and perimeter length are estimated from aerial photographs.
6. Downstream slopes are 4.5:1 except for the south side where Cell 3 is currently being constructed. On the south embankment, downstream slopes are approximately 2.5:1.

2.3 Other Impoundment Facilities

The Butterfly Pond and the Horseshoe Pit Evaporation Pond are impoundments located on the Milton R. Young Station Property but do not currently receive CCW or sluiced ash or contain CCW. The Butterfly Pond and the Horseshoe Pit Evaporation Pond were not included in our Field Assessment or document review but are discussed briefly below.

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In approximately 1979 to 1980, the Butterfly Pond was commissioned to hold FGD sludge and fly ash from the plant. The Butterfly Pond is located directly north of Cell 1 and consists of two 4-acre sections, the west section and east section, separated by a divider dike. The Butterfly Pond was last used as a pond in 1997, when Cell 1 was commissioned. The Butterfly Pond is currently certified to hold solid waste, but is not certified as a pond. Precipitation from the Butterfly Pond is pumped to Cell 2. The Butterfly Pond is not assessed in this report because it has not received sluiced ash since 1997 and is not certified to function as a pond.

The Horseshoe Pit Evaporation Pond was commissioned in 1990 and is located approximately 3 miles northwest of the plant. The Horseshoe Pit Evaporation Pond receives leachate from the adjacent Horseshoe Landfill, which is a capped and closed landfill containing CCW. The Horseshoe Pit Evaporation Pond and adjacent landfill are permitted by the NDDH – Division of Waste Management. The Horseshoe Pit Evaporation Pond was inspected during the October 20 site visit and was included in the Response to Request for Information under Section 104(e) as a management unit. Because the Horseshoe Pit Evaporation Pond receives only a minimal amount of leachate runoff and does not receive any CCW or other sluiced ash, the Horseshoe Pit Evaporation Pond was not assessed in this specific site assessment.

2.4 Spillways

The three CCW impoundments (the Alternate Bottom Ash Pond, Cell 1 and Cell 2) do not have uncontrolled emergency spillways.

2.5 Intakes and Outlet Works

The Alternate Bottom Ash Pond has two permanent inlet pipes and two temporary inlet pipes, which do not penetrate the dike. The permanent inlet pipes are above-ground pipes supported on concrete piers. The temporary inlet pipes are laid directly on the ground surface over the dike crest. The outlet consists of a square concrete drop-inlet structure with stop logs that discharges through an 18-inch-diameter reinforced concrete pipe (RCP) to the Cooling Water Canal located at the toe of the north dike. The Cooling Water Canal discharges into Nelson Lake.

Leachate is removed from the bottom of Cell 1 through the leachate collection system (at approximate El. 2005) by means of a pump and discharge pipe, which are installed within one of the two 18-inch-diameter pipes. The pipes are encased in concrete along the upstream slope of the south embankment and do not penetrate the dike. Precipitation that accumulates in Cell 1 is pumped to Cell 2 through temporary pipes that are placed over the dike crest.

Two inlet pipes from Unit 1 to Cell 2 are routed across Cell 1 and over Cell 2's north embankment, and two pipes from Unit 2 are routed across Cell 1, along the crest of Cell 2's

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west embankment and into the pond. The inlet pipes do not penetrate the embankments. Water from Cell 2 is decanted through four 14-inch-diameter high density polyethylene (HDPE) siphon pipes and flows by gravity back to the plant for reuse in the scrubber system. Two pipes go to Unit 1 and two pipes go to Unit 2. The floating intake invert of the siphon pipes is set at five feet below the impoundment's water elevation. At the time of the inspection, the water elevation within Cell 2 was El. 2071.5 and the siphon pipe invert was El. 2066.5. The siphon outlet pipes are placed above the 4-foot thick clay liner and beneath the 5-foot thick random clay fill on the dike crest. Currently, the pipes penetrate the dike at about El. 2081, and the water level is maintained by Minnkota below El. 2079. By design, there is an additional 5-feet of clay liner for frost protection above the top of the pipes, so the actual dike crest elevation is at about El. 2086. The siphons can lift up to about 15 feet of head, and as water levels in Cell 2 rise, the elevation of the pipes are raised and the clay liners are rebuilt. Cell 2 also has two 18-inch-diameter PVC pipes at about invert El. 2008 that are encased in concrete along the upstream slope of the south embankment and will be used to dewater leachate from Cell 2 after Cell 2 is filled and capped.

2.6 Vicinity Map

Milton R. Young Station is located approximately 5 miles southeast of Center in Oliver County, North Dakota, as shown on Figure 1. The Cell 1 and Cell 2 impoundments are located adjacent to and south of the plant, and the Alternate Bottom Ash Pond impoundment is located adjacent to and west of the plant.

2.7 Plan and Sectional Drawings

Engineering design drawings for the Alternate Bottom Ash Pond were prepared by Ebasco Services Inc. Design and Construction drawings for Cell 1 and Cell 2 were prepared by Barr Engineering Co.

2.8 Standard Operational Procedures

Milton R. Young Station is a coal-fired power plant composed of two units. Unit 1 produces about 250 MW and Unit 2 produces about 450 MW for a total combined capacity of about 700 MW. Coal is mined and transported from the nearby BNI Coal mine, where it is then combusted to power the steam turbines. In Units 1 and 2, flue gases and fly ash are conducted through the boiler, through an electrostatic precipitator where the fly ash is collected. Bottom ash is produced as molten slag, then is crushed and sluiced from the bottom of the boiler. Coal combustion waste from Units 1 and 2 are wet sluiced into Cell 2. When Unit 2 is in a scheduled major outage or in the event of a disruption in the normal bottom ash dewatering system, bottom ash is wet sluiced into the Alternate Bottom Ash Pond.

Cell 2 is currently used for primary settling and permanent storage of CCW. Cell 1 was formerly used for settling and storage. Wet ash is no longer sluiced to Cell 1, and Cell 1 is

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being prepared for capping. Stormwater and leachate from Cell 1 are discharged into Cell 2. Water from Cell 2 is discharged back to the power plant for reuse in the scrubber facility.

The Alternate Bottom Ash Pond is used for primary settling on a temporary basis. The bottom ash settles out and the water is discharged to the Cooling Water Canal which discharges to Nelson Lake. The Alternate Bottom Ash Pond is only used during Unit 2 outages for approximately 2 to 3 months every 3 years. After the water is discharged to the Cooling Water Canal, the dry bottom ash in the pond is hauled to a landfill.

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3.0 Summary of Construction History and Operation

The first unit at Milton R. Young Station went online in 1970. The second unit went online in 1977. The Butterfly Pond was commissioned sometime in 1979 or 1980, and stopped receiving sluiced ash in 1997 when Cell 1 was commissioned.

The Alternate Bottom Ash Pond was commissioned in 1986. The dikes of the Alternate Bottom Ash Pond were constructed of on-site soils. On-site soils consist of sands, silts and clays. The pond has an approximate 15-foot thick clay liner covered with a bottom ash/concrete mix liner for erosion control.

Cell 1 was commissioned in 1997, and Cell 2 was commissioned in 2005. Cells 1 and 2 were excavated to a depth of about 50 feet to mine coal from the Hagel formation. Embankments were constructed of excavated on-site soils reused as fill. Cells 1 and 2 have a 10-foot thick clay liner from the base of the pond to just above the Hagel Bed, above which they have a 4-foot thick clay liner covered with 5 feet of random clay fill, a geotextile for erosion control and a layer of bottom ash. Typical geometries of the dikes are presented in Table 2-1 and Figure 3.

An original design drawing for the Alternate Bottom Ash Pond was available along with operating procedures for the pond. Design reports and construction records were not available for the Alternate Bottom Ash Pond. Design and construction drawings and records were available for Cells 1 and 2. Records indicate CCW was not present in the foundation materials for any of the ponds. Construction documentation for Cells 1 and 2 reports topsoil and subsoil were stripped within the dike footprints, and fill material was placed in lifts and compacted. Compaction records were available for our review. When embankments for Cells 1 and 2 were raised, the embankments were raised on the downstream slope and were not founded on CCW. The clay liner was removed from the top of the embankment during the dam raise and reconstructed on the upstream slope to provide a continuous 4-foot thick clay liner as the dam was raised.

No evidence of prior releases, failures or patchwork construction was observed during the site visit or disclosed by plant personnel. The ponds were constructed on natural soils.

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4.0 Hazard Potential Classification

4.1 Overview

According to the Federal Guidelines for Dam Safety the hazard potential classification for the CCW impoundments is based on the possible adverse incremental consequences that result from release of stored contents due to failure of the dam or misoperation of the dam or appurtenances. Impoundments are classified as Low, Significant, or High hazard, depending on the potential for loss of human life and/or economic and environmental damages.

4.2 Alternate Bottom Ash Pond

The Alternate Bottom Ash Pond dikes with a surface area of about 2.4 acres and a height of about 31 feet would be considered a "small" sized dam in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

A hydraulics and hydrology study and dam break analysis has not been performed for the Alternate Bottom Ash Pond. However, based on inspection a failure of the north or west dike of the Alternate Bottom Ash Pond would result in CCW being released in the Cooling Water Canal and Nelson Lake. Minnkota constructed Nelson Lake in the 1960's to provide water for the plant, and Minnkota owns the lake and surrounding land. Minnkota Power allows Nelson Lake to be used by the general public for recreational purposes. The Alternate Bottom Ash Pond volume is small relative to Nelson Lake, and therefore, impacts of an accidental release of CCW into Nelson Lake would be limited to environmental impacts. A release into Nelson Lake is not anticipated to cause loss of life, and environmental losses are expected to be limited to Minnkota property. A failure of the south dike would release CCW onto Minnkota plant roads and surrounding property, and is not expected to cause loss of life. A failure of the east embankment would release CCW into the North Retaining Basin. The North Retaining Basin receives rainfall runoff and low volume sump water from coal handling facilities. During the site visit, very little water was observed in the North Retaining Basin, and the basin is expected to be able to hold the inflow from the Alternate Bottom Ash Pond in the event of a failure of the east dike.

Consistent with the Federal Guidelines for Dam Safety and the North Dakota State Water Commission, Department of Dam Safety, North Dakota Dam Design Handbook, we recommend the Alternate Bottom Ash Pond be classified as a "Low" hazard structure.

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4.3 Cell 1 and Cell 2

The pond size and capacity of each unit provided by Minnkota is summarized in Table 4-1. The dam height is estimated based on available design drawings and topographic information.

Table 4-1: Milton R. Young Station – Summary of Impoundment Parameters

Pond Name	Height (ft)	Storage (Ac-ft)	Surface Area (acres)
Cell 1	~100	1,178	30
Cell 2	~90	1,252	27

Note: Cell 1 no longer receives CCW and is being dewatered into Cell 2 in preparation for capping and closure.

Based on current pond heights and storage capacity shown in Table 4-1 the size classification for Cell 1 and Cell 2 is "Intermediate" in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

A hydraulics and hydrology study and dam break analysis has not been performed for Cell 1 or Cell 2. Cell 1 and Cell 2 do not receive any surface run-off and only receive precipitation falling within the cell. However, based on inspection a failure of the north or east dikes of Cell 1 or Cell 2 would result in CCW being released towards the plant and Nelson Lake Dam. The diversion ditch on the east side of the impoundments is expected to be overwhelmed and it is possible CCW could flow along natural drainage paths to the downstream slope of Nelson Lake Dam and enter Square Butte Creek. The closest structure downstream of Nelson Lake Dam is approximately 6 miles. Erosion of the downstream slope of Nelson Lake Dam could potentially occur. Loss of life is not anticipated, but environmental losses from CCW material entering Square Butte Creek could occur. A failure of the west dike of Cells 1 or 2 would release CCW to reclaimed agricultural fields owned by Minnkota located west of the ponds. Due to current construction of Cell 3, a release of the south dike of Cell 2 would result in CCW floodwaters flowing to the south and then east and/or west. A breach of the south dike is expected to be relatively slow, and it is anticipated that construction personnel would have time to vacate the area in the event of a breach. Loss of life is not anticipated.

Based on potential environmental impacts to Square Butte Creek and associated economic impacts, and consistent with the Federal Guidelines for Dam Safety and the North Dakota State Water Commission, Department of Dam Safety, North Dakota Dam Design Handbook, we recommend Cell 1 and Cell 2 be classified as "Significant" or "Medium" hazard structures.

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5.0 Hydrology and Hydraulics

5.1 Floods of Record

Floods of record have not been evaluated and documented for the CCW impoundments at the Milton R. Young Station.

5.2 Inflow Design Floods

Currently there is no hazard classification for the three CCW impoundments at the Milton R. Young Station. We recommend the Alternate Bottom Ash Pond be rated "Low" hazard (Section 4.0). Based on the recommended "Low" hazard classification, the North Dakota Dam Design Handbook specifies "Low" hazard dams between 25 to 39 feet high be capable of passing the 30 percent probable maximum precipitation (PMP) without overtopping the dam. The USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 recommends a small "Low" hazard dam be capable of passing the 50- to 100-year storm event without overtopping the dam. Considering the relatively low economic and environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, it is reasonable to select the 6-hour 30 percent PMP storm event as the inflow design storm. The 6-hour 30 percent PMP precipitation event at the Milton R. Young Station is about 6.5 inches based on Hydrometeorological Report Number 51 6-hour PMP data.

Based on observations during the field inspection, we recommend Cell 1 and Cell 2 be rated a "Significant" hazard dam (see Section 4.0). Based on the recommended "Significant" hazard classification, the North Dakota Dam Design Handbook specifies "Significant" or "Medium" hazard dams over 55 feet high be capable of passing the 50 percent probable maximum precipitation (PMP) without overtopping the dam. The USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 recommends an intermediate "Significant" hazard dam be capable of passing 50 to 100 percent of the probable maximum flood (PMF) without overtopping the dam. Considering the "Significant" hazard rating, the scale of the economic and environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, it is reasonable to select 50 percent of the PMP as the inflow design storm for Cell 1 and Cell 2. The 6-hour 50 percent PMP precipitation at the Milton R. Young Station is about 10.8 inches based on Hydrometeorological Report Number 51 6-hour PMP data.

5.2.1 Alternate Bottom Ash Pond

The Alternate Bottom Ash Pond is a diked pond that has contributing drainage area limited to the impoundment. Therefore, the inflow design flood is limited to the precipitation within

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the impoundment dikes. The Alternate Bottom Ash Pond is normally empty except for approximately 3 months every 3 years when Unit 2 is in outage. When the Alternate Bottom Ash Pond is in use, the maximum operating water level is approximately El. 1957.3, which provides about 2.7 feet of freeboard. Normal operations require the use of stop logs in the outlet works facility, which controls the flow exiting the pond. The stop logs limit the water surface elevation to El. 1953.0, providing about 7.0 feet of freeboard. Based on the 6-hour 30 percent PMP, the Alternate Bottom Ash Pond would have a water surface elevation of about El. 1957.8, providing 2.2 feet of freeboard. Based on these results, the Alternate Bottom Ash Pond meets the regulatory requirements for storage of the 6-hour 30 percent PMP inflow design flood without overtopping the dam.

5.2.2 Cell 1 and Cell 2

The contributing drainage areas for Cell 1 and Cell 2 are limited to the impoundments because of their perimeter dikes. Therefore, the inflow design flood is limited to the precipitation within the impoundment dikes. Cell 1 is not currently receiving sluiced ash and grades are being raised to design cover grades with dry, hauled ash. At the time of the site visit, there was a limited amount of water observed in Cell 1. Any water in Cell 1 was maintained with a minimum of 7 feet of freeboard during operations when ash was sluiced to the pond. It appears from topographic drawings dated June 2, 2010, that on average there is greater than one foot of freeboard available for Cell 1, which is greater than the 10.8 inches that needs to be stored. Therefore, in the event of the 50 percent PMP, Cell 1 would be able to store the design flood without overtopping the dam.

Cell 2 had a water level elevation of about El. 2071.5 at the time of the site inspection, which provides about 14.5 feet of freeboard from the lowest dike elevation. Minnkota personnel indicated to GEI at the site visit, that at least 7 feet of freeboard is maintained in the pond at all time. In the event of the 50 percent PMP, Cell 2 would be able to store the design flood without overtopping the dam.

5.2.3 Determination of the PMF

Not applicable.

5.2.4 Freeboard Adequacy

Based on a simplified evaluation, the freeboard appears to be adequate to store the inflow design flood at the three CCW impoundments.

5.2.5 Dam Break Analysis

Dam break analyses have not been performed for the three CCW impoundments at the Milton R. Young Station.

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5.3 Spillway Rating Curves

The three CCW impoundments do not have emergency spillways.

5.4 Evaluation

Based on the current facility operations and inflow design floods documents, the Alternate Bottom Ash Pond, Cell 1 and Cell 2 at the Milton R. Young Station appear to have adequate capacity to store the regulatory design floods without overtopping the dams. A dam break analysis has not been performed for Cell 1 and Cell 2 to determine if a dam break flood would cause significant erosion damage to Nelson Lake Dam.

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6.0 Geologic and Seismic Considerations

Boring logs and construction laboratory test results indicate the overburden soil consists of brown to gray clay, silt, and silty to clayey sands. The Hagel lignite coal formation is located approximately 50 feet below ground surface in the area of Cell 1 and Cell 2. Bedrock in the area consists of layered claystone, siltstone and sandstone.

We are not aware of any seismic analyses that have been performed on the dams at Milton R. Young Station. According to the 2008 U.S. Geological Survey (USGS) Seismic Hazard Map of North Dakota, the site has a regional probabilistic peak ground acceleration of approximately 0.03g with a 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2,500 years). This level of seismic acceleration is considered very low.

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7.0 Instrumentation

7.1 Location and Type

According to the project drawings, there are monitoring wells along the Cell 1 east embankment and the divider dike between Cell 1 and Cell 2. The monitoring wells are for environmental purposes; however, Minnkota personnel indicate the wells are also used to monitor the water surface in the embankment.

There are surveyed markings on the concrete dewatering structure in Cell 2. Minnkota personnel estimate water levels in Cell 2 using the surveyed markings.

There are no instruments installed at the Alternate Bottom Ash Pond.

7.2 Readings

7.2.1 Flow Rates

Water discharges into Cell 2 are known since all discharges are from pumps at the plant site. The return water from Cell 2 is controlled by the scrubber room operators, and all return water flow rates are captured real time by flow transmitters.

Flows to the Alternate Bottom Ash Pond are also pumped flows that are known. Discharges from the Alternate Bottom Ash Pond are monitored daily by operators, who estimate flow by measuring depth of flow in the discharge pipe. These outflow estimates are used by Minnkota to complete the monthly discharge monitoring reports required by the Station NDPDES permit.

7.2.2 Staff Gauges

There are no staff gauges at the CCW impoundment. There are surveyed markings on the concrete dewatering structure in Cell 2. Minnkota personnel estimate water levels in Cell 2 using the surveyed markings.

7.3 Evaluation

Consideration should be given to installing surveyed benchmarks and embankment settlement monuments to measure and record movement of the dikes and to tie measurements to a known vertical datum. Monitoring well readings should be recorded and analyzed with respect to dam safety.

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8.0 Field Assessment

8.1 General

A site visit to assess the condition of the CCW impoundments at the Milton R. Young Station was performed on October 20, 2010, by Ken Hardesty, P.E., and Gillian M. Hinchliff of GEI. Craig Bleth and Scott Hopfauf from Minnkota, Diana Trussell and Ted Poppke from the North Dakota Department of Health – Division of Waste Management, and Karen Goff and Jeff Berger from the North Dakota State Water Commission assisted in the assessment.

The weather during the site visit (October 20, 2010) was generally sunny, with temperatures around 60 degrees Fahrenheit. The ground was dry at the time of the site visit.

At the time of inspection, GEI completed an EPA inspection checklist, which is provided in Appendix A, and photographs, which are provided in Appendix B. Field assessment of the three CCW impoundments included a site walk to observe the dam crest, upstream slope, downstream slope, and intake structures.

8.2 Embankment Dam

8.2.1 Dam Crest

The dam crests of the three CCW impoundments appeared to be in good condition. No signs of cracking, settlement, movement, erosion or deterioration were observed during the assessment. The dam crest surface is generally composed of road base material that traverses the length of the dam for vehicle access.

8.2.2 Upstream Slope

The upstream slopes of the three CCW impoundments are protected by clay liners and erosion control measures such as a geotextile and bottom ash layer for Cells 1 and 2 and a bottom ash/concrete mix for the Alternate Bottom Ash Pond. The upstream slope protection for the three CCW impoundments showed signs of minor erosion, generally in the layer of bottom ash or bottom ash/concrete mix. The slope protection otherwise appeared to be in satisfactory condition. No scarps, sloughs, depressions or other indications of slope instability were observed during the inspection of the three CCW impoundments.

8.2.3 Downstream Slope

The downstream slopes of the three CCW impoundments have well-established stands of grass, which provides some erosion protection. No scarps, sloughs, depressions or other indications of slope instability were observed during the inspection of the ponds. An erosion

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channel was observed near the west embankment downstream toe of Cell 1. The channel appears to have eroded due to surface runoff (see Photo 30) and is not significant enough at this time to impact Cell 1.

8.3 Seepage and Stability

No evidence of seepage was observed at the three CCW impoundments. No evidence of slumps, sloughs, or settlement associated with slope instability was observed.

8.4 Appurtenant Structures

8.4.1 Outlet Structures

The concrete outlet structure at the Alternate Bottom Ash Pond appeared to be in good condition consistent with its age. The structure was observed to be working properly and was discharging decant water to the Cooling Water Canal. The outlet conduits for Cell 2 appeared to be in good condition. The Cell 2 outlet conduits were not conveying water at the time of the site visit due to the plant outage. The outlet conduits for Cell 1 appeared to be in good condition.

8.4.2 Pump Structures

No pump structures are present at the three CCW impoundments.

8.4.3 Emergency Spillway

The three CCW impoundments do not have emergency spillways.

8.4.4 Water Surface Elevations and Reservoir Discharge

The water surface elevation in the Alternate Bottom Ash Pond was estimated by GEI to be about El. 1950.5. Cell 1 is not currently receiving sluiced ash, and interior grades are being raised for capping with dry, hauled ash. Minnkota personnel indicated that any water in Cell 1 was maintained with a minimum of 7 feet of freeboard. Minnkota indicated the water surface elevation for Cell 2 at the time of inspection was approximately El. 2071.5.

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9.0 Structural Stability

9.1 Visual Observations

The assessment team saw no visible signs of instability associated with the dikes of the three CCW impoundments during the October 20, 2010 site assessment.

9.2 Field Investigations

No subsurface investigation reports were provided for the Alternate Bottom Ash Pond. Based on the design and construction drawings, the following subsurface investigations were performed at the site:

- Multiple boring and test pit exploration programs were performed for Cells 1, 2 and 3 by Barr Engineering Co. Based on the drawing "Existing Conditions" dated 8/30/2003, prepared by Barr Engineering Co. exploration programs appear to have been performed in 1991, 1992, and 2000. Based on the drawing "Existing Conditions & Monitoring System" dated February 1994, prepared by Barr Engineering Co. explorations were also performed in 1994. The plans provided to GEI may not have all of the explorations performed to date for Cells 1, 2 and 3.

- According to the plans, three monitoring wells were installed on the Cell 1 east dike. Two monitoring wells were installed on the Cell 1 south dike (divider dike between Cell 1 and Cell 2). It appears about 15 borings were performed for Cell 1 based on the plans provided.

- Approximately 16 borings and four test pits were performed for Cell 2.

- About seven borings were performed for the future Cell 3. Additionally, four monitoring wells were installed within the limits of the future Cell 3.

9.3 Methods of Analysis

There is no documentation of slope stability analyses performed for the Alternate Bottom Ash Pond. In 1994, Barr Engineering Co. performed slope stability analyses for a representative section of Cells 1 and 2 and the future Cell 3 using the computer program SLOPE/W by GeoStudio. The slope stability analysis was performed as part of the initial design of the CCW impoundment embankments and was included as part of the NDDH permit application. Slope stability analyses performed are summarized in Table 9-1.

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Table 9-1: Slope Stability Analyses for Cells 1, 2 and the future Cell 3

Slope	Loading Condition
Upstream Slope	Rapid Liner Construction
	Liner Construction
	Facility Operations – Early Stages
	Facility Operations – Late Stages
	Liner Failure – Rapid Drawdown
	Deep Rotational Failure – Rapid Drawdown
Downstream Slope	Maximum Pool – Average Soil Properties
	Maximum Pool – Minimum Soil Properties
	Maximum Pool – Minimum Soil Properties, Failure along Coal Bed

The upstream slope stability analyses were modeled with a height of 30 feet, a slope angle of 2.5H:1V, and a 4-foot thick liner. The clay liner undrained and drained strength parameters were determined from laboratory testing. The clay liner undrained strength parameters were modeled with a unit weight of 115 pound per cubic foot (pcf), friction angle of 19.4 degrees, and cohesion of 0.05 tons per square foot (tsf). Drained strength was modeled with a unit weight of 94 pcf, friction angle of 23.9 degrees, and cohesion of 0.16 tsf.

The downstream slope stability analyses were modeled with both average and minimum soil properties as determined from laboratory testing. The average strength parameters were modeled with a unit weight of 127 pcf, friction angle of 31.6 degrees and no cohesion. Minimum embankment soil properties were modeled with a unit weight of 127 pcf, a friction angle of 27 degrees, and no cohesion. The downstream slope configuration included a height of about 95 feet and downstream slope of 3H:1V. A phreatic surface was included in case of failure of the clay liner. The phreatic surface was modeled as maximum pool elevation on the upstream slope to the downstream toe. The phreatic surface was modeled with substantial head loss through the embankment.

In February 2011, Barr Engineering Co. performed slope stability analyses of the divider dike between Cell 2 and the future Cell 3 for the construction condition. The analyses were performed at the request of Minnkota in response to a recommendation for consideration of slope stability of the divider dike by GEI in the DRAFT Coal Ash Impoundment SSA Report dated December 2010. The model included a height of 95 feet, a downstream slope of 2.5H:1V, a phreatic surface extending from the maximum pool elevation on the upstream slope to the downstream slope, and updated soil strength parameters based on field investigations subsequent to 1994.

9.4 Discussion of Stability Analysis and Results

The material properties used in the Barr Engineering Co. stability evaluations for the Cell 1, 2 and 3 representative slope stability section are considered consistent with drained

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and undrained parameters. The minimum factors of safety for each load case are shown in Table 9-2.

Table 9-2: 1994 Slope Stability Analyses Results and Guidance Values

Slope	Loading Condition	Calculated Factor of Safety	Minimum Recommended Factor of Safety (FERC)
Upstream Slope	Rapid Liner Construction	1.6	1.3
	Liner Construction	3.3	1.3
	Facility Operations – Early Stages	3.1 – 6.4	1.3
	Facility Operations – Late Stages	2.6	1.5
	Liner Failure – Rapid Drawdown	0.7	1.1
	Deep Rotational Failure – Rapid Drawdown	1.4	1.1
Downstream Slope	Maximum Pool – Average Soil Properties	1.83 - 1.97	1.5
	Maximum Pool – Minimum Soil Properties	1.51 - 1.63	1.5
	Maximum Pool – Minimum Soil Properties, Failure along Coal Bed	1.88 - 2.30	1.5

The calculated factors of safety of Liner Failure – Rapid Drawdown and Deep Rotational Failure – Rapid Drawdown are considered by Barr Engineering to be the lower and upper bound of the factor of safety for rapid drawdown. The Liner Failure – Rapid Drawdown failure surface is a shallow failure surface that does not appear to engage the full dike crest width and would not cause a CCW release, and therefore, is not considered to be a failure loading condition. The factors of safety calculated by Barr Engineering for the loading cases are considered greater than the guidance values.

The calculated factor of safety for the February 2011 slope stability analyses of the Cell 2 and future Cell 3 divider dike was 1.8, which is higher than the recommended minimum of 1.5.

9.5 Seismic Stability and Liquefaction Potential

Earthquake acceleration at the site for 2,500 year return interval is very low and is not considered capable of generating sufficient seismic loads to create concern for liquefaction or seismic stability.

9.6 Summary of Results

There is no documentation of slope stability analyses performed for the Alternate Bottom Ash Pond. Based on the Barr Engineering Co. 1994 and 2011 analyses, the stability analyses that have been performed for the embankments at Cells 1 and 2 exceed the minimum required factors of safety.

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10.0 Maintenance and Methods of Operation

10.1 Procedures

Minnkota has a Facility Operations Plan for Cell 2, and a basin operating procedure for the Alternate Bottom Ash Pond. Detailed facility inspections are made monthly for Cell 2. The plant scrubber operator performs periodic inspections of the CCW impoundments which are currently not recorded.

Cell 1 and Cell 2 are permitted by the NDDH – Division of Waste Management, and are typically inspected by the Division of Waste Management at least once per year. The Alternate Bottom Ash Pond is permitted by the NDDH – Division of Water Quality, and is typically inspected by the Division of Water Quality at least once per year.

10.2 Maintenance of Impoundments

Maintenance of the three CCW impoundments is performed by Minnkota or by contractor under the supervision of Minnkota personnel. Dam safety-related inspections have not been previously made by state or federal agencies.

10.3 Surveillance

The ash ponds are regularly patrolled by Minnkota personnel. Plant personnel are available at the power plant and on 24-hour call for emergencies that may arise.

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11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

No visual signs of instability, movement or seepage were observed. Adequate erosion protection was observed on the embankment slopes of the ash ponds. An erosion channel was observed near the west embankment downstream toe of Cell 1 and minor erosion was observed on the upstream slope protection of the Alternate Bottom Ash Pond and Cell 2. The erosion channel near Cell 1 appears to have eroded due to surface runoff. Minnkota personnel should monitor the channel for continued erosion that could encroach on the west embankment downstream slope of Cell 1.

11.1.2 Adequacy of Structural Stability

There is no documentation of slope stability analyses performed for the Alternate Bottom Ash Pond. The factors of safety for stability cases analyzed as part of this specific site assessment for the Cell 1 and Cell 2 embankments at the Milton R. Young Station meet stability criteria.

11.1.3 Adequacy of Hydrologic/Hydraulic Safety

The Alternate Bottom Ash Pond has adequate capacity to store the 30 percent PMP, and Cells 1 and 2 have adequate capacity to store the 50 percent PMP without overtopping the dam. The hydrologic capacity of the three CCW impoundments should be verified as part of a site flood study. A dam break analysis has not been performed for Cells 1 and 2 to determine if a dam break flood would cause erosion to the downstream slope of Nelson Lake Dam. A stage-storage curve for Cell 2 has been provided.

11.1.4 Adequacy of Instrumentation and Monitoring of Instrumentation

Instrumentation and monitoring programs are considered adequate for the current facility operations. Daily flows into Cell 2 are captured real time by flow transmitters, as well as flows into the Alternate Bottom Ash Pond. There are no staff gages in Cell 2 or the Alternate Bottom Ash Pond, however water levels are estimated in Cell 2 based on measurements taken from survey markings on the concrete dewatering structure. Water levels are measured in monitoring wells located in the dam embankment and divider dike between Cells 1 and 2. Monitoring well water level measurements should be taken and recorded in reference to dam safety.

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11.1.5 Adequacy of Maintenance and Surveillance

The three CCW impoundments have fair maintenance and surveillance programs. The facilities are generally adequately maintained and routine surveillance is performed by Minnkota staff. Minnkota currently employs two engineers who have performed quarterly inspections of Nelson Lake Dam and have participated in dam safety training programs. The engineers also have responsibility for inspecting the waste management facilities. There are currently no scheduled inspections by state regulators or third-party engineering companies experienced in dam safety inspections.

11.1.6 Adequacy of Project Operations

Operating personnel are knowledgeable and are well trained in the operation of the project. The current operations of the facilities are satisfactory.

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12.0 Recommendations

12.1 Corrective Measures and Analyses for the Structures

1. Continue to monitor the erosion channel located near the west embankment downstream toe of Cell 1 to ensure the erosion does not affect the west embankment downstream slope.

2. Perform a slope stability analysis for the Alternate Bottom Ash Pond.

3. Perform a hydrologic analysis of the Milton R. Young Station site and the three CCW impoundments to verify the adequacy of the pond volumes to store the direct precipitation from the inflow design flood. A dam break analysis should be performed for Cell 1 and Cell 2 to evaluate whether significant erosion damage to Nelson Lake Dam would result in the event of dam breach of Cell 1 or Cell 2.

12.2 Corrective Measures Required for Instrumentation and Monitoring Procedures

No corrective measures are required. We do recommend installing staff gages at Cell 2 and the Alternate Bottom Ash Pond to accurately measure water levels and to develop and implement an instrumentation and monitoring program that would include, at a minimum, recorded daily water levels and flow measurements.

12.3 Corrective Measures Required for Maintenance and Surveillance Procedures

Currently, the three CCW impoundments are visually inspected at least once a year by the North Dakota Department of Health. Develop and document formal inspections of the ash ponds, and include an inspection at a minimum of every 5 years by a third-party professional engineer with experience in dam safety evaluations. Perform a daily check inspection of the facilities with documentation on an inspection form.

12.4 Corrective Measures Required for the Methods of Operation of the Project Works

None.

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12.5 Basis of Assessment

12.5.1 Cell 1

The following factors were the main considerations in determining the final rating of the Cell1 impoundment as SATISFACTORY.

- The dikes at Cell 1 are Significant Hazard structures based on federal and state classifications.
- Cell 1 was generally observed to be in good condition in the field assessment.
- Slope stability analyses resulted in calculated factors of safety above the recommended minimums.
- No hydraulic and hydrology studies have been performed for Cell 1; however, a check analysis indicates the impoundment has adequate capacity to store the appropriate inflow flood. A dam break analysis has not been performed for Cell 1 to evaluate whether significant erosion damage to Nelson Lake Dam would result in the event of dam breach of Cell 1.
- Consideration should be given to installing survey monuments to monitor for settlement of the embankments at Cell 1.
- Operational procedures are considered adequate.

12.5.2 Cell 2

The following factors were the main considerations in determining the final rating of the Cell 2 impoundment as SATISFACTORY.

- The dikes at Cell 2 are Significant Hazard structures based on federal and state classifications.
- Cell 2 was generally observed to be in good condition in the field assessment.
- Slope stability analyses resulted in calculated factors of safety above the recommended minimums.
- No hydraulic and hydrology studies have been performed for Cell 2; however, a check analysis indicates the impoundment has adequate capacity to store the appropriate inflow flood. A dam break analysis has not been performed for Cell 2 to evaluate whether significant erosion damage to Nelson Lake Dam would result in the event of dam breach of Cell 2.

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- Consideration should be given to installing survey monuments to monitor for settlement of the embankments at Cell 2.

- Operational procedures are considered adequate.

12.5.3 Alternate Bottom Ash Pond

The following factors were the main considerations in determining the final rating of the Alternate Bottom Ash Pond as FAIR.

- The dikes at the Alternate Bottom Ash Pond are Low Hazard structures based on federal and state classifications.

- The Alternate Bottom Ash Pond generally observed to be in good condition in the field assessment except for some minor erosion of the upstream slope.

- No slope stability analyses have been performed for the Alternate Bottom Ash Pond.

- Operational procedures are considered adequate.

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12.6 Acknowledgement of Assessment

I acknowledge that the management unit(s) referenced herein was personally inspected by me and was found to be in the following condition **(select one only):**

Management Unit	Rating
Cell 1	Satisfactory
Cell 2	Satisfactory
Alternate Bottom Ash Pond	Fair

DEFINITIONS:

SATISFACTORY: No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR: Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR: A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY: Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

I acknowledge that the management unit referenced herein:

Has been assessed on October 20, 2010 (date)

Signature:

List of Participants:

Ken L. Hardesty, P.E.,	Senior Project Engineer/Task Leader, GEI Consultants, Inc.
Gillian M. Hinchliff,	Project Engineer, GEI Consultants, Inc.
Craig Bleth,	Plant Environmental Superintendent, Minnkota PC
Scott Hofauf,	Civil Engineer, Minnkota PC
Diana Trussell,	North Dakota Dept. of Health – Waste Management
Ted Poppke,	North Dakota Dept. of Health – Waste Management
Karen Goff	Dam Safety Engineer, North Dakota State Water Commission
Jeff Berger	North Dakota State Water Commission

13.0 References

Barr Engineering Co., 2007. "Cell 2 – Phases II and III FGD Sludge Disposal Facility Construction". Construction Drawings, prepared for Minnkota Power Cooperative, dated February.

Barr Engineering Co., 2008. "Construction Documentation Report, FGD Sludge Disposal Facility – Cell 2 Phase III," prepared for Minnkota Power Cooperative, dated December.

Barr Engineering Co., 1994. "Milton R. Young Station No. 2," Design Drawings, prepared for Minnkota Power Cooperative, dated February.

Barr Engineering Co., 2007. "Soil Data Report, Cell 3 Borrow Areas and Select Clay Stockpiles," prepared for Minnkota Power Cooperative, dated March.

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Ebasco Services Incorporated, 1986. "Wastewater Handling System Upgrade, Basin Operating Procedures," prepared for Minnkota Power Cooperative, dated 1985, revised.

Minnkota Power Cooperative, 2009. "CERCLA 104(e) Request for Information Response," prepared for U.S. Environmental Protection Agency, March 17.

North Dakota Department of Health (NDDH). Inspection Reports, Permit 159, 30 Year Ponds. Annual inspections for 2004-2007.

North Dakota State Engineer, 1985. "North Dakota Dam Design Handbook," June.

U.S. Army Corps of Engineers (USACE), 1979. "Recommended Guidelines for Safety Inspections of Dams. (ER 1110-2-106)." September 26.

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Figures

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0 1 2 3

SCALE IN MILES

NOTES:

1. BASE MAP OBTAINED FROM NATIONAL GEOGRAPHIC NORTH DAKOTA TOPOGRAPHIC MAPS, DATED 2002.

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Milton R. Young Station	GEI Consultants	VICINITY MAP
Environmental Protection Agency Washington, D.C.	Project 092884	June 2011 Figure 1

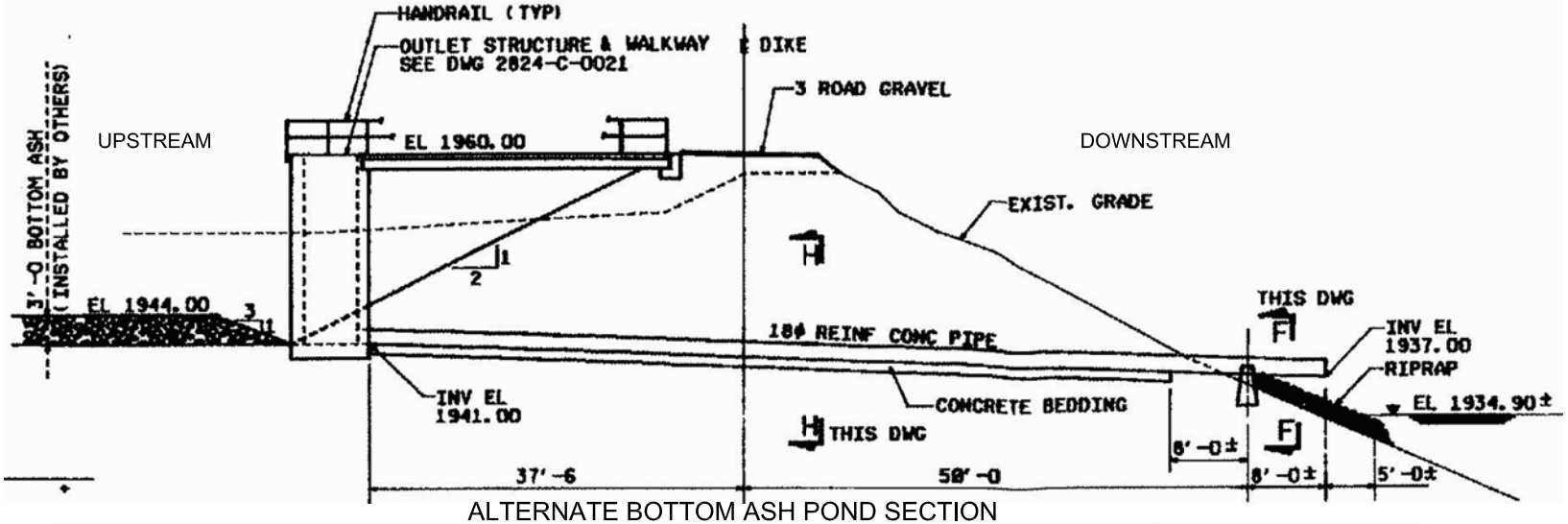
P:\092884 EPA Ash Ponds\Milton R. Young Station\ Figure 1 - Vicinity Map.dwg Dec 2010

NOTES:

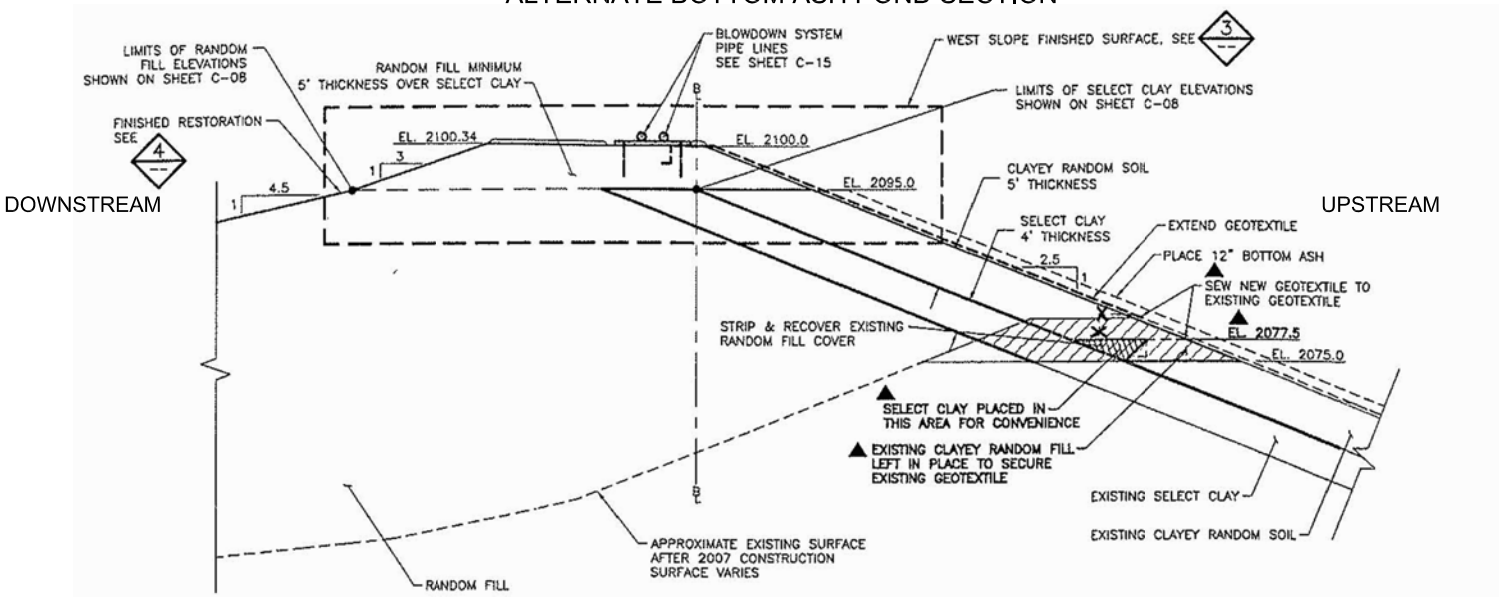
1. AERIAL PHOTO OBTAINED FROM GOOGLE EARTH DATED 2005-2007.

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Minnkota Milton R. Young Station	GEI Consultants	PLAN OF ASH IMPOUNDMENTS
Environmental Protection Agency Washington, D.C.	Project 092884	June 2011 Figure 2

P:\092884 EPA Ash Ponds\Milton R. Young Station\ Figure 2 - Aerial Plan.dwg Dec 2010



ALTERNATE BOTTOM ASH POND SECTION



TYPICAL CELL 1 / CELL 2 SECTION

NOTES:

1. ALTERNATE BOTTOM ASH POND SECTION PREPARED BY EBASCO SERVICES INC. DATED 1984, REVISED.

2. CELL 1/CELL 2 SECTION PREPARED BY BARR ENGINEERING TITLED "PHASE III - CELL 2 LINER SECTIONS" RECORD DRAWING DATED 12/22/08.

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Minnkota Milton R. Young Station	GEI Consultants	TYPICAL DAM EMBANKMENT SECTIONS
Environmental Protection Agency Washington, D.C.	Project 092884	June 2011 Figure 3

P:\092884 EPA Ash Ponds\Milton R. Young Station\ Figure 3 - Typical Sections.dwg Dec 2010

Appendix A

Inspection Checklists

October 20, 2010

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Site Name: Milton R. Young Station, Center, ND Date: October 20, 2010

Unit Name: Alternate Bottom Ash Pond Operator's Name: Minnkota Power Cooperative, Inc.

Unit ID: ND0000370 Hazard Potential Classification: High Significant Low

Inspector's Name: Ken Hardesty/Gillian Hinchliff

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	None		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	El. 1950.5 (approx)		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	El. 1950.5 (approx)		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	El. 1960		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	NA		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	NA		From underdrain?	NA	
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
2. Pool elevation	2. The Alternate Bottom Ash Pond is only used when Units 1 and 2 are shutdown, which occurs for approximately 3 months every 3 years. The pond was being used during the site visit.
23. Water against downstream toe?	23. The cooling canal is at the downstream toe of the north dike, Lake Nelson is at the downstream toe of the west dike, and the North Retaining Basin is at the downstream toe of the east dike.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ND0000370 INSPECTOR Ken Hardesty/Gillian Hinchliff

Date October 20, 2010

Impoundment Name Alternate Bottom Ash Pond

Impoundment Company Minnkota Power Cooperative, Inc.

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Alternate Bottom Ash Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Fly ash and bottom ash

Nearest Downstream Town: Name Mandan / Bismarck
Distance from the impoundment 44 miles
Impoundment
Location:

Longitude	101	Degrees	13	Minutes	8.9	Seconds
Latitude	47	Degrees	4	Minutes	11.1	Seconds

State ND County Oliver

Does a state agency regulate this impoundment? YES X NO _____

If So Which Sate Agency? North Dakota Dept of Health, Division of Water Quality

EPA Form, Jan 09

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

__X__ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

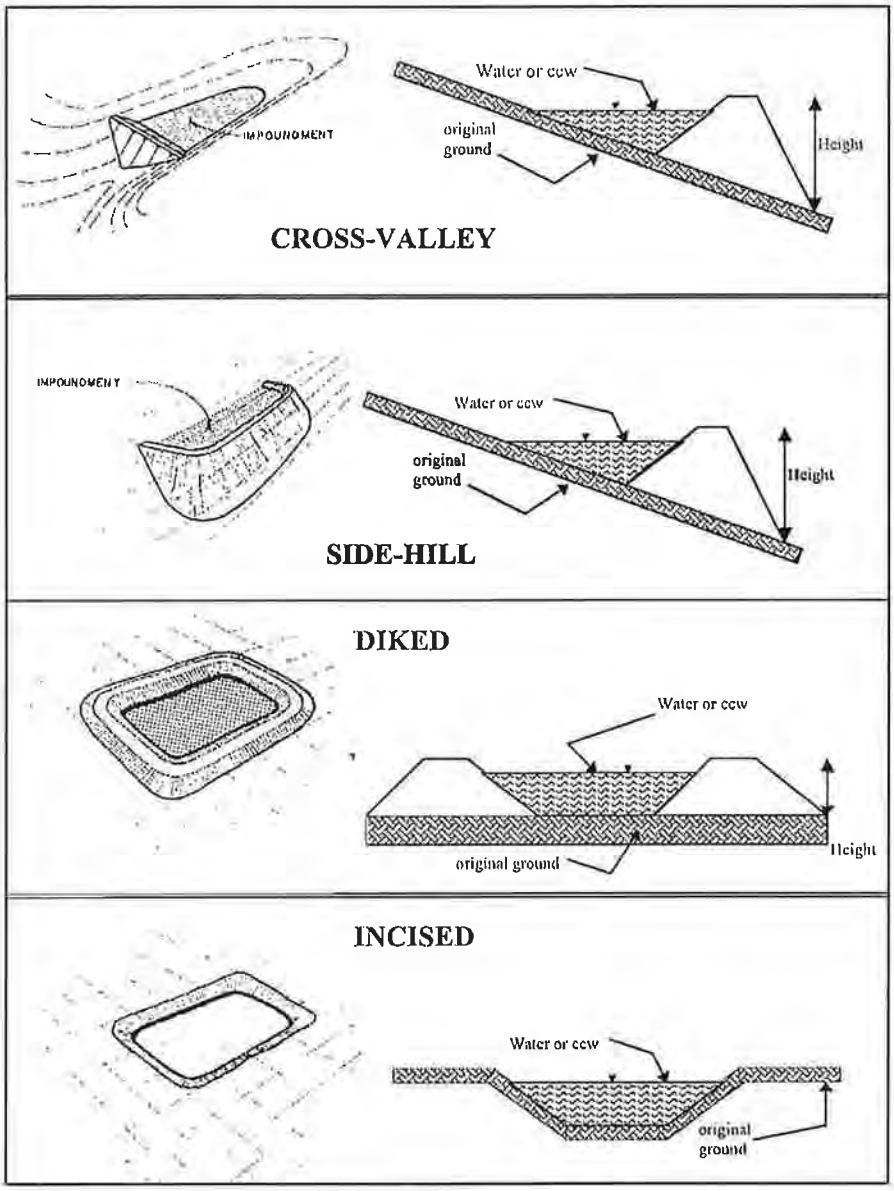
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

A failure of the embankments of the Alternate Bottom Ash Pond would result in coal combustion ash being released into the cooling water canal and Lake Nelson. Coal combustion ash could also flood plant roads located south of the pond. Loss of life is not anticipated; however, there would be environmental impacts. Since Minnkota Power Cooperative owns Nelson Lake losses would most likely be limited to the Owner's property.

CONFIGURATION:



_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

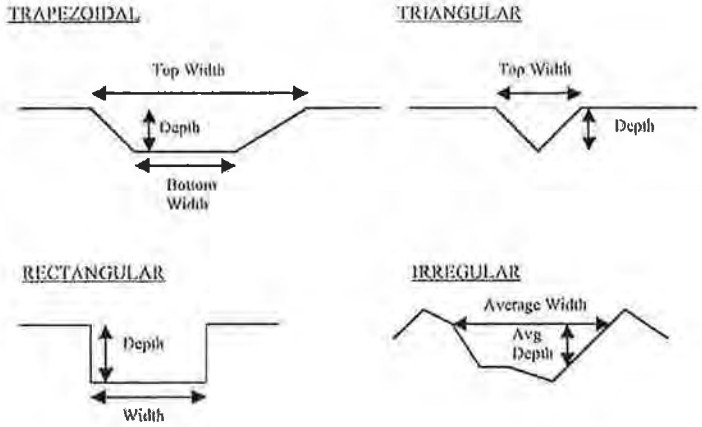
Embankment Height __31*__ feet Embankment Material __Earth__
Pool Area __2.4__ acres Liner __Compacted Clay__
Current Freeboard __~9.5__ feet Liner Permeability __1e-5 cm/sec**__

***Embankment height calculated from an estimated bottom of cooling water canal El. 1929.**
****Permeability of clay estimated from typical values for low to medium plasticity clay**

TYPE OF OUTLET (Mark all that apply)

NA **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

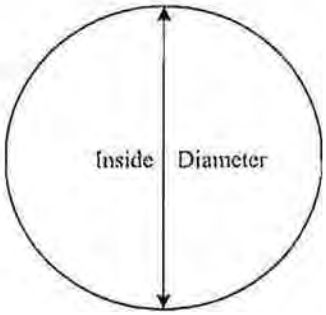
_____ Depth
_____ Bottom (or average) width
_____ Top width



X **Outlet**

18 in inside diameter

Material
_____ corrugated metal
_____ welded steel
X Reinforced concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify_____



Is water flowing through the outlet? YES X NO_____

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By **Ebasco Services Inc.**

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Milton R. Young Station, Center, ND

Date: October 20, 2010

Unit Name: Cell 1 – 30 Yr Pond

Operator's Name: Minnkota Power Cooperative, Inc.

Unit ID:

Hazard Potential Classification: High **Significant** Low

Inspector's Name: Ken Hardesty/Gillian Hinchliff

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	None		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	~El. 2100		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	~El. 2005		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	~El. 2100		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	NA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	NA		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
2. Pool Elevation	2. Pool elevation estimated from topography on Minnkota FGD Pond Cell 3 – Phase 1 Design drawing dated June 2010. Ash is currently being hauled in and dumped into Cell 1 to raise grades to design grades for capping Cell 1. A cover plan has been approved for Cell 1.
6. Instrumentation	6. Piezometers on the downstream slopes monitor groundwater levels in the Hagle Bed.
20. Decant Pipes	20. Decant pipes outlet into Cell 2. Pipes collect leachate at bottom of pond and can be pumped out. Water was not observed flowing during the inspection.
23. Water against downstream toe?	23. Cell 2 is located downstream of the south embankment.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # NA INSPECTOR Ken Hardesty/Gillian Hinchliff

Date October 20, 2010

Impoundment Name Cell 1 – 30 Yr Pond

Impoundment Company Minnkota Power Cooperative, Inc.

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Cell 1 – 30 Yr Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Fly ash, boiler slag, flue gas emission control residues

Nearest Downstream Town: Name Mandan / Bismarck
Distance from the impoundment 44 miles
Impoundment
Location: Longitude 101 Degrees 13 Minutes 14.1 Seconds
Latitude 47 Degrees 3 Minutes 35.2 Seconds
State ND County Oliver

Does a state agency regulate this impoundment? YES X NO _____

If So Which Sate Agency? North Dakota Dept of Health (Waste Management Permit #SP-159)
North Dakota Water Commission (Construction Permit #901)

EPA Form, Jan 09

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL**: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

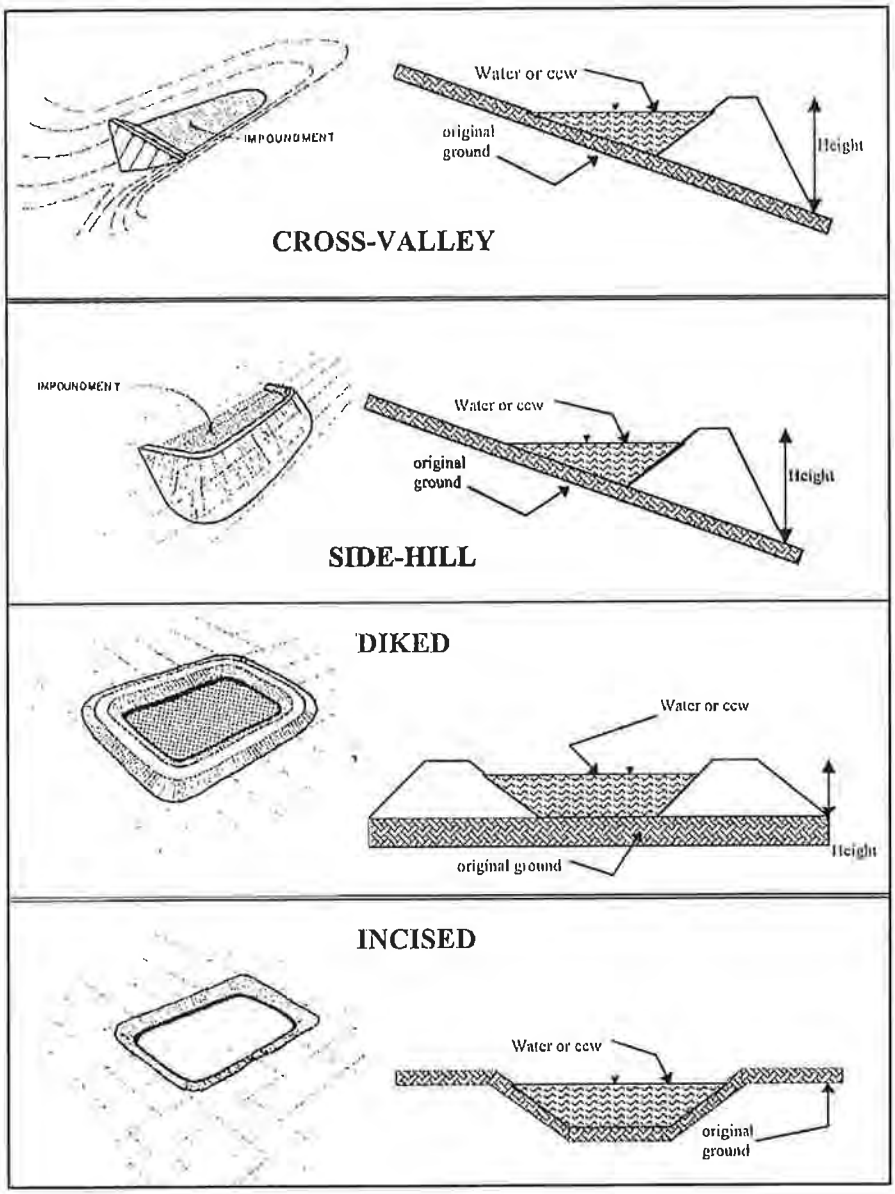
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

A failure of the embankment would release CCW to the areas surrounding the pond. Diversion ditches located at the toe of the embankments would likely be overwhelmed in the event of a failure and floodwaters could follow natural drainage paths to the downstream slope of Nelson Lake Dam and enter Square Butte Creek below Nelson Lake Dam. Erosion of the downstream slope of Nelson Lake Dam could occur. The closest structure downstream of Nelson Lake Dam is approximately 6 miles. Loss of life is not anticipated; however, environmental impacts are anticipated.

CONFIGURATION:



_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

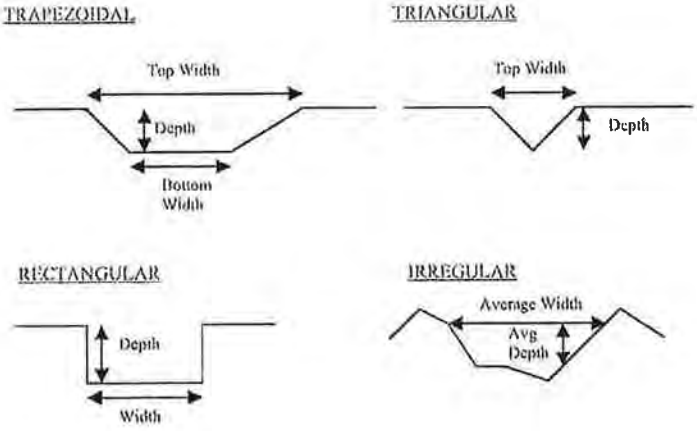
Embankment Height __~100__ feet Embankment Material __Earth__
Pool Area __~30*__ acres Liner __4' Compacted Clay Liner__
Current Freeboard __0**__ feet Liner Permeability __1e-7 cm/sec__

*Estimated from aerial photograph
**Cell 1 is currently being filled with ash hauled in and dumped to raise grades to design grades for cover of Cell 1. A cover plan is approved for Cell 1. A minimum freeboard of 2 feet is maintained for any water in Cell 1.

TYPE OF OUTLET (Mark all that apply)

NA **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

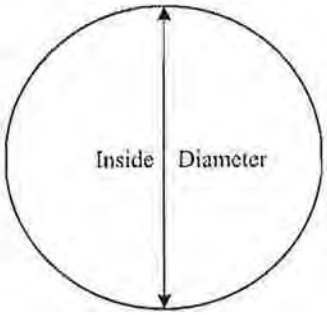
_____ Depth
_____ Bottom (or average) width
_____ Top width



2 **Outlet**

18" inside diameter

Material
_____ corrugated metal
_____ welded steel
_____ concrete
X plastic (hdpe, pvc, etc.)
_____ other (specify_____



Is water flowing through the outlet? YES_____ NO X

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Barr Engineering Co.

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Milton R. Young Station, Center, ND Date: October 20, 2010

Unit Name: Cell 2 – 30 Yr Pond Operator's Name: Minnkota Power Cooperative, Inc.

Unit ID: Hazard Potential Classification: High **Significant** Low

Inspector's Name: Ken Hardesty/Gillian Hinchliff

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	None		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	~El. 2071.5		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	~El. 2071.5		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	~El. 2086		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	NA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	NA		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
6. Instrumentation	**6. Piezometers on the downstream slopes monitor groundwater levels in the Hagle Bed.**
20. Decant Pipes	**20. Decant pipes outlet in the plant and were not observed by GEI.**
23. Water against downstream toe?	**23. Cell 1 is located downstream of the north embankment (divider dike). Cell 1 currently holds a small amount of water, mostly from precipitation.**

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # NA INSPECTOR Ken Hardesty/Gillian Hinchliff

Date October 20, 2010

Impoundment Name Cell 2 – 30 Yr Pond

Impoundment Company Minnkota Power Cooperative, Inc.

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Cell 2 – 30 Yr Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Fly ash, boiler slag, flue gas emission control residues

Nearest Downstream Town: Name Mandan / Bismarck
Distance from the impoundment 44 miles
Impoundment
Location: Longitude 101 Degrees 13 Minutes 13.3 Seconds
Latitude 47 Degrees 3 Minutes 27.4 Seconds
State ND County Oliver

Does a state agency regulate this impoundment? YES X NO _____

If So Which Sate Agency? North Dakota Dept of Health (Waste Management Permit #SP-159)
North Dakota Water Commission (Construction Permit #901)

EPA Form, Jan 09

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL**: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

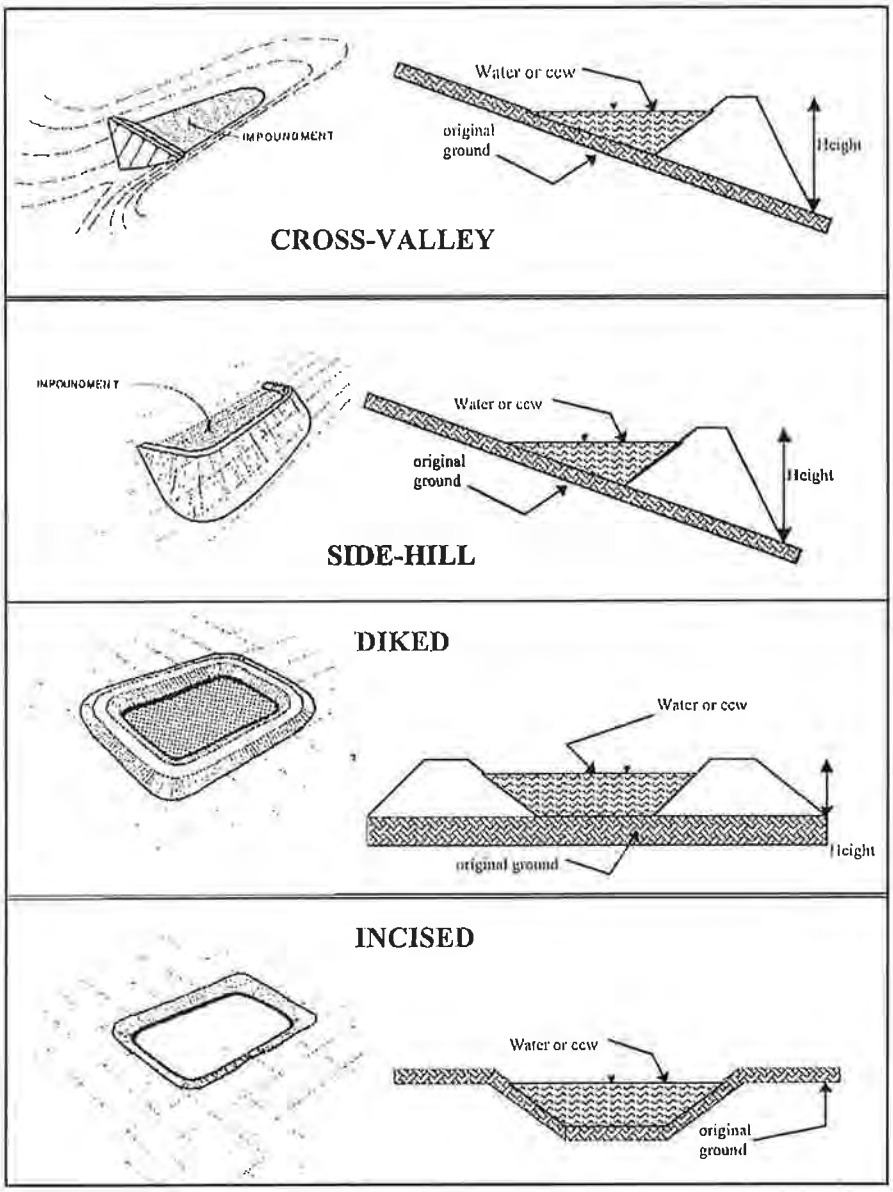
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

A failure of the embankment would release CCW to the areas surrounding the pond. Diversion ditches located at the toe of the embankments would likely be overwhelmed in the event of a failure and floodwaters could follow natural drainage paths to the downstream slope of Nelson Lake Dam and enter Square Butte Creek below Nelson Lake Dam. Erosion of the downstream slope of Nelson Lake Dam could occur. The closest structure downstream of Nelson Lake Dam is approximately 6 miles. Loss of life is not anticipated; however, environmental impacts are anticipated.

CONFIGURATION:



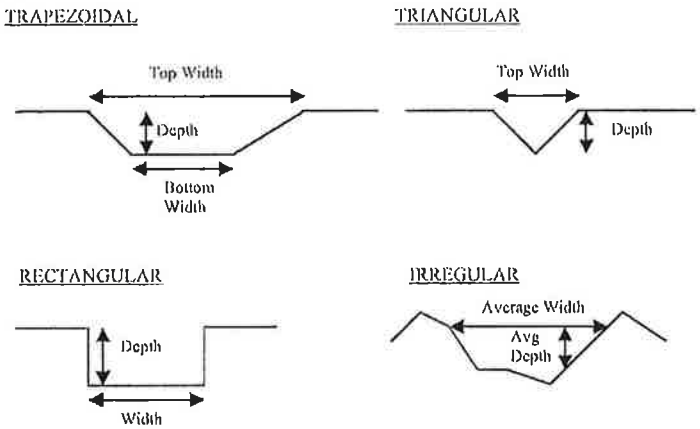
_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

Embankment Height __~90__ feet Embankment Material __Earth__
Pool Area __27__ acres Liner __4' Compacted Clay Liner__
Current Freeboard __14.5__ feet Liner Permeability __1e-7 cm/sec__

TYPE OF OUTLET (Mark all that apply)

NA **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

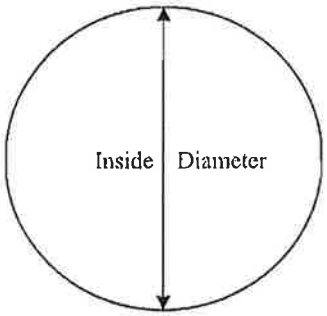
_____ Depth
_____ Bottom (or average) width
_____ Top width



4 **Outlet**

14" inside diameter

Material
_____ corrugated metal
_____ welded steel
_____ concrete
X plastic (hdpe, pvc, etc.)
_____ other (specify_____



Is water flowing through the outlet? YES_____ NO X*

***At the time of the inspection, the plant was shutdown for maintenance. Water was not being returned to the plant because the power units were not being run.**

_____ **No Outlet**

X **Other Type of Outlet (Specify)** Two 18" diameter PVC leachate dewatering pipes at about invert El. 2008. Pipes are not currently being used.

The Impoundment was Designed By Barr Engineering Co.

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Appendix B

Inspection Photographs

October 20, 2010

US EPA ARCHIVE DOCUMENT

Photo 1: Alternate Bottom Ash Pond – North dike upstream slope, looking east.

Photo 2: Alternate Bottom Ash Pond – North dike downstream slope and cooling canal, looking east.

US EPA ARCHIVE DOCUMENT

Photo 3: Alternate Bottom Ash Pond – Stop log structure on north dike, looking west.

Photo 4: Alternate Bottom Ash Pond – Outlet to cooling canal, looking north.

US EPA ARCHIVE DOCUMENT

Photo 5: Alternate Bottom Ash Pond – 18" diameter RCP discharge to cooling canal, looking south.

Photo 6: Alternate Bottom Ash Pond – Stop log structure inlet.

US EPA ARCHIVE DOCUMENT

Photo 7: Alternate Bottom Ash Pond – West dike upstream slope, looking south.

Photo 8: Alternate Bottom Ash Pond – West dike downstream slope, looking south.

US EPA ARCHIVE DOCUMENT

Photo 9: Alternate Bottom Ash Pond – South dike upstream slope, looking east.

Photo 10: Alternate Bottom Ash Pond – South dike downstream slope, looking east.

US EPA ARCHIVE DOCUMENT

Photo 11: Alternate Bottom Ash Pond – East dike upstream slope and temporary inlet pipes, looking northeast.

Photo 12: Alternate Bottom Ash Pond – North dike upstream slope and permanent inlet pipes, looking northwest.

US EPA ARCHIVE DOCUMENT

Photo 13: Alternate Bottom Ash Pond – East dike upstream slope, looking south.

Photo 14: Alternate Bottom Ash Pond – East dike downstream slope, looking south.

US EPA ARCHIVE DOCUMENT

Photo 15: Cell 1 – Looking south across Cell 1.

Photo 16: Cell 1 – East dike upstream slope, looking south.

US EPA ARCHIVE DOCUMENT

Photo 17: Cell 1 – South dike upstream slope, looking west, divider dike with Cell 2.

Photo 18: Cell 1 – Looking northwest across Cell 1.

US EPA ARCHIVE DOCUMENT

Photo 19: Cell 2 – North dike upstream slope, looking east, divider dike with Cell 1.

Photo 20: Cell 2 – North dike upstream slope, looking south, inlet pipes from Unit 1 and leachate collection from Butterfly Pond and Cell 1.

US EPA ARCHIVE DOCUMENT

Photo 21: Cell 2 – South dike upstream slope, looking south, underdrain/leachate pipes for Cell 2.

Photo 22: Cell 2 – West dike upstream slope, looking south, inlet pipes from Unit 2.

US EPA ARCHIVE DOCUMENT

Photo 23: Cell 2 – West dike downstream slope, looking south.

Photo 24: Cell 2 – West dike crest, looking south, inlet pipes from Unit 2.

US EPA ARCHIVE DOCUMENT

Photo 25: Cell 1 – West dike upstream slope, looking north.

Photo 26: Cell 2 – East dike upstream slope, looking north, note siphon outlet pipes.

US EPA ARCHIVE DOCUMENT

Photo 27: Cell 2 – South dike downstream slope, looking northwest.

Photo 28: Cell 2 – West dike downstream slope, looking south.

US EPA ARCHIVE DOCUMENT

Photo 29: Cell 1 – West dike downstream slope, looking north.

Photo 30: Cell 1 – Erosion channel near west dike downstream toe, looking south.

US EPA ARCHIVE DOCUMENT

Photo 31: Cell 1 – East dike downstream slope and manhole for outlet pipes from Cell 2 returning to plant, looking north.

Photo 32: Cell 2 – East dike downstream slope, looking south.

US EPA ARCHIVE DOCUMENT

Appendix C

Reply to Request for Information Under Section 104(e)

US EPA ARCHIVE DOCUMENT

Minnkota Power
MPC COOPERATIVE, INC.

Your Touchstone Energy® Partner

Milton R. Young Station • P.O. Box 127 • Center, ND 58530-0127 • Phone (701) 794-8711

March 17, 2009

Mr. Richard Kinch
U.S. Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor N-5783
Arlington, VA 22202-2733

RE: Request for Information Under Section 104 (e) of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9604(e).

Dear Mr. Kinch:

In response to the U.S. Environmental Protection Agency's request for information, the Milton R. Young Station of Minnkota Power Cooperative, Inc. submits three completed questionnaires, with supporting information, for management units associated with the plant.

Please contact me at (701) 794-8711, if you have any questions regarding this information.

Sincerely,

MINNKOTA POWER COOPERATIVE, INC.

Stuart Libby

Stuart Libby
Plant Manager - Operations

Enclosures

cc: Craig Bleth/File 160.001
John Graves
Scott Hopfauf

Certification

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature Stuart Libby

Name: Stuart Libby

Title: Plant Manager - Operations

Minnkota Power Cooperative, Inc.
Milton R. Young Station
March 17, 2009

Management Unit: 30- Year Ponds (Cell 2)

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

   MPC response: This management unit is permitted by two state agencies; the North Dakota State Water Commission (Construction Permit # 901) and the North Dakota Department of Health - Division of Waste Management (Permit SP-159). No regulatory agency has established a National Inventory of Dams potential hazard rating for this management unit.

2. What year was each management unit commissioned and expanded?

   MPC response: This management unit was commissioned in 2005 (Phase I) and, by design, was expanded in 2007 (Phase II) and 2008 (Phase III).

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other", please specify the other types of materials that are temporarily or permanently contained in the unit (s).

   MPC response: This management unit permanently contains for disposal; (1) fly ash, (3) boiler slag, (4) flue gas emission control residuals.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management units(s) under the supervision of a Professional Engineer?

   MPC response: This management unit was designed and constructed under the supervision of a Professional Engineer. The inspection and monitoring of the safety of the management unit is under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management units(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

   MPC response: By design, this management unit was expanded in 2007 (Phase II) and 2008

(Phase III). All designs, and construction, were certified by a Professional Engineer employed by Barr Engineering Company, Minneapolis, MN. Barr Engineering employs over 400 engineers, scientists, and technical support staff providing consultant services in the engineering, environmental, and information technologies disciplines. Barr Engineering has been involved with this project since its inception. Construction Documentation Reports are submitted to the North Dakota Department of Health for approval at the conclusion of each phase of construction.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management units(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

   MPC response: This management unit was last inspected by a ND Department of Health Division of Waste Management (NDDH-DWM) official in February 2008. Inspections have typically been made by NDDH-DWM officials at least once per year. The most recent inspection report is attached.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management units(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

   MPC response: No safety related issues regarding this management unit have been observed during past evaluations or inspections by State regulatory officials.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

   MPC response: This management unit is approximately 27 acres in size, with a storage capacity of 2.02 million cubic yards. Current waste volume as of January, 2009 is 1.08 million cubic yards. The maximum height of the management unit is approximately sixty feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

   MPC response: No spills or unpermitted releases have occurred from this management unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

    MPC response: Minnkota Power Cooperative, Inc., is the owner and operator of this facility.

Minnkota Power Cooperative, Inc.
Milton R. Young Station
March 17, 2009

Management Unit: Unit 1 Alternate Bottom Ash Pond

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

   MPC response: This management unit is permitted by the North Dakota Department of Health, Division of Water Quality, under ND Pollutant Discharge Elimination System ND-0000370. No regulatory agency has established a National Inventory of Dams potential hazard rating for this management unit.

2. What year was each management unit commissioned and expanded?

   MPC response: This management unit was commissioned in 1986. No expansions have taken place.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other", please specify the other types of materials that are temporarily or permanently contained in the unit (s).

   MPC response: This management unit temporarily stores bottom ash (2) for dewatering purposes. The pond contains water for approximately 2-3 months every three years.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management units(s) under the supervision of a Professional Engineer?

   MPC response: This management unit was designed and constructed under the supervision of a professional engineer. The inspection and monitoring of the safety of the management unit is under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management units(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

MPC response: When in service, this management unit is monitored daily by plant operations personnel. Discharge quantity, quality, and pond structural integrity are monitored. If any concerns are apparent the Plant Environmental Department is notified immediately. The Plant Environmental Department is comprised of three engineers (one registered, two non-registered), supervised by a Registered Professional Engineer.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management units(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

   MPC response: This management unit was last inspected by a ND Department of Health Division -of Water Quality (NDDH-WQ) official on July 11, 2008. Inspections have typically been made by NDDH-WQ officials at least once per year. A copy of the most recent inspection report is attached.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management units(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

   MPC response: No safety related issues regarding this management unit have been observed during past evaluations or inspections by State regulatory officials.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

   MPC response: This management unit is approximately 2.4 acres in size, with a storage capacity of approximately 40,000 cubic yards. Current waste volume as of March, 2009 is 3,000 dry cubic yards of bottom ash. The pond does not contain free water at this time. The maximum height of the management unit is approximately ten feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

   MPC response: No spills or unpermitted releases have occurred from this management unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

    MPC response: Minnkota Power Cooperative, Inc., is the owner and operator of this facility.

Minnkota Power Cooperative, Inc.
Milton R. Young Station
March 17, 2009

Management Unit: Horseshoe Pit Evaporation Pond

Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

MPC response: This management unit is permitted by two state agencies; the North Dakota State Water Commission (Construction Permit # 363) and the North Dakota Department of Health - Division of Waste Management (Permit SP-040). No regulatory agency has established a National Inventory of Dams potential hazard rating for this management unit.

2. What year was each management unit commissioned and expanded?

   MPC response: This management unit was commissioned in 1990. No expansions of the facility have taken place.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other", please specify the other types of materials that are temporarily or permanently contained in the unit (s).

   MPC response: This management unit contains liquids only (leachate), a category (5) material. This leachate is collected from a closed landfill and placed into the surface impoundment to allow evaporation.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management units(s) under the supervision of a Professional Engineer?

   MPC response: This management unit was designed and constructed under the supervision of a Professional Engineer. The inspection and monitoring of the safety of the management unit is under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management units(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

MPC response: This management unit is monitored for structural integrity during the monthly inspection conducted under the supervision of a Professional Engineer.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management units(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

   MPC response: This management unit was last inspected by a ND Department of Health Division of Waste Management (NDDH-DWM) official in February 2008. Inspections have typically been made by NDDH-DWM officials at least once per year. The most recent inspection report is attached.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management units(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

   MPC response: No safety related issues regarding this management unit have been observed during past evaluations or inspections by State regulatory officials.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

   MPC response: This management unit is approximately four acres in size, with a storage capacity of 34 acre-feet. Current leachate volume contained in the management unit, as of March, 2009, is 11.2 acre-feet. The maximum height of the management unit is approximately six feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

   MPC response: No spills or unpermitted releases have occurred from this management unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

    MPC response: Minnkota Power Cooperative, Inc., is the owner and operator of this facility.

Minnkota Power
MPC COOPERATIVE, INC.

Your Touchstone Energy® Partner

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March 18, 2009

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S Crystal Dr.
5th Floor; N-5783
Arlington, VA 22202-2733

Subject: Request for Information Under Section 104(e) of CERCLA, 42 U.S. C. 9604(e)

Dear Mr. Kinch:

Minnkota has no other facilities to whom you have not sent an information request and which have surface impoundments or similar diked or bermed management units designated as landfills which receive liquid-borne material from a surface impoundment used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals.

The responses from those facilities you have sent information requests to will be responded to by those facilities separately.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of the response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware of significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

MINNKOTA POWER COOPERATIVE, INC

David Loer
President & CEO