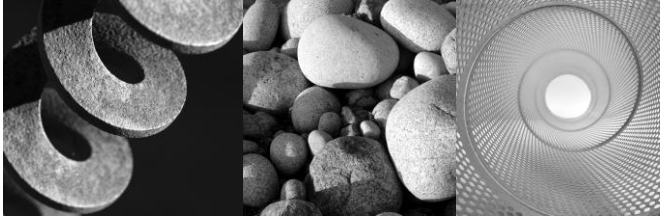

GEI Consultants

Geotechnical
Environmental
Resources
Ecological

Specific Site Assessment for Coal Combustion Waste Impoundments at Basin Electric Leland Olds Station

Stanton, North Dakota

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
5304P
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted by:
GEI Consultants, Inc.
4601 DTC Blvd., Suite 900
Denver, CO 80237

June 2011
Project 092883

Steven R. Townsley, P.E.
Senior Project Engineer

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Acronym and Abbreviations

ac-ft	acre-feet
CCM	cellular concrete mat
CCW	coal combustion waste
CMP	corrugated metal pipe
El.	elevation
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
ft	feet
GEI	GEI Consultants, Inc.
H	horizontal
IDF	inflow design flood
LOS	Leland Olds Station
MW	megawatts
NDDH	North Dakota Department of Health
PMF	probable maximum flood
PMP	probable maximum precipitation
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
V	vertical

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 Leland Olds Station (LOS) in Stanton, North Dakota. The Leland Olds Station is operated and owned by Basin Electric Power Cooperative. The impoundments are Ash Pond #1 (now referred to as Former Ash Pond #1 by Basin Electric), Ash Pond #2 and Ash Pond #3 (referred to as Pond #3 by Basin Electric). The specific site assessment was performed on September 21, 2010.

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 includes defaults to state requirements were not specifically addressed by federal guidance or if the state requirements were more stringent.

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 Basin Electric.
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-CALL-0003 between EPA and GEI, dated August 26, 2010.

1.4 Project Personnel

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

Steven R. Townsley, P.E.	Senior Project Engineer/Task Leader
Stephen G. Brown, P.E.	Project Manager
Ken L. Hardesty, P.E.	Project Engineer
Nick Miller, P.E.	Project Water Resources Engineer

The Program Manager for the EPA was Stephen Hoffman.

1.5 Limitation of Liability

This report summarizes the assessment of dam safety of coal combustion waste impoundments Ash Pond #1, Ash Pond #2 and Ash Pond #3 at Leland Olds Station, Stanton, 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

The project coordinate system is identified as State Plane south zone on the Site Layout and Cross Section Locations plan developed by Braun Engineering Testing dated August 21, 1990. No references to the project datum or a vertical datum were discovered during the document review process.

1.7 Prior Inspections

Basin Electric reported that the North Dakota Department of Health (NDDH) made periodic inspections of the CCW impoundments from 1982 to 2008. Bi-annual inspections for the CCW impoundments by a NDDH inspector began in 2008. The NDDH representative present during the site assessment indicated that the bi-annual inspections were intended to assess the environmental conditions of the CCW impoundments and not to assess conditions from a dam safety perspective. A third-party inspection of the impoundments was performed on August 4 -5, 2009 by AECOM. A visual inspection of the CCW impoundments is performed at least once per 12-hour shift by a Basin Electric employee.

2.0 Description of Project Facilities

2.1 General

Leland Olds Station is a coal-fired power plant consisting of two units that generate about 669 megawatts (MW) combined. The power plant is located approximately 4 miles southeast of Stanton in Mercer County, North Dakota along the Missouri River (see Figure 1). Both generating units are owned and operated by Basin Electric. Unit 1 went online in 1966 and Unit 2 went online in 1975. The CCW impoundments are located southeast of the power plant. The CCW impoundments include Ash Pond #1, Ash Pond #2, and Ash Pond #3 and are permitted to dispose of bottom ash. There are no design records from the original construction of the impoundments.

Based on information provided in the CERCLA 104e response by Basin Electric (provided in Appendix C), Ash Pond #1 appears to have been commissioned in the 1960s. The primary use of Ash Pond #1 was the holding and recovery of bottom ash received from Unit 1 and Unit 2. Ash Pond #1 has since been decommissioned and is now used for dry ash storage. A concrete containment area has been constructed on the west edge of Ash Pond #1 and is used for collection and drying of sluiced bottom ash for saleable purposes. Ash Pond #1 is near capacity and the majority of the pond will be reclaimed in the near future. Basin Electric reports that as of March 2011, Ash Pond #1 is 90 percent reclaimed; however, this has not been confirmed by GEI. Ash Pond #2 was commissioned in the 1970s and is the primary settling basin for bottom ash storage. The ash is transferred to the ash pond as slurry from Unit 1 and Unit 2 through an elevated pipeline. Bottom ash sluiced to Ash Pond #2 settles out and water flows into Ash Pond #3. Ash Pond #3 was commissioned between 1974 and 1976 and is the secondary settling basin used to store decant water from Ash Pond #2. Water is piped back to the plant from Ash Pond #3 through the pump station located at the west edge of Ash Pond #3.

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.

Ash Pond #1 is approximately 27.1 acres and is impounded by approximately 4,100 linear feet of perimeter embankment dikes. The perimeter embankment dikes are approximately 10 to 20 feet high with crest widths of approximately 15 feet. The downstream slopes of the dikes appear to be 1.5H:1V to 1.2H:1V and are either exposed earth or covered with sparse vegetation. The coal yard runoff drainage ditch is located along the toe of the north

embankment dike and currently contains no erosion protection measures. The east perimeter dike divides Ash Pond #1 with Ash Pond #2 and is sparsely vegetated.

Ash Pond #2 is approximately 38.2 acres and is impounded by approximately 5,500 linear feet of perimeter embankment dikes. The perimeter embankment dikes are approximately 10 to 20 feet high with crest widths of approximately 15 feet. The upstream and downstream slopes of the dikes appear to be 1.5H:1V to 1.2H:1V and are covered with vegetation. The north perimeter dike divides Ash Pond #2 with Ash Pond #3. The downstream slopes of the south and east perimeter dikes of Ash Pond #2 are backfilled to approximately 6-10 feet below the crest with reclaimed materials as part of the reclamation of previous ponds to the south and east.

Ash Pond #3 is approximately 3.1 acres and is impounded by approximately 2,300 linear feet of perimeter embankment dikes. The perimeter embankment dikes are approximately 10 to 30 feet high with crest widths of approximately 15 feet. The upstream and downstream slopes of the dikes appear to be 1.5H:1V to 1.2H:1V and are covered with vegetation. The north perimeter dike is the tallest dike at approximately 30 feet and is located approximately 100 to 150 feet from the edge of the Missouri River high flood plain. LOS had just completed reconstructing the Ash Pond #3 perimeter dikes prior to the inspection. The dike between Ash Pond #2 and Ash Pond #3 was excavated down 10 feet and reconstructed back to the previous elevation. Erosion control mats were installed along the inside toe approximately 4 feet up the slope.

Table 2-1: Summary Information for Impoundment Dam Parameters

Parameter	Value		
Dam	Ash Pond #1	Ash Pond #2	Ash Pond #3
Estimated Maximum Height (ft)	20	20	30
Estimated Perimeter Length (ft)	4,100	5,500	2,300
Crest Width (ft)	15	15	15
Crest Elevation[2] (ft)	1,700-1,710	1,690-1,710	1,690-1,710
Design Side Slopes Upstream/Downstream (H:V)	N/A/1.5 to 1:1	1.5 to 1:1/1.5 to 1:1	1.5 to 1:1/1.5 to 1:1
Estimated Freeboard (ft) at time of site visit	N/A	10	10
Storage Capacity[1] (ac-ft)	N/A[3]	924	12
Surface Area[1] (acres)	27.1	38.2	3.1

[1] Surface area and capacity based on CERCLA 104(e) Request for Information prepared by LOS at the request of the EPA, dated March 25, 2009.

[2] Based on drawings provided by LOS, vertical datum not specified.

[3] Ash Pond #1 is currently a dry ash storage facility. The estimated dry ash storage volume reported by LOS on the CERCLA 104(e) document dated March 25, 2009 is 1,200,000 cubic yards.

There are no records of the original geotechnical design or material properties for the embankment perimeter dikes. In 1990, a Hydrogeologic and Geotechnical Report was compiled by Braun Engineering Testing on the LOS ash pond disposal area. The geotechnical investigation included drilling three borings in the embankment dikes; two in the south dike of Ash Pond #2 and one in the north dike of Ash Pond #3. The material descriptions indicated in the borings suggest the embankments are typically constructed of native clay/silt material with zones of gravel and fly ash or bottom ash.

2.3 Spillways

None of the impoundments have spillways.

2.4 Intakes and Outlet Works

Ash Pond #1 functions as a dry CCW landfill and the previous outlet conduits are no longer in operation and were decommissioned. Two corrugated metal pipe (CMP) outlet conduits were decommissioned; one 36-inch-diameter pipe is located near the midpoint of the east perimeter dike and one 48-inch-diameter pipe is located near the northwest corner of the ash pond. Basin Electric reports that the pipes were decommissioned by removing as much of the pipe as possible and backfilling with clay material. An elevated steel pipe tees off of the ash supply pipeline to Ash Pond #2 and discharges bottom ash into the concrete containment area located in the west portion of Ash Pond #1. The steel pipe appears to be approximately 12-inch diameter. Water drains out of the concrete containment area to the north and enters the north coal yard drainage ditch through two PVC drain outlet pipes. The outlet pipes appear to be approximately 8-inch diameter and do not have a device for flow measurement.

Ash Pond #2 contains 3 inlet pipes and 1 outlet pipe. The coal yard runoff drainage ditch located north of Ash Pond #1 drains stormwater runoff from the plant site into Ash Pond #2 through a 36-inch diameter steel CMP located at the northwest corner of Ash Pond #2. Surface water runoff from reclaimed areas south and east of Ash Pond #2 is collected in ditches and routed to two separate inlet pipes and discharged into Ash Pond #2. One inlet pipe is located near the midpoint of the south perimeter dike and the other is located near the east perimeter dike. The diameters of the inlet pipes vary from 24-inch to 30-inch and are combinations of CMP and concrete pipe. Decant water from Ash Pond #2 is discharged to Ash Pond #3 through a small drop inlet and 48-inch CMP located in the northeast corner of Ash Pond #2. The drop inlet is a small steel weir box approximately 2’ x 3’.

Ash Pond #3 receives decant water through the 48-inch CMP from Ash Pond #2 described above. Water is pumped back to the plant through the pump station located at the west end of the pond. A decommissioned 36-inch CMP extends through the north perimeter dike near the pump house in the northwest corner. This CMP was an overflow outlet which discharged into the low area north of the pond. The CMP contains a riser pipe that was sealed with a concrete plug according to information provided by Basin Electric.

2.5 Vicinity Map

Leland Olds Station is located approximately 4 miles southeast of Stanton, North Dakota, as shown on Figure 1. The three CCW impoundments are located east of the station, as shown on Figure 2.

2.6 Plan and Sectional Drawings

Survey drawings for the three CCW impoundments were provided by Basin Electric and were prepared as part of the North Dakota Department of Health (NDDH) Special Permit #038 report for the ash pond facility. Construction record drawings from the original construction were not prepared.

2.7 Standard Operational Procedures

LOS is a coal-fired power plant producing a total combined capacity of 669 MW. Coal is delivered to the power plant by train, where it is then combusted to power the steam turbines. The burning of coal produces several gases and fly ash which are vented from the boiler, and bottom ash, which is made of coarse fragments, falls to the bottom of the boiler, and is removed along with boiler slag. Coal combustion waste from Units 1 and 2 are wet sluiced along an elevated pipe into Ash Pond #2.

Ash Pond #2 is used for primary settling. Decant water is discharged into Ash Pond #3, which is the secondary settling basin. The water level in Ash Pond #3 is regulated by pumps located in the pumphouse. An automatic water level sensor activates the pumps at low and high flows. The water level is manually set to maintain approximately 2 feet of water over the suction of the pumps. Decant water is pumped through pipes from Ash Pond #3 to the plant where it is mixed with cooling water and discharged into the Missouri River at the river discharge structure located north of the plant. Discharge to the Missouri River is under NDDH discharge permit number NDPES ND-0025232.

The majority of Ash Pond #1 is currently being reclaimed. A concrete containment area is located on the west edge of Ash Pond #1 and is used for drying and storage of bottom ash sold for beneficial use. The ash waste from the plant is sold for beneficial use when there is a market for it to be sold. When the ash is going to be sold, the ash is diverted from the Ash Pond #2 discharge to the concrete containment area for drying.

According to Basin Electric, an operation and maintenance manual currently does not exist for the CCW facilities. At the time of our inspection on September 21, 2010, plant operators performed inspections once per shift of the CCW facilities; however these inspections were mostly site security inspections. Since GEI's site inspection, Basin Electric reports that recorded, daily inspections are performed by plant operators and checks for seepage, sinkholes/sloughing, normal water level and water elevation of Ash Pond #3 are made.

3.0 Summary of Construction History and Operation

Ash Pond #1 went into service sometime in the 1960s. Coal combustion waste was originally wet sluiced into Ash Pond #1. Ash Pond #2 went into service in the 1970s. At this time, coal combustion waste was wet sluiced into both Ash Pond #1and Ash Pond #2. Ash Pond #3 went into service between 1974 and 1976 as a secondary settling pond for decant water from Ash Pond #2. In 1995, Ash Pond #2 was cleaned and re-graded to provide more storage capacity. In 2010, the perimeter dikes of Ash Pond #3 were excavated down 10 feet and reconstructed with native clay/silt fill to repair areas of sloughing and erosion. The interior slopes of Ash Pond #3 were re-graded and erosion control mats were installed along the inside toe of the perimeter embankment dam.

Existing documentation of the original design and construction of the CCW facilities could not be located at the time of the inspection. Survey drawings and boring logs developed in the 1990s by Braun Engineering Testing for the CCW facilities were reviewed, though design reports and construction records were not available. Three of the borings were located in the perimeter dikes of Ash Ponds #2 and #3 and they extended between 20 to 50 feet beneath the base of the dike and bedrock was not encountered.

Based on visual observations during the site visit and review of available construction records, the embankments were not constructed over wet ash, slag or other unsuitable materials. Evidence of prior releases, failures or patchwork construction were not observed or evident based on review of available design documents or disclosed by plant personnel during the site visit.

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 Ash Pond #1

The Ash Pond #1 perimeter dikes, with a surface area of about 27.1 acres and a height of about 20 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.

Ash Pond #1 functions as a dry CCW landfill. Excess water from the CCW as well as any stormwater that enters the impoundment are collected in the coal yard runoff ditch north of Ash Pond #1 and flow to Ash Pond #2. The most likely scenario which could result in a potential breach of the perimeter embankment dikes would be during a significant rain storm event where the dry ash storage could become moistened or partially saturated. Based on observed current operations, the ash pond contents include CCW material that has the potential to become moist and possibly partially saturated due to precipitation from storm events. In the event of a breach of the north perimeter embankment dike, CCW would enter the coal yard runoff ditch to the north, blocking stormwater runoff and causing the runoff to overtop the access road to the north or potentially failing the access road berm. CCW could potentially flood Basin Electric facilities to the north of the ash pond and potentially enter the Missouri River. An uncontrolled release of CCW into the Missouri River would pose no threat to human life in our opinion. Some environmental damage to the wetlands adjacent to the river is possible, but the amount of water and waste that could be discharged into the river is small due to the size of the impoundment.

In the event of a breach of the east perimeter embankment dike, CCW would flow into the larger Ash Pond #2, which has the capacity to contain the CCW. Ash Pond #2 also appears to have sufficient freeboard capacity to contain the associated rise in water elevation due to flooding and any potential CCW entering the pond from Ash Pond #1.

Basin Electric reported that they are currently in the process of capping Ash Pond #1 with a clay cap. Basin Electric reports that as of March 2011, Ash Pond #1 is 90 percent reclaimed; however, this has not been confirmed by GEI. When capping of the pond is completed, the

hazard potential should be re-evaluated based on the methods of capping and potential failure modes.

Based on the potential environmental impacts to the Missouri River 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 the Ash Pond #1 dike be classified as a "Significant" or "Medium" hazard structure.

4.3 Ash Pond #2

The Ash Pond #2 perimeter dikes, with a surface area of about 38.2 acres, storage capacity of 924 acre-feet and a height of about 20 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.

There are no structures present between the downstream portion of Ash Pond #2 and the Missouri River, except for Ash Pond #3. An uncontrolled release of the CCW impoundment's contents due to a failure of the dike at Ash Pond #2 therefore poses no threat to human life in our opinion. Reclaimed areas south and east of Ash Pond #2 are higher in elevation than the perimeter dike crest, eliminating the potential of flooding from a dike breach of the south and east perimeter dikes. In the event of a failure of the north perimeter dike, flood waters would enter Ash Pond #3, however based on the current operations of the CCW impoundment, the water levels in Ash Ponds #2 and #3 are equivalent and any ash escaping into Ash Pond #3 would be contained within the pond. During a flood event, the water levels within Ash Pond #2 and #3 may be high enough that a failure of the dividing dike between the ash ponds could cause a surge of water to overtop the north perimeter dike of Ash Pond #3. Some environmental damage to the wetlands adjacent to the river is possible, but the amount of water and waste that could be discharged into the river is small due to the size of the impoundment.

Based on the potential environmental impacts to the Missouri River 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 the Ash Pond #2 dike be classified as a "Significant" or "Medium" hazard structure.

4.4 Ash Pond #3

The Ash Pond #3 perimeter dikes, with a surface area of about 3.1 acres, storage capacity of 12 acre-feet and a height of about 30 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.

An uncontrolled release of the structure's contents due to a failure or misoperation is not considered to cause loss of human life; however, decant water and CCW could flow into the Missouri River and areas surrounding the pond. River flood waters would likely be widespread with shallow depths and gradually rising waters. Based on the pond height and volume, the majority of inundation would be limited to the wetlands directly north of the pond along the shores of the Missouri River.

Based on the potential environmental impacts to the Missouri River 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 the Ash Pond #3 dike be classified as a "Significant" or "Medium" hazard structure.

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 LOS. The rainfall events for the year 2009 were evaluated but the maximum rainfall evaluated was 1.51 inches, which is significantly less than the floods of record.

5.2 Inflow Design Floods

Currently there is no hazard classification for the three CCW impoundments at the LOS. Based on observations during the field inspection, we recommend that Ash Pond #1, Ash Pond #2 and Ash Pond #3 be rated "Significant" hazard dams (see Section 4.0). Based on the recommended "Significant" or "Medium" hazard classification, the North Dakota State Engineer Dam Design Handbook specifies "Medium" hazard Class III dams 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 "Significant" hazard dam be capable of passing the 100-year to 50 percent 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 30 percent of the PMP as the inflow design storm for the Ash Pond #1, Ash Pond #2 and Ash Pond #3. Considering the small drainage area and time of concentration, the 6-hour PMP event should be used to analyze the inflow design floods for the ash ponds. Accordingly, the 6-hour 30 percent PMP precipitation at the Leland Olds Station is about 6.4 inches based on Hydrometeorological Report Number 51 6-hour PMP data.

5.2.1 Ash Pond #1

The Ash Pond #1 contributing drainage area is limited to the impoundment area (approximately 27.1 acres) because of the dikes. Ash Pond #1 is near capacity and currently there is no water being stored in the pond. Runoff from Ash Pond #1 drains to a surrounding drainage ditch that discharges to Ash Pond #2. Based on the 6-hour 30 percent PMP, Ash Pond #1 would produce approximately 14.5 acre-feet of stormwater runoff assuming no losses.

5.2.2 Ash Pond #2 and Ash Pond #3

The Ash Pond #2 contributing drainage area includes significant portions of the LOS site. Stormwater runoff from the majority of the site is routed to Ash Pond #2 through multiple stormwater drainage ditches and culverts surrounding the pond. The total contributing drainage area to Ash Pond #2 was estimated to be approximately 527 acres. The Ash Pond #3 drainage area is generally limited to the impoundment area (approximately 3.9 acres). Based

on these estimates, the total contributing drainage area to Ash Pond #2 and Ash Pond #3 is approximately 531 acres.

Under the current configuration, decant water in Ash Pond #2 is routed to Ash Pond #3 through a decant structure located through the interior separating dike. Ash Pond #3 is not provided with a spillway for maintaining the reservoir level or stormwater discharge; rather, the dam is equipped with a pump station that discharges excess water back to the plant where it is mixed with cooling water and returned to the Missouri River. Currently, Ash Pond #2 and Ash Pond #3 water levels are maintained at elevation (El.) 1,680.0, providing about 10.0 feet of freeboard and approximately 400 acre-feet of combined additional storage capacity. Once the Ash Pond #3 water level reaches the elevation of the weir in the decant structure in Ash Pond #2, flow will begin to equalize and storage from both ponds will be utilized.

Based on the 6-hour 30 percent PMP, Ash Pond #2 and Ash Pond #3 would receive approximately 283 acre-feet of stormwater runoff assuming no losses. Based on this inflow volume, storage from both ponds would be utilized. After flows are stabilized, the water elevation in the event of the 30 percent PMP would raise the water surface in the combined pool to about El. 1,687.1, providing about 2.9 feet of freeboard.

5.2.3 Determination of the PMF

Not applicable.

5.2.4 Freeboard Adequacy

Based on a very simplified evaluation using conservative assumptions, the freeboard appears to be adequate at Ash Pond #2 and Ash Pond #3.

5.2.5 Dam Break Analysis

Dam break analyses have not been performed for the three CCW impoundments at the LOS.

5.3 Spillway Rating Curves

Not applicable.

5.4 Evaluation

Based on the current facility operations and inflow design floods documents, the three CCW impoundments at the LOS appear to have adequate capacity to store the regulatory design floods without overtopping the dams based on the recommended hazard classifications for the dams. A hydrologic evaluation of the three CCW impoundments should be performed to determine the inflow design flood and the capacity of the impoundments to store the flood. This evaluation should also verify that the intake from the Coal Yard Drainage Ditch to Ash Pond #2 is adequately sized for the inflow design flood.

6.0 Geologic and Seismic Considerations

Boring logs taken by Braun Engineering Testing in 1990 at the LOS indicate that the predominant overburden soil consists of brown to gray clay, silty clay and fine sand. The borings extend to a maximum depth between 20 to 50 feet below the dam foundation, and bedrock was not encountered. Geologic information about the underlying bedrock in the area was not available.

We are not aware of any seismic analyses that have been performed on the dams at the LOS. Seismic information, as compiled during design and construction of the LOS Scrubbers, includes a maximum considered earthquake spectral response acceleration (0.2 second period) S_s=0.063g, maximum considered earthquake spectral response acceleration (1.0 second period) S_1=0.022g, and the plant site has been assigned to Site Class D. 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 0.025g with a 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2,500 years).

7.0 Instrumentation

7.1 Location and Type

There is no instrumentation at Ash Ponds #1 and #2. There is an ultrasonic water level indicator at the Recirculation Pump House Structure at Ash Pond #3. The water level sensor is installed at the pumphouse in Ash Pond #3 and triggers the pump based on maintaining 3 feet of suction head over the pump inlet. There are no records of water level readings from the water level sensor in the pumphouse.

7.2 Readings

7.2.1 Flow Rates

Flow rates are not recorded at the CCW impoundment.

7.2.2 Staff Gauges

There are no staff gages at the CCW impoundment.

7.3 Evaluation

There is no instrumentation at Ash Ponds #1 and #2. There is an ultrasonic water level indicator at Ash Pond #3. It would be beneficial to install staff gages and flow measurement devices to measure and record water levels in the ash ponds and flows into and out of the ash ponds, along with surveyed benchmarks, embankment settlement monuments and piezometers to measure and record any movement of the perimeter dikes and to tie measurements to a known vertical datum.

8.0 Field Assessment

8.1 General

A site visit to assess the condition of the CCW impoundments at the LOS was performed on September 21, 2010, by Steven R. Townsley, P.E., and Ken L. Hardesty, P.E. of GEI. Maria Barnhardt, Lyle Witham, Les Allery, Kim Rudningen, Mark Thompson and Kris Schmidt of Basin Electric, Steve Tillotson of NDDH, Jeff Berger and Dwight Comfort of the ND State Water Commission and Joe Byron of the EPA assisted in the assessment.

The weather during the site visit (September 21, 2010) was cloudy, with temperatures around 50 degrees Fahrenheit. The majority of 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 crest 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 slope of the three CCW impoundments is protected by either riprap, grassy vegetation or, in the case of the Ash Pond #3, a cellular concrete mat (CCM) system was installed along the upstream toe. The upstream slope protection appeared to be in satisfactory condition. No scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed during the inspection of the three CCW impoundments.

8.2.3 Downstream Slope

The downstream slopes of the three CCW showed no signs of scarps, sloughs, depressions or other indications of slope instability or signs of erosion during the inspection. The downstream slopes of Ash Pond #1 were generally exposed earth, with little or no vegetation or other erosion control measures. Ash Pond #2 contains grassy, vegetated downstream slopes. New construction was just completed on the perimeter embankment dikes of

Ash Pond # 3, therefore the embankment slopes are currently exposed earth with no erosion control measures.

8.3 Seepage and Stability

No evidence of ongoing seepage or potential seepage was observed at any of the three CCW impoundments.

8.4 Appurtenant Structures

8.4.1 Outlet Structures

All of the outlet structures identified in the three CCW impoundments appeared to be in good condition. Ash Pond #1 currently stores dry ash and any outlet structures that penetrate the perimeter embankment dikes have been decommissioned. The drain inlets located in the south and east perimeter dikes of Ash Pond #2 were not found during the site inspection. The outlet pipe and decant structure from Ash Pond #2 to Ash Pond #3 located in the northeast corner of Ash Pond #2 was observed to be working properly, decanting water into Ash Pond #3. There appeared to be adequate riprap protection around the decant overflow structure.

8.4.2 Pump Structures

The equipment in the pumphouse located on the west edge of Ash Pond #3 appeared to be working properly.

8.4.3 Emergency Spillway

There are no emergency spillways present at the three CCW impoundments.

8.4.4 Water Surface Elevations and Reservoir Discharge

Reservoir water surface elevations or discharge flow readings were not available. Based on visual observations, the reservoir freeboard during the site inspections was approximately 10 feet.

9.0 Structural Stability

9.1 Visual Observations

The assessment team saw no visible signs of instability associated with the interior or exterior dikes of the three impoundments during the September 21, 2010 site assessment.

9.2 Field Investigations

No structural stability field investigations have been performed on any of the three impoundments perimeter dikes.

10.0 Maintenance and Methods of Operation

10.1 Procedures

From 1982 to 2008, the NDDH performed periodic inspections of the impoundments. Bi-annual inspections of the three CCW impoundments began in 2008 and are documented by NDDH. A third-party inspection of the CCW impoundments was conducted by AECOM on August 4–5, 2009.

At the time of GEI's site specific assessment on September 21, 2010, visual, non-recorded inspections of the CWW impoundments are made once per shift by LOS plant operators, mostly for security reasons. Since GEI's site inspection, Basin Electric reports that a daily, recorded site inspection is made by plant operators and includes checks for seepage, sinkholes/sloughing, normal water level, and the water level elevation of Ash Pond #3.

10.2 Maintenance of Impoundments

Maintenance of the three CCW impoundments is performed by LOS staff under the guidance of LOS managers and engineers. Visual inspections of the three CCW impoundments were performed by AECOM on August 4–5, 2009. However, dam safety-related inspections have not been previously made by state or federal agencies.

10.3 Surveillance

The ash ponds and settling basins are patrolled once per shift by LOS operations personnel. Plant personnel are available at the power plant 24 hours a day, 365 days a year for emergencies that may arise.

11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

The dams and outlet works facilities associated with the CCW impoundments at the LOS were generally found to be in satisfactory condition. No visual signs of instability, movement or seepage were observed. The Ash Pond #1 north dike downstream slope in the Coal Yard Runoff Drainage Ditch has no erosion protection and shows signs of erosion from surface runoff. There are no signs of vegetation growing at or near the toe of the perimeter dikes.

11.1.2 Adequacy of Structural Stability

There are no records of a structural stability evaluation of the CCW impoundments.

11.1.3 Adequacy of Hydrologic/Hydraulic Safety

The three CCW impoundments currently appear to have adequate freeboard and storage capacity to safely store the 6-hour 30 percent PMP inflow design flood. The hydrologic capacity of the three CCW impoundments should be verified as part of a site flood study. This study should also verify the adequacy of the culverts to pass the design flood into the CCW impoundments. There is also no stage-storage curve associated with Ash Pond #2 or #3.

11.1.4 Adequacy of Instrumentation and Monitoring of Instrumentation

There is currently no instrumentation installed at the three CCW impoundments, except for an ultrasonic water level indicator in the Ash Pond #3 Recirculation Pump House Structure. Instrumentation and monitoring at the three CCW impoundments is considered inadequate. Water levels and flow measurement are estimated visually.

11.1.5 Adequacy of Maintenance and Surveillance

The three CCW impoundments at the LOS have fair maintenance and surveillance programs. The facilities are generally adequately maintained and routine surveillance is performed by LOS staff, however there are currently no staff members trained in dam safety inspections. There are currently no scheduled inspections by 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.

12.0 Recommendations

12.1 Corrective Measures and Analyses for the Structures

1. Ash Pond #1 north dike downstream slope in the Coal Yard Runoff Drainage Ditch has no erosion protection. Erosion protection should be installed along the slopes of the Coal Yard Runoff Drainage Ditch (Erosion Control mats, riprap, grassy vegetation, etc.).
2. A geotechnical exploration program should be performed to classify the embankment soils and the foundation soils. A geotechnical soils testing program should accompany the drilling program and should include index property tests along with strength tests. These test results would provide the necessary information to perform slope stability analysis on the CCW impoundments as is described below.
3. Slope stability analyses for the three CCW impoundments should be performed on the maximum section of each CCW impoundment with a phreatic surface representative of steady seepage with normal water surface conditions. CCW materials in the foundation of the dikes, if not specifically removed during construction, should be included in the stability analyses. For the dry ash storage in Ash Pond #1, the stability analyses should use loading conditions of dry ash and partially saturated ash. The slope stability analysis should be presented relative to the appropriate dam guidelines such as the Army Corps of Engineers, Bureau of Reclamation or the Federal Energy Regulatory Committee (FERC).
4. A liquefaction potential analysis should be conducted on the perimeter dikes and foundation soils for the three CCW impoundments.
5. A hydrologic analysis of the LOS site and the three CCW impoundments should be performed to verify the adequacy of the pond volumes to store the inflow design flood and that the intakes for the CCW impoundments are adequately sized for the design flood. As part of the hydrologic analysis, stage-storage curves should be developed to provide accurate pond volumes.

12.2 Corrective Measures Required for Instrumentation and Monitoring Procedures

Currently, there are no benchmarks located at the CCW impoundments which tie to a vertical datum. Benchmarks should be set and inverts of the operational outlet/inlet structures should be surveyed. Staff gages and flow measurement devices (weirs, flumes, etc.) should also be installed in both Ash Ponds #2 and #3 to allow for measurement and recording of water levels and discharge into and out of Ash Ponds #2 and #3. The staff gages should be set to the vertical datum used.

12.3 Corrective Measures Required for Maintenance and Surveillance Procedures

Currently, the three CCW impoundments are visually inspected bi-annually by NDDH staff. We recommend Basin Electric develop and document informal annual inspections of the ash ponds and settling basins by Basin Electric staff trained in dam safety evaluations, and include an inspection at a minimum of every 5 years by a third-party professional engineer with experience in dam safety evaluations. We also recommend a brief daily check inspection of the facilities and seepage areas be conducted by Basin Electric personnel.

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

None.

12.5 Summary

The following factors were the main considerations in determining the final rating of the three CCW impoundments at LOS.

- The perimeter dike at Ash Pond #1 is a significant-hazard structure based on federal and state classifications. Ash Pond #1 facilities are suitable for their current function as dry landfill storage.
- The dike at Ash Pond #2 is a significant-hazard structure based on federal and state classifications.
- The dike at Ash Pond #3 is a significant-hazard structure based on federal and state classifications.
- The three CCW impoundments were generally observed to be in good condition in the field assessment.
- There is minor erosion of the north dike of Ash Pond #1 and currently does not have erosion protection installed.
- There are no hydrologic analyses indicating the Ash Ponds can store the regulatory design flood without overtopping. There is also no stage-storage curve associated with the ponds or no accurate record of reservoir volumes.
- There is no stability analysis on record for the three CCW impoundments.
- There is currently no instrumentation in place for the three CCW impoundments. There is no method of accurately recording water levels, flow volumes or monitoring of perimeter dike performance (i.e. movement, settling, etc.).
- Maintenance, surveillance and operational procedures are considered fair.

12.6 Acknowledgement of Assessment

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

Management Unit	Rating
Ash Pond No. 1	Poor
Ash Pond No. 2	Poor
Ash Pond No. 3	Poor

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 September 21, 2010 (date)

Signature: Steven R. Townsley

COLORADO REGISTERED
STEVEN R. TOWNSLEY
27730
6-10-2011
PROFESSIONAL ENGINEER

List of Participants:

Steven R. Townsley, P.E.	Senior Project Engineer/Task Leader, GEI Consultants, Inc.
Ken L. Hardesty, P.E.	Project Engineer, GEI Consultants, Inc.
Maria Barnhardt, P.E.	Civil Engineer, Basin Electric
Lyle Witham	Manager Environmental Services, Basin Electric
Kris Schmidt	Operations Manager, Basin Electric
Kim Rudningen	Basin Electric
Les Allery	Basin Electric
Mark K. Thompson	Plant Manager, Basin Electric
Steven J. Tillotson	Assistant Director, North Dakota Department of Health
Dwight Comfort	North Dakota State Water Commission
Jeff Berger	North Dakota State Water Commission
Joe Byron	Environmental Protection Agency

13.0 References

Basin Electric North Dakota (2009). "CERCLA 104(e) Request for Information Response," prepared for U.S. Environmental Protection Agency, March 25, 2009.

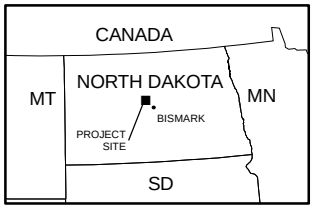
North Dakota State Water Commission, Dam Safety Division. North Dakota Dam Design Handbook, June 1985.

AECOM (2009). "Ash Pond Assessment and Inspection Report, Project No. 60101965", prepared for Basin Electric, August 2009.

Braun Engineering Testing (1990). Boring logs from the "Hydrogeologic Investigation Report", prepared for Basin Electric, 1990.

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

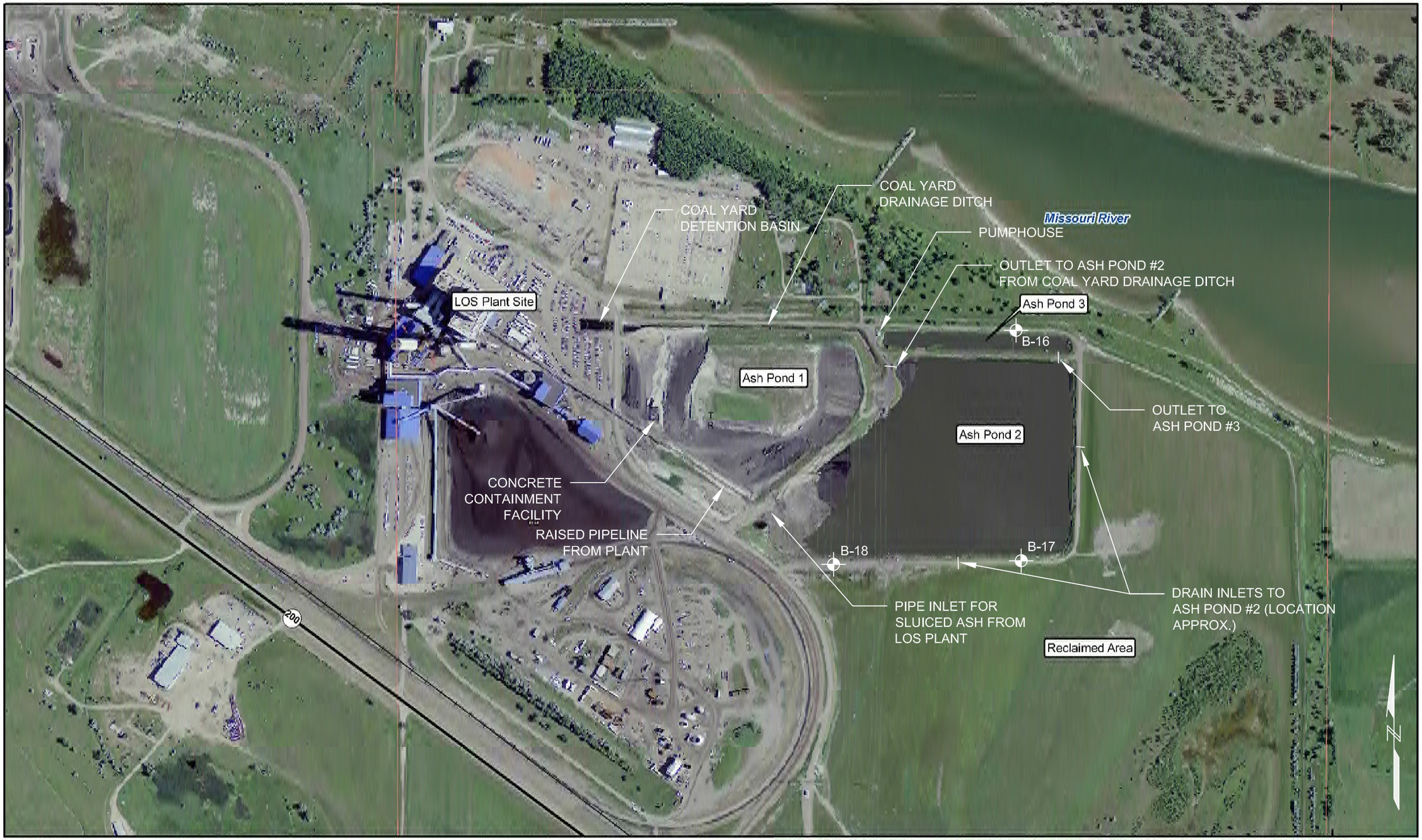
Figures



5 2.5 0 5 10 15
Miles

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Basin Electric Leland Olds Station	GEI Consultants	SITE VICINITY MAP
Environmental Protection Agency Washington, D.C.	Project 092883	June 2011 Figure 1

P:\092883 EPA - Leland Olds\Site Vicinity Map.mxd 10/10



Legend

Interstate
State Highway
US Highway
Railroads
PLSS Townships
PLSS Sections

B-16 APPROX. LOCATION OF BORINGS FROM BRAUN REPORT, 1990

NOTES:

1. AERIAL BASE MAP PROVIDED BY BASIN ELECTRIC. MAP IS SHOWN NOT TO SCALE.

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Basin Electric Leland Olds Station

Environmental Protection Agency
Washington, D.C.

GEI Consultants

Project 092883

SITE MAP

June 2011

Figure 2

P:\092883 EPA Ash Ponds\Leland Olds\ Site Map.dwg Jun 2011

Appendix A

Inspection Checklists

September 21, 2010

Site Name: **Leland Olds Station, Stanton, ND** Date: **September 21, 2010**

Unit Name: **Ash Pond #1** Operator's Name: **Basin Electric Power Coop.**

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

Inspector's Name: **Steve Townsley/Ken Hardesty**

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)?	N/A		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	1,700 ft (approximately)		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A		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)?	N/A	N/A	From underdrain?	N/A	
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?	N/A		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
3. 2 – 48 to 36-inch CMP's from ash pond 1 to ash pond 2 abandoned. Two 24-inch pipes collect drainage from concrete dewatering basin on west side of pond and discharge into north stormwater channel.	**3. Two CMP's are partially backfilled with low-strength flow fill concrete. 24-inch pipes still in operation.**
20. No water flowing during site inspection.	**20. Pipes appear clear.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ND-0025232 INSPECTOR Steve Townsley/Ken Hardesty

Date September 21, 2010

Impoundment Name Ash Pond #1

Impoundment Company Basin Electric Power Cooperative

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Ash Pond #1
(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 Washburn
Distance from the impoundment 16 miles
Impoundment Location:

Longitude	101	Degrees	19	Minutes	5.5	Seconds
Latitude	47	Degrees	16	Minutes	50.5	Seconds
State	ND	County	Mercer			

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

If So Which Sate Agency? North Dakota Dept of Health (Waste Management Permit #SP-038)

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.

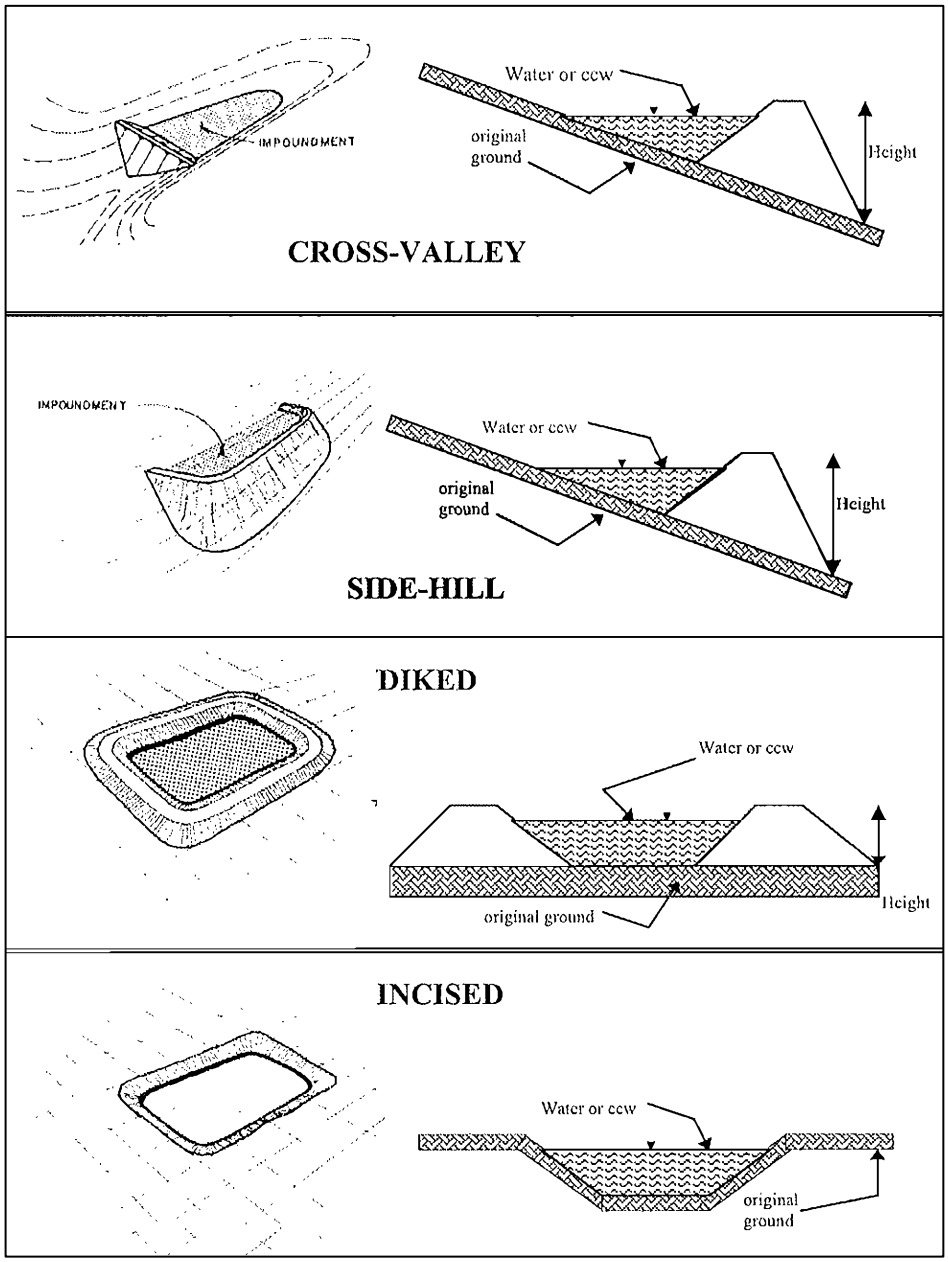
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

The embankments surrounding the impoundment have the potential to release coal combustion ash into the Missouri River causing environmental damage and losses.

CONFIGURATION:



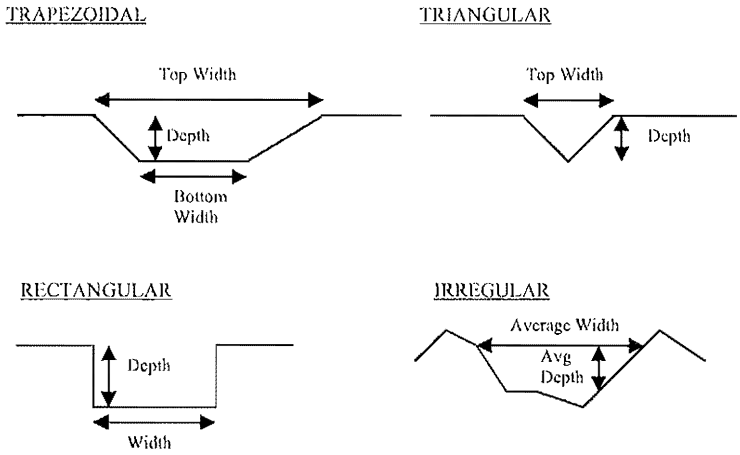
_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

Embankment Height __20__ feet Embankment Material _____Earth_____
Pool Area____N/A_____ acres Liner_____N/A_____
Current Freeboard __N/A__ feet Liner Permeability_____N/A_____

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

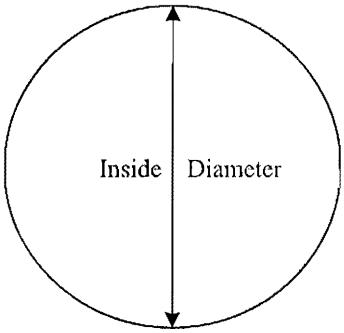
_____ Depth
_____ Bottom (or average) width
_____ Top width



X **Outlet**

24 in 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 N/A _____

_____

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: **Leland Olds Station, Stanton, ND** Date: **September 21, 2010**

Unit Name: **Ash Pond #2** Operator's Name: **Basin Electric Power Coop.**

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

Inspector's Name: **Steve Townsley/Ken Hardesty**

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)?	1,680 ft (approximately)		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	1,680 ft (approximately)		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	1,690 ft (approximately)		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A		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)?	N/A	N/A	From underdrain?	N/A	
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
7. North divider dike between Ash Pond #2 and Ash Pond #3 reconstructed in 2010.	**7. Upper 10' of dike reconstructed in 2010.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ND-0025232 INSPECTOR Steve Townsley/Ken Hardesty

Date September 21, 2010

Impoundment Name Ash Pond #2

Impoundment Company Basin Electric Power Cooperative

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Ash Pond #2
(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 Washburn
Distance from the impoundment 16 miles
Impoundment
Location:

Longitude	101	Degrees	19	Minutes	5.5	Seconds
Latitude	47	Degrees	16	Minutes	50.5	Seconds
State	ND	County	Mercer			

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

If So Which Sate Agency? North Dakota Dept of Health (Waste Management Permit #SP-038)

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.

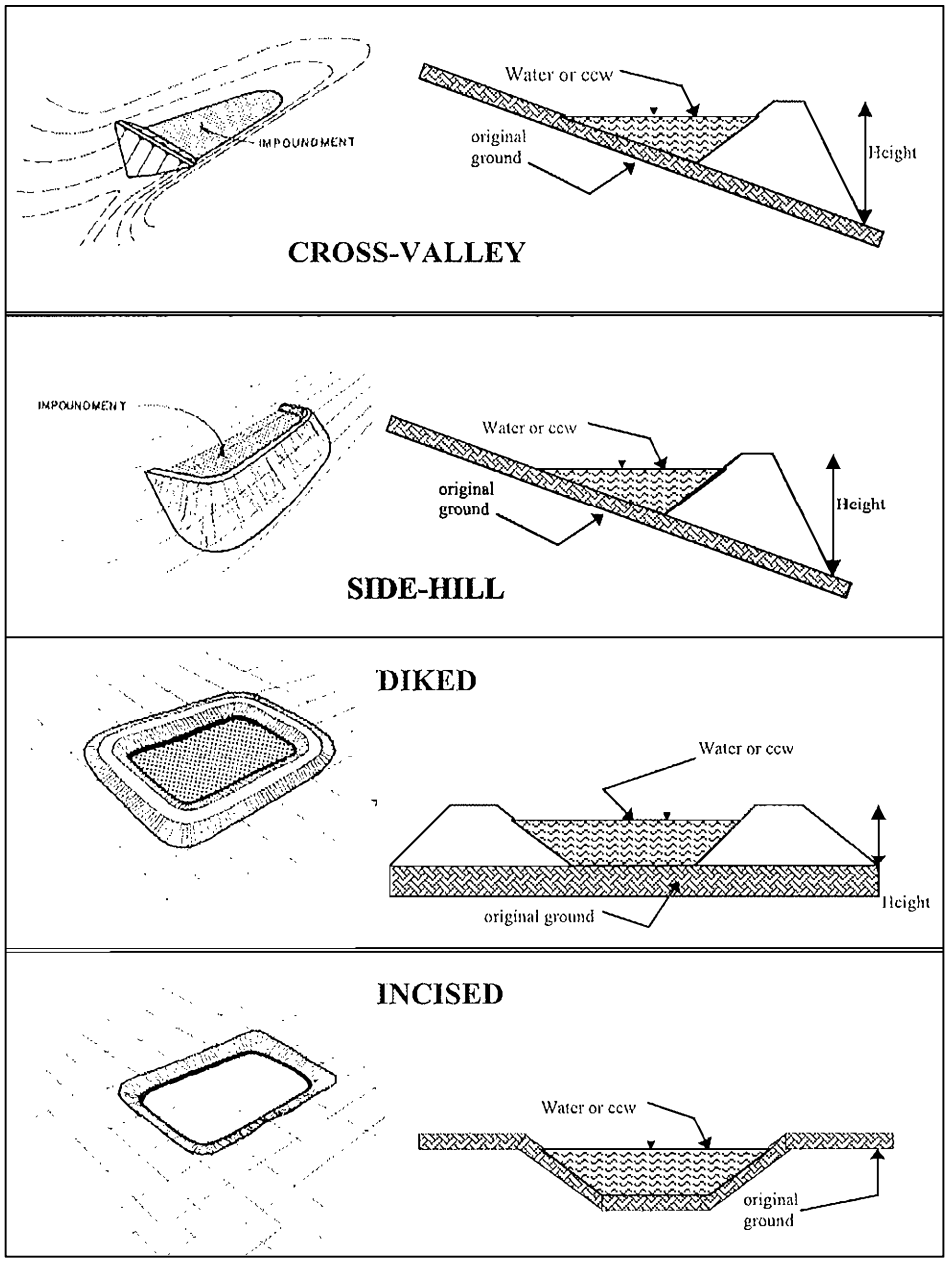
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

The embankments surrounding the impoundment have the potential to release coal combustion ash into the Missouri River causing environmental damage and losses.

CONFIGURATION:



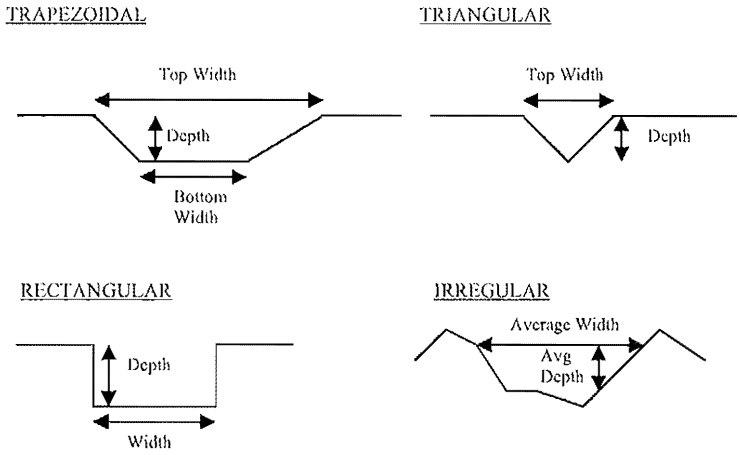
_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

Embankment Height __19__ feet Embankment Material _____Earth_____
Pool Area____38_____ acres Liner_____N/A_____
Current Freeboard __10__ feet Liner Permeability_____N/A_____

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

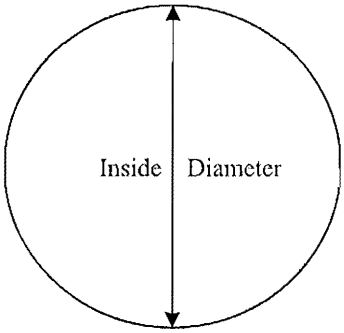
_____ Depth
_____ Bottom (or average) width
_____ Top width



X **Outlet**

48 in inside diameter

Material
X corrugated metal
_____ welded steel
_____ 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 N/A _____

_____

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: **Leland Olds Station, Stanton, ND** Date: **September 21, 2010**

Unit Name: **Ash Pond #3** Operator's Name: **Basin Electric Power Coop.**

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

Inspector's Name: **Steve Townsley/Ken Hardesty**

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)?	1,680 ft (approximately)		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	1,690 ft (approximately)		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
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)?	N/A	N/A	From underdrain?	N/A	
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?	N/A		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?	N/A		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
3. Decant pipe abandoned.	**3. Pump station pumps decant water back to power station for mixing prior to discharging into Missouri River.**
7. North, south and east dikes of Ash Pond #3 reconstructed in 2010.	**7. Upper 10' of north, south and east dikes reconstructed in 2010.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ND-0025232 INSPECTOR Steve Townsley/Ken Hardesty

Date September 21, 2010

Impoundment Name Ash Pond #3

Impoundment Company Basin Electric Power Cooperative

EPA Region 8

State Agency (Field Office) Address 1595 Wynkoop St

Denver, CO 80202

Name of Impoundment Ash Pond #3
(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 Washburn
Distance from the impoundment 16 miles
Impoundment
Location:

Longitude	101	Degrees	19	Minutes	5.5	Seconds
Latitude	47	Degrees	16	Minutes	50.5	Seconds
State	ND	County	Mercer			

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

If So Which Sate Agency? North Dakota Dept of Health (Waste Management Permit #SP-038)

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.

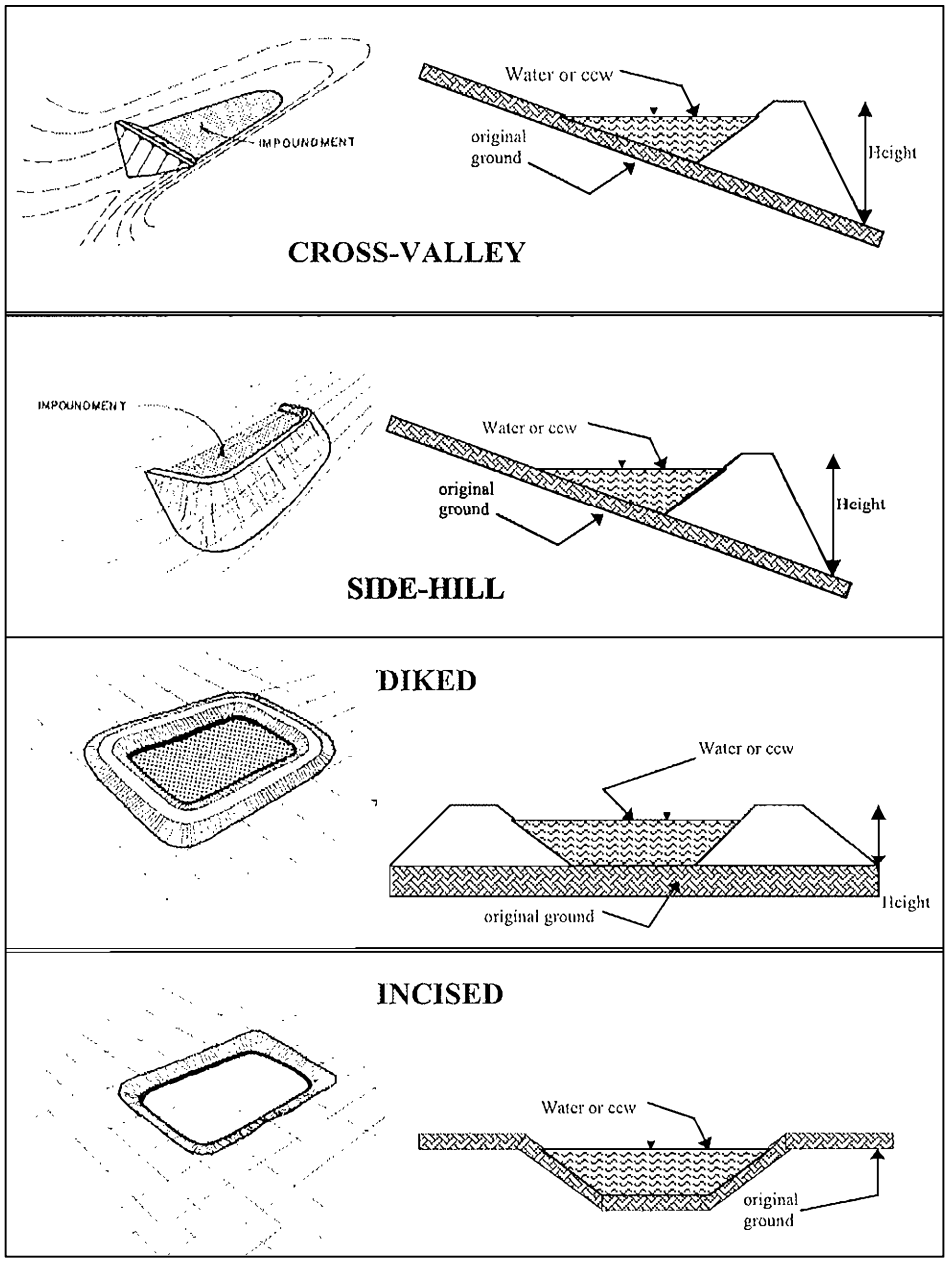
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

The embankments surrounding the impoundment have the potential to release coal combustion ash into the Missouri River causing environmental damage and losses.

CONFIGURATION:



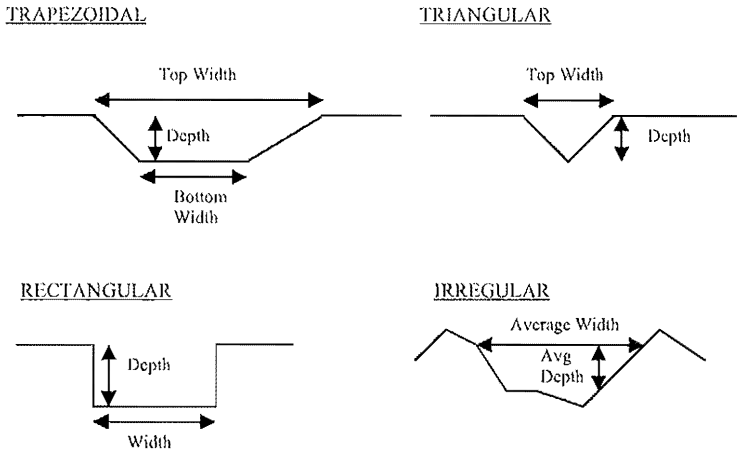
_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

Embankment Height __18__ feet Embankment Material _____Earth_____
Pool Area____3_____ acres Liner_____N/A_____
Current Freeboard __10__ feet Liner Permeability_____N/A_____

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

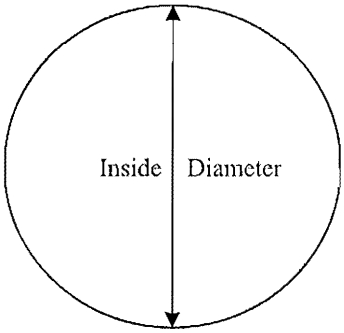
_____ Depth
_____ Bottom (or average) width
_____ Top width



X **Outlet**

N/A inside diameter

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



Is water flowing through the outlet? YES X NO_____

_____ **No Outlet**

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

The Impoundment was Designed By N/A _____

_____

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

September 21, 2010

Photo 1: Coal Yard Stormwater Detention Pond, showing gates leading to Drainage Ditch.

Photo 2: Coal Yard Drainage Ditch showing north dike of Ash Pond #1 dry ash storage on left.

Photo 3: Ash Pond #1: Concrete containment structure for saleable dry ash.

Photo 4: Ash Pond #2: Elevated pipes sluicing ash and water from plant into pond.

Photo 5: Ash Pond #2 – View of south perimeter dike looking east.

Photo 6: Ash Pond #2 – Grassy vegetation and riprap in southeast corner of pond.

Photo 7: Ash Pond #2 – New riprap placed in northeast corner of pond.

Photo 8: Ash Pond #2 – New riprap along north dike between Ash Ponds #2 and #3. Ash Pond #3 is shown on the right.

Photo 9: Ash Pond #2 – Decant structure on outlet pipe to Ash Pond #3.

Photo 10: Ash Pond #2 – Outlet from Coal Yard Drainage Ditch to Ash Pond #2, showing drainage ditch in foreground.

Photo 11: Ash Pond #2 – Outlet from Coal Yard Drainage Ditch to Ash Pond #2, showing northwest corner of Ash Pond #2.

Photo 12: Ash Pond #3 – Outlet pipe from Ash Pond #2.

Photo 13: Ash Pond #3 – Cellular concrete mats installed at the upstream toe of the pond.

Photo 14: Ash Pond #3 – Re-graded perimeter dike at northeast corner of pond, showing Missouri River in background.

Photo 15: Ash Pond #3 – Pumphouse at the west edge of Ash Pond #3.

Photo 16: Ash Pond #3 – Decommissioned riser in northwest corner of pond, adjacent to pumphouse.

Appendix C

Reply to Request for Information Under Section 104(e)

BASIN ELECTRIC POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE: 701-223-0441
FAX: 701-557-5336

March 25, 2009

OVERNIGHT MAIL

Mr. Richard Kinch
US 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:

This letter is in response to the letter dated March 9, 2009, from Barry N. Breen, Acting Assistant Administrator of the U.S. Environmental Protection Agency (EPA) to the Plant Manager of the Leland Olds Station (LOS), Stanton, North Dakota. The March 9, 2009 EPA letter was received by LOS on March 13, 2009.

The Leland Olds Station (LOS) is owned and operated by Basin Electric Power Cooperative (Basin Electric) and consists of two coal-based electrical generation units. Unit 1 became operational in January 1966; Unit 2 became operational in December 1975.

LOS uses primarily lignite coal with some sub-bituminous coal to fuel its two units. Two kinds of ash are produced. The fly ash that is produced is collected from the flue gas in the electrostatic precipitators. The bottom ash that is created settles to the bottom of the boiler.

The bottom ash disposal facility is permitted under permit SP-038 which is issued by the North Dakota Health Department, Waste Management Division. A separate discharge permit has been issued to the Leland Olds Station by the North Dakota Health Department, Water Quality Division under permit number NDPDES ND-0025232.

LOS uses three management units to settle out and recover bottom ash. The management units are not lined with engineered clay or synthetic materials. Other than natural precipitation, inflows to the ponds are controlled by pumps operated by plant employees. Bottom ash from both generating units is sluiced in water and transported via pipe from the plant to Pond #1 and #2. Pond #1 is near capacity and the majority of the area will be reclaimed. An area on the west side of Pond #1 will remain active and be used for storage of bottom ash sold for beneficial use. Bottom ash sluiced to Pond #2 settles out and water flows into Pond #3. Water is piped back to the plant where it is mixed with cooling water and returned to the Missouri River. The #2 settling pond was cleaned and re-graded for use in 1995.

The Plant Manager of the LOS is Mr. Mark Thompson who reports to me as the Vice President of Operations for Basin Electric. Enclosed are the specific responses to the Enclosure of the March 9, 2009 EPA letter to the LOS Plant Manager. If you have any further questions, please advise.

Sincerely,

Robert W. Holzwarth
V.P. Plant Operations

/gmj
Enclosures
cc: Ron Harper (w/enc.)
Dave Glatt (w/enc.)

CERTIFICATION

By

Authorized Representative

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.

Robert W. Holzwarth

Name: ROBERT W. HOLZWARTH
Title: V.P. PLANT OPERATIONS

Leland Olds Station (LOS) responses to the Enclosure of the March 9, 2009 EPA letter.

Question 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 does not have a rating, please note that fact.**

Response 1 The Leland Olds Station management units do not have an official rating that has been assigned by a state or federal regulatory agency. The LOS management units are regulated under North Dakota Department of Health Waste Management Permit SP-038. The North Dakota Department of Health, Waste Management Division inspects the management units annually. The North Dakota Department of Health, Water Quality Division also inspects the ponds that are discharge points under the approved discharge permit.

Question 2 **What year was each management unit commissioned and expanded?**

Response 2 Exact commissioning dates are unknown. Settling pond #1 was commissioned in the late 1960s. Settling pond #2 was commissioned in the mid 1970s. Settling pond #3 was commissioned between 1974 and 1976. In 1995, settling pond #2 was cleaned and re-graded for use again.

Question 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).**

Response 3 The LOS management units are permitted to accept bottom ash, Unit 2 economizer ash, Unit 2 air heater ash and Unit 1 inside hopper ash. The bottom ash fraction amounts to 90% of the waste stream going out to the disposal area.

Question 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 unit(s) under the supervision of a Professional Engineer?**

Response 4 Due to the age of LOS, documentation regarding the design and construction of the waste management units are unavailable. The inspection and monitoring of the safety of the waste management units are not under the supervision of a Professional Engineer.

Question 5 **When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(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?

Response 5 The management units at LOS have not been assessed or evaluated for safety (i.e., structural integrity) by Basin Electric. In approximately 1977, level indicators were installed in settling pond #3 to maintain a more constant level within the pond. Basin Electric plans to complete a structural integrity assessment of these management units by a Professional Engineer in 2009 and every five (5) years thereafter.

Question 6 When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(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.

Response 6 The management units at LOS have not been assessed or evaluated for safety (i.e., structural integrity) by a State or Federal regulatory official. In approximately 1977, level indicators were installed in settling pond #3 to maintain a more constant level within the pond.

Question 7 Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issues(s) with the management unit(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.

Response 7 No safety issues have been identified with any of the management units at LOS. Please see "Response 7 Attachment 1".

Question 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.

Response 8 The surface area of settling pond #1 is 27.1 acres. The surface area of settling pond #2 is 38.2 acres. The surface area of settling pond #3 is 3.1 acres. The management units have never been surveyed. Therefore, the current volume of materials cannot be measured. However, the maximum volume that settling pond #1 can hold is believed to be 1,200,000 cubic yards; the maximum volume that settling pond #2 can hold is believed to be 1,490,000 cubic yards; and the maximum volume that settling pond #3 can contain is believed to be 20,000 cubic yards. The maximum height of settling pond #1 is 35 feet. The maximum height of settling pond #2 is 19 feet. The maximum height of settling pond #3 is 18 feet.

Question 9 **Please provide a brief history of known spills or unpermitted releases from the unit within the last 10 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).**

Response 9 There have been no known spills or unpermitted releases from ponds #1 or #2 of the management units within the last 10 years. Pond #3 had an oil and grease exceedance in May, 2000. That exceedence was due to servicing of a pump and not related to the waste management role of the facility.

Question 10 **Please identify all current legal owner(s) and operator(s) of the facility.**

Response 10 The facility is owned and operated by Basin Electric Power Cooperative.