FINAL REPORT
ROUND 10 DAM ASSESSMENT
XCEL ENERGY – BAY FRONT GENERATING STATION
SURGE BASIN, POLISHING BASIN
ASHLAND, WISCONSIN
DECEMBER 31, 2012

PREPARED FOR:

U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

PREPARED BY:

GZA GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, Ma 02062
GZA File No. 01.0170142.30

GZA
GeoEnvironmental, Inc.

Engineers and
Scientists

December 31, 2012
GZA File No. 170142.30

Mr. Stephen Hoffman
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: FINAL Assessment of Dam Safety of Coal Combustion Surface Impoundments at the Bay Front Generating Station

Dear Mr. Hoffman,

One Edgewater Drive
Norwood,
Massachusetts 02062
Phone: 781-278-3700
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In accordance with our proposal 01.P0000177.11 dated March 28, 2011, and U.S. Environmental Protection Agency (EPA) Contract No. EP10W001313, Order No. EP-B115-00049, GZA GeoEnvironmental, Inc. (GZA) has completed our assessment of the Bay Front Generating Station Coal Combustion Waste (CCW) Impoundments located in Ashland, Wisconsin. The site visit was conducted on June 14, 2011. The purpose of our efforts was to provide the EPA with a site specific assessment of the impoundments to assist EPA in assessing the structural stability of the impoundments under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e). We are submitting one hard copy and one CD-ROM copy of this Final Report directly to the EPA.

Based on our visual assessment, and in accordance with the EPA's criteria, the Surge Basin and Polishing Basin are currently in SATISFACTORY condition in our opinion. Further discussion of our evaluation and recommended actions are presented in the Task 3 Dam Assessment Report. The report includes: (a) a completed Coal Combustion Dam Assessment Checklist Form for each Basin; (b) a field sketch; and (c) selected photographs with captions. Our services and report are subject to the Limitations found in **Appendix A** and the Terms and Conditions of our contract agreement.

We are happy to have been able to assist you with this assessment and appreciate the opportunity to continue to provide you with dam engineering consulting services. Please contact the undersigned if you have any questions or comments regarding the content of this Task 3 Dam Assessment Report.

Sincerely,
GZA GeoEnvironmental, Inc.

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PREFACE

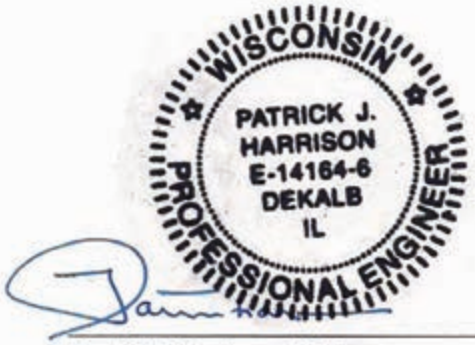
The assessment of the general condition of the dams/impoundment structures reported herein was based upon available data and a visual assessment. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dams and/or impoundment structures was based on observations of field conditions at the time of assessment, along with data available to the assessment team. In cases where an impoundment is lowered or drained prior to assessment, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam and/or impoundment structures depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the reported condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Prepared by:

GZA GeoEnvironmental, Inc.



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EXECUTIVE SUMMARY

This Assessment Report presents the results of a visual assessment of the Xcel Energy (Xcel) – Bay Front Generating Station (BFGS) Coal Combustion Waste (CCW) Impoundments located at 122 North 14th Avenue West, Ashland, Wisconsin. These assessments were performed on June 14, 2011 by representatives of GZA GeoEnvironmental, Inc (GZA), accompanied by representatives of Xcel.

The BFGS power plant currently has three coal fired boiler and turbine units with a current generating capacity of approximately 74 Megawatts (MW). Commercial operation of the facility began in the 1916 with small second hand boilers and turbines. Additions over the next forty (40) years increased the number of plant units to five boilers and six turbines for a generating capacity of 92 MW. The plant was renovated in 1986 to its present configuration and current generating capacity. The Surge and Polishing Basins at the Site are embankment structures consisting of bottom ash fill that was placed and compacted with engineering oversight that were designed and constructed in 1976. The basins were built as an industrial wastewater treatment facility to clarify residual amounts of CCW combustion byproducts, including slag fines, from the BFGS water prior to discharge into Lake Superior. Fly ash and bottom ash produced at the BFGS are managed in silos and a dewatering bin respectively, and trucked off-site for beneficial re-use.

For the purposes of this EPA-mandated assessment, the size of the impoundments was based on U. S. Army Corps of Engineers (COE) criteria. Based on the maximum structural height of 9.5 feet and a storage volume of approximately 1.4 acre-feet, the Surge Basin is classified as a **Small**-sized structure. Based on the maximum structural height of 7.5 feet and a storage volume of approximately 3.1 acre-feet, the Polishing Basin is classified as a **Small**-sized structure. According to guidelines established by the COE, dams with a storage volume less than 1,000 acre-feet and/or a height less than 40 feet are classified as Small-sized structures.

Under the EPA classification system, as presented on page 2 of the EPA check list (**Appendix C**) and Definitions section (**Appendix B**), it is GZA's opinion that the Surge and Polishing Basins would be considered as having a **Less than Low** hazard potential. The hazard potential rating is based on no probable loss of human life due to failure and the low potential for environmental impacts outside of Utility-owned property.

Assessments

In general, the overall condition of the Surge Basin was judged to be SATISFACTORY and was found to have the following deficiencies:

1. Localized (small diameter) animal burrows along the upstream slope;
2. Minor to moderate erosion on portions of the upstream slope (presumably from wave action);
3. Minor erosion at the downstream toe;

Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above three items have been addressed which satisfies our recommendation. No further action is recommended at this time.

4. Incomplete documentation for the hydrologic/hydraulic analysis; and, no stability analysis for seismic loading conditions.

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time.

In general, the overall condition of Polishing Basin was judged to be SATISFACTORY and was found to have the following deficiencies:

1. Localized (small diameter) animal burrows along the crest;
2. Minor to moderate erosion along portions of the upstream slope (presumably from wave action);

   Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above two items have been addressed which satisfies our recommendation. No further action is recommended at this time.

3. Incomplete documentation for the hydrologic/hydraulic analysis; and, no stability analysis for seismic loading conditions.

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time

The following sections describe the recommended approach to address current deficiencies. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of permits needs to be determined for activities that may occur within the jurisdiction of the appropriate regulatory agencies.

Studies and Analyses

GZA recommends the following studies and analyses:

1. Perform a stability analysis of the impoundments under seismic loading; and,

2. Update the hydrologic/hydraulic analysis for the impoundments to document the adequacy of the impoundments to accommodate the 100-year, 24-hour event.

   Additional analysis was completed for these recommendations and provided to GZA after issuance of the DRAFT report that satisfies our recommendations. No further analysis is recommended at this time

Recurrent Operation & Maintenance Recommendations

GZA recommends the following operation and maintenance level activities:

1. Repair erosion on the downstream slope of the Surge Basin;

2. Fill currently observed animal burrows by injecting grout under low to moderate pressures to ensure the entire limits of the respective burrow is adequately filled;

3. Repair observed erosion on the upstream slopes of the Surge and Polishing Basins;

4. Monitor decant outflow structures and clear silt or debris which may block or impede outflow; and,

5. Take measures as necessary so as to maintain operability and function of the various impoundment water level control mechanisms.

   Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above five items have been addressed which satisfies our recommendation. No further action is recommended at this time.

Remedial Measures Recommendations

1. In conjunction with the results of the hydrologic and hydraulic analyses, make provisions for an emergency overflow spillway(s) if required; and,

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time

2. In conjunction with the results of the stability analyses, make provisions to address deficiencies if required/as necessary.

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time

SURGE BASIN AND POLISING BASIN
XCEL ENERGY, BAY FRONT GENERATING STATION
ASHLAND, WISCONSIN

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1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority

The United States Environmental Protection Agency (EPA) has retained GZA GeoEnvironmental, Inc. (GZA) to perform a visual assessment and develop a report of conditions for Xcel Energy (Xcel, Owner) Bay Front Generating Station (BFGS, Site) Coal Combustion Waste (CCW) Impoundments in Ashland County, Wisconsin. This assessment was authorized by the EPA under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Section 104(e). This assessment and report were performed in accordance with Request for Quote (RFQ) RFQ-DC-16, dated March 16, 2011, and EPA Contract No. EP10W001313, Order No. EP-B11S-00049. The assessment generally conformed to the requirements of the Federal Guidelines for Dam Safety[1] and this report is subject to the limitations provided in **Appendix A** and the Terms and Conditions of our Contract Agreement.

1.1.2 Purpose of Work

The purpose of this investigation was to visually assess and evaluate the condition of the impoundments and appurtenant structures (the management unit[s]) to attempt to identify conditions that may adversely affect their structural stability and functionality, to note the extent of any deterioration that may be observed, review the status of maintenance and needed repairs and to evaluate the conformity with current design and construction standards of care.

The investigation was divided into five parts: 1) obtain and review available reports, investigations and data from the Owner pertaining to the impoundment and appurtenant structures; 2) perform a review with the Owner of available design, inspection and maintenance data and procedures for the management unit(s); 3) perform a visual assessment of the Site; 4) prepare and submit a field assessment checklist; and 5) prepare and submit a draft and final report presenting the evaluation of the structure(s), including recommendations and proposed remedial actions.

1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in **Appendix B**. Many of these terms may be included in this report. The terms are presented under common categories associated with dams, which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; 5) general; and 6) condition rating.

1.2 Description of Project

1.2.1 Location

The BFGS is located at 122 North 14th Avenue West in the City of Ashland, Wisconsin. The main entrance to the Site is located near the intersection of Lake Shore Drive W with

[1] FEMA/ICODS, April 2004: http://www.ferc.gov/industries/hydropower/safety/guidelines/fema-93.pdf.

11th Avenue West and the CCW impoundments are located on the western end of the Site approximately 650 feet southwest of the power plant at approximately latitude 46˚ 35' 14" North and longitude 90˚ 54' 08" West. A Site locus of the impoundments and surrounding area is shown on **Figure 1**. An aerial photograph of the impoundments and surrounding area is provided as **Figure 2**. The impoundments can be accessed by vehicles from access roads from the power plant.

1.2.2 Owner/Caretaker

The CCW impoundments are owned by Xcel and are operated by the BFGS.

	Dam Owner/Caretaker
Name	Xcel Energy, Bay Front Generating Station
Mailing Address	122 North 14th Avenue West
City, State, Zip	Ashland, Wisconsin 54806
Contact	David Fulweber
Title	Plant Manager
E-Mail	David.fulweber@xcelenergy.com
Daytime Phone	715-682-7200
Emergency Phone	911

1.2.3 Purpose of the Impoundments

The BFGS power plant currently has three coal fired boiler and turbine units with a current generating capacity of approximately 74 Megawatts (MW). Commercial operation of the facility began in the 1916 with small second hand boilers and turbines. Additions over the next forty (40) years increased the number of plant units to five boilers and six turbines for a generating capacity of 92 MW. The plant was renovated in 1986 to its present configuration and current generating capacity. The Surge and Polishing Basins at the Site are embankment structures consisting of bottom ash fill that was placed and compacted with engineering oversight that were designed and constructed in 1976. The basins were built as an industrial wastewater treatment facility to clarify residual amounts of CCW combustion byproducts, including slag fines, from the BFGS process water prior to discharge into Lake Superior. Fly ash and bottom ash produced at the BFGS are managed in silos and a dewatering bin respectively, and trucked off-site for beneficial re-use.

Slag generated by the BFGS is first sent to the slag dewatering bin where it is separated out before process water is discharged into the surge basin. The Surge Basin receives process water from the slag dewatering bin including residual amounts of slag fines through a sluice transport pipe. Solids are allowed to settle in the Surge Basin and decant water is discharged into the Polishing Basin. Slag fines that do not settle out in the surge basin are removed during routine cleaning events and recycled for beneficial re-use. Decanted water from the Polishing Basin is subsequently discharged into Lake Superior as authorized by a Wisconsin Pollutant Discharge Elimination System permit (WPDES).

1.2.4 Description of the Surge Basin and Appurtenances

The Surge Basin was designed Barr Engineering (Barr) in 1976. Barr also analyzed the impoundments in 1992 for compliance to revisions in Chapter NR 213 of the Wisconsin Administrative Code for industrial lagoon and storage structure requirements. The following description of the impoundment is based on information provided in the Barr design drawings, project specifications and studies, information received from Xcel and observations made by GZA during our Site visit.

The Surge Basin is located southwest of the BFGS as shown on **Figure 2**. This impoundment was commissioned in 1976, and functions as a settling basin for process water received from the dewatering bins. Slag fines that do not settle out in the surge basin are removed during routine cleaning events and recycled for beneficial re-use. The process water primarily includes plant water discharges and residual amounts of CCW's. The process water is transported through piping from the plant to the Surge Basin intake structure and then into the Surge Basin through three 12-inch diameter steel pipes which are embedded in the east embankment. Decanted water from the Surge Basin is discharged into the Polishing Basin through a flow control structure which is located along the northwest embankment of the Surge Basin. The flow control structure design uses an orifice to moderate the discharge flow from the Surge Basin into the Polishing Basin. The orifice was designed to maintain the water level in the Surge Basin within one-half foot of the design operating level while minimizing variations in the discharge into the Polishing Basin. If the flow of process water is less than the design discharge to the Surge Basin, the flow into the Polishing Basin is maintained by the constant overflow. If the flow of process water is more than the design discharge to the Surge Basin, the flow control will discharge over the top of the weir in the structure which prevents overtopping of the Surge Basin embankments. The approximate location of the Surge Basin inlet and outlet structures are shown on **Figure 2**.

The Surge Basin consists of bottom ash fill embankments (placed/compacted in a controlled manner) with a crest length of approximately 540 feet, a structural height (from the lowest downstream toe elevation to the crest of the impoundment) of approximately 9.5 feet, and a corresponding crest elevation of approximately 613.5 feet MSL. The embankments were designed and constructed with 3-foot horizontal to one-foot vertical (3H: 1V) upstream and downstream slopes consisting of compacted bottom ash fill (designated as granular fill on the design drawings). There was no evidence that the basin was built over wet ash or slag. The embankments were constructed on native and/or prepared subgrade (i.e. compacted bottom ash fill) soils. Within the exterior embankments, a liner consisting of a 2 foot layer of compacted clay ("impervious blanket") was placed over the base of the basin and extended along the upstream slopes to form an "impervious core" approximately 10 feet from upstream face. The southwestern embankment of the Surge Basin is common to the Polishing Basin and does not have this compacted clay core. A plan view of the impoundment design is provided on **Figure 4.** Typical sections of the embankments and other design details are provided on **Figures 5, 6 and 7**.

No instrumentation is present in the area of the Surge Basin.

1.2.5 Description of the Polishing Basin and Appurtenances

The Polishing Basin was designed Barr Engineering (Barr) in 1976. Barr also analyzed the impoundments in 1992 for compliance to revisions in Chapter NR 213 of the Wisconsin

Administrative Code for industrial lagoon and storage structure requirements. The following description of the impoundment is based on information provided in the Barr design drawings, project specifications and studies, information received from Xcel and observations made by GZA during our Site visit.

The Polishing Basin is located southwest of the BFGS and the Surge Basin as shown on **Figure 2**. This impoundment was commissioned in 1976, and receives process water and residual quantities of slag fines at a controlled rate from the Surge Basin outlet structure. Decant water and unsettled slag fines enter the Polishing Basin from the Surge Basin flow control structure through three 12-inch diameter steel discharge pipes which are located near the northern corner of the basin and are embedded in the northwest embankment. The Polishing basin is divided for ¾ths of its length by a "training dike" which increases the effluent detention time. Decanted water from the Polishing Basin flows into a concrete decant structure which is located on the northwestern embankment of the impoundment and then into the water quality monitoring structure. Water from the quality monitoring structure discharges through a 12-inch diameter steel pipe into Lake Superior. The approximate location of the discharge pipes and decant structure in the Polishing Basin are shown on **Figure 3**.

Similar to the Surge Basin, the Polishing Basin consists of bottom ash fill embankments (placed/compacted in a controlled manner) with a crest length of approximately 684 feet, a structural height (from the lowest downstream toe elevation to the crest of the impoundment) of approximately 7.5 feet, and a corresponding crest elevation of approximately 611.5 feet MSL. The embankments were constructed with 3H:1V upstream and downstream slopes consisting of a compacted bottom ash (designated as granular fill on the design drawings). The embankments were constructed on native and/or prepared subgrade (i.e. compacted bottom ash fill) soils. There was no evidence that the basin was built over wet ash or slag. Within the exterior embankments, a liner consisting of a 2 foot layer of compacted clay ("impervious blanket") was placed over the base of the basin and extended along the upstream slopes to form an "impervious core" approximately 10 feet from upstream face. The northeastern embankment of the Polishing Basin is common to the Surge Basin and does not have this compacted clay core. A plan view of the impoundment design is provided on **Figure 4.** Typical sections of the embankments and other design details are provided on **Figures 5, 6 and 7**.

No instrumentation is present in the area of the Polishing Basin.

1.2.6 Operations and Maintenance

The BFGS and the impoundments are maintained by Xcel Energy personnel. Maintenance of the BFGS facility, including the impoundments, is regulated under the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0002887-06-0. BFGS personnel perform routine visual and formal annual inspections of the impoundments. Copies of the annual inspection reports for the period of November 25, 1997 through August 17, 2010 were provided to GZA for review. Other maintenance performed on the impoundments by BFGS personnel includes cleaning the basins, repair of slope erosion, grass mowing, repair of animal burrows, and maintenance of the monitoring building equipment.

1.2.7 Size Classification

For the purposes of this EPA-mandated assessment, the size of the impoundments was based on U. S. Army Corps of Engineers (COE) criteria. Based on the maximum structural height of 9.5 feet and a storage volume of approximately 1.4 acre-feet, the Surge Basin is classified as a **Small**-sized structure. Based on the maximum structural height of 7.5 feet and a storage volume of approximately 3.1 acre-feet, the Polishing Basin is classified as a **Small**-sized structure. According to guidelines established by the COE, dams with a storage volume less than 1,000 acre-feet and/or a height less than 40 feet are classified as Small-sized structures.

1.2.8 Hazard Potential Classification

Under the EPA classification system, as presented on page 2 of the EPA check list (**Appendix C**) and Definitions section (**Appendix B**), it is GZA's opinion that the Surge and Polishing Basins would be considered as having a **Less Than Low** hazard potential. The hazard potential rating is based on no probable loss of human life due to failure and the low potential for environmental impacts outside of Utility-owned property. The impoundments are not regulated as dams by the State of Wisconsin.

1.3 Pertinent Engineering Data

1.3.1 Drainage Area

The Surge and Polishing Basins are elevated relative to the surrounding area and have no appreciable drainage areas.

1.3.2 Reservoir

Based on information provided by Xcel, the Surge and Polishing Basins have surface areas of 0.15 and 0.41 acres at the normal operating levels. The pool areas observed on GZA's June 14, 2011 Site visit were generally consistent with those reported by Xcel. The storage volumes at normal operating levels of the Surge and Polishing Basins are approximately 1.4 and 3.1 acre-feet, respectively.

1.3.3 Discharges at the Impoundment Sites

As discussed previously, water from the Surge Basin discharges into the Polishing Basin and then into Lake Superior as authorized in the BFGS WPDES permit. Average rate of discharge flow is generally 0.4 million gallons per day (MGD) under normal operating conditions.

1.3.4 General Elevations (feet – MSL)

Elevations were taken from design drawings and data provided by Xcel. Unless otherwise noted, elevations were based on the United States Geological Survey (USGS) topographic map MSL vertical datum.

Surge Basin

A. Crest of Embankment	± 613.5 feet
B. Upstream Water at Time of Assessment	± 609.3 feet
C. Downstream Water at Time of Assessment	± 608.5 feet[2] (Polishing Basin)
D. Maximum Basin Water Elevation	± 610.7 feet

Polishing Basin

A. Crest of Embankment (Minimum)	± 611.5 feet
B. Upstream Water at Time of Assessment	± 608.6 feet
C. Downstream Water at Time of Assessment	± Not Applicable[3]
D. Maximum Basin Water Elevation	± 608.6 feet

1.3.5 Design and Construction Records and History

Design drawings, specifications and other documents for the Surge and Polishing Basins were provided to GZA. The information included descriptions of the as-built construction quality control documentation that was prepared for Xcel by Barr with regards to the impoundments. A list of the documents provided to GZA by Xcel is provided in **Appendix D**.

1.3.6 Operating Records

No operating records were available for the impoundments.

1.3.7 Previous Inspection Reports

Inspection of the impoundments includes routine visual inspections and annual formal inspections by Xcel personnel in accordance with the "Inspection and Maintenance Plan for the Surge Basin and Polishing Basin". The inspection reports from the period of November 25, 1997 through August 17, 2010 were reviewed by GZA and are included as **Appendix E**. In general, minor erosion of the upstream slope was the only deficiency noted and it appeared that the erosion was repaired each year.

2.0 ASSESSMENT

2.1 Visual Assessment

The BFGS impoundments were inspected on June 14, 2011, by Patrick J. Harrison, P.E., and Douglas P. Simon, P.E., of GZA, and accompanied by several Xcel personnel. The weather was sunny with temperatures in the 70°s Fahrenheit. Photographs to document the current conditions of the impoundments were taken during the assessment and are provided in **Appendix F**. The water levels in the impoundments at the time of the inspection were as provided in Section 1.3.4. Areas beneath the water levels were not inspected, as this level of investigation was beyond GZA's scope of services. Copies of the EPA Checklists are provided in **Appendix C**.

[2] The water level in the Polishing Basin was taken to be the downstream water level south of the Surge Basin. There is no downstream water level northwest, northeast, and southeast of the impoundment.

[3] Given the distance from the decant structure to the discharge point, the water level in Lake Superior is not appropriate to be considered as the downstream water level. Therefore, no downstream water elevation is provided.

With respect to our visual assessment, there was no evidence of prior releases, failures, or repairs observed by GZA.

2.1.1 Surge Basin General Findings

In general, the Surge Basin was found to be in **SATISFACTORY** condition. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of the Surge Basin photographs provided in **Appendix F** are shown on **Figure 3**.

2.1.2 Surge Basin Upstream Slope (Photos 1 through 5, 7)

The water surface elevation at the time of the assessment was at elevation 609.3 feet MSL. Therefore, the lower portion of the upstream slope was below the water level and not visible. The upstream slope above the water level generally appeared to be in good condition. Minor to moderate erosion (presumably from wave action) was noted at the interface between the water surface and the upstream slope generally around the eastern half of the impoundment. Small, localized animal burrows (less than 2 inches in diameter) were observed on the slope. No unusual movement, depressions or sloughing was observed on the slope.

2.1.3 Surge Basin Crest of Impoundment (Photos 1, 2, 4, and 7)

The crest of the Surge Basin was vegetated with well maintained grass. The crest of the impoundment had occasional localized animal burrows present at the time of assessment. The alignment of the crest of the impoundment appeared generally level with no structurally significant depressions or irregularities observed. Based on information provided by Xcel, the crest of the impoundment is at approximately elevation 613.5 feet MSL. No significant settlement was observed at the time of our assessment. . There was approximately 4 feet of free board at the time of our assessment.

2.1.4 Surge Basin Downstream Slope (Photos 4, 6, and 7)

The downstream slope of the impoundment was vegetated with well maintained grass. No seepage was observed on the downstream slope. An area of minor erosion was present where an access road intersects the toe near the southern corner of the impoundment.

2.1.5 Surge Basin Discharge Pipes (Photos 8 through 10)

Process water and residual slag fines from the plant slag dewatering bins are discharged into the Surge Basin through three (3) 12-inch diameter steel pipes that are located along the southeastern embankment of the impoundment. Water is decanted from the Surge Basin through three (3) 12-inch diameter steel pipes which are located along the northwestern embankment of the impoundment. The decant pipes converge at the flow control structure. The discharge pipes and decant pipes are located below the water level and were not visible during our assessment. The flow control structure was generally in good condition with no cracks or defects observed.

2.1.6 Polishing Basin General Findings

In general, the Polishing Basin was found to be in **SATISFACTORY condition**. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of photographs provided in **Appendix F** are shown on the Photo Plan in **Figure 3**.

2.1.7 Polishing Basin Upstream Slope (Photos 11 through 17)

The water surface elevation at the time of the assessment was at elevation 608.6 feet MSL. Therefore, the lower portion of the upstream slope was below the water level and not visible. The upstream slope above the water level generally appeared to be in good condition. Minor to moderate erosion (presumably from wave action) was noted at the interface between the water surface and the upstream slope generally along the eastern side. Small, localized animal burrows (less than 2 inches in diameter) were observed on the slope. No unusual movement, depressions or sloughing was observed on the slope.

2.1.8 Polishing Basin Crest of Impoundment (Photos 12 through 15, 17)

The crest of the Surge Basin was vegetated with well maintained grass. The crest of the impoundment had occasional localized animal burrows present at the time of our assessment. The alignment of the crest of the impoundment appeared generally level with no structurally significant large depressions or irregularities observed. Based on information provided by Xcel, the crest of the impoundment is at approximately elevation 611.5 feet MSL. No significant settlement was observed at the time of our assessment. There was approximately 3 feet of free board at the time of our assessment.

2.1.9 Polishing Basin Downstream Slope (Photos 27 and 28)

The downstream slope of the impoundment was vegetated with well maintained grass. No seepage, sloughing or depressions were observed on the downstream slope.

2.1.10 Polishing Basin Discharge Pipes (Photos 19 through 26)

Decanted water and CCW from the Surge Basin is discharged into the Polishing Basin through three (3) 12-inch diameter steel pipes which are located along the northwestern embankment at the approximate locations shown on **Figure 3**. The discharge pipes are located below the water level and were not visible.

Decanted water from the Polishing Basin is discharged into Lake Superior through a decant structure which is located along the northwestern embankment. The decant structure and discharge pipe to Lake Superior appeared to be in good condition.

2.2 Caretaker Interview

Maintenance of the impoundments is the responsibility of BFGS personnel. GZA met with BFGS personnel and discussed the operations and maintenance procedures, regulatory requirements and the history of the impoundments since their construction. The observations, descriptions and findings presented in this report reference these discussions.

2.3 Operation and Maintenance Procedures

Operation and maintenance of the BFGS facility, including the impoundments, is regulated by a Wisconsin Pollutant Discharge Elimination System permit (Permit No. WI-0002887-06-0). As discussed in Section 1.2.5, BFGS personnel are responsible for maintenance of the impoundments. Maintenance is conducted in accordance with the *NSPW Bay Front Generation Facility Inspection and Maintenance Plan for the Surge Basin and Polishing Basin* (Maintenance Plan). Based on the Maintenance Plan, the impoundments are to be informally inspected 'regularly' by the certified treatment system operator and a formal inspection is to occur on an annual basis.

2.4 Emergency Action Plan

The BFGS has a general Emergency Action Plan (EAP) for the facility; however, it is not specific to potential situations that may arise at the impoundments. Note that the hazard potential classification for the impoundments is discussed in Section 1.2.8. The State of Wisconsin does not regulate the impoundments as dams and therefore does not require an EAP for the structures.

2.5 Hydrologic/Hydraulic Data

Based on the information provided, a hydrologic/hydraulic analysis of the impoundments was performed as part of the original 1976 design work by Barr and was the basis for the selection of the maximum operating water levels. However, the details of the analysis including the design storm event were not included in the documents provided by Xcel to GZA. GZA did not perform an independent assessment of the hydraulics and hydrology for the impoundments as this was beyond our scope of services. Subsequent to submittal of the draft report, Xcel provided additional hydrologic/hydraulic analyses prepared by Barr that indicate that the basins were constructed with adequate capacity/free-board for a 100-year, 24 hour storm event.

2.6 Structural and Seepage Stability

A stability analysis was conducted by Barr as part of the 1976 design of the impoundments. The analysis considered piping, sliding failure, block failure of the downstream slope, and rapid drawdown conditions. The parameters used for the analysis were based on soil borings, laboratory testing and literature research on the properties of bottom ash. The analysis indicated factors of safety above the generally accepted values for the failure modes noted. However, the analysis did not address the stability of the impoundments under seismic loading conditions. Subsequent to submittal of the draft report, Xcel provided additional stability analyses prepared by Barr that indicates a factory of safety greater than 1.2 for the basins under seismic conditions which meets generally accepted criteria. The factors of safety (FOS) calculated in the recent Barr study were as follows;

Condition	Computed FOS	Minimum FOS
Drained static conditions	2.68	1.5
Undrained static conditions	2.20	1.5
Seismic conditions	1.66	1.2

3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 Assessments

In general, the overall condition of the Surge Basin was judged to be **SATISFACTORY** and was found to have the following deficiencies:

1. Localized (small-diameter) animal burrows along the upstream slope;
2. Minor to moderate erosion on portions of the upstream slope (presumably due to wave action);
3. Minor erosion at the downstream toe;

   Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above three items have been addressed which satisfies our recommendation. No further action is recommended at this time.

4. Incomplete documentation for the hydrologic/hydraulic analysis; and, no stability analysis for seismic loading conditions.

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time.

In general, the overall condition of Polishing Basin was judged to be **SATISFACTORY** and was found to have the following deficiencies:

1. Localized (small diameter) animal burrows along the crest;
2. Minor to moderate erosion along portions of the upstream slope (presumably due to wave action);

   Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above two items have been addressed which satisfies our recommendation. No further action is recommended at this time.

3. Incomplete documentation for the hydrologic/hydraulic analysis; and, no stability analysis for seismic loading conditions.

   Additional analysis was completed for this recommendation and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time.

The following sections describe the recommended approach to address current deficiencies. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of permits needs to be determined for activities that may occur within the jurisdiction of the appropriate regulatory agencies.

3.2 Studies and Analyses

GZA recommends the following studies and analyses:

1. Perform a stability analysis of the impoundments under seismic loading; and,

2. Update the hydrologic/hydraulic analysis for the impoundments to document the adequacy of the impoundments to accommodate the 100-year, 24-hour event.

   Additional analysis was completed for the above items and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time.

3.3 Recurrent Operation & Maintenance Recommendations

GZA recommends the following operation and maintenance level activities:

1. Repair erosion on the downstream slope of the Surge Basin;

2. Fill currently observed animal burrows by injecting grout under low to moderate pressures to ensure the entire limits of the respective burrow is adequately filled;

3. Repair observed erosion on the upstream slopes of the Surge and Polishing Basins;

4. Monitor decant outflow structures and clear silt or debris which may block or impede outflow; and,

5. Take measures as necessary so as to maintain operability and function of the various impoundment water level control mechanisms.

   Information reported by Xcel and provided to GZA after issuance of the DRAFT report indicates that the above five items have been addressed which satisfies our recommendation. No further action is recommended at this time.

3.4 Remedial Measures Recommendations

1. In conjunction with the results of the hydrologic and hydraulic analyses, make provisions for an emergency overflow spillway(s) if required; and,

2. In conjunction with the results of the stability analyses, make provisions to address deficiencies if required/as necessary.

   Additional analysis was completed for the above items and provided to GZA after issuance of the DRAFT report that satisfies our recommendation. No further analysis is recommended at this time.

3.5 Alternatives

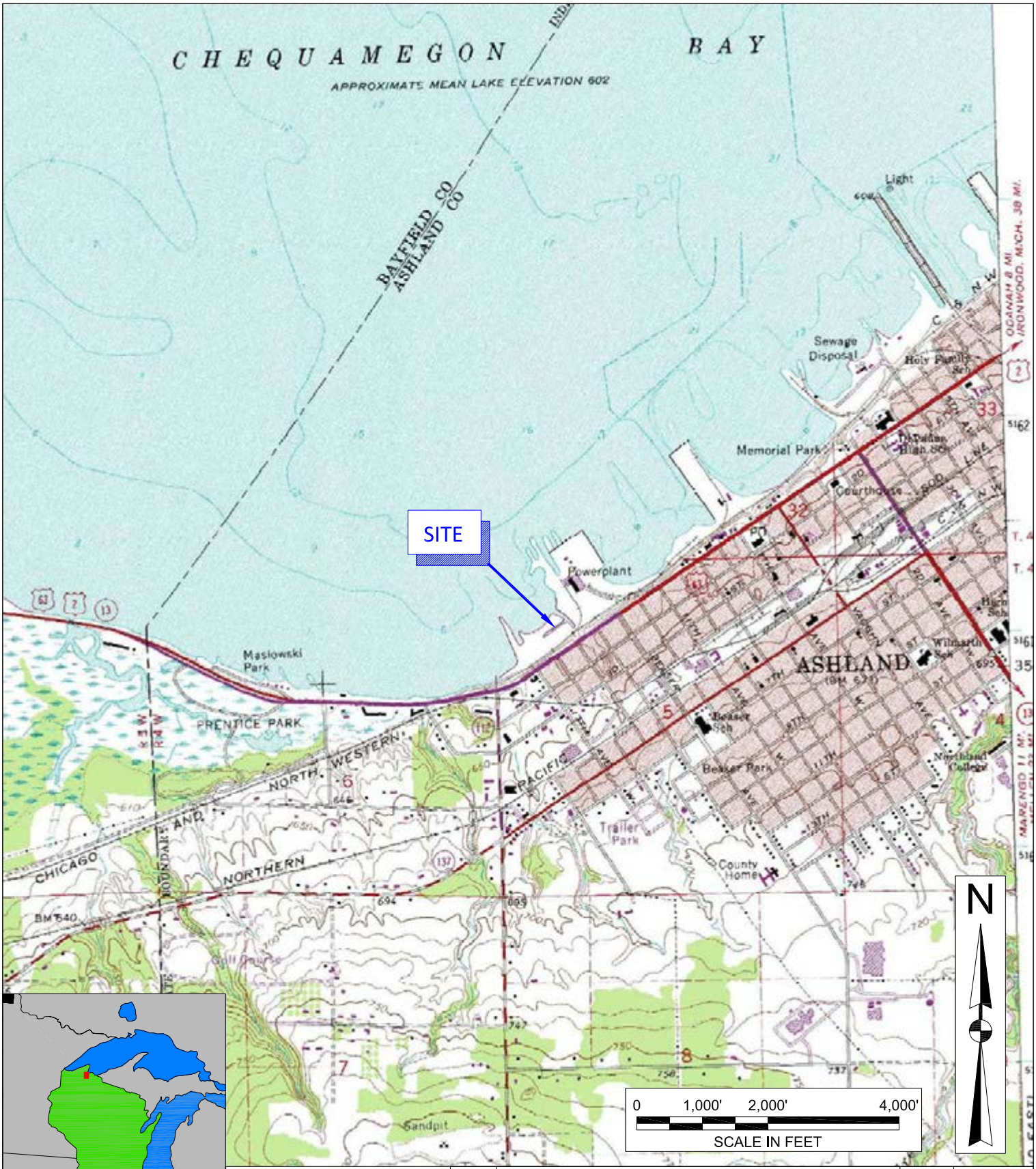
There are no alternatives currently recommended.

4.0 ENGINEER'S CERTIFICATION

I acknowledge that the management units referenced herein, the Surge Basin and Polishing Basin have been assessed to be in **SATISFACTORY** condition on June 14, 2011.

Patrick J. Harrison, P.E.
Senior Consultant

FIGURES



SOURCE: U.S.G.S. QUADRANGLE MAP
ASHLAND WEST, WI (1964)
PHOTOREVISED (1975)

NO.	ISSUE/DESCRIPTION	BY	DATE

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
20900 SWENSON DRIVE, SUITE 150
WAUKESHA, WISCONSIN 53186
(262) 754-2560

PREPARED FOR:

SITE LOCATION MAP

BAY FRONT GENERATING STATION
ASHLAND, WISCONSIN
N. 14th AVE. W.

FIGURE 1

SHEET NO.

PROJ MGR: DS	REVIEWED BY: DS	CHECKED BY: DS	DATE 11/15/11	PROJECT NO. 01.0170142.30	REVISION NO.
DESIGNED BY: DS	DRAWN BY: CLK	SCALE: 1 : 24000			

SOURCE: DIGITAL ORTHOPHOTO/AERIAL IMAGERY PRODUCED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) AND RETRIEVED THROUGH USE OF A PROFESSIONAL LICENSE OF THE GOOGLE EARTH MAPPING PROGRAM.
DATA ACCESSED JULY 2011

N
W E
S

200 100 0 200 Feet

SURGE BASIN

POLISHING BASIN

LAKE SHORE DRIVE W

LEGEND

APPROXIMATE IMPOUNDMENT BOUNDARY

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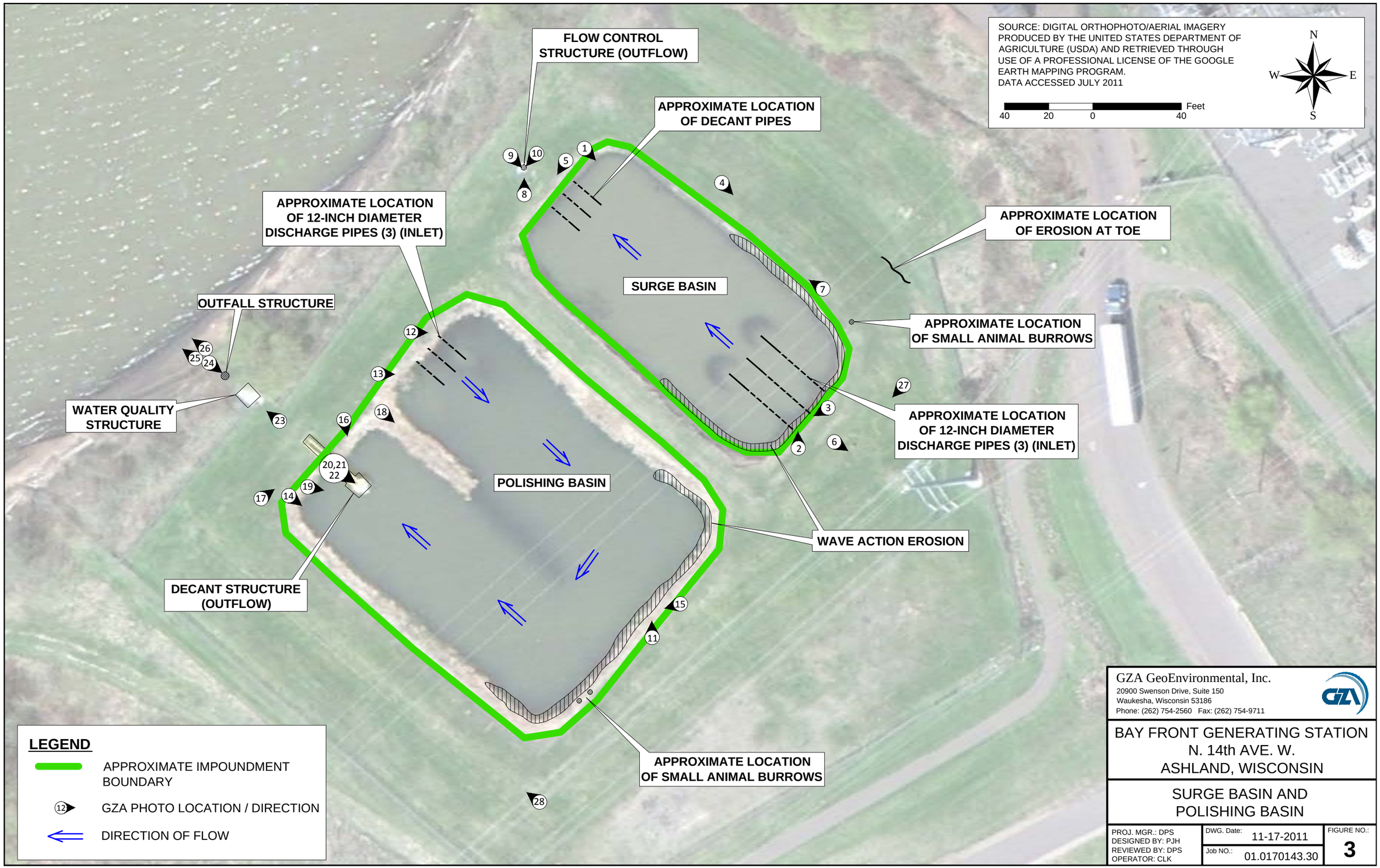
BAY FRONT GENERATING STATION
N.14th AVE. W.
ASHLAND, WISCONSIN

OVERALL ASH BASIN PLAN

PROJ. MGR.: DPS DESIGNED BY: PJH REVIEWED BY: DPS OPERATOR: CLK	DWG. Date: 11-15-2011 Job NO.: 01.0170143.30	FIGURE NO.: 2



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20900 Swenson Drive, Suite 150
Waukesha, Wisconsin 53186
Phone: (262) 754-2560 Fax: (262) 754-9711

BAY FRONT GENERATING STATION
N. 14th AVE. W.
ASHLAND, WISCONSIN

SURGE BASIN AND POLISHING BASIN

PROJ. MGR.: DPS
DESIGNED BY: PJH
REVIEWED BY: DPS
OPERATOR: CLK

DWG. Date: 11-17-2011

Job NO.: 01.0170143.30

FIGURE NO.: 3

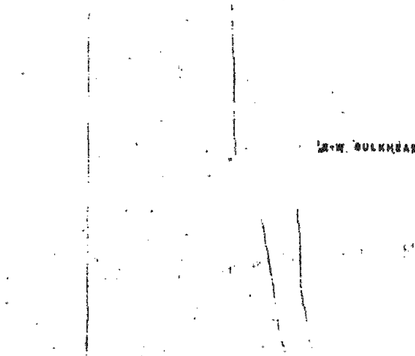
BOILER #5 BLDG.

NORTH

0 10 20 30 40 50
SCALE IN FEET

NOTE:
LOCAL GRID SYSTEM ESTABLISHED FOR LOCATING SETTLING BASINS ONLY.

SHEET INDEX



LOCATION MAP

LAKE SUPERIOR

N.W. BULKHEAD LINE N62° 64'E

ANGLE IRON

BURGE BASIN OUTLET

CONSTRUCTION LIMITS

FLOW CONTROL STRUCTURE

POLISHING BASIN INLET

WATER QUALITY MONITORING STRUCTURE

END POST

WALKWAY BRIDGE

TERMINAL POST

POLISHING BASIN OUTFLOW STRUCTURE

LINE POST (TYP.)

7' CHAIN LINK FENCE INCLUDING 3 STRANDS BARBED WIRE

SUBSTATION

POLISHING BASIN

SURGE BASIN

TRAINING DIKE

SURGE BASIN INLET

INTAKE PIPE STRUCTURE (PIPING FROM PLANT TO INTAKE STRUCTURE BY OTHERS)

NOTE: FOR PIPING SEE 5/2

STEEL TOWER

STUB POLE (PROTECT)

TERMINAL POST

CONSTRUCTION LIMITS

6 POLE A-FRAME 33'x7' LINE (PROTECT)

GATE POSTS

NOTE: EXACT ALIGNMENT OF FENCE TO BE DETERMINED BY THE ENGINEER IN THE FIELD

CONNECT TO EXISTING FENCE

2-10' PANEL SWING GATE 7' CHAIN LINK INCLUDING 3 STRANDS BARBED WIRE

ACCESS

C.C.F. NW RR

FINAL CONTOURS

EXISTING CONTOURS CHANGED BY PROJECT

I HEREBY CERTIFY THAT THIS DRAWING OR PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.

DATE: 4/1/76

REVISIONS
MAY 4, 1976 Add Fencing And Gate

SCALE: AS SHOWN
DWG. BY: W.J.O.
DATE: 3/10/76
DWG. NO.: 10/1-3 [illegible] 809

LAKE SUPERIOR DISTRICT POWER CO
ASHLAND, WISCONSIN

BARR ENGINEERING CO.
CONSULTING HYDRAULIC ENGINEERS
MINNEAPOLIS, MINNESOTA

BAY FRONT SETTLING BASINS
SITE PLAN

SHEET NO. 1 OF 5 SHEETS

BAY FRONT GENERATING STATION
N. 14th AVE. W.
ASHLAND, WISCONSIN

PLAN OF DESIGN

PROJ MGR: DPS
DESIGNED BY: PJH
REVIEWED BY: DPS
OPERATOR: CLK
DATE: 11-10-2011

JOB NO. 01.0170142.30

FIGURE NO. 4

NOTE: IMAGE HAS BEEN REDUCED AND IS NO LONGER TO A SCALE

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Consulting Engineers and Scientists
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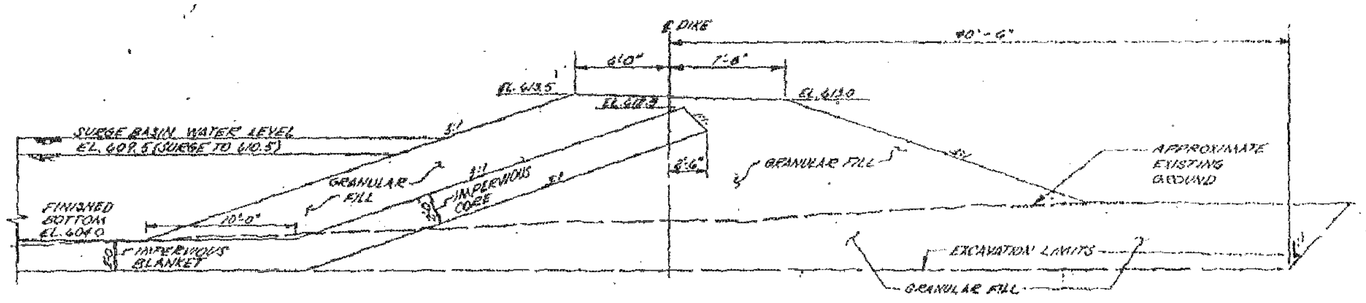
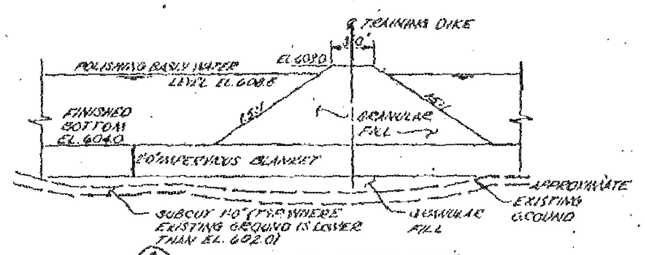
DATE | BY | DESCRIPTION | REV. NO.

GZA Drawing Name: J:\GZA_USA\01.0170142.30 Ash Imp. Round 1\01.0170142.30 Task 2 - Bayfront\Drawings\Autocad\Scanned Figures - Bay Front.dwg Last Modified: Nov 15, 2011 - 2:01pm Printed on: Nov 15, 2011 - 2:02pm by justinhegarty



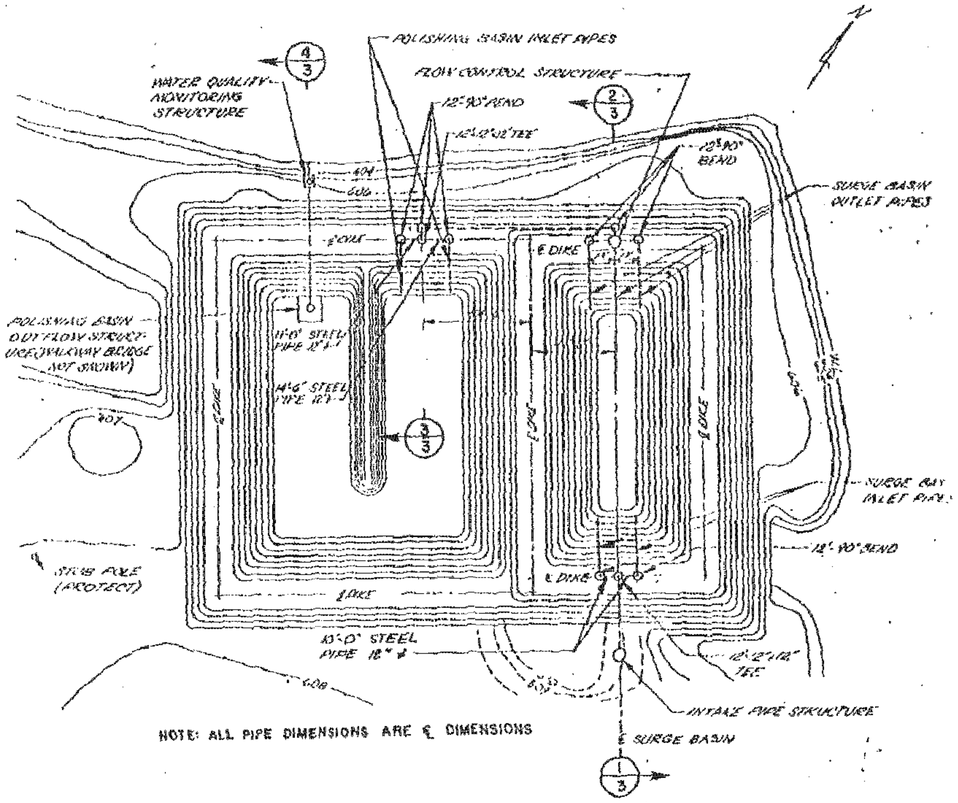
1/2 SECTION: SURGE BASIN DIKE (TYP)

SCALE: 1"=5'-0"



4/2 SECTION: TRAINING DIKE

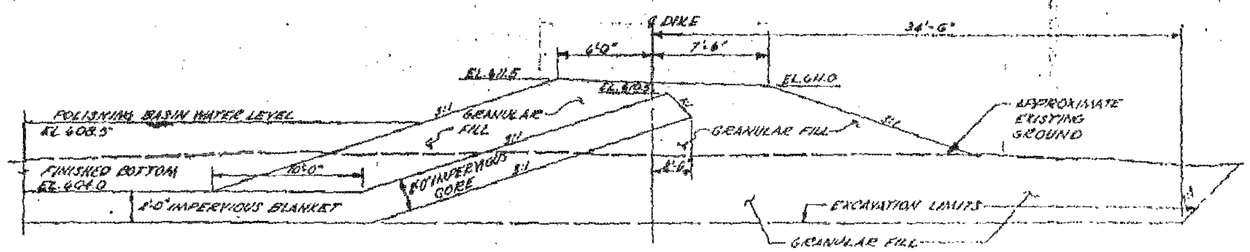
SCALE 1"=5'-0"



NOTE: ALL PIPE DIMENSIONS ARE ℄ DIMENSIONS

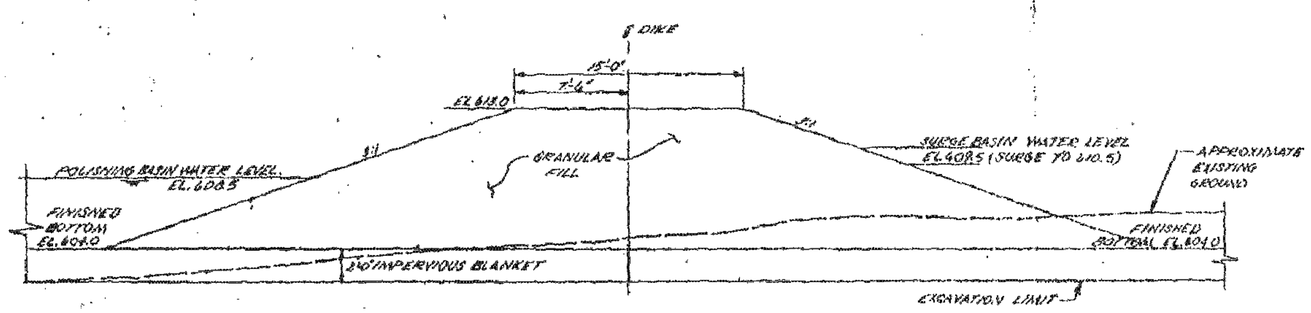
3/2 DETAIL: PIPING PLAN

SCALE 1"=40'



2/2 SECTION: POLISHING BASIN DIKE (TYP)

SCALE 1"=5'-0"



3/2 SECTION: DIKE BETWEEN SURGE BASIN AND POLISHING BASIN

SCALE 1"=5'-0"

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REVISIONS	SCALE: AS SHOWN
	DWN. BY: JEL/REG
	DATE: 3/30/76

BAY FRONT GENERATING STATION
N. 14th AVE. W.
ASHLAND, WISCONSIN

TYPICAL SECTIONS

JOB NO. 01.0170142.30

FIGURE NO. 5

REV. NO.	DESCRIPTION	BY	DATE

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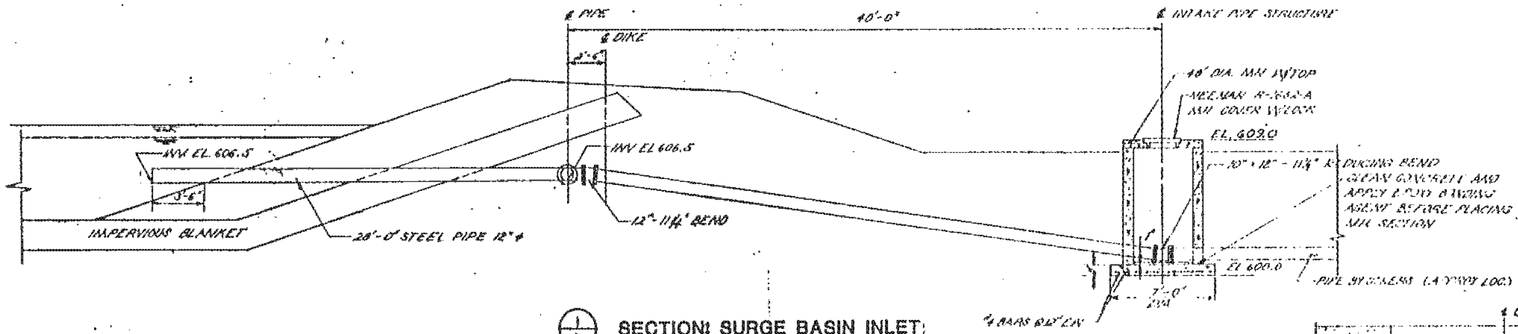
Phone (262) 754-2800 ■ Fax (262) 754-9911
www.gza.com

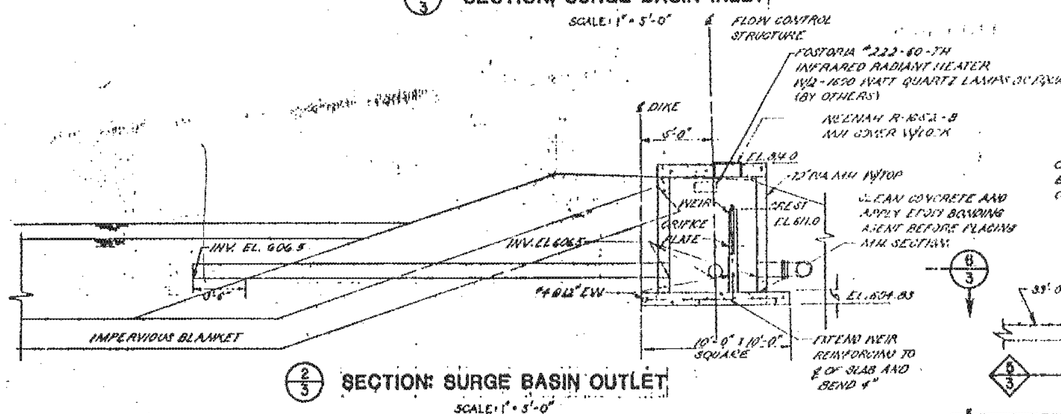
PROJ MGR: DPS
DESIGNED BY: PJH
REVIEWED BY: DPS
OPERATOR: CLK
DATE: 11-10-2011

GZA Drawing Name: z:\GZA_USA\01.0170142.30 Ash Imp. Round 10\01.0170142.30 Task 2 - Bayfront\Drawings\Autocad\Scanned Figures - Bay Front.dwg Last Modified: Nov 15, 2011 - 2:03pm Plotted on: Nov 16, 2011 - 10:30am by doug.aimon



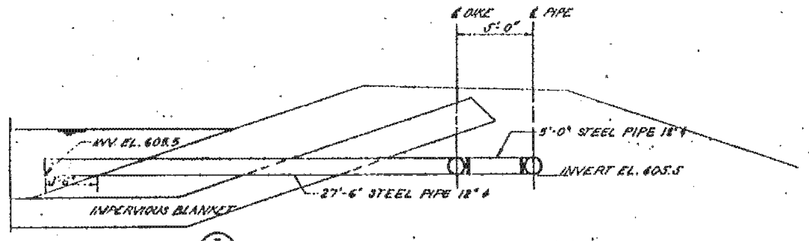
1/3 SECTION: SURGE BASIN INLET

SCALE: 1" = 5'-0"



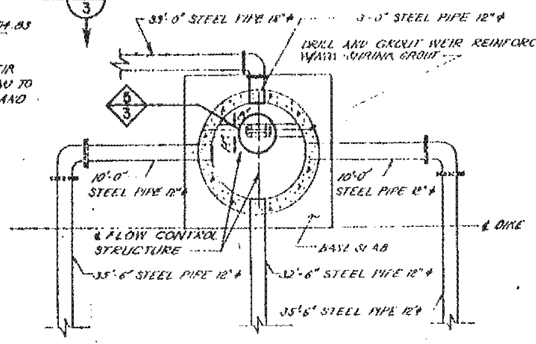
2/3 SECTION: SURGE BASIN OUTLET

SCALE: 1" = 5'-0"



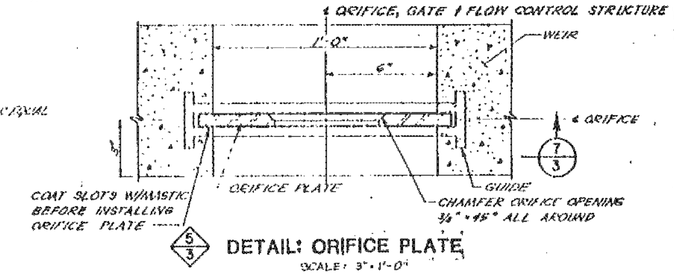
3/3 SECTION: POLISHING BASIN INLET

SCALE: 1" = 5'-0"



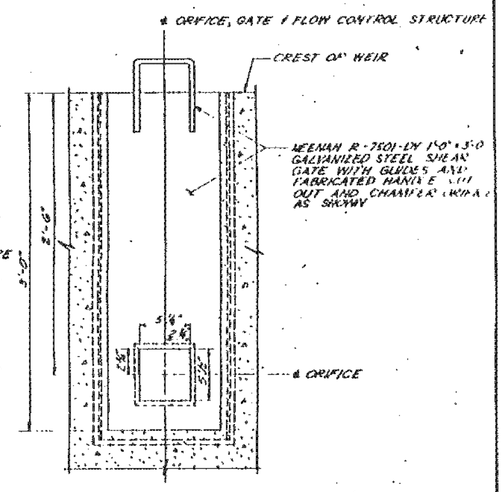
6/3 SECTION: FLOW CONTROL STRUCTURE

SCALE: 1" = 5'-0"



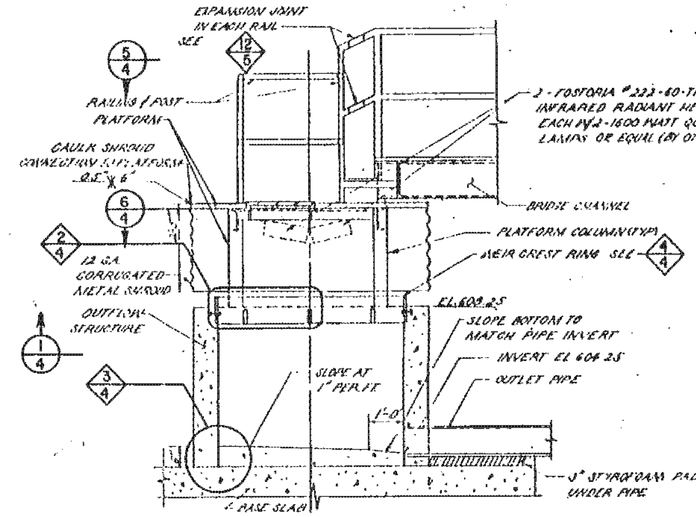
5/3 DETAIL: ORIFICE PLATE

SCALE: 3" = 1'-0"



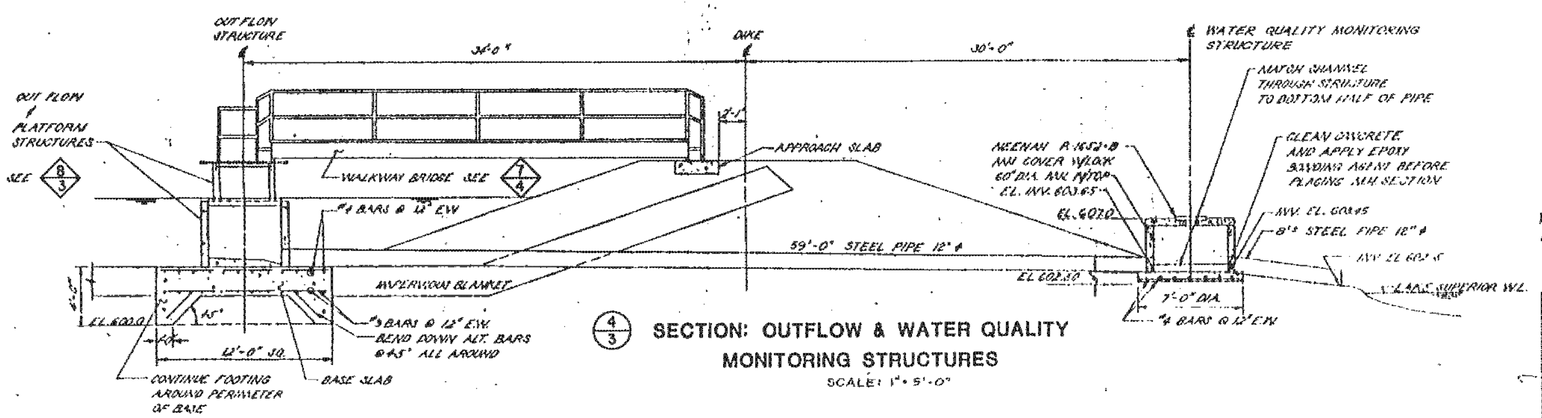
7/3 SECTION: ORIFICE PLATE

SCALE: 1½" = 1'-0"



8/3 DETAIL: OUTFLOW STRUCTURE & PLATFORM

SCALE: ½" = 1'-0"



4/3 SECTION: OUTFLOW & WATER QUALITY MONITORING STRUCTURES

SCALE: 1" = 5'-0"

NOTE: ALL PIPE DIMENSIONS ARE ℄ DIMENSIONS

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DATE:

REG. NO. E13595

REVISIONS

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DATE: 5/30/76
DWG. NO.: 412-3[illegible] B11

LAKE SUPERIOR DISTRICT POWER CO.
ASHLAND, WISCONSIN

BARR ENGINEERING CO.
CONSULTING HYDRAULIC ENGINEERS
MINNEAPOLIS, MINNESOTA

BAY FRONT SETTLING BASINS
PIPING & STRUCTURE DETAILS

SHEET NO. 3 OF 5 SHEETS

REV. NO.	BY	DATE	DESCRIPTION

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DESIGNED BY: PJH
REVIEWED BY: DPS
OPERATOR: CLK
DATE: 11-10-2011

BAY FRONT GENERATING STATION
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ASHLAND, WISCONSIN

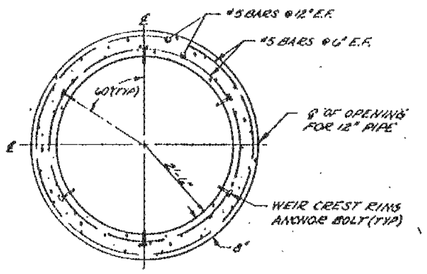
PIPING DETAILS

JOB NO. 01.0170142.30

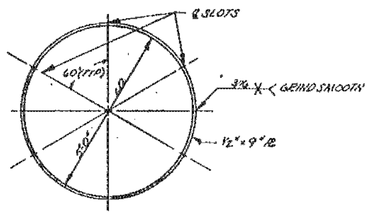
FIGURE NO. 6

GZA Drawing Name: z:\GZA_USA\Gl\01.0170142.30 Ash Imp. Round 1\01.0170142.30 Task 2 – Bayfront\Drawings\Autocad\Scanned Figures – Bay Front.dwg Last Modified: Nov 15, 2011 – 2:03pm Plotted on: Nov 16, 2011 – 10:31am by doug.simon

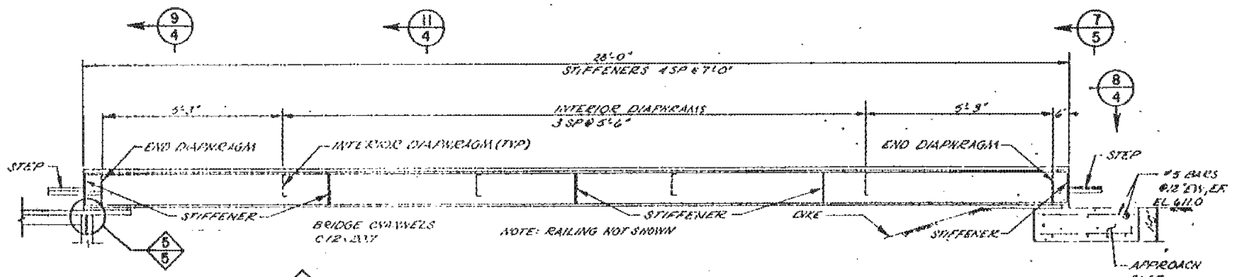
NOTE: COAT OUTSIDE OF WEIR CREST RING W/MASTIC & SECURELY SUPPORT THE RING IN ITS CORRECT POSITION INSIDE THE FORMS WHILE CASTING THE OUTFLOW RISER



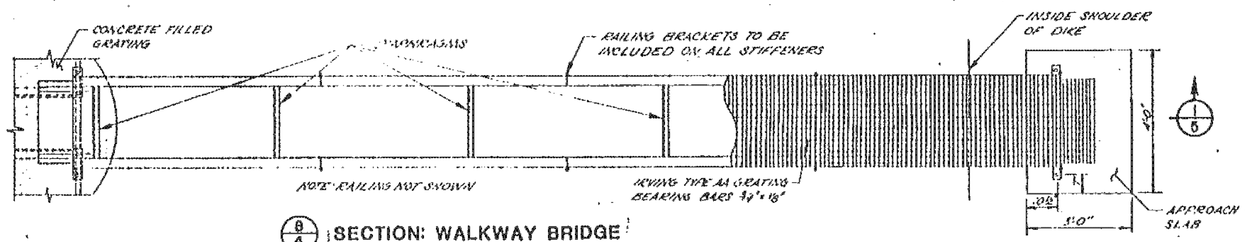
(1/4) **SECTION: OUTFLOW RISER**
SCALE ½"=1'-0"



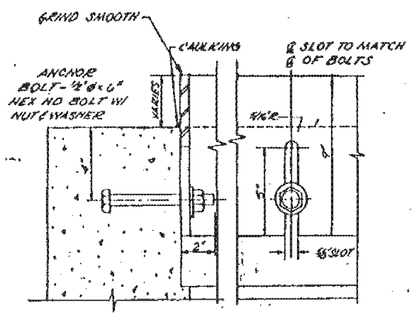
(9/4) **DETAIL: WEIR CREST RING**
SCALE ½"=1'-0"



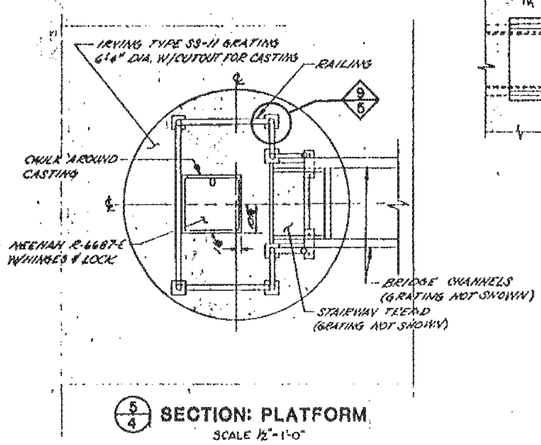
(7/4) **DETAIL: WALKWAY BRIDGE**
SCALE ½"=1'-0"



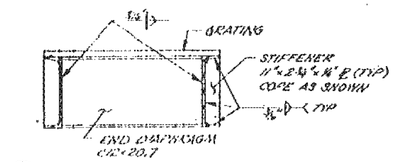
(8/4) **SECTION: WALKWAY BRIDGE**
SCALE ½"=1'-0"



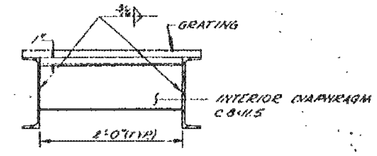
(2/4) **DETAIL: WEIR CREST RING INSTALLATION**
SCALE 3"=1'-0"



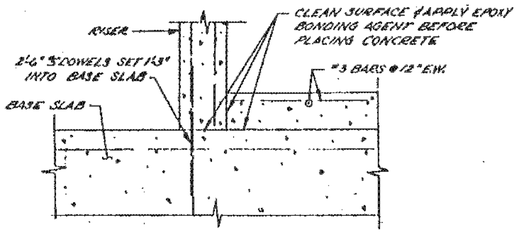
(6/4) **SECTION: PLATFORM**
SCALE ½"=1'-0"



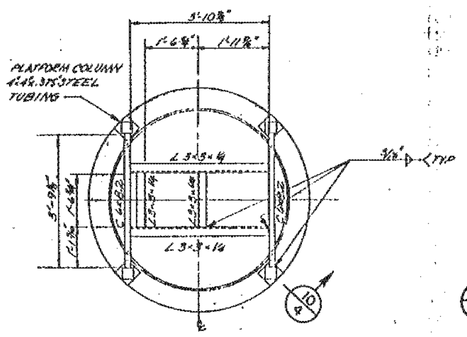
(9/4) **SECTION: END DIAPHRAGM (TYP)**
SCALE 1"=1'-0"



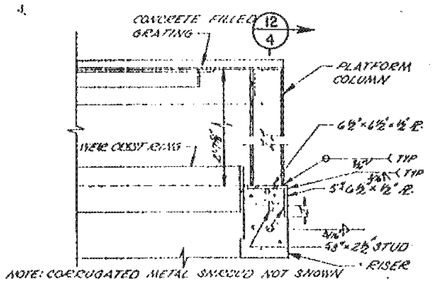
(11/4) **SECTION: INTERIOR DIAPHRAGM (TYP)**
SCALE 1"=1'-0"



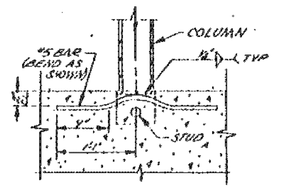
(3/4) **DETAIL: CONNECTION TO BASE**
SCALE 1"=1'-0"



(6/4) **SECTION: PLATFORM FRAME**
SCALE ½"=1'-0"



(10/4) **SECTION: PLATFORM COLUMN CONNECTION**
SCALE 1"=1'-0"



(12/4) **SECTION: PLATFORM COLUMN ANCHOR**
SCALE 1"=1'-0"

NOTE: THE DIAMETER OF ALL BOLT HOLES SHALL BE EQUAL TO THE MINIMAL DIA. OF THE BOLT + ⅛" UNLESS OTHERWISE SPECIFIED.

I HEREBY CERTIFY THAT THIS DRAWING OR PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.

DATE: 3/30/76
REG. NO. E-13295

REVISIONS	

SCALE: AS SHOWN
DWN. BY: V.C.L.F.R.L.G.
DATE: 3/30/76
DWG. NO.: 6112 5000 B/2

LAKE SUPERIOR DISTRICT POWER CO.
ASHLAND, WISCONSIN

BARR ENGINEERING CO.
CONSULTING HYDRAULIC ENGINEERS
MINNEAPOLIS, MINNESOTA

BAY FRONT SETTLING BASINS
WALKWAY BRIDGE & PLATFORM DETAILS

SHEET NO. 4 OF 5 SHEETS

NOTE:
IMAGE HAS BEEN REDUCED AND IS NO LONGER TO A SCALE

NO.	DESCRIPTION	BY	DATE

GZA GeoEnvironmental, Inc.
Consulting Engineers and Scientists
380 Foxborough Boulevard ■ Foxborough, Massachusetts 02035
Phone: (508) 543-1500 ■ Fax: (508) 543-1503
www.gza.com

PROJ MGR: DPS
DESIGNED BY: PJH
REVIEWED BY: DPS
OPERATOR: CLK
DATE: 11-10-2011

BAY FRONT GENERATING STATION
N. 14th AVE. W.
ASHLAND, WISCONSIN

ADDITIONAL PIPING DETAILS

JOB NO. 01.0170142.30

FIGURE NO. 7

GZA Drawing Name: J:\GZA_LIVE\01.0170142.30 Ash Imp. Round 10\01.0170142.30 Task 2 — Bayfront\Drawings\Autocad\Screened Figures — Rev Front.dwg Last Modified: Nov 10, 2011 — 10:09pm Plotted on: Nov 15, 2011 — 1:39pm by johnhegarty

APPENDIX A

LIMITATIONS

DAM ENGINEERING & VISUAL INSPECTION LIMITATIONS

1. The observations described in this report were made under the conditions stated herein. The conclusions presented in the report were based solely on the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the United States Environmental Protection Agency (EPA).

2. In preparing this report, GZA GeoEnvironmental, Inc. (GZA) has relied on certain information provided by Xcel Energy, Inc. (Xcel) (and their affiliates) as well as Federal, state, and local officials and other parties referenced therein. GZA has also relied on other parties which were available to GZA at the time of the inspection. Although there may have been some degree of overlap in the information provided by these various sources, GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this work.

3. In reviewing this Report, it should be noted that the reported condition of the Ash Ponds is based on observations of field conditions during the course of this study along with data made available to GZA. The observations of conditions at the Ash Ponds reflect only the situation present at the specific moment in time the observations were made, under the specific conditions present. It may be necessary to reevaluate the recommendations of this report when subsequent phases of evaluation or repair and improvement provide more data.

4. It is important to note that the condition of a dam or embankment depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam or embankment will continue to represent the condition of the dam or embankment at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions may be detected.

5. Water level readings have been reviewed and interpretations have been made in the text of this report. Fluctuations in the level of the groundwater and surface water may occur due to variations in rainfall, temperature, and other factors different than at the time measurements were made.

6. GZA's comments on the history, hydrology, hydraulics, and embankment stability for the Ash Ponds are based on a limited review of available design documentation for the Bay Front Generating Station. Calculations and computer modeling used in these analyses were not available and were not independently reviewed by GZA.

7. This report has been prepared for the exclusive use of EPA for specific application to the existing dam facilities, in accordance with generally accepted dam engineering practices. No other warranty, express or implied, is made.

8. This dam inspection verification report has been prepared for this project by GZA. This report is for broad evaluation and management purposes only and is not sufficient, in and of itself, to prepare construction documents or an accurate bid.

9. The Phase I investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

APPENDIX B

DEFINITIONS

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to references published by the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from, including but not be limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

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.

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.

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.

APPENDIX C

INSPECTION CHECKLISTS

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name:	Bayfront Generating Plant	Date:	6/14/11
Unit Name:	Surge Pond	Operator's Name:	Excel Energy, Inc
Unit I.D.:		Hazard Potential Classification:	High Significant Low ✓

Inspector's Name: Patrick J. Harrison, P.E. and Doug P. Simon, P.E.

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?	Annual		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	609.5		19. Major erosion or slope deterioration?		✓
3 Decant inlet elevation (operator records)?	609.3		20. Decant Pipes:		
4 Open channel spillway elevation (operator records)?			Is water entering inlet, but not exiting outlet?		
5. Lowest dam crest elevation (operator records)?	613.5		Is water exiting outlet, but not entering inlet?		
6. If instrumentation is present, are readings recorded (operator records)?			Is water exiting outlet flowing clear?		
7 Is the embankment currently under construction?		✓	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)?			From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		✓	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15 Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?			23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24 Were Photos taken during the dam inspection?	✓	

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

4. No open channel spillway is present.

6. No instrumentation is present.

8. No information regarding foundation preparation is available.

16, 20. Outlet discharges below the water level in the Polishing Pond and was not visible.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WI-0002887-06-0 INSPECTOR Patrick J. Harrison, P.E.
Date June 14, 2011 Doug P. Simon, P.E.

Impoundment Name Surge Pond
Impoundment Company Xcel Energy, Inc.
EPA Region Region V
State Agency (Field Office) Addresss Wisconsin Department of Natural Resources
Rhinelander, WI
Name of Impoundment Surge Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update _____

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

IMPOUNDMENT FUNCTION: _____

Nearest Downstream Town : Name Impoundment along Lake Superior - No downstream
Distance from the impoundment town present.
Impoundment
Location: Longitude -90 Degrees 54 Minutes 18 Seconds
Latitude 46 Degrees 35 Minutes 14 Seconds
State Wisconsin County Ashland

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

If So Which State Agency? The Wisconsin Department of Natural Resources regulates the discharge of water (NPDES Permit).

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

X
_____ **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.

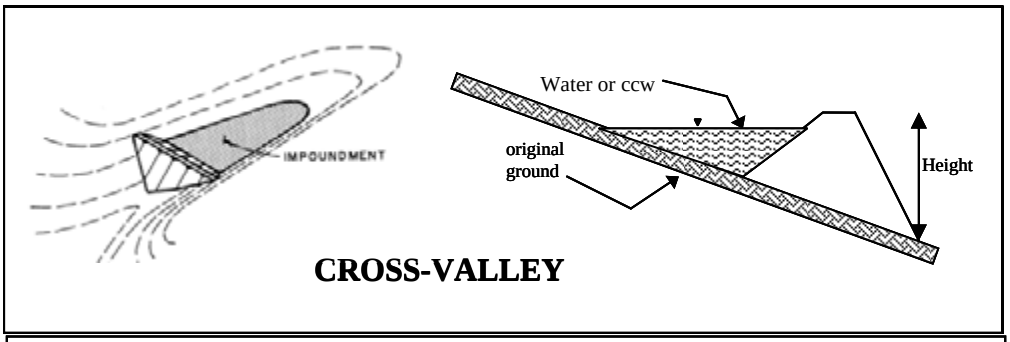
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

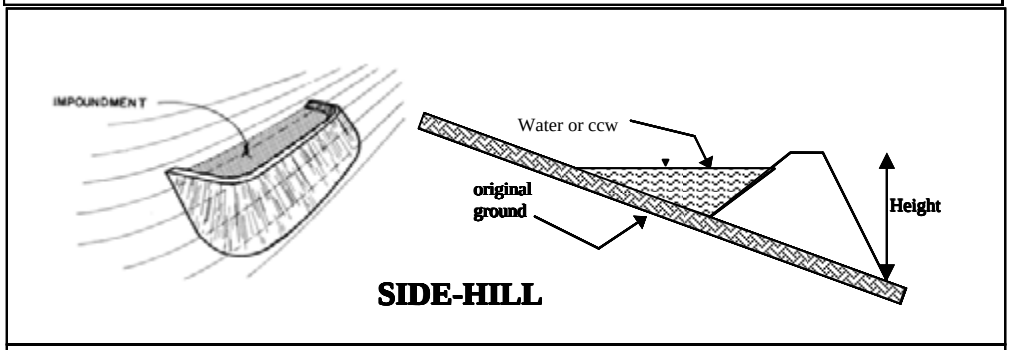
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

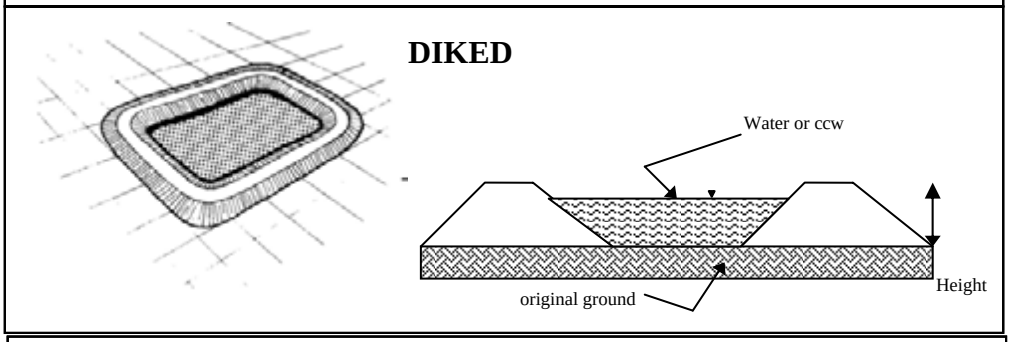
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

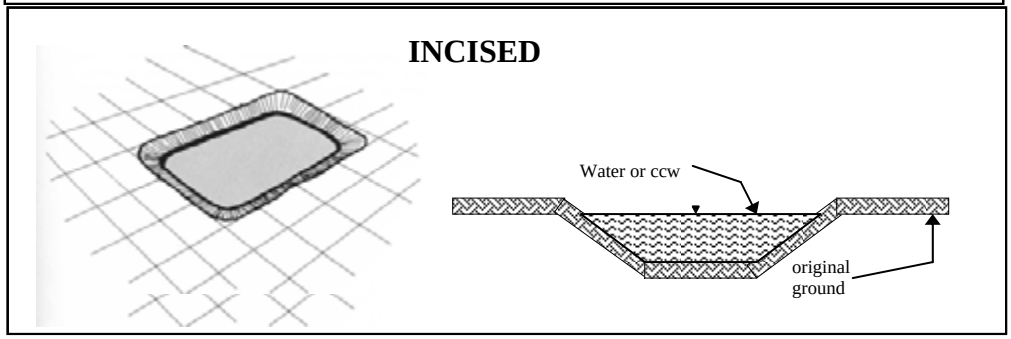
Potential failure of the impoundment embankment would not likely result in loss of human life. Economic or environmental damages would be limited to the owners property.

CONFIGURATION:









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

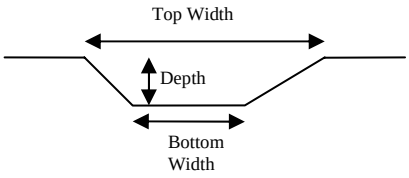
Embankment Height 9.5 feet
Pool Area 0.15 acres
Current Freeboard _____ feet

Embankment Material Granular Fill with Impervious Core
Liner Liner present
Liner Permeability Unknown

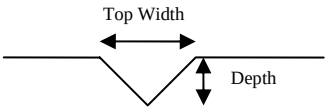
TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

TRAPEZOIDAL

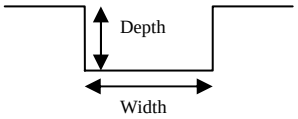


TRIANGULAR

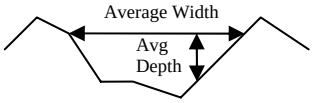


_____ depth
_____ bottom (or average) width
_____ top width

RECTANGULAR

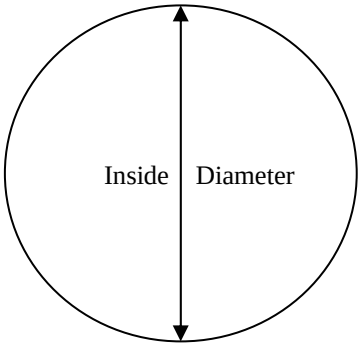


IRREGULAR



X **Outlet**

12 inside diameter
Varies: See Below.



Material
_____ corrugated metal
X 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 Barr Engineering Company, Minneapolis, MN

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 __N/A___

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:	Bayfront Generating Plant	Date:	6/14/11
Unit Name:	Polishing Basin	Operator's Name:	Excel Energy, Inc
Unit I.D.:		Hazard Potential Classification:	High Significant Low ✓

Inspector's Name: Patrick J. Harrison, P.E. and Doug P. Simon, P.E.

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?	Annual		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	608.6		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	608.5		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?			Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	611.5		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?			Is water exiting outlet flowing clear?	✓	
7. Is the embankment currently under construction?		✓	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)?			From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?	✓		From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, grain or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

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

4. No open channel spillway is present.
6. No instrumentation is present.
8. No information about foundation preparation is available.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WI-0002887-06-0 INSPECTOR Patrick J. Harrison, P.E.
Date June 14, 2011 Doug P. Simon, P.E.

Impoundment Name Polishing Basin
Impoundment Company Xcel Energy, Inc.
EPA Region Region V
State Agency (Field Office) Addresss Wisconsin Department of Natural Resources
Rhinelander, WI
Name of Impoundment Polishing Basin
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update _____

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

IMPOUNDMENT FUNCTION: _____

Nearest Downstream Town : Name Impoundment along Lake Superior - No downstream
Distance from the impoundment town present.
Impoundment
Location: Longitude -90 Degrees 54 Minutes 10.1 Seconds
Latitude 46 Degrees 35 Minutes 7.4 Seconds
State Wisconsin County Ashland

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

If So Which State Agency? The Wisconsin Department of Natural Resources regulates the discharge of water (NPDES Permit).

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

X **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.

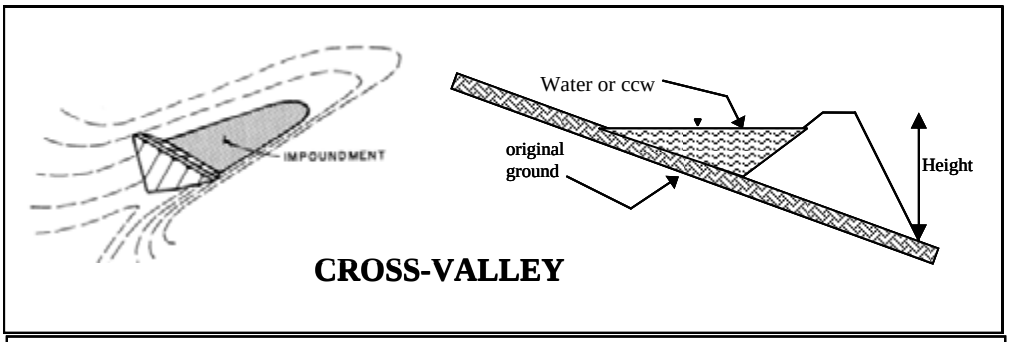
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

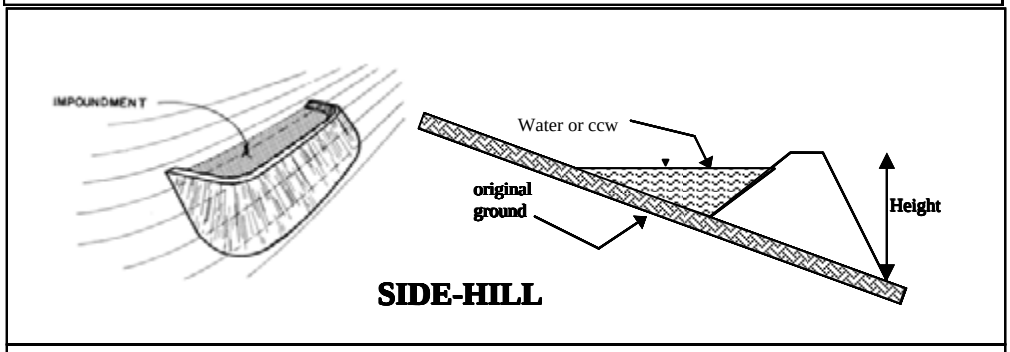
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

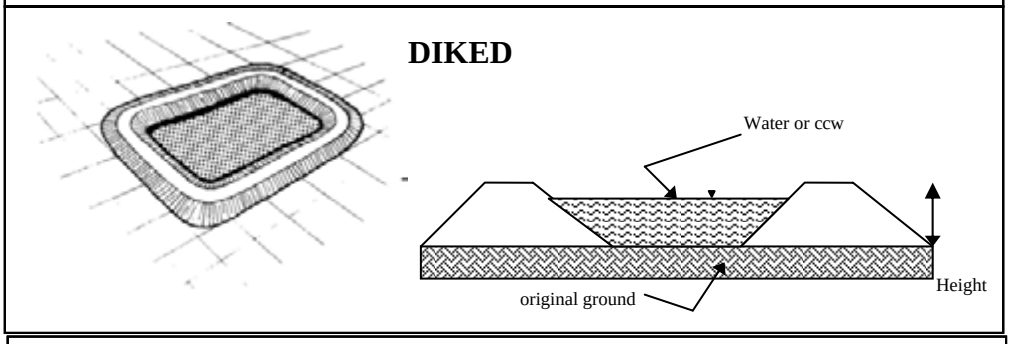
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

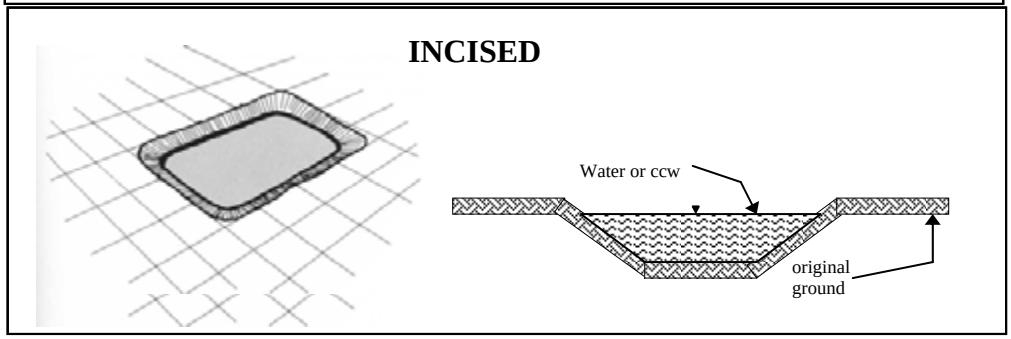
Potential failure of the impoundment embankment would not likely result in loss of human life. Economic or environmental damages would be limited to the owners property.

CONFIGURATION:









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

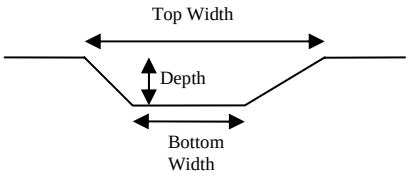
Embankment Height 7.5 feet
Pool Area 0.41 acres
Current Freeboard _____ feet

Embankment Material Granular Fill with Impervious Core
Liner Liner present
Liner Permeability Unknown

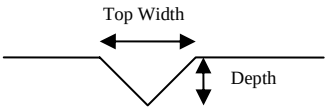
TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

TRAPEZOIDAL

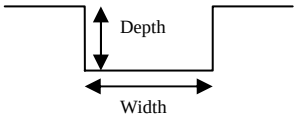


TRIANGULAR

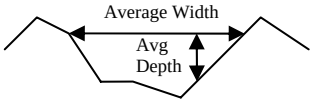


_____ depth
_____ bottom (or average) width
_____ top width

RECTANGULAR

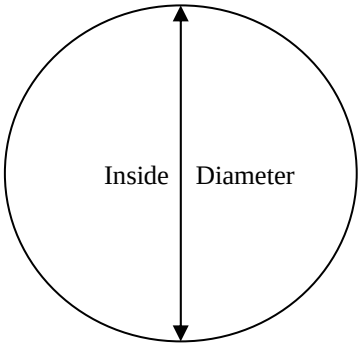


IRREGULAR



X **Outlet**

12 inside diameter
Varies: See Below.



Material
_____ corrugated metal
X 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 Barr Engineering Company, Minneapolis, MN

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 __N/A___

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

If so Please Describe : _____

APPENDIX D

REFERENCES

REFERENCE LIST
BAY FRONT GENERATING STATION

Barr Engineering Company, "Lake Superior Power District Bayfront Settling Basins", "Soil Boring Locations", drawing Dated February 2, 1976.

Barr Engineering Company, "Bayfront Settling Basins", Sheet 1 of 5, Site Plan, Dated March 3, 1976, and revised May 6, 1974.

Barr Engineering Company, "Bayfront Settling Basins", Sheet 2 of 5, "Typical Sections & Piping", Dated March 30, 1976.

Barr Engineering Company, "Bayfront Settling Basins", Sheet 3 of 5, "Piping & Structural Details", Dated March 30, 1976.

Barr Engineering Company, "Bayfront Settling Basins", Sheet 4 of 5, "Walkway Bridge & Platform Details", Dated March 30, 1976.

Barr Engineering Company, "Bayfront Settling Basins", Sheet 5 of 5, "Railing & Bridge Details", Dated March 30, 1976.

Barr Engineering Company, "Bayfront Settling Ponds Demonstration of Non-Adverse Impact on the Waters of the State of Wisconsin", Dated March 3, 1992.

Barr Engineering Company, "Seismic Stability and Hydrology Analysis of Water Treatment Basins, Bay Front Generating Station", Dated July 2012.

Wilder, Jr., LeRoy, Coordinator, Environmental Activities, "NSPW Bay Front Generating Facility, Inspection and Maintenance Plan for the Surge Basin and Polishing Pond", Revised: September 23, 1997, October 16, 1997.

SEH, Engineers, Architects, Planners, "Bayfront Generating Plant Facility Plot", Dated October 3, 1992.

State of Wisconsin Department of Natural Resources, "Beneficial Use of Cyclone Boiler Ash (Slag) As a Substitute for Sand and Gravel or Aggregate Material", letter Dated May 8, 1990.

State of Wisconsin Department of Natural Resources, Chapter NR 213, Lining of Industrial Lagoons and Design of Storage Structures, Pages 83 thru 84-15, History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

State of Wisconsin Department of Natural Resources, "Ch. NR 213 Wis. Adm. Code Lagoon Evaluation Northern States Power-Bay Front Generating Facility, Final Determination", letter, Dated January 6, 1995.

State of Wisconsin Department of Natural Resources, "Beneficial Use of Northern States Power Company (NSP) Bay Front Boiler Slag as Base Course, Subbase or Sub-Grade Fill for the Construction of Paved Roadways", letter Dated July 28, 1999.

State of Wisconsin Department of Natural Resources, WPDES Permit Reissuance No. WI-00082887-06-0, Dated December 30, 2002.

Wisconsin Administrative Code, Chapter 213, "Lining of Industrial Lagoons and Design of Storage Structures, Pages 109 thru 115, Register, September, 1997, No. 501.

Hall, Lynn "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated August17, 2010.

Sanders, Susan, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated November 17, 2009.

Sanders, Susan, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated October 23, 2008.

Sanders, Susan, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated April 30, 2007.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated June 27, 2006.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated September 13, 2005.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated August 31, 2004.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated July 30, 2003.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated October 11, 2002.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated September 20, 2001.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated October 24, 2000.

Sullivan, Ed, "NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log", Dated July 29, 1999.

Sullivan, Ed, “NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log”, Dated March 25, 1999.

Sullivan, Ed, “NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log”, Dated May 1, 1998.

Sullivan, Ed, “NSPW Bay Front Surge Basin and Polishing Pond Annual Inspection Log”, Dated November 25, 1997.

Unknown Author, Bayfront Settling Pond, Dike and Structure Design, 1976.

APPENDIX E

PREVIOUS INSPECTION REPORTS

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Not much weed growth this year. No erosion noted.

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Pond seem was minimal through August. Some emergent growth around edges. Cleaned out seam + berm around outlet / confined space on catwalk in August. Area around both ponds maintained / manicured by Jesson Lawn service. Some purple loosestrife invasive species growing around edges of ponds. Jenny Tyler painted catwalk in August + contacted mike Mantone to catwalk.

Lynn Hall
August 17th, 2010.

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

There was much less weed growth during the past summer. Boiler 5 was taken offline on 9/27/07 for an indefinite amount of time. Slag was visible when the Boiler 5 is off and the flow to the pond is low. No erosion noticed.

Polishing Pond	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Pond seem started to emerge beginning of August. It formed around the east and west sides and was a little heavier on the north side. Cleaned out seem that during an inspection area around south ponds was maintained by Lawn Lawn Service and Plant employee Mike Foley. No erosion noticed. Mike also trimmed brushes growing along north side outside the chain-linked fence by Outfall 003

Susan Sanders
November 17, 2007

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin — **Circle One**

Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Surge basin was drained into polishing pond on 10/22/08 by Brad Swartz & Mike Foley. Wendy & Wendy then dredged the pond starting 10/23/08.

Polishing Pond — **Circle One**

Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Slight build-up of scum during end of June & July on north side. Covered open area was checked every week while getting Outfall 003 water samples. Cleared scum surrounding the manhole flow as needed. Mike Foley trimmed weeds and underbrush around discharge area and gate area.

Susan Sarden
10/23/08

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Pond was drained starting on April 20, 2007. Veerdy & Hassly Inc dredged the pond starting April 23 and completing on April 25. Slag Gravel the pond was stockpiled on the north side of the plant. See attached email from Jerry Tyler

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Floating pond scum. Heavy on north side.

Susan Gardner
April 30, 2007

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

SURGE BASIN WAS CLEANED IN OCT 05.

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

pond scum covering about half of pond surface

Ed Sullivan 6/27/06

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

#5 BOILER SLAG BUILDING UP IN FRONT OF INLET PIPES. SURGE POND WILL BE CLEANED IN 2005

Polishing Pond	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

HEAVY POND SCUM DURING MONTH OF AUGUST.

E.L. Sullivan 9/13/05

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

H & RAILS SLAB BUILDING UP IN FRONT OF TOILET PIPES.

Polishing Pond	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

FLOATING PUMP SCREEN HEAVY FOULING AND COVERING APP 3/4 OF POLISHING POND.

Ed Sullivan 8/31/04

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

BOILER SLAG IS BUILDING UP ACROSS POND IN FRONT OF INLET PIPES.

Polishing Pond	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

ONLY A SMALL AMOUNT OF POND SCUM THIS YEAR. SO FAR, CATAILS WERE PULLED FROM SOUTHEAST CORNER OF SETTLING BASIN EARLIER THIS SUMMER.

Ed Sullivan 7/30/03

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

MORE THAN USUAL FLOATING POND SCUM DURING SUMMER, ALMOST ALL CLEARED UP NOW. ASHLAND CONSTRUCTION CLEANED BOTH SIDES AS FAR AS THEY COULD REACH WITH BACKHOE ON 10/10/02. POND SLUG STOCKPILED ON NORTH SIDE OF PLANT.

Polishing Pond	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

MORE THAN USUAL FLOATING POND SCUM DURING SUMMER, BUT HAS ALMOST ALL CLEARED UP AS OF THIS DATE. CLUMP OF CATAILS IN SW CORNER PULLED OUT WITH BACKHOE ON 10/10/02

Ed Sullivan
10/11/02

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Polishing Pond	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

Some sand accumulating on NW corner of Settling Basin polishing pond.

EJ Sulzman 9/20/01

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

SURGE BASIN CLEANED BY ROFFERS CONSTRUCTION ON 10/11/2000. LANDSCAPING AND SEEDING WILL BE DONE IN SPRING TO REPAIR SURFACE DAMAGE ON TOP & OUTSIDE SLOPE OF BARGE BASIN. APPROXIMATELY 500 YARDS OF SOLIDS REMOVED.

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	(Yes) No

Comments/Observations

SLIGHT ENHENTATION ON INSIDE ON NORTH END OF POND, DOES NOT REQUIRE IMMEDIATE ATTENTION, WILL BE REPAIRED IN SPRING ALONG WITH SURGE BASIN LAND SCAPING

Ed Sullivan
10/24/2000

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	(Yes) No

Comments/Observations

EROSION CAUSED BY WATER ENTERING POND FOR CLEANING WAS REPAIRED BY ADDING CLAY FILL IN JUNE OF 1999. VERY LITTLE WEED GROWTH IN SUMMER OF 1999

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

VERY LITTLE WEED GROWTH IN SUMMER OF 1999

Ed Sullivan 7/29/99

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	(Yes) No

Comments/Observations

SURGE BASIN CLEANED ON 8/26/98. APP. 300 YARDS OF SOLIDS WERE REMOVED. SOME EROSION WAS NOTED WHERE WATER ENTERED POND. WILL BE REPAIRED IN SPRING OF '99. BY SOUTHWEST CORP.

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	(Yes) No

Comments/Observations

SLIGHT EROSION ON NORTH END OF POND. WILL BE REPAIRED IN SUMMER OF 1999

Ed Anderson

8/25/98

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

When #5 Berlin is off - coal slag can be seen above the water surface. It settles out fast north of the 4 10" influent lines. The weed extract about 30 ft long almost across pond east to west. Management agrees that Surge Basin should be cleaned during summer of 1998.

Polishing Pond

	Circle One
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	(Yes) No

Comments/Observations

Some Erosion noticed on inside on north end of polishing pond. It should be restored when Surge Basin is cleaned this summer.

Ed Sullivan
5/1/98

NSPW Bay Front
Surge Basin and Polishing Pond Annual Inspection Log

Surge Basin	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

There was some sign of weed growth during summer of 1997. There either were no beavers or along the front of Basin 1 there was some evidence of beaver activity. There is some erosion along the dividing line. This is mostly only where it is lower than the water level.

Polishing Pond	**Circle One**
Is there excessive emergent weed growth?	Yes (No)
Is there excessive submergent weed growth?	Yes (No)
Are there signs of animal damage to the berms?	Yes (No)
Are there signs of erosion occurring along either the interior or exterior of the berms?	Yes (No)

Comments/Observations

There was excessive weed growth during summer of 1997 along edges.

Ed Sullivan
10/25/97

APPENDIX F

PHOTOGRAPHS

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
1	6/14/11

Direction Photo Taken:
Southeast

Description:
Upstream slopes and Crest of the Surge Basin.

Photo No.	Date:
2	6/14/11

Direction Photo Taken:
North

Description:
Upstream Slopes and Crest of the Surge Basin.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
3	6/14/11

Direction Photo Taken:
Southwest

Description:
Upstream slope of the Surge Basin and overview of Polishing Basin.

Photo No.	Date:
4	6/14/11

Direction Photo Taken:
Southeast

Description:
Upstream slope, Downstream slope and Crest of the Surge Basin.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
5	6/14/11

Direction Photo Taken:
Southwest

Description:
Upstream slopes and Crest of the Surge Basin.

Photo No.	Date:
6	6/14/11

Direction Photo Taken:
Southeast

Description:
Surge Basin intake pipe clean-out.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
7	6/14/11

Direction Photo Taken:
Northwest

Description:
Upstream slope, downstream slope, and crest of the Surge Basin.

Photo No.	Date:
8	6/14/11

Direction Photo Taken:
Northwest

Description:
Surge Basin Flow Control structure.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
9	6/14/11

Direction Photo Taken:
Southeast

Description:
Surge Basin flow control structure.

Photo No.	Date:
10	6/14/11

Direction Photo Taken:
Southwest

Description:
Surge Basin flow control structure.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
11	6/14/11

Direction Photo Taken:
North

Description:
Upstream slope of the Polishing Basin.

Photo No.	Date:
12	6/14/11

Direction Photo Taken:
East

Description:
Upstream slope and Crest of the Polishing Basin.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
13	6/14/11

Direction Photo Taken:
East

Description:
Upstream slopes and Crest of the Polishing Basin.

Photo No.	Date:
14	6/14/11

Direction Photo Taken:
Southeast

Description:
Upstream slopes and Crest of the Polishing Basin.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
15	6/14/11

Direction Photo Taken:
West

Description:
Upstream slopes and Crest of the Polishing Basin.

Photo No.	Date:
16	6/14/11

Direction Photo Taken:
South

Description:
Upstream slope of the Polishing Basin.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
17	6/14/11

Direction Photo Taken:
Northeast

Description:
Upstream slope and Crest of the Polishing Basin.

Photo No.	Date:
18	6/14/11

Direction Photo Taken:
Southeast

Description:
Polishing Basin training dike.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
19	6/14/11

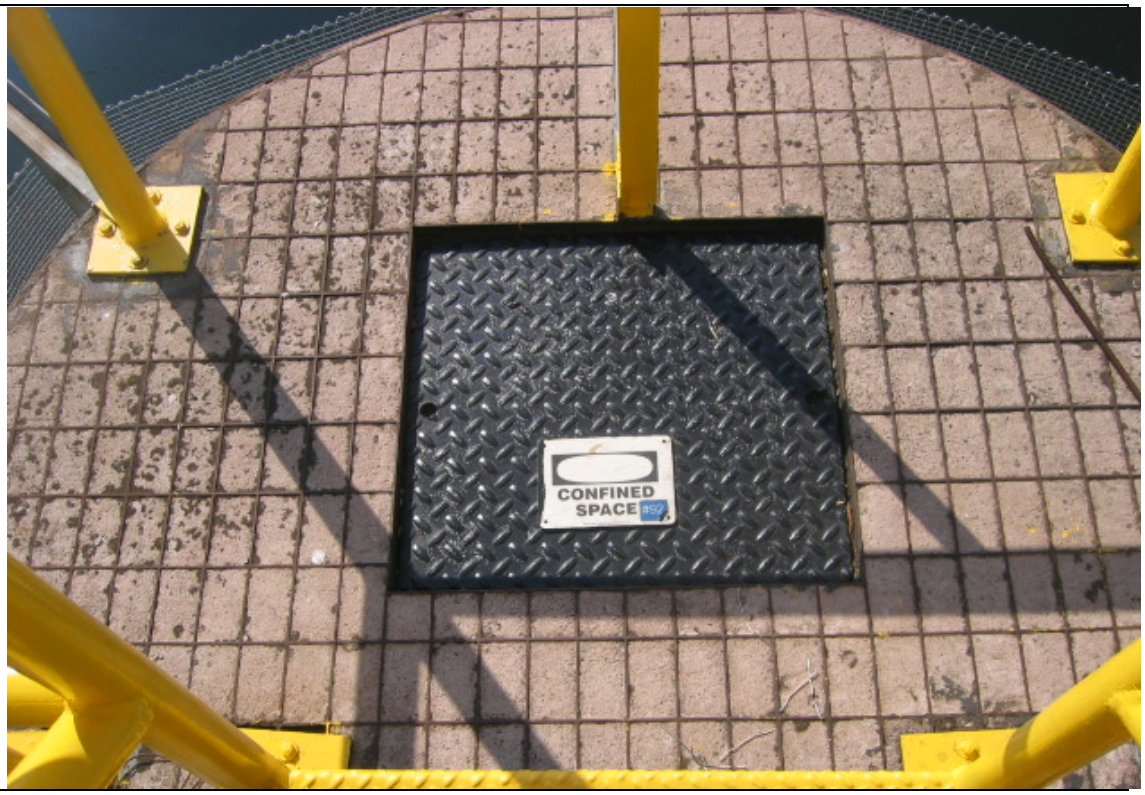
Direction Photo Taken:
East

Description:
Polishing Basin Outfall structure.

Photo No.	Date:
20	6/14/11

Direction Photo Taken:
Southeast

Description:
Polishing Basin Outfall structure.



GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
21	6/14/11

Direction Photo Taken:
Southeast

Description:
Flow into the Polishing Basin Outfall structure.

Photo No.	Date:
22	6/14/11

Direction Photo Taken:
Southeast

Description:
Flow into the Polishing Basin Outfall structure.

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
23	6/14/11

Direction Photo Taken:
Northwest

Description:
Polishing Basin Water Quality structure

Photo No.	Date:
24	6/14/11

Direction Photo Taken:
Southeast

Description:
Polishing Basin Outflow Discharge pipe

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No.	Date:
25	6/14/11

Direction Photo Taken:
Northwest

Description:
Flow from Polishing Basin Outflow Discharge pipe toward Lake Superior

Photo No.	Date:
26	6/14/11

Direction Photo Taken:
Northwest

Description:
Flow from Polishing Basin Outflow Discharge pipe into Lake Superior

GZA GeoEnvironmental, Inc.

PHOTOGRAPHIC LOG

Client Name: U.S. EPA	Site Location: Bay Front Generating Station Ashland, Wisconsin	Project No. 01.0170142.30

Photo No. 27	Date: 6/14/11

Direction Photo Taken:
Southwest

Description:
Downstream slope of the Surge and Polishing Basin.

Photo No. 28	Date: 6/14/11

Direction Photo Taken:
Northwest

Description:
Downstream slope of the Polishing Basin.