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Coal Combustion Residue Impoundment
Round 12 - Dam Assessment Report

Weston Generating Station (Site 26)

Northeastern, Northwestern, Southeastern and Southwestern Secondary Bottom Ash Treatment Ponds
Wisconsin Public Service
Rothschild, Wisconsin

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, was a wake-up call for diligence on coal combustion residue disposal units. A major step toward preventing such catastrophic failures is to assess the stability and functionality of the ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the following management units: Northeastern Secondary Pond, Northwestern Secondary Pond, Southeastern Secondary Pond, Southwestern Secondary Pond is based on a review of available documents and on the site assessment conducted by Dewberry personnel on Tuesday, August 21, 2012. The four management units are small (2.4 acres or less), low hazard potential impoundments. We found the supporting technical documentation adequate, although the inability to produce the original design reports made a complete review difficult. The management units have been given a "Satisfactory" rating.

The Northeastern Secondary Pond is **SATISFACTORY** for continued safe and reliable operation, with no recognized visual management unit safety deficiencies, associated with the low hazard dam.

The Northwestern Secondary Pond is **SATISFACTORY** for continued safe and reliable operation, with no recognized visual management unit safety deficiencies, associated with the low hazard dam.

The Southeastern Secondary Pond is **SATISFACTORY** for continued safe and reliable operation, with no recognized visual management unit safety deficiencies, associated with the low hazard dam.

The Southwestern Secondary Pond is **SATISFACTORY** for continued safe and reliable operation, with no recognized visual management unit safety deficiencies, associated with the low hazard dam.

Two primary ponds were viewed during the site visit, however, due to their height (under 4 feet) and small size, these units were not included as part of this report. Additionally, a Tertiary Pond was viewed as part of the site visit, but since it contains no CCR, it was not assessed.

There are no recommendations for additional actions to be taken concerning the CCR management units.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is investigating the potential for catastrophic failure of Coal Combustion Residue Surface Management Units at electric utilities in an effort to protect lives and property from the consequences of a management unit failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

In February 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of CCR release from management units and rate the units for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry about the Northeastern, Northwestern, Southeastern and Southwestern Secondary Ponds, which was reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS
The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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Doc 04: Sargent & Lundy Drawing No. C-20, Grading, Roadwork, and Drainage Plan, Sheet 10
Doc 05: Sargent & Lundy Drawing No. C-21, Grading, Roadwork, and Drainage Plan, Sheet 11
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Doc 22: Geotechnical Stability Analysis, Secondary Bottom Ash Basins, Weston Generating Station, May 22, 2014

1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, Tuesday, August 21, 2012, and review of technical documentation provided by Wisconsin Public Service.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments around the four impoundments did not exhibit obvious structural stability issues of concern based on the visual inspection. In May 2014 Wisconsin Public Service Corporation (WPSC, the Utility) provided relevant engineering analyses that allowed Dewberry engineers to determine the structural stability of the dikes surrounding the management units (Appendix D, Doc 22). The ponds are rated SATISFACTORY for structural stability.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

No hydrologic or hydraulic analyses were provided to Dewberry by the utility. Dewberry determined the ring dikes receive no drainage other than the surface area of the ponds. It is noted that the impoundments are not immediately adjacent to a water body.

As part of its comments on the draft report the utility performed an informal hydrologic evaluation of the management units. The utility provided a flood inundation map (Appendix D, Doc 21) and showed the management units are removed from and above the river, even under the 500-year flood conditions. The 19-inch freeboard is more than adequate to hold direct precipitation in the impoundments. Therefore the units are rated Satisfactory for hydrologic/hydraulic safety.

There have been two overtopping events of the northeastern secondary pond due to operational failures. In response to the overtopping events, WPSC raised the grade in low areas along the embankment and installed level meters to monitor water elevations in the management units.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is not complete since the design report for the original management units (constructed in 1981, designed by Sargent & Lundy, Chicago, IL) has not been provided by the utility, nor did Dewberry receive any relevant design analysis information on these units. Construction specifications and liner permeability related to the original design was provided by the utility. An engineering report related to embankment construction for the new embankments constructed in 2005 when a railroad loop was constructed was provided by WPSC.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management units provided by the owner was an accurate representation of what Dewberry engineers observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management units and was able to conduct a thorough field observation. The visible parts of the embankment dikes and outlet structure were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. Embankments appear structurally sound. There are no apparent indications of unsafe conditions or conditions needing remedial action.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for all four bottom ash management units observed.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The Weston Generating Station does not have a formal surveillance program. The informal monitoring program in place currently appears to be appropriate. The bottom ash basins have water level sensors. An alarm will sound in the plant if the ponds begin to approach an overfilling situation.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The four CCR management units are each rated SATISFACTORY.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

No additional recommendations are warranted at this time.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

No additional recommendations are warranted at this time.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

No additional recommendations are warranted at this time.

1.2.4 Recommendations Regarding Continued Safe and Reliable Operation

No recommendations appear warranted at this time.

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1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Mark Metcalf, Integrys Business Support
Dave Molzahn, Wisconsin Public Service Corporation
Randy Oswald, Integrys Business Support
Kevin Mataczynski, Integrys Business Support
Gerard Skrzypchak, Wisconsin Public Service Corporation
Steve Schaefer, Wisconsin Public Service Corporation
John Myers, Integrys Business Support
Cleighton Smith, Cleighton Smith Engineering LLC (Dewberry)
Lauren Ohotzke, Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the management units referenced herein have been assessed on August 21, 2012.

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2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The WPSC – Weston Generating Station is located at 2501 Morrison Avenue, Rothschild, Wisconsin. The Station is about 10 miles south of the city of Wausau in Marathon County, in north central Wisconsin. The western property line of the plant is adjacent to the Wisconsin River. The below image has been referenced from Google Maps.

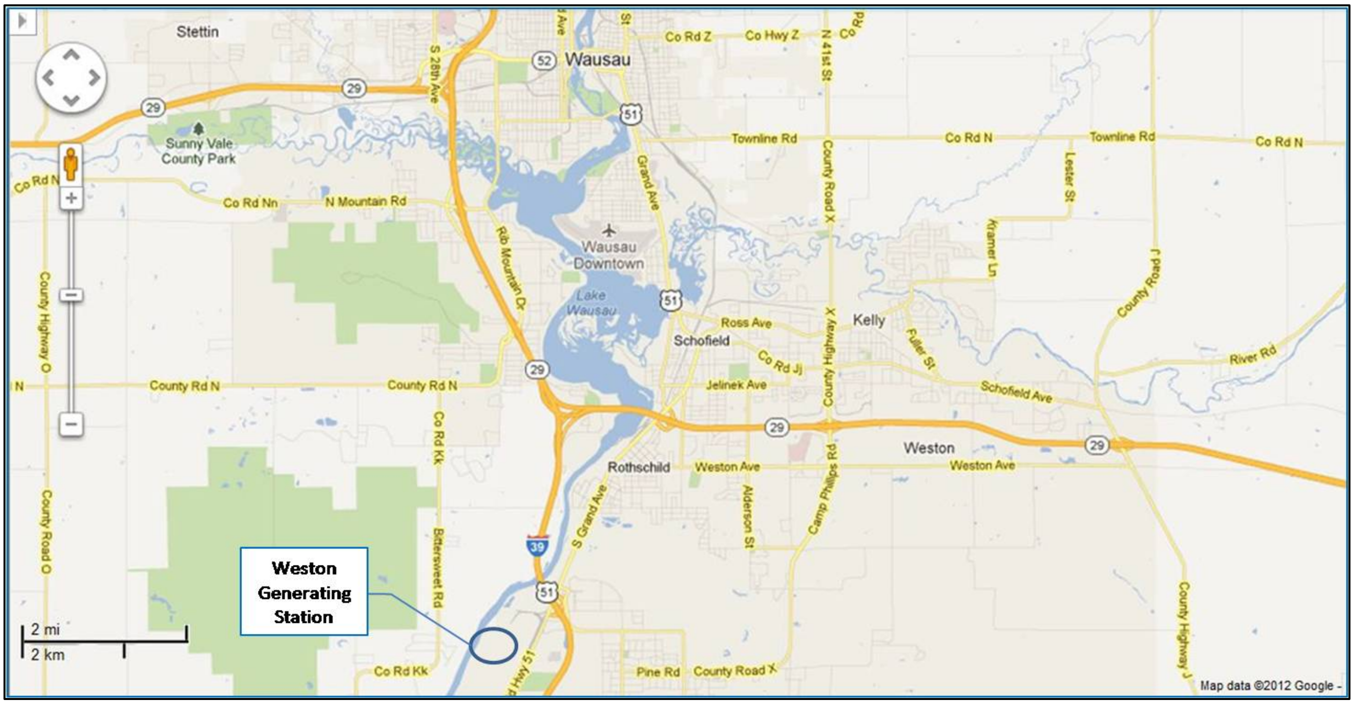

Figure 2.1a: Google Map of the Weston Generating Station

At the Weston Generating Station there are four coal fired boilers used for the production of electricity. WPSC utilizes sub-bituminous coal from the Powder River Basin (PRB) as the primary fuel in the boilers. As a result of the combustion process, coal combustion residuals (CCRs) are generated. CCRs can generally be classified as either fly ash or bottom ash. WPSC actively markets CCRs, both fly ash and bottom ash, produced at the facility for beneficial reuse in accordance with Chapter NR 538, Wisconsin Administrative Code. The biggest reuse for CCRs generated at the site is the use of fly ash as a replacement for Portland cement in concrete applications. The next biggest use for ash is in structural fill projects such as highway embankments followed by the use of bottom ash as a daily cover at local landfills. In the event that WPSC is unable to find a beneficial reuse project for CCRs generated at the facility, the material is taken to a licensed landfill for disposal. Section 2.2 of this report describes the CCR handling activities at the Weston Generating Station.

The impoundments assessed in this report are as follows:

Northeastern Secondary
Northwestern Secondary
Southeastern Secondary
Southwestern Secondary

Table 2.1a: Summary of Management Unit Dimensions and Size	
	Northeastern Secondary Ash Pond
Dam Height (ft)	8.5
Crest Width (ft)	10
Length (ft)	513
Side Slopes (upstream) H:V	3:1
Side Slopes (downstream) H:V	3:1

Table 2.1b: Summary of Management Unit Dimensions and Size	
	Northwestern Secondary Ash Pond
Dam Height (ft)	8.5
Crest Width (ft)	10
Length (ft)	275
Side Slopes (upstream) H:V	3:1
Side Slopes (downstream) H:V	3:1

Table 2.1c: Summary of Management Unit Dimensions and Size	
	Southeastern Secondary Ash Pond
Dam Height (ft)	11
Crest Width (ft)	10
Length (ft)	575
Side Slopes (upstream) H:V	3:1
Side Slopes (downstream) H:V	3:1

Table 2.1d: Summary of Management Unit Dimensions and Size	
	Southwestern Secondary Ash Pond
Dam Height (ft)	11
Crest Width (ft)	10
Length (ft)	150
Side Slopes (upstream) H:V	3:1
Side Slopes (downstream) H:V	3:1

The three aerial maps featured below, referencing Bing Maps, depict the specific location of the treatment ponds described above.

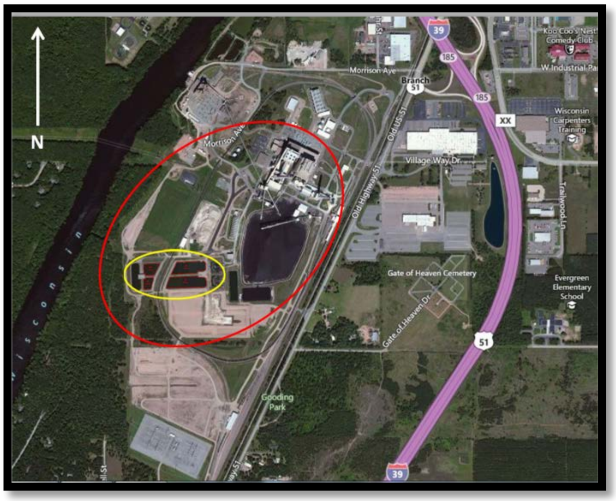

Figure 2.1b: General Area of Facility

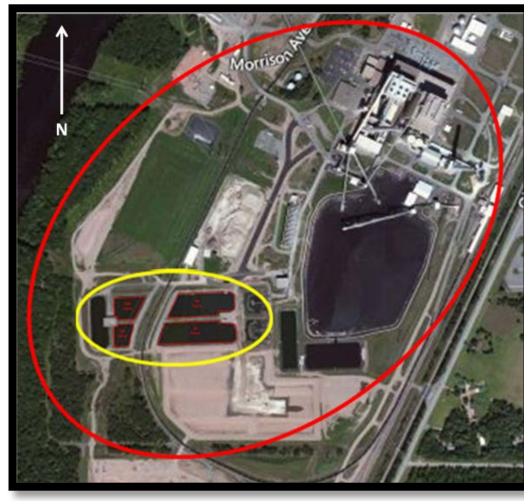

Figure 2.1c: Weston Generating Station

Figure 2.1d: Treatment Ponds at Weston Generating Station

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

Fly ash generated at the facility is handled dry. Fly ash generated by Units 3 and 4 is removed with a baghouse. Fly ash removed from the flue gas is collected in hoppers, and pneumatically transferred to a storage silo (see Photo 1 within Appendix C, Doc 20). Fly ash stored in the silo is unloaded via the silo discharge chute by either a dry or wet method. If the dry method is used, a telescopic spout is connected to an enclosed tanker truck and an automatic gate is opened to transfer ash to the truck. Dry fly ash is transported to the various vendors that typically use the product as a concrete replacement. The wet method utilizes a rotary mixer/unloader which uses water to condition the fly ash before it is loaded onto a dump truck and transferred to a temporary ash storage pad on site. The majority of Unit 4 fly ash is unloaded wet and transferred to the onsite temporary storage pad for use in beneficial reuse projects (see Photo 2 within Appendix C, Doc 20).

2.2.2 Bottom Ash and Boiler Slag

Bottom ash and boiler slag from Weston Unit 3 are collected in hoppers located directly beneath the boiler. These CCRs are sluiced from the boiler to a series of treatment basins designed to allow settling for the removal the CCRs. Specifically, the bottom ash is sluiced directly from the boiler to one of two primary settling basins (see Photo 3 within Appendix C, Doc 20). The facility has redundant basins for the removal of CCRs, which allows the facility to perform maintenance on one set of basins while the other basins are kept in service. These redundant basins have been labeled Northern and Southern Primary Ponds, within this report.

Within the primary basins, the majority of bottom ash is dewatered and quickly settles out. Bottom ash in the primary basins is removed weekly with a front end loader and transported via truck to a temporary storage pad for future beneficial reuse or used as daily cover in a local landfill (see Photo 2 within Appendix C, Doc 20).

Bottom ash and boiler slag from Weston Unit 4 are received, cooled, and dewatered by a submerged bottom ash scraper and conveyor located directly beneath the boiler. Ash collected in the economizer hoppers and rejects from the pulverizing mills are also transferred to the receiving trough of the submerged scraper conveyor. After dewatering, the comingled material is transferred to a truck which transports the material to a temporary storage area (see Photo 2 within Appendix C, Doc 20). The Unit 4 bottom ash/slag accumulated in the temporary storage area is loaded onto trucks and transported offsite for beneficial reuse projects.

Sluice water and bottom ash fines then flow via gravity into a secondary settling basin. The secondary basins are designed to allow for settling of the fines by providing residence time for the sluice water. The facility also uses sediment curtains within the secondary basins to assist in settling of fines (see Photos 4 and 5 within Appendix C, Doc 20). In 2005, the secondary basins were separated by a loop railroad line to serve the needs of the plant. The secondary basins have been labeled Northeastern, Northwestern, Southeastern, and Southwestern. Equalizing underground conduits allow these basins to maintain the same elevations.

Sluice water from the secondary basins is then treated for pH and/or total suspended solids (as needed) prior to being pumped into a tertiary basin. Water in the tertiary basin is either pumped back to the unit for use in the closed loop sluice water system or discharged to the Wisconsin River in accordance with the WPDES permit number WI-0042756-07-0 for Weston Units 3 and 4 (See Appendix A, Doc 01). WSPC does not consider the tertiary basin to be a basin that contains CCRs. Based on the description of plant operations and visual assessment, Dewberry concurs.

Bottom ash and boiler slag from Units 1 and 2 are treated in basins considered to be incisions and therefore are not considered to be impoundments assessed as part of this report; WSPC refers to these as Seepage Basins. These incised basins were observed as part of the site visit (see Photos 6 through 13 within Appendix C, Doc 20. Units 1 and 2 operate under WPDES Permit No. WI-0003131-06-0 (see Appendix A, Doc 02).

2.2.3 Flue Gas Desulfurization Sludge

Not applicable; no flue gas desulfurization sludge is generated at this plant.

2.3 SIZE AND HAZARD POTENTIAL CLASSIFICATION

Based on the impoundment size classifications in Table 2.2a, all CCR impoundments at the Weston Generating Station are classified as “Small”; all heights are less than 25 feet and all storage capacities are less than 1,000 ac-ft.

Table 2.2a: USACE ER 1110-2-106 Size Classification		
	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

Based on the hazard potential classifications in Table 2.2b, all CCR impoundments at Weston should be classified as Low Hazard Potential. In the event of a failure, no loss of human life would be expected, and economic, environmental, and lifeline losses would be low and generally limited to the plant.

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Potential Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low; Less-than-Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The CCRs treated in the ponds at Weston are bottom ash and boiler slag. The maximum capacities are shown in Tables 2.3a through 2.3d.

Table 2.3a: Maximum Capacity of Unit	
Northeastern Secondary Pond	
Surface Area (acre)	1.91
Total Storage Capacity (Max) (cubic yards)	14,583
Total Storage Capacity (acre-feet)	9.0
Crest Elevation (feet)	1182

Table 2.3b: Maximum Capacity of Unit	
Northwestern Secondary Pond	
Surface Area (acre)	0.92
Total Storage Capacity (Max) (cubic yards	7,366
Total Storage Capacity (acre-feet)	4.6
Crest Elevation (feet)	1182

Table 2.3c: Maximum Capacity of Unit	
Southeastern Secondary Pond	
Surface Area (acre)	2.34
Total Storage Capacity (Max) (cubic yards)	17,862
Total Storage Capacity (acre-feet)	11.1
Crest Elevation (feet)	1182

Table 2.3d: Maximum Capacity of Unit	
Southwestern Secondary Pond	
Surface Area (acre)	0.61
Total Storage Capacity (Max) (cubic yards)	4863
Total Storage Capacity (acre-feet)	3.0
Crest Elevation (feet)	1182

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

The secondary treatment ponds are formed by earthen embankments in the form of a ring dike. The embankments were designed by Sargent & Lundy, Chicago, IL, around 1980 and constructed in 1981. Appendix A, Document 3 contains construction specifications dated 03-19-1980. In addition, design drawings C-20, C-21, C-42, C-43 and C-44, referenced in the construction specifications are attached in Appendix A Documents 4, 5, 6, 7 and 8, respectively.

These design drawings specify upstream and downstream side slopes at 3:1. The drawings and construction specifications also indicate that a 1.0 foot layer of bentonite was specified for the upstream side slope, with a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec. Appendix A, Document 9 contains laboratory test results (dated July 16, 1980) performed by Merrill Gravel & Construction Company intended to meet the specifications of the bentonite liner.

The design specifies 1.0-foot soil cover above the bentonite liner and a 2.0-foot layer of crushed gravel above the soil cover. The majority of the remainder of the embankments specifies compacted fill, and seeding with 4 inches of topsoil on the downstream side slopes.

The facility was originally designed with two secondary storage basins. In 2005, the railroad loop was constructed which essentially split the existing basins into four secondary basins. New embankments were constructed with an underground conduit to allow the north and south secondary basins to operate as one hydraulically connected pond. This design was performed by Black & Veatch, Kansas City, MO in 2004. Appendix A, Document 10, correspondence from WPSC to Wisconsin DNR, dated Feb 21, 2005, contains pertinent details of the design. This document contains specification for maintaining permeability specification for a bentonite layer to be 1 x 10^{-7} cm/sec (same as original design). Appendix A, Documents 11, 12, 13, 14, 15 and 16 are key Black & Veatch drawings related to the design of the railroad line through the secondary treatment ponds.

2.5.2 Outlet Structures

As shown in Appendix A, Documents 12 and 16, the Northeastern and Southeastern Secondary Ponds each have two 24-inch submerged CDHPE culverts connecting to the Northwestern Pond and Southwestern Secondary Ponds, respectively. These culverts are submerged beneath the railroad tracks between the east and west Secondary Ponds.

The Northwestern and Southwestern Secondary Ponds have no outlet structure. Water is pumped out as needed for treatment in the Tertiary Pond.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

Critical infrastructure within five miles downstream is nearly non-existent. This area is a rural, wooded reach of the Wisconsin River in Marathon County, upstream of the Mosinee Dam in Mosinee, Wisconsin.

From the site visit, it appeared that the embankment with the greatest potential for release of CCR to off-site, possibly to the Wisconsin River, was the southwest portion of the embankment of the Southwestern Secondary Pond. A view of the potential release path is shown in Photos 14 and 15 within Appendix C, Doc 20. During the site visit this potential failure path was observed to intersect a perimeter ditch, originally constructed as part of construction storm water management (see Photos 16 and 17 within Appendix C, Doc 20). This ditch terminates at a berm, which would prevent releases from entering the Wisconsin River.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

WPSC was not able to produce reports related to the safety of the impoundments.

3.2 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

The impoundments are not under the jurisdiction of any regulatory agency.

Treated water discharged from the tertiary pond into the Wisconsin River is regulated by the Wisconsin Department of Natural Resources under the Wisconsin Pollutant Discharge Emissions System (WPDES). Weston Units 3 and 4 operate under WPDES Permit No. WI-0042765-07-0, issued April 1, 2010. (See Appendix A, Doc 01).

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

While briefly mentioned during the site investigation, the majority of the information collected regarding two overtopping events at the Weston Generating Station was received via e-mail correspondence between Dewberry and the utility.

WPSC has had two overtopping events of the secondary bottom ash treatment basins at the Weston Generating Station. The first occurrence was in January 2008, during the startup of Weston Unit 4. A surge tank used to store treated river water had a level sensor failure, which resulted in an overflow of the surge tank to a sump that directs water to the secondary treatment basin. Approximately 120,000 gallons of treated river water was pumped to the Northern Secondary Pond, which resulted in an overflow of that pond. At the time of the incident, the bottom ash treatment system was discharging treated water to the Wisconsin River. Once the bypass was discovered, the treatment rate of the bottom ash treatment system was increased. WPSC estimated that the over-topping lasted approximately 48 hours and that approximately 8,700 gallons had over topped the basin into an adjacent ditch (i.e., 3 gpm).

A second overtopping event occurred in February 2008. At the time of the incident, the bottom ash treatment system was out of service. As the facility was not able to treat bottom ash transport water, the level increased and eventually over topped the basin. Portable pumps were brought in to transfer water from the bottom ash basin to the metal cleaning water basin where the water was treated and discharged. It was estimated that less than 2,000 gallons of water were released.

Both overtopping events occurred at a low point on the Northeastern Ash Pond embankment on the northern portion approximately 100 feet east of the northwest corner of the embankment.

In response to these events in 2008 WPSC raised the grade of the area on the embankment where the overtopping occurred and installed level meters on the basins to monitor water elevation to prevent any future overflow of the secondary or tertiary basins.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The original construction of the bottom ash treatment basins took place in 1981.

The construction specifications from Sargent & Lundy Engineers (Appendix A, Doc. 3), specify a soil bentonite lining, composted of bentonite, soil for a bentonite soil mixture and protective sand layer and a protective rock layer of crushed stone or crushed gravel.

Fill for the dikes was specified to be "CCF1 compacted". The subgrade for the basin lining was said to be compacted to 90% of the maximum Standard Proctor density as determined by ASTM D 698, Method B. Then, before the 1 foot bentonite lining could be placed, the sides of the basins were to be drained and bladed smooth. Any holes seen in the basin were to be filled with a dry mixture of one part bentonite and four parts sand, blended dry.

There was also to be a clay lining installed. This clay was to have a plasticity index (PI) greater than or equal to 15 and more than 50% of the clay particles must have passed a #200 sieve as determined by ASTM D1140. Immediately prior to the installation of the clay liner, the basin slopes and bottom were to be compacted to a density not less than 90% of the Standard Laboratory Maximum Dry Density (ASTM D698). Once installed, the clay was then to be compacted using a sheep's foot roller to 95% of the Modified Laboratory Maximum Dry Density (ASTM D1557). Next, a protective sand and rock layer was installed.

4.1.2 Significant Changes/Modifications in Design since Original Construction

In 2005 the secondary treatment basins were modified for the installation of a railroad loop track at the site. As a result, new embankments were constructed, effectively separating the existing secondary basins. New embankments were constructed parallel to the railroad track using the same materials and configuration as the existing embankments. The eastern and western basins are connected via a culvert underneath the railroad track, oriented perpendicular to the track. There is one culvert connecting the southern basins.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No significant repairs or rehabilitation appear to have been performed to the bottom ash treatment basins since original construction.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

Basic operations for treatment of CCRs at this site were described in Section 2.2 of this report.

4.2.2 Significant Changes in Operational Procedures and Original Startup

With the exception of the railroad loop, essentially separating the secondary treatment basins, there has been no change in operations since original start up.

4.2.3 Current Operational Procedures

Current operations are the same as original.

4.2.4 Other Notable Events since Original Startup

Based on the overtopping events described in Section 3.2, additional water level monitoring has been added and is used in operations to prevent future overtopping incidents.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Cleighton Smith, P.E. and Lauren Ohotzke, E.I.T. performed a site visit on Tuesday, August 21, 2012 with the participants listed in 1.3.1.

The site visit began at about 9:00 AM. The weather was warm, approximately 75º F, with clear, sunny skies. Please refer to the Dam Inspection Checklists in Appendix B, Doc 19, for specific information gathered during this visit. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the management units, based on the site visit, were that they were in satisfactory condition and no significant findings were noted.

There is a northern and southern system of treatment ponds that can be run simultaneously or independently if necessary (shut down the north to work/clean the south and vice versa). The ponds within this system are described in the following sections; all ponds appeared to be constructed similarly and visually appeared to be in the same or similar condition.

5.2 NORTHEASTERN SECONDARY POND

5.2.1 Crest

The crest appeared to be in sound, structural condition with no obvious signs of settling, cracking or other areas of concern.

5.2.2 Upstream/Inside Slope

We observed a side slope that was in good condition, with no sloughing, animal burrows, excess vegetation or other areas of concern. The composition appeared to be that of an earthen clayey-silt.

5.2.3 Outside Slope and Toe

The outside slope and toe were composed of earthen materials showing no visual signs of sand boils, indications of seepage, or other areas of concern.

5.2.4 Abutments and Groin Areas

As these management units are essentially ring dikes, there are no abutments or groin areas.

Field conditions of the Northeastern Secondary Ash Pond embankments are shown in the photos below.

Photo 5.2.4a: Looking West at berm between Northern and Southern Secondary Ponds

Photo 5.2.4b: Looking Northwest from Southeast corner of Northeastern Secondary Pond (water level ~4' deep)

Photo 5.2.4c: Looking Northeast from berm between Northeastern and Southeastern Secondary Ponds

Photo 5.2.4d: Looking Northwest from midpoint of Northeastern Secondary Pond's Southern embankment (note silt curtain in foreground)

Photo 5.2.4e: Looking Northwest from midpoint of Northeastern Secondary Pond's Southern embankment (note silt curtain in foreground)

Photo 5.2.4f: Crest on West berm of Northeastern Secondary Pond

Photo 5.2.4g: Crest beside Southeastern Secondary Pond

5.3 NORTHWESTERN SECONDARY POND

5.3.1 Crest

The crest appeared to be in sound, structural condition with no obvious signs of settling, cracking or other areas of concern.

5.3.2 Upstream/Inside Slope

We observed a side slope that was in good condition, with no sloughing, animal burrows, excess vegetation or other areas of concern. The composition appeared to be that of an earthen clayey-silt.

5.3.3 Downstream/Outside Slope and Toe

The outside slope and toe were composed of earthen materials showing no visual signs of sand boils, indications of seepage, or other areas of concern.

5.3.4 Abutments and Groin Areas

As these management units are essentially ring dikes, there are no abutments or groin areas.

Field conditions of the Northwestern Secondary Ash Pond embankments are shown in the photos below.

Photo 5.3.4a: Looking Southwest from Northeast corner of Northwest Secondary Pond; Treatment center at Southwest corner of Northwest Secondary Pond

Photo 5.3.4b: Outside slope from Northwest corner of Northwest Secondary Pond

5.4 SOUTHEASTERN SECONDARY POND

5.4.1 Crest

The crest appeared to be in sound, structural condition with no obvious signs of settling, cracking or other areas of concern.

5.4.2 Upstream/Inside Slope

We observed a side slope that was in good condition, with no sloughing, animal burrows, excess vegetation or other areas of concern. The composition appeared to be that of an earthen clayey-silt.

5.4.3 Downstream/Outside Slope and Toe

The outside slope and toe were composed of earthen materials showing no visual signs of sand boils, indications of seepage, or other areas of concern.

5.4.4 Abutments and Groin Areas

As these management units are essentially ring dikes, there are no abutments or groin areas.

Field conditions of the Southeastern Secondary Ash Pond embankments are shown in the photos below as well as Photos 5.2.4a, 5.2.4f, and 5.2.4g above.

Photo 5.4.4a: Southeast Secondary Pond (water level ~4' deep)

FINAL

Photo 5.4.4b: Looking Northeast at Plant and Southeastern Secondary Pond

5.5 SOUTHWESTERN SECONDARY POND

5.5.1 Crest

The crest appeared to be in sound, structural condition with no obvious signs of settling, cracking or other areas of concern.

5.5.2 Upstream/Inside Slope

We observed a side slope that was in good condition, with no sloughing, animal burrows, excess vegetation or other areas of concern. The composition appeared to be that of an earthen clayey-silt.

5.5.3 Downstream/Outside Slope and Toe

The outside slope and toe were composed of earthen materials showing no visual signs of sand boils, indications of seepage, or other areas of concern.

5.5.4 Abutments and Groin Areas

As these management units are essentially ring dikes, there are no abutments or groin areas.

Field conditions of the Southwestern Secondary Ash Pond embankments are shown in the photos below.

Photo 5.5.4a: Pump at Southwest corner of Southwestern Secondary Pond. Transfers water to the truck washing station on the temporary CCR storage pad adjacent to the management units.

Photo 5.5.4b: Crest along Southwestern Secondary Pond's berm

5.6 OUTLET STRUCTURES

5.6.1 Overflow Structure

There are no overflow structures.

5.6.2 Outlet Conduit

The inlets and outlets were seen to be in good working condition. The conduits themselves were beneath the ground with a drivable crest above them. Seeing as though water seemed to be flowing from one pond to the next, we can say that the conduits would also appear to be in good working condition.

5.6.3 Emergency Spillway

Emergency spillways are not present for any ponds at this site.

5.6.4 Low Level Outlet

No low level outlets exist for this site.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

As part of its comments on the draft report, WPSC provided a flood inundation map for the 100- and 500- year floods (see Appendix D, Doc 21).

6.1.2 Inflow Design Flood

The inundation map shows there is no inflow from the river to the management units under the 500-year flood conditions.

6.1.3 Spillway Rating

There is not a spillway present at this site.

6.1.4 Downstream Flood Analysis

No downstream flood analysis was provided.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The only hydraulic calculations, assumptions, and hydrology data provided were the 100- and 500-year flood zone/inundation map. This is adequate since the map shows no influence from the river.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Design reports have not been provided for verification; however, it appears that there is no drainage area other than the surface area of the ponds. The comments on the draft report show there is no overtopping from an extreme rainfall event and river flooding. Low points on the northeastern secondary pond resulted in overtopping due to improper operations on two occasions. As a result, actions were taken to avoid future overtopping. The remedial actions were described above in Section 3.3.

The overall rating for hydrologic/hydraulic safety is SATISFACTORY.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Structural stability for static and seismic conditions was analyzed based upon the geotechnical report received in May 2014 (Appendix D, Doc 22).

7.1.2 Design Parameters and Dam Materials

Design parameters cannot be assessed without the design report. Significant information regarding embankment materials is contained in the construction specifications (Appendix A, Document 3; also, see Section 4.1.1) and geotechnical report (Appendix D, Doc 22).

7.1.3 Uplift and/or Phreatic Surface Assumptions

This information could not be assessed without the design report. However reasonable phreatic surface assumptions were made in the May 2014 geotechnical report.

7.1.4 Factors of Safety and Base Stresses

This information was assessed in the May 2014 geotechnical report.

The utility performed a geotechnical stability analysis of the secondary bottom ash basins. The analysis used soil boring data collected in 2003 near the management units (Appendix D, Doc 21). The soils were extracted from five holes using hollow stem augers to the water level, and then rotary wash drilling below the water table. In general these borings encountered fill near the surface, underlain by natural granular sandy soils. Based on the geotechnical borings near the secondary bottom ash basins an estimated moist unit weight of 120 pcf with a conservative friction angle of 30 degrees for the medium dense natural sands (SP-SW) was used for the stability analysis.

One cross section was used for the analysis (see drawings in Appendix D, Doc 22). Soil parameters selected are shown in Table 7.1.

Table 7.1: Soil Parameters Used For the Geotechnical Stability Analysis

Soil Description	Unit Weight (pcf)	Effective Stress Strength Parameters		Total Stress Strength Parameters	
		c' (psf)	ϕ'	c' (psf)	ϕ'
Compacted Dike Fill Soils (SW)	120	0	28	0	28
Natural Sands Medium Dense (SP-SW)	120	0	30	0	30
Bentonite-Sand Liner	130	0	22	1,000	0
Soil Cover (SW)	120	0	28	0	28
Crushed Stone (GP)	110	0	32	0	32

The utility chose a maximum probable earthquake for Weston Generating Station based on the 2008 United States Geological Survey National Seismic Hazard Maps, Peterson et.al (2008). The maximum probable earthquake has a peak ground acceleration of 0.02 g with a 2 percent Probability of Exceedance in 50 years. Desired factors of safety are based on the loading condition and normal engineering practice. For the steady-state loading condition (Scenarios I and II) a safety factor of 1.5 or greater is considered acceptable; and for the seismic event (Scenario III) a safety factor of 1.0 or greater is generally considered acceptable. Table 7.2 – Slope Stability Analysis Results summarizes the analyses that were completed and the resulting computed factors of safety (Appendix D, Doc 22).

Table 7.2: Geotechnical Stability Analysis Results

Design Scenario, Pond and Loading Condition			**Effective Stress Analysis**	**Total Stress Analysis**	**Required Minimum Factor of Safety**
Scenario I	Normal Pool / Static	Downstream	1.8	1.8	1.5
Scenario II	Maximum Pool / Static	Downstream	1.8	1.8	1.5
Scenario IV	Normal Pool / Seismic	Downstream	1.7	1.7	1.0

7.1.5 Liquefaction Potential

In its comments on the draft report (Appendix D, Doc 21), WPSC provided information from the 2003 geotechnical investigation for the Weston Unit 4 Project. This investigation included subsurface soil conditions around the existing bottom ash management units. The conclusions were that the area is suitable for construction and no critical hydrogeologic conditions are present. Therefore soil liquefaction potential can be considered low.

Dewberry's review of the U.S.G.S. Seismic Hazard Map for the Central and Eastern United States indicates the estimated peak ground acceleration for a 2-percent probability of exceedance in 50 years is 0.02g. The 0.02g is the lower limit of mapped values. The same value was used in the seismic analysis as well.

Available geologic data indicates surface deposits in the Weston Plant area consist of glacial till (Figure 7.6b) made up of sandy silts and silty sands (Figure7.6b). These soil types are considered only somewhat susceptible to liquefaction.

Based on the estimated low 2-percent probability of exceedance peak ground acceleration at the site, soils with a relatively low susceptibility to liquefaction, and releases from the low hazard dams and small pond volumes would result in minimal releases under liquefaction conditions, Dewberry does not consider liquefaction to be a concern at the site.

7.1.6 Critical Geological Conditions

No information on area geology was provided by the Utility. However, utilizing "wisconsingeologicalsurvey.org", we can confirm that the general area of Rothschild, WI has bedrock composed of a basaltic to rhyolitic metavolcanic rock with some metasedimentary rock; deposits of till are present as a result of the ice age. The town of Rothschild is on the boarder of forested, sandy soils and forested, silty soils over igneous/metamorphic rock. Lastly, the thickness of unconsolidated material in this area ranges from 0 to 100 feet.

The maps seen below were taken from wisconsingeologicalsurvey.org. We have outlined the county of Marathon and called out the city of Rothschild for visual clarity, as the Weston Generating Station is located in Rothschild, WI within the county of Marathon in the state of Wisconsin.

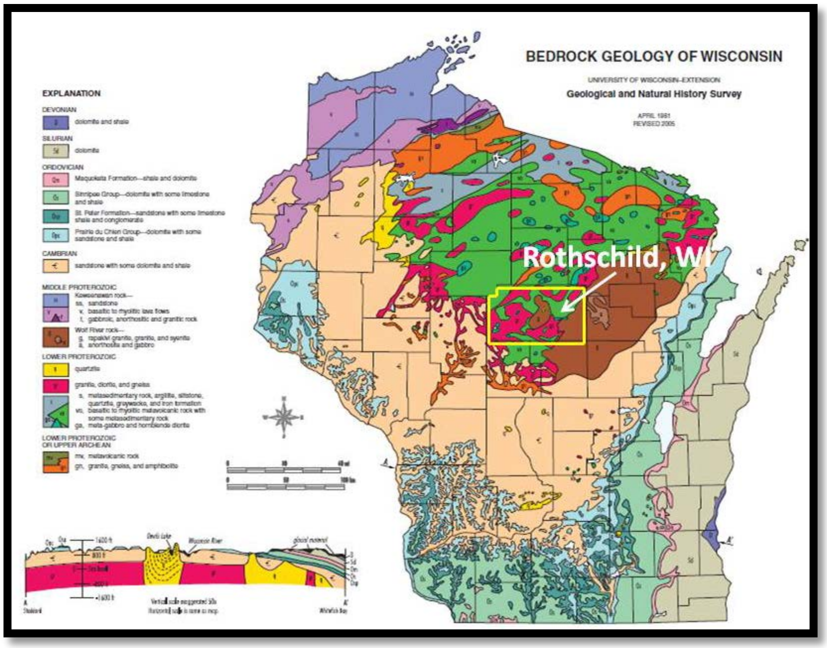

Figure 7.1.6a: Bedrock Geology of Wisconsin

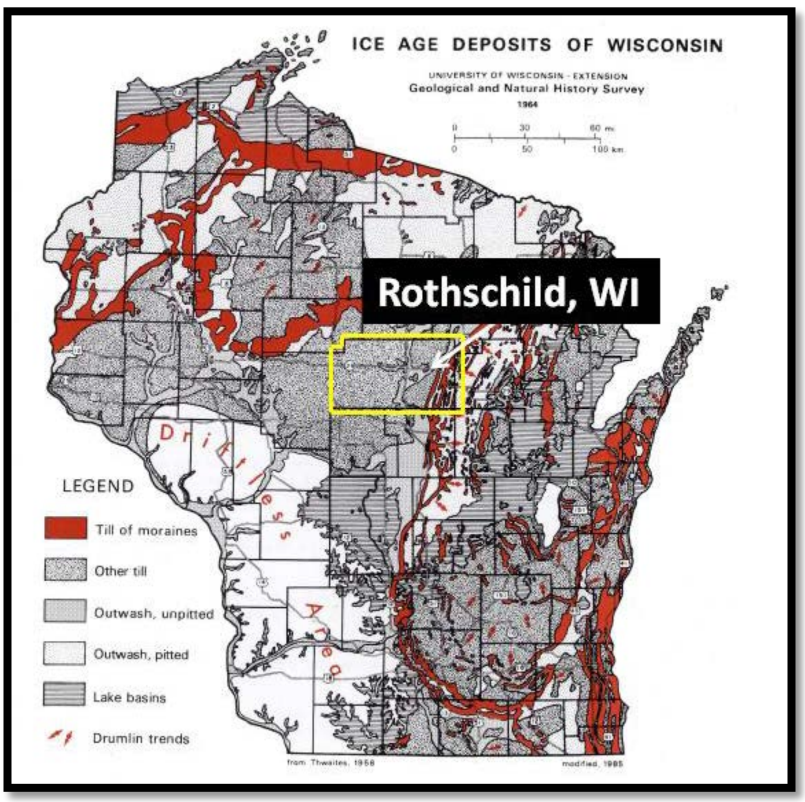

Figure 7.1.6b: Ice Age Deposits of Wisconsin

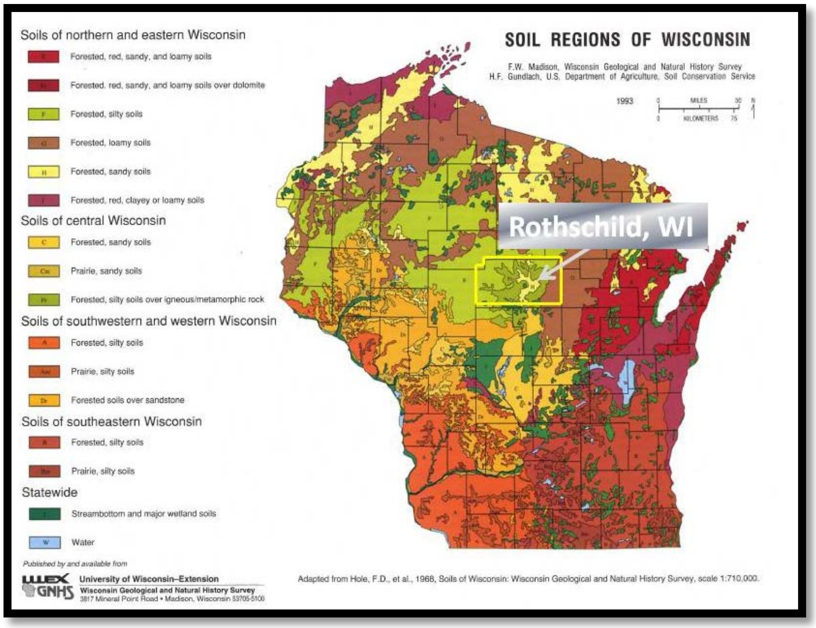

Figure 7.1.6c: Soil Regions of Wisconsin

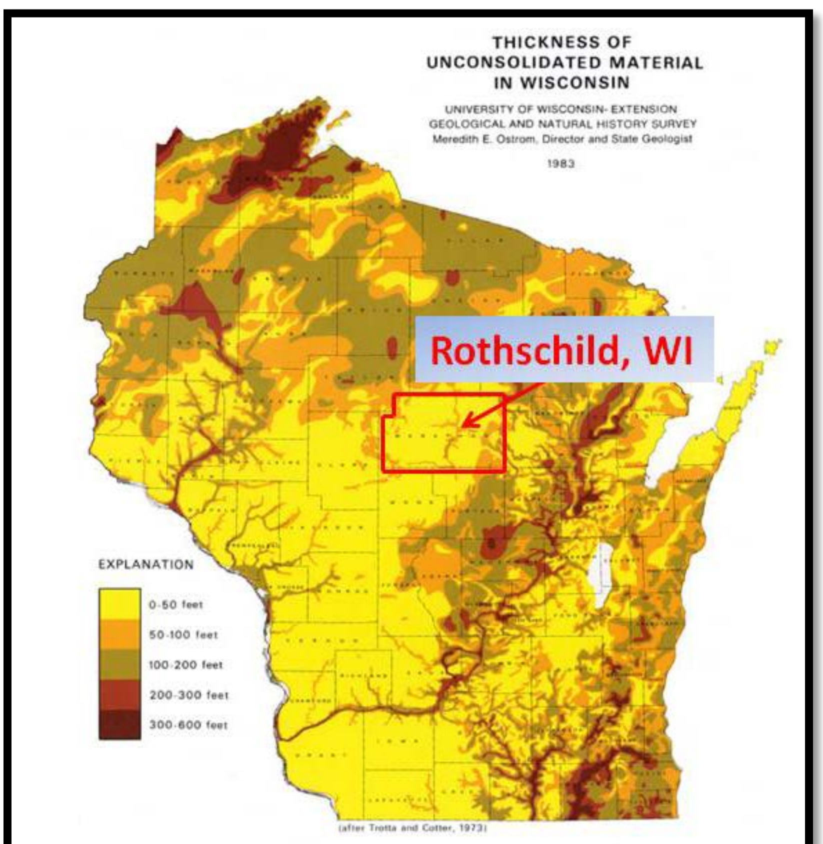

Figure 7.1.6d: Thickness of Unconsolidated Material in Wisconsin

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is considered to be adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

The result of the geotechnical stability analysis shows that the secondary bottom ash basins have adequate factors of safety under the normal pool, maximum pool, and seismic conditions modeled. The calculated factor of safety values exceed generally accepted minimum factor of safety criteria and no further exploration or investigation is necessary at this time. Based on the one site visit, adequate supporting documentation, and assessment of structural stability, the Northeastern Secondary Pond, Northwestern Secondary Pond, Southeastern Secondary Pond, Southwestern Secondary Pond management units are each rated SATISFACTORY for structural stability.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

Operating methods appear appropriate; especially since level monitors have been installed to prevent accidental overfilling of the ponds.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Routine site visits by plant personnel are made of the embankments. Indications of seepage, settling, sloughing, and erosion are part of a visual check. Vegetative growth is maintained as appropriate.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Based on the assessments of this report, maintenance procedures appear to be adequate.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

WPSC does not have a formal surveillance plan at this plant.

9.2 INSTRUMENTATION MONITORING

The Weston Generating Station bottom ash impoundment dikes do not have an instrumentation monitoring system. There are water level monitors to prevent accidental overfilling. A typical record of this monitor is shown in Appendix A, Document 17.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, as well as review of the WPSC Weston Power Plant draft Preventative Maintenance Procedures (Appendix A, Document 18), the inspection program is adequate. The impoundments are small and low hazard.

9.3.2 Adequacy of Instrumentation Monitoring Program

The instrumentation monitoring (water level monitors) is adequate for these small, low hazard impoundments.

APPENDIX A

Document 1

Wisconsin Pollution Discharge Emission System Permit No. WI-0042765-07-0

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

Wisconsin Public Service Corporation - Weston Units 3 & 4

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
2501 Morrison Avenue, Rothschild, WI
to
The Upper Wisconsin River in Marathon County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By Russell Rasmussen
Russell Rasmussen
Director, Bureau of Watershed Management

March 30, 2010
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE - April 01, 2010 **EXPIRATION DATE - March 31, 2015**

TABLE OF CONTENTS

1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	River water intake sampling point for Wisconsin River supply for Weston units 3 and 4

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INTAKE WATER

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Grab	Optional monitoring, see paragraph 1.2.1.1

1.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

1.2.1.1 Influent Mercury Sampling

The Department **highly recommends** that the permittee collect a monthly sample that is representative of the intake water from the river and have it analyzed for low level mercury to help determine the intake mercury contribution to the discharge. This permit does not **require** that the permittee report an influent mercury sample result for any month.

1.2.1.2 Cooling Water Intake Structure (CWIS)

The permittee shall at all times properly operate and maintain all CWIS equipment. The permittee shall give advance notice to the Department of any planned changes in the location, design, operation, or capacity of the CWIS.

2 In-Plant Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
112	Discharge from the coal pile runoff containment/detention pond that is treated for metals precipitation, suspended solids removal and pH control
102	Discharge from the metal wastewater treatment pond that includes wastewaters from boiler water acid/caustic demineralizer regeneration, reverse osmosis membrane cleaning, and non-chemical metal surface cleaning that are equalized and treated for metals precipitation, suspended solids removal and pH control
103	Discharge from the Weston 3 bottom ash wastewater treatment pond that includes wastewater from bottom ash sluicing, floor & equipment drain water, and reverse osmosis reject water from groundwater (treated to supply the boiler), that is equalized, treated to remove solids and adjusted for pH control
104	The blowdown discharge from the Weston 3 recycled water, condenser cooling tower system to control the concentration of dissolved solids
105	The blowdown discharge from the Weston 4 recycled water, condenser cooling tower system to control the concentration of dissolved solids
106	Total discharge from the combination of the unit 3 cooling tower blowdown (104) and unit 4 cooling tower blowdown (105) discharges
109	Effluent field blank sample needed to check for contamination of samples collected from outfall 002

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point 112 - TREATED COAL PILE RUNOFF

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Suspended Solids, Total	Daily Max	50 mg/L	3/Week	24-Hr Comp	See note 2.2.2.2
pH (Minimum)	Daily Min	4.0 su	Daily	Continuous	See note 2.2.3.1
pH (Maximum)	Daily Max	11 su	Daily	Continuous	See note 2.2.3.1
pH Total Exceedance Time Minutes	Monthly Total	446 minutes	Daily	Calculated	See note 2.2.3.1
pH Exceedances Greater Than 60 Minutes	Monthly Total	0 Number	Daily	Calculated	See note 2.2.3.1

2.2.2 Sampling Point 102 - METAL TREATMENT WASTEWATER

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
pH (Minimum)	Daily Min	4.0 su	Daily	Continuous	See note 2.2.3.1
pH (Maximum)	Daily Max	11 su	Daily	Continuous	See note 2.2.3.1
pH Total Exceedance Time Minutes	Monthly Total	446 minutes	Daily	Calculated	See note 2.2.3.1
pH Exceedances Greater Than 60 Minutes	Monthly Total	0 Number	Daily	Calculated	See note 2.2.3.1
Suspended Solids, Total	Daily Max	100 mg/L	3/Week	24-Hr Comp	See note 2.2.2.2
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Comp	See note 2.2.2.2
Oil & Grease (Hexane)	Daily Max	20 mg/L	Weekly	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Weekly	Grab	
Iron, Total Recoverable	Daily Max	1.0 mg/L	Daily	24-Hr Comp	
Copper, Total Recoverable	Daily Max	1.0 mg/L	Daily	24-Hr Comp	

2.2.2.1 Metals Analyses

Unless specified otherwise in the table above, metals analyses shall measure metals as total recoverable. Measurements of total metals and total recoverable metals shall be considered as equivalent.

2.2.2.2 TSS Monitoring (Including Frequency Increase Following Limit Exceedence)

Total Suspended Solids shall be monitored three times per week (if possible, not on consecutive days), except as provided below. A daily sampling frequency for Total Suspended Solids (TSS) is required for 7 days from when sample results are available to the permittee to determine a daily maximum TSS limit exceedence has occurred. A daily sampling frequency for TSS shall be required for 30 days from when sample results are available to the permittee to determine a monthly average TSS limit exceedence has occurred.

2.2.3 Sampling Point 103 - BOTTOM ASH SLUICE WATER

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
pH (Minimum)	Daily Min	4.0 su	Daily	Continuous	See note 2.2.3.1
pH (Maximum)	Daily Max	11 su	Daily	Continuous	See note 2.2.3.1
pH Total Exceedance Time Minutes	Monthly Total	446 minutes	Daily	Calculated	See note 2.2.3.1
pH Exceedances Greater Than 60 Minutes	Monthly Total	0 Number	Daily	Calculated	See note 2.2.3.1
Suspended Solids, Total	Daily Max	100 mg/L	3/Week	24-Hr Comp	See note 2.2.3.2
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Comp	See note 2.2.3.2
Oil & Grease (Hexane)	Daily Max	20 mg/L	Weekly	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Weekly	Grab	

2.2.3.1 Limitations for Continuous pH Monitoring

The permittee shall maintain the pH of the discharge within the range of 6.0 to 9.0 standard units (s.u.), except excursions are permitted subject to the following conditions:

- The pH is monitored continuously;
- The total time during which the pH is outside the range of 6.0 to 9.0 s.u. shall not exceed 446 minutes in any calendar month;
- No individual pH excursion outside the range of 6.0 to 9.0 s.u. shall exceed 60 minutes in duration; and
- No individual pH excursion shall be outside the range of 4.0 to 11.0 s.u.

2.2.3.2 TSS Monitoring (Including Frequency Increase Following Limit Exceedence)

Total Suspended Solids shall be monitored three times per week (if possible, not on consecutive days), except as provided below. A daily sampling frequency for Total Suspended Solids (TSS) is required for 7 days from when sample results are available to the permittee to determine a daily maximum TSS limit exceedence has occurred. A daily sampling frequency for TSS shall be required for 30 days from when sample results are available to the permittee to determine a monthly average TSS limit exceedence has occurred.

2.2.4 Sampling Point 104 - COOLING TOWER BLOWDOWN 3

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Chlorine, Total Resdl Discharge Time	Daily Max	120 min/day	Daily	See Permit	See note 2.2.4.1 below
Chlorine, Total Residual		μg/L	Daily	Grab	See note 2.2.4.2 below
Chlorine, Variable Limit		μg/L	Daily	Calculated	See note 2.2.4.3 below
Chlorine, Total Resdl Computed Compliance	Daily Max	0 Number	Daily	Calculated	

2.2.4.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge shall be reported as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

2.2.4.2 Chlorine Sampling Procedure

At least one grab sample for total residual chlorine shall be collected during the peak chlorine discharge of each chlorination event. The discharge monitoring reported value shall be the maximum of the chlorination events for that day. A continuous monitor may be used to determine the peak value and length of chlorine discharge as long as it duplicates the accuracy of a NR 219 approved method.

2.2.4.3 Total Residual Chlorine Limitations

The daily maximum limit for total residual chlorine is 200 μg/L when chlorine is discharged for 160 minutes per day or less. If chlorine is discharged for more than 160 minutes per day, the daily maximum limit is 38 μg/L.

2.2.4.4 Cooling Tower Maintenance Chemicals

This discharge may not contain detectable amounts of any of the 126 priority pollutants contained in cooling tower maintenance chemicals including Chromium and Zinc.

2.2.5 Sampling Point 105 - COOLING TOWER BLOWDOWN 4

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Chlorine, Total Resdl Discharge Time	Daily Max	120 min/day	Daily	See Permit	See note 2.2.5.1 below
Chlorine, Total Residual		µg/L	Daily	Grab	See note 2.2.5.2 below
Chlorine, Variable Limit		µg/L	Daily	Calculated	See note 2.2.5.3 below
Chlorine, Total Resdl Computed Compliance	Daily Max	0 Number	Daily	Calculated	

2.2.5.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge shall be reported as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

2.2.5.2 Chlorine Sampling Procedure

At least one grab sample for total residual chlorine shall be collected during the peak chlorine discharge of each chlorination event. The discharge monitoring reported value shall be the maximum of the chlorination events for that day. A continuous monitor may be used to determine the peak value and length of chlorine discharge as long as it duplicates the accuracy of a NR 219 approved method.

2.2.5.3 Total Residual Chlorine Limitations

The daily maximum limit for total residual chlorine is 200 µg/L when chlorine is discharged for 160 minutes per day or less. If chlorine is discharged for more than 160 minutes per day, the daily maximum limit is 38 µg/L.

2.2.5.4 Cooling Tower Maintenance Chemicals

This discharge may not contain detectable amounts of any of the 126 priority pollutants contained in cooling tower maintenance chemicals including Chromium and Zinc.

2.2.6 Sampling Point 106 - TOWER BLOWDOWN TOTAL 3 & 4

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Chlorine, Total Resdl Discharge Time	Daily Max	240 min/day	Daily	See Permit	See note 2.2.6.1 below
Chlorine, Total Residual		μg/L	Daily	Grab	See note 2.2.6.2 below
Chlorine, Total Residual	Daily Max	0.9 lbs/day	Daily	Calculated	See note 2.2.6.3 below
Chlorine, Variable Limit		μg/L	Daily	Calculated	See note 2.2.6.4 below
Chlorine, Total Resdl Computed Compliance	Daily Max	0 Number	Daily	Calculated	

2.2.6.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge shall be reported as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

2.2.6.2 Chlorine Sample Reporting Procedure

Report the highest result from the daily sample for total residual chlorine collected during the peak chlorine discharge from sample point 104 (unit 3 cooling tower blowdown) or from sample point 105 (unit 4 cooling tower blowdown). The discharge monitoring reported value shall be the maximum of the chlorination events for that day. A continuous monitor may be used to determine the peak value and length of chlorine discharge as long as it duplicates the accuracy of a NR 219 approved method.

2.2.6.3 Chlorine Mass Limit and Reporting

The total residual chlorine mass limit of 0.9 pounds/day and chlorine mass discharge reporting only applies if chlorine is discharged via sample point 106 for more than 160 minutes per day.

2.2.6.4 Total Residual Chlorine Limitations

The daily maximum limit for total residual chlorine is 200 μg/L when chlorine is discharged for 160 minutes per day or less. If chlorine is discharged for more than 160 minutes per day, the daily maximum limits are 38 μg/L and 0.9 lbs/day.

2.2.6.5 Use of Cooling System Water for Dust Suppression

Weston 3 & 4 condenser cooling water, including water monitored via sample point 106, may be used for fugitive dust control on roads and parking lots within the Weston power plant site. The application of this water shall be limited so the dust control water seeps into the ground within the Weston power plant site.

2.2.7 Sampling Point 109 - EFFLUENT FIELD BLANK

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Grab	

2.2.7.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3 Surface Water Requirements

3.1 Sampling Point(s)

The discharge(s) shall be limited to the waste type(s) designated for the listed sampling point(s).

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Wastewater discharge to the Wisconsin River that is a combination of the process wastewater discharges from sample points 112, 102, 103 and 106
003	Condenser cooling water (from Weston 1&2) that is used for the Weston 3 & 4 operation for dust suppression or to prevent ice formation on the intake screen
004	River water discharged while backwashing the water intake traveling screens
005	Discharge of once-through noncontact cooling water to the Wisconsin River

3.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 002 - PROCESS WTR TO WIS RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Temperature Maximum		deg F	Weekly	Grab	See temperature monitoring paragraph below
Mercury, Total Recoverable	Daily Max	11 ng/L	Monthly	Grab	See mercury monitoring paragraph 3.2.4.5
Copper, Total Recoverable	Daily Max	63 µg/L	Quarterly	Composite	
Copper, Total Recoverable	Daily Max	1.5 lbs/day	Quarterly	Composite	
Hardness, Total as $CaCO_3$		mg/L	Annual	24-Hr Comp	
Acute WET		TU_a	Annual	24-Hr Comp	See WET paragraph for specific quarters for testing

3.2.1.1 Temperature Monitoring

The amount of heat discharged to the Wisconsin River through outfall 002 shall be sampled at least weekly by (1) grab sample measurement of the 002 discharge temperature, or (2) grab or continuous measurement of the temperature of the cooling tower blowdown (sample point 104) from Weston unit 3 and the cooling tower blowdown (sample point 105) from Weston unit 4. Enter the maximum measured temperature for the day in the discharge monitoring report.

3.2.1.2 Copper Analysis Method

The permittee shall utilize test methods listed in Ch. NR 219, Wis. Adm. Code, when analyzing for Total Recoverable Copper, except that use of other equivalent analysis methods may be approved in writing by the Department. The selected Total Recoverable Copper test shall have a method detection level of 1 ug/L or less. Measurement of total metals and total recoverable metals shall be considered to be equivalent.

3.2.1.3 Composite Sample

A representative composite sample of the wastewater discharge shall be created by combining at least three individual grab samples of equal volume taken at approximately equal intervals over a 24 hour period. There shall be at least 1 hour between individual grab samples. The permittee may collect a 24 hour composite sample in lieu of a composite sample.

3.2.1.4 24 hour Composite Sample

A representative composite sample of the wastewater discharge shall be created by combining individual grab samples in proportion to the volume of discharge flow during the 24 hour period as specified in NR 218.04(12), Wisconsin Adm. Code.

3.2.1.5 Polychlorinated Biphenyls

The permittee shall manage polychlorinated biphenyl compounds (PCB's) used in the facility (such as in transformer fluid) so PCB's from the facility are not discharged to the river.

3.2.1.6 Whole Effluent Toxicity (WET) Testing

WET Testing Frequency: Acute whole effluent toxicity tests are required during the following quarters.

- **Acute:** 2nd quarter 2010, 3rd quarter 2011, 4th quarter 2012, 2nd quarter 2013, and 1st quarter 2014.

Primary Control Water: The Wisconsin River, upstream of the WPS Weston discharges. The control water samples shall be collected from areas outside of the mixing zone of any other discharger, if possible.

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Watershed Management, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The original Discharge Monitoring Report (DMR) form and one copy shall be sent to the contact and location provided on the DMR by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: If $LC_{50} \geq 100$, then $TU_a = 1.0$. If LC_{50} is < 100, then $TU_a = 100 \div LC_{50}$.

Additional Testing Requirements: Within 90 days of a WET test which showed a positive result, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after completion of the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements permit section).

3.2.2 Sampling Point (Outfall) 003 - INTAKE DE-ICE WATER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

3.2.2.1 Use of Noncontact Cooling Water for Dust Suppression

Noncontact cooling water, including water allowed to be discharged through outfall 003, can be utilized as source water for dust suppression on roads within the Weston power plant site.

3.2.3 Sampling Point (Outfall) 004 - SCREEN BACKWASH WATER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

3.2.3.1 Intake Screen Backwash Discharges

Trash and coarse debris accumulated on the condenser cooling (river) water intake screen shall be captured so it is not returned to the river with the intake screen backwash discharge. The captured material shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the State pursuant to s. NR 205.07(3)(a), Wis. Adm. Code. Fine debris, aquatic organisms and vegetation may be returned to the river if they cannot reasonably be captured from the screen backwash water discharge.

3.2.4 Sampling Point (Outfall) 005 - NCCW TO WIS RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Chlorine, Total Resdl Discharge Time	Daily Max	120 min/day	Daily	Calculated	See paragraph 3.2.4.1 below
Chlorine, Total Residual		µg/L	Daily	Grab	See paragraph 3.2.4.2 below
Chlorine, Variable Limit		µg/L	Daily	Calculated	See paragraph 3.2.4.3 below
Chlorine, Total Resdl Computed Compliance	Daily Max	0 Number	Daily	Calculated	
Chlorine, Total Residual	Daily Max	1.1 lbs/day	Daily	Calculated	See paragraph 3.2.4.4 below
Temperature Maximum		deg F	Weekly	Grab	Report maximum measure temperature for the day
Mercury, Total Recoverable		ng/L	Quarterly	Grab	See mercury monitoring paragraph 3.2.4.5

3.2.4.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge may be reported as being equivalent to the time of chlorine addition or, alternatively, as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

3.2.4.2 Chlorine Sampling Procedure

At least one grab sample for total residual chlorine shall be collected during the peak chlorine discharge of each chlorination event. The discharge monitoring reported value shall be the maximum of the chlorination events for that day. A continuous monitor may be used to determine the peak value and length of chlorine discharge as long as it duplicates the accuracy of a NR 219 approved method.

3.2.4.3 Total Residual Chlorine Limitations

The daily maximum limit for total residual chlorine is 200 μg/L when chlorine is discharged for 160 minutes per day or less. If chlorine is discharged for more than 160 minutes per day, the daily maximum limits are 38 μg/L and 1.1 lbs/day.

3.2.4.4 Chlorine Mass Limit and Reporting

The total residual chlorine mass limit of 1.1 pounds/day and chlorine mass discharge reporting only apply if chlorine is discharged for more than 160 minutes per day.

3.2.4.5 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). Mercury testing of the water taken in from the Wisconsin River is also highly recommended. The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3.2.4.6 Use of Noncontact Cooling Water for Dust Suppression

Noncontact cooling water, including water allowed to be discharged through outfall 005, may be used for fugitive dust control on roads and parking lots within the Weston power plant site. The application of this water shall be limited so the dust control water seeps into the ground within the Weston power plant site.

4 Schedules of Compliance

4.1 Mercury Pollutant Minimization Program

The permittee shall continue to implement a pollutant minimization program as defined in s. NR 106.145(2), Wis. Adm. Code.

Required Action	Date Due
Submit Annual Status Reports: The permittee shall submit to the Department an annual status report on the progress of the PMP as required by s. NR 106.145(7), Wis. Adm. Code. Submittal of the first annual status report is required by the December 31, 2010. Note: If the permittee wishes to apply for an alternative mercury effluent limitation, that application is due with the application for permit reissuance by 6 months prior to permit expiration. The permittee should submit or reference the PMP plan as updated by the Annual Status Report or more recent developments as part of that application.	12/31/2010
Mercury Removal Enhancement Study: Wisconsin Public Service shall submit a study plan to the Department for an evaluation to determine whether Weston 3&4 wastewater treatment system modifications, such as consistent operation of the tertiary filters for the BAT wastewater discharge through sample point 103 or diversion of the sludge belt press filtrate to the wastewater treatment system, would result in a reduction in the discharge of mercury to the Wisconsin River.	12/31/2010
Mercury Removal Enhancement Study: By June 30, 2011, Wisconsin Public Service shall commence the evaluation of whether Weston 3&4 wastewater treatment system modifications, such as consistent operation of the tertiary filters for the BAT wastewater discharge through sample point 103 or diversion of the sludge belt press filtrate to the wastewater treatment system, would result in a reduction in the discharge of mercury to the Wisconsin River.	06/30/2011
Mercury Removal Enhancement Study Report: Wisconsin Public Service shall submit the results of the study evaluating whether Weston 3&4 wastewater treatment system modifications, such as consistent operation of the tertiary filters for the BAT wastewater discharge through sample point 103 or diversion of the sludge belt press filtrate to the wastewater treatment system, would result in a reduction in the discharge of mercury to the Wisconsin River.	12/31/2012

5 Standard Requirements

NR 205, Wisconsin Administrative Code (Conditions for Industrial Dischargers): The conditions in ss. NR 205.07(1) and NR 205.07(3), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(3).

5.1 Reporting and Monitoring Requirements

5.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. When submitting a paper Discharge Monitoring Report form, the original and one copy of the Wastewater Discharge Monitoring Report Form shall be submitted to the return address printed on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

All Wastewater Discharge Monitoring Reports submitted to the Department should be submitted using the electronic Discharge Monitoring Report system. Permittees who may be unable to submit Wastewater Discharge Monitoring Reports electronically may request approval to submit paper DMRs upon demonstration that electronic reporting is not feasible or practicable.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

An Electronic Discharge Monitoring Report Certification sheet shall be signed and submitted with each electronic Discharge Monitoring Report submittal. This certification sheet, which is not part of the electronic report form, shall be signed by a principal executive officer, a ranking elected official or other duly authorized representative and shall be mailed to the Department at the time of submittal of the electronic Discharge Monitoring Report. The certification sheet certifies that the electronic report form is true, accurate and complete. Paper reports shall be signed by a principal executive officer, a ranking elected official, or other duly authorized representative.

5.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

5.1.3 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

5.1.4 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

5.1.5 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application, except for sludge management forms and records, which shall be kept for a period of at least 5 years.

5.1.6 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

5.2 System Operating Requirements

5.2.1 Noncompliance Notification

- The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance;
  - any noncompliance which may endanger health or the environment;
  - any violation of an effluent limitation resulting from an unanticipated bypass;
  - any violation of an effluent limitation resulting from an upset; and
  - any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit.

- A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 calendar days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within calendar 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

- The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at **1-800-943-0003**.

5.2.2 Unscheduled Bypassing

Any unscheduled bypass or overflow of wastewater at the treatment works or from the collection system is prohibited, and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats., unless:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- The permittee notified the Department as required in this Section.

Whenever there is an unscheduled bypass or overflow occurrence at the treatment works or from the collection system, the permittee shall notify the Department <u>within 24 hours</u> of initiation of the bypass or overflow occurrence by telephoning the wastewater staff in the regional office as soon as reasonably possible (FAX, email or voice mail, if staff are unavailable).

In addition, the permittee shall <u>within 5 days</u> of conclusion of the bypass or overflow occurrence report the following information to the Department in writing:

- Reason the bypass or overflow occurred, or explanation of other contributing circumstances that resulted in the overflow event. If the overflow or bypass is associated with wet weather, provide data on the amount and duration of the rainfall or snow melt for each separate event.
- Date the bypass or overflow occurred.
- Location where the bypass or overflow occurred.
- Duration of the bypass or overflow and estimated wastewater volume discharged.
- Steps taken or the proposed corrective action planned to prevent similar future occurrences.
- Any other information the permittee believes is relevant.

5.2.3 Scheduled Bypassing

Any construction or normal maintenance which results in a bypass of wastewater from a treatment system is prohibited unless authorized by the Department in writing. If the Department determines that there is significant public interest in the proposed action, the Department may schedule a public hearing or notice a proposal to approve the bypass. Each request shall specify the following minimum information:

- proposed date of bypass;
- estimated duration of the bypass;
- estimated volume of the bypass;
- alternatives to bypassing; and
- measures to mitigate environmental harm caused by the bypass.

5.2.4 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

5.2.5 Spill Reporting

The permittee shall notify the Department in accordance with ch. NR 706 (formerly NR 158), Wis. Adm. Code, in the event that a spill or accidental release of any material or substance results in the discharge of pollutants to the waters of the state at a rate or concentration greater than the effluent limitations established in this permit, or the spill or accidental release of the material is unregulated in this permit, unless the spill or release of pollutants has been reported to the Department in accordance with s. NR 205.07 (1)(s), Wis. Adm. Code.

5.2.6 Planned Changes

In accordance with ss. 283.31(4)(b) and 283.59, Stats., the permittee shall report to the Department any facility expansion, production increase or process modifications which will result in new, different or increased discharges of pollutants. The report shall either be a new permit application, or if the new discharge will not violate the effluent limitations of this permit, a written notice of the new, different or increased discharge. The notice shall contain a description of the new activities, an estimate of the new, different or increased discharge of pollutants and a description of the effect of the new or increased discharge on existing waste treatment facilities. Following receipt of this report, the Department may modify this permit to specify and limit any pollutants not previously regulated in the permit.

5.2.7 Duty to Halt or Reduce Activity

Upon failure or impairment of treatment facility operation, the permittee shall, to the extent necessary to maintain compliance with its permit, curtail production or wastewater discharges or both until the treatment facility operations are restored or an alternative method of treatment is provided.

5.3 Surface Water Requirements

5.3.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

5.3.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average limits and mass limits:

Weekly/Monthly average concentration = the sum of all daily results for that week/month, divided by the number of results during that time period.

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

5.3.3 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

5.3.4 Total Residual Chlorine Requirements (For De-Chlorinated Effluent)

Test methods for total residual chlorine, approved in ch. NR 219 - Table B, Wis. Adm. Code, normally achieve a limit of detection of about 20 to 50 micrograms per liter and a limit of quantitation of approximately 100 micrograms per liter. Reporting of test results and compliance with effluent limitations for chlorine residual and total residual halogens shall be as follows:

- Sample results which show no detectable levels are considered to show compliance with the concentration limits. These test results shall be reported on Wastewater Discharge Monitoring Report Forms as "< 100 μg/L". (Note: 0.1 mg/L converts to 100 μg/L)

- Sample results showing detectable traces of chlorine will be considered to be in compliance with the 38 ug/L limit if measured at less than 100 μg/L, unless there is a consistent pattern of detectable values in this range for total residual chlorine discharges lasting more than 160 minutes per day. These values shall also be reported on Wastewater Discharge Monitoring Report Forms as "<100 μg/L". The facility operating staff shall record actual readings on logs maintained at the plant, shall take action to determine the reliability of detected results (such as re-sampling and/or calculating dosages), and shall adjust the chemical feed system if necessary to reduce the chances of detected results.

- When total residual chlorine is discharged for more than 160 minutes a day, a sample result showing a detectable level greater than 100 μg/L shall be considered as an exceedance of the 38 ug/L daily maximum limitation, and shall be reported as measured.

- To calculate average or mass discharge values, a "0" (zero) may be substituted for any test result less than 100 μg/L. Calculated values shall then be compared directly to the average or mass limitations to determine compliance.

5.3.5 Additives

For water treatment additives that will be contained in the wastewater discharge to the Wisconsin River, if the permittee wishes to commence use of a water treatment additive, or increase the usage of an additive greater than indicated in the permit application, the permittee must get a written approval from the Department prior to initiating such changes. This written approval shall provide authority to utilize the additives at the specific rates until the permit can be either reissued or modified in accordance with s. 283.53, Stats. Restrictions on the use of the additives may be included in the authorization letter.

5.3.6 Whole Effluent Toxicity (WET) Monitoring Requirements

In order to determine the potential impact of the discharge on aquatic organisms, static-renewal toxicity tests shall be performed on the effluent in accordance with the procedures specified in the *"State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition" (PUB-WT-797*, November 2004) as required by NR 219.04, Table A, Wis. Adm. Code). All of the WET tests required in this permit, including any required retests, shall be conducted on the *Ceriodaphnia dubia* and fathead minnow species. Receiving water samples shall not be collected from any point in contact with the permittee's mixing zone and every attempt shall be made to avoid contact with any other discharge's mixing zone.

5.3.7 Whole Effluent Toxicity (WET) Identification and Reduction

If a WET retest shows a positive result, the permittee shall submit a written report to the Biomonitoring Coordinator, Bureau of Watershed Management, 101 S. Webster St., PO Box 7921, Madison, WI 53707-7921, within a 60 day period that begins the day after completion of the positive retest. The WET Identification and Reduction report shall contain, at a minimum, the following information:

- A description of actions the permittee has taken or will take to remove toxicity and to prevent the recurrence of toxicity;
- A description of toxicity reduction evaluation (TRE) investigations that have been or will be done to identify potential sources of toxicity, including some or all of the following actions:
  - (a) Evaluate the performance of the treatment system to identify deficiencies contributing to effluent toxicity (e.g., operational problems, chemical additives, incomplete treatment)
  - (b) Identify the compound(s) causing toxicity
  - (c) Trace the compound(s) causing toxicity to their sources (e.g., industrial, commercial, domestic)
  - (d) Evaluate, select, and implement methods or technologies to control effluent toxicity (e.g., in-plant or pretreatment controls, source reduction or removal)
- Where corrective actions including a TRE have not been completed, an expeditious schedule under which corrective actions will be implemented;
- If no actions have been taken, the reason for not taking action.

The permittee may also request approval from the Department to postpone additional retests in order to investigate the source(s) of toxicity. Postponed retests must be completed after toxicity is believed to have been removed.

6 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Mercury Pollutant Minimization Program -Submit Annual Status Reports	December 31, 2010	13
Mercury Pollutant Minimization Program -Mercury Removal Enhancement Study	December 31, 2010	13
Mercury Pollutant Minimization Program -Mercury Removal Enhancement Study	June 30, 2011	13
Mercury Pollutant Minimization Program -Mercury Removal Enhancement Study Report	December 31, 2012	13
Wastewater Discharge Monitoring Report	no later than the date indicated on the form	14

Report forms shall be submitted to the address printed on the report form. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Watershed Management, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:

Dept. of Natural Resources – WCR Wausau, Attn: Watershed Engineer, 5301 Rib Mountain Drive, Wausau, WI 54401

APPENDIX A

Document 2

Wisconsin Pollution Discharge Emission System Permit No. WI-0003131-06-0

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary

101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921
Telephone (608) 266-2621
FAX (608) 267-3579
TTY Access via relay - 711

Randal Oswald
Manager- Environmental Program
Wisconsin Public Service Corp Weston Power
700 N Adams Street
P O Box 19002
Green Bay, WI 54307-9002

SUBJECT: WPDES Permit Reissuance No. WI-0003131-06-0
Wisconsin Public Service Corp Weston Power , 2501 Morrison Avenue

Dear Permittee:

Your Wisconsin Pollutant Discharge Elimination System (WPDES) Permit is enclosed. The conditions of the enclosed permit reissuance were determined using the permit application, information from your WPDES permit file, other information available to the Department, comments received during the public notice period, and applicable Wisconsin Administrative Codes. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of the enclosed permit.

This enclosed permit requires you to submit monitoring results to the Department on a periodic basis. Blank copies of the appropriate monitoring forms and instructions for completing them will be mailed to you under separate cover.

The WPDES permit program has been approved by the Administrator of the U.S. Environmental Protection Agency pursuant to Section 402(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1342 (b)). The terms and conditions of the enclosed permit are accordingly subject to enforcement under ss. 283.89 and 283.91, Stats., and Section 309 of the Federal Act (33 U.S.C. Section 1319).

The Department has the authority under chs. 160 and 283, Stats., to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwater and surface waters of the State. The Department also has the authority to issue, reissue, modify, suspend, or revoke WPDES permits under ch. 283, Stats.

The enclosed permit contains total residual chlorine water quality-based effluent limitations that are necessary to ensure the water quality standards for the Wisconsin River are met. You may apply for a variance from the water quality standard used to derive the limitations pursuant to s. 283.15, Stats., by submitting an application to the Director of the Bureau of Watershed Management, P.O. Box 7921, Madison, Wisconsin 53707 within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). Subchapter III of ch. NR 200, Wis. Adm. Code, specifies the procedures that must be followed and the information that must be included when submitting an application for a variance.

To challenge the reasonableness of or necessity for any term or condition of the enclosed permit, s. 283.63, Stats., and ch. NR 203, Wis. Adm. Code, require that you file a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit).

Sincerely,

Russell Rasmussen

Russell Rasmussen
Director, Bureau of Watershed Management

Dated: January 4, 2007

cc: Legal Permit File
Cyndi Barr, WT/2
U.S. Fish and Wildlife Service (Electronic Copy via Email)
Eric Donaldson

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE
WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

Wisconsin Public Service Corporation - Weston Units 1 & 2

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
2501 Morrison Avenue, Rothschild, Wisconsin
to
the Wisconsin River in Marathon County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By Russell Rasmussen

Russell Rasmussen
Director, Bureau of Watershed Management

January 4, 2007
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE - February 01, 2007 EXPIRATION DATE - December 31, 2011

TABLE OF CONTENTS

1 In-Plant Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)
110	Noncontact cooling water from the unit 1 steam condenser.
111	Noncontact cooling water from the unit 2 steam condenser

1.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

1.2.1 Sampling Point 110 - UNIT 1 CONDENSER COOLING WATER

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Chlorine, Total Resdl Discharge Time	Daily Max	120 min/day	Daily	Record of Addition	See note 1.2.2.1 below

1.2.2 Sampling Point 111 - UNIT 2 CONDENSER COOLING WATER

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Chlorine, Total Resdl Discharge Time	Daily Max	120 min/day	Daily	Record of Addition	See note 1.2.2.1 below

1.2.2.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge may be reported as being equivalent to the time of chlorine addition or, alternatively, as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

2 Surface Water Requirements

2.1 Sampling Point(s)

The discharge(s) shall be limited to the waste type(s) designated for the listed sampling point(s).

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Condenser cooling water from units 1 and 2 discharged to the Wisconsin River
002	River water discharged while backwashing the cooling water intake traveling screens.
004	Condenser cooling water that is recirculated back to the river intake to prevent winter ice formation.

2.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point (Outfall) 001 - COOLING WATER TO WI RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Chlorine, Total Resdl Discharge Time		minutes	Daily	Record of Addition	See note 2.2.1.1 below
Chlorine, Total Resdl Discharge Time	Daily Max	240 min/day	Daily	Measure	See note 2.2.1.1 below
Chlorine, Total Residual	Daily Max - Variable	µg/L	Daily	Grab	See note 2.2.1.2 below
Chlorine, Variable Limit		µg/L	Daily	Calculated	See note 2.2.1.3 below
Chlorine, Total Residual	Daily Max	37 lbs/day	Daily	Calculated	See note 2.2.1.5 below
Flow Rate		MGD	Daily	Continuous	
Temperature Maximum		deg F	Daily	Continuous	

2.2.1.1 Time of Chlorine Discharge

Neither free available chlorine nor total residual chlorine shall be discharged for more than 2 hours per unit per day, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a Department approved macro-invertebrate management plan. The time of chlorine discharge may be reported as being equivalent to the time of chlorine addition or, alternatively, as the time that detectable levels of chlorine, using the analysis methods specified in this permit's "Chlorine Compliance and Analysis Methods" Standard Condition, are present in the cooling water discharge. The time of total residual chlorine discharge shall be monitored and summed for each day that chlorine is added to the condenser cooling water system.

2.2.1.2 Chlorine Sampling Procedure

At least one grab sample for total residual chlorine shall be collected during the peak chlorine discharge of each chlorination event. The discharge monitoring reported value shall be the maximum of the chlorination events for that day. A continuous monitor may be used to determine the peak value and length of chlorine discharge as long as it duplicates the accuracy of a NR 219 approved method.

2.2.1.3 Total Residual Chlorine Limitations

The daily maximum limit for total residual chlorine is 200 µg/L when chlorine is discharged for 160 minutes per day or less. If chlorine is discharged for more than 160 minutes per day, the daily maximum limits are 38 µg/L and 37 lbs/day.

2.2.1.4 Reporting A Total Residual Chlorine Concentration Limit Exceedence

The number of days that the total residual chlorine concentration sample value exceeds the daily maximum variable limit shall be reported in the Daily Max summary box for the "Chlorine, Total Residual" parameter.

2.2.1.5 Chlorine Mass Limit and Reporting

The total residual chlorine mass limit of 37 pounds/day and chlorine mass discharge reporting only apply if chlorine is discharged for more than 160 minutes per day.

2.2.1.6 Three Grab Composite Sample

A representative composite sample of the wastewater discharge shall be created by combining at least three individual grab samples of equal volume taken at approximately equal intervals over an 8 hour period. There shall be at least 1 hour between individual grab samples. The permittee may collect a 24 hour composite sample in lieu of a composite sample.

2.2.2 Sampling Point (Outfall) 002 - SCREEN BACKWASH WATER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

2.2.2.1 Intake Screen Backwash Discharges

Trash and coarse debris accumulated on the condenser cooling (river) water intake screen shall be captured so it is not returned to the river with the intake screen backwash discharge. The captured material shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the State pursuant to s. NR 205.07(3)(a), Wis. Adm. Code. Fine debris, aquatic organisms and vegetation that cannot reasonably be sorted from living fish may be returned to surface waters.

2.2.3 Sampling Point (Outfall) 004 - INTAKE DEICE WATER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

3 Land Treatment Requirements

3.1 Sampling Point(s)

The discharge(s) shall be limited to the waste type(s) designated for the listed sampling point(s).

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, Waste Description/Sample Contents and Treatment Description (as applicable)**
005	Discharge to settling/absorption ponds of non-contact cooling waters and ash sluice waters, with small amounts of boiler blowdown and other low volume wastewaters.

3.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 005 - ASH POND WASTEWATER , Solids Settling Basin

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Weekly	Estimated	
Copper, Total Recoverable		µg/L	Annual	Grab	
Sulfate Dissolved		mg/L	Annual	Grab	
pH Field		su	Annual	Grab	

3.2.1.1 Polychlorinated Biphenyls

The permittee shall manage polychlorinated biphenyl compounds (PCB's) used in the facility (such as in transformer fluid) so that PCB's are not added to the wastewater discharge.

3.2.1.2 Total Metals Analysis

Measurement of total metals and total recoverable metals shall be considered to be equivalent.

4 Schedules of Compliance

4.1 Impingement Mortality and Entrainment Characterization Study

Conduct a study to support development of a scientifically valid estimate of impingement mortality and entrainment impact on all life stages of fish and shellfish found in the vicinity of the existing Weston units 1 & 2 Wisconsin River intake system.

Required Action	Date Due
Submit proposed plan of study for comment: Submit a proposed plan of study for evaluating the impingement mortality and entrainment impact of the Weston units 1 & 2 river water intake system. The purpose of the study is to provide information to: (1) characterize current impingement mortality and entrainment at the site, and (2) support the development of an estimate of impingement mortality and entrainment to be used as the calculation baseline for the facility.	02/15/2007
Begin Impingement Mortality and Entrainment Characterization Study: Begin the study for evaluation of the current impingement mortality and entrainment impact on all life stages of fish and shellfish found in the vicinity of the existing Weston units 1 & 2 Wisconsin River water intake system.	03/01/2007

4.2 Comprehensive Demonstration Study

The Comprehensive Demonstration Study documents the evaluation and selection of an appropriate alternative that demonstrates compliance with best technology available to minimize adverse environmental impact for the Weston units 1 & 2 intake system.

Required Action	Date Due
Submit the Comprehensive Demonstration Study: Submit the documentation of the Comprehensive Demonstration Study that: (1) characterizes the impingement mortality and entrainment at the permittee's site, (2) describes the operation of the cooling water intake structures, and (3) confirms that the technologies, operational measures, and/or other features that the permittee has selected and installed, or will install meets the requirement for installation of best technology available for minimizing adverse environmental impact from the water intake system at this facility.	01/07/2008

5 Standard Requirements

NR 205, Wisconsin Administrative Code (Conditions for Industrial Dischargers): The conditions in ss. NR 205.07(1) and NR 205.07(3), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(3).

5.1 Reporting and Monitoring Requirements

5.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report Form in either electronic or paper format. The report form may require reporting of any or all of the information specified below under 'Recording of Results'. This report form is to be returned to the Department no later than the date indicated on the form. When submitting a paper Discharge Monitoring Report form, the original and one copy of the Wastewater Discharge Monitoring Report Form shall be submitted to the return address printed on the form. A copy of the Wastewater Discharge Monitoring Report Form shall be retained by the permittee.

Electronic discharge monitoring reports may be submitted instead of paper reports. Prior to submitting any electronic discharge monitoring reports, the permittee shall obtain a Trading Partner Agreement that is signed by both the permittee and the Department. The Trading Partner Agreement becomes effective upon the date of signature by both parties and continues in effect until modified or terminated. An Electronic Discharge Monitoring Report Certification sheet shall also be signed and submitted with each electronic Discharge Monitoring Report submittal. This certification sheet, which is not part of the electronic report form, shall be signed by a principal executive officer, a ranking elected official or other duly authorized representative and shall be mailed to the Department at the time of submittal of the electronic Discharge Monitoring Report. The certification sheet certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report Form.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

Monitoring reports shall be signed by a principal executive officer, a ranking elected official, or other duly authorized representative.

5.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

5.1.3 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

5.1.4 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

5.1.5 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application, except for sludge management forms and records, which shall be kept for a period of at least 5 years.

5.1.6 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

5.2 System Operating Requirements

5.2.1 Noncompliance Notification

- The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance;
  - any noncompliance which may endanger health or the environment;
  - any violation of an effluent limitation resulting from an unanticipated bypass;
  - any violation of an effluent limitation resulting from an upset; and
  - any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit.

- A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the

Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

- The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at **1-800-943-0003**.

5.2.2 Unscheduled Bypassing

Any unscheduled bypass or overflow of wastewater at the treatment works or from the collection system is prohibited, and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats., unless:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- The permittee notified the Department as required in this Section.

Whenever there is an unscheduled bypass or overflow occurrence at the treatment works or from the collection system, the permittee shall notify the Department <u>within 24 hours</u> of initiation of the bypass or overflow occurrence by telephoning the wastewater staff in the regional office as soon as reasonably possible (FAX, email or voice mail, if staff are unavailable).

In addition, the permittee shall <u>within 5 days</u> of conclusion of the bypass or overflow occurrence report the following information to the Department in writing:

- Reason the bypass or overflow occurred, or explanation of other contributing circumstances that resulted in the overflow event. If the overflow or bypass is associated with wet weather, provide data on the amount and duration of the rainfall or snow melt for each separate event.
- Date the bypass or overflow occurred.
- Location where the bypass or overflow occurred.
- Duration of the bypass or overflow and estimated wastewater volume discharged.
- Steps taken or the proposed corrective action planned to prevent similar future occurrences.
- Any other information the permittee believes is relevant.

5.2.3 Scheduled Bypassing

Any construction or normal maintenance which results in a bypass of wastewater from a treatment system is prohibited unless authorized by the Department in writing. If the Department determines that there is significant public interest in the proposed action, the Department may schedule a public hearing or notice a proposal to approve the bypass. Each request shall specify the following minimum information:

- proposed date of bypass;
- estimated duration of the bypass;
- estimated volume of the bypass;
- alternatives to bypassing; and
- measures to mitigate environmental harm caused by the bypass.

5.2.4 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

5.2.5 Spill Reporting

The permittee shall notify the Department in accordance with ch. NR 706 (formerly NR 158), Wis. Adm. Code, in the event that a spill or accidental release of any material or substance results in the discharge of pollutants to the waters of the state at a rate or concentration greater than the effluent limitations established in this permit, or the spill or accidental release of the material is unregulated in this permit, unless the spill or release of pollutants has been reported to the Department in accordance with s. NR 205.07 (1)(s), Wis. Adm. Code.

5.2.6 Planned Changes

In accordance with ss. 283.31(4)(b) and 283.59, Stats., the permittee shall report to the Department any facility expansion, production increase or process modifications which will result in new, different or increased discharges of pollutants. The report shall either be a new permit application, or if the new discharge will not violate the effluent limitations of this permit, a written notice of the new, different or increased discharge. The notice shall contain a description of the new activities, an estimate of the new, different or increased discharge of pollutants and a description of the effect of the new or increased discharge on existing waste treatment facilities. Following receipt of this report, the Department may modify this permit to specify and limit any pollutants not previously regulated in the permit.

5.2.7 Duty to Halt or Reduce Activity

Upon failure or impairment of treatment facility operation, the permittee shall, to the extent necessary to maintain compliance with its permit, curtail production or wastewater discharges or both until the treatment facility operations are restored or an alternative method of treatment is provided.

5.3 Requirements for Discharges to Surface Waters

5.3.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

5.3.1.1 Chlorine Compliance and Analysis Methods

Compliance with the daily maximum Total Residual Chlorine limits can be demonstrated by reporting an analysis result of less than the limitation. A second way to demonstrate compliance is by the use of Standard Method #408B (amperometric back titration), Standard Method #408D or #408E (DPD titration or colorimetric), or by using an ion specific electrode or other method approved in Ch. NR 219, Wis. Adm. Code, and reporting a result of less than the method detection limit. The numerical method detection limit shall be established by the permittee for the condenser cooling water discharge, and it shall be reported on the discharge monitoring report. A zero amount may be substituted for any TRC analysis result of less than the method detection limit for calculating average or maximum pounds/day discharge values.

5.3.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average limits and mass limits:

Weekly/Monthly average concentration = the sum of all daily results for that week/month, divided by the number of results during that time period.

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

5.3.3 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

5.3.4 Additives

In the event that the permittee wishes to commence use of a water treatment additive, or increase the usage of the additives greater than indicated in the permit application, the permittee must get a written approval from the Department prior to initiating such changes. This written approval shall provide authority to utilize the additives at the specific rates until the permit can be either reissued or modified in accordance with s. 283.53, Stats. Restrictions on the use of the additives may be included in the authorization letter.

5.4 Land Treatment Requirements for Industrial Discharges

NR 214, Wisconsin Administrative Code: The requirements of this section are based on ss. NR 214.12, Wis. Adm. Code, and apply to wastewater discharges to designed and constructed absorption pond treatment systems.

5.4.1 Absorption Pond Discharge Restrictions

The volume of discharge to the absorption pond system shall be limited so that the discharge volume combined with the precipitation from a 10-year frequency, 24-hour duration rainfall event does not reduce the available freeboard to less than 1 foot below the top of the dike.

5.4.2 Discharges to the Absorption Pond System

No discharge to the absorption pond system may have physical or chemical characteristics which prevent the proper operation of the system.

6 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Impingement Mortality and Entrainment Characterization Study -Submit proposed plan of study for comment	February 15, 2007	6
Impingement Mortality and Entrainment Characterization Study -Begin Impingement Mortality and Entrainment Characterization Study	March 1, 2007	6
Comprehensive Demonstration Study -Submit the Comprehensive Demonstration Study	January 7, 2008	6
Wastewater Discharge Monitoring Report Form	no later than the date indicated on the form	7

All submittals required by this permit shall be submitted to the West Central Region, 1300 W. Clairemont Ave., P.O. Box 4001, Eau Claire, WI 54702-4001, except as follows. Report forms shall be submitted to the address printed on the report form. Any construction plans and specifications for industrial wastewater systems shall be submitted to the Bureau of Watershed Management, P.O. Box 7921, Madison, WI 53707-7921.

APPENDIX A

Document 3

Sargent & Lundy Construction Specifications (03-19-80)

STD-EF-121 - Pulling-In Iron for Manholes (10-5-79).

STD-EF-125 - Straight Thru Manhole, 1 or 2 Cables Horiz. 12' Max. Inside Height (2-28-66).

STD-EF-126 - Corner Type Manhole 1 or 2 Cables Horizontal 12' Max. Inside Height (2-28-66).

STD-EF-136 - Steel Covers for Control Manholes (5-2-55).

202.2 Dates for the foregoing Sargent & Lundy Standard Specifications are indicated in the written material for each Standard Specification. Suffix letters A, B, C, etc., indicate revisions, and the latest date for each Standard Specification is for the latest revision (if any). References to these Standard Specifications elsewhere in this Project Specification or on the Design Drawings do not include the letter suffix after the form number.

202.3 Reference throughout this Project Specification to specific Articles or Paragraphs of the indicated Standard are for convenience only and shall not relieve Contractor from all obligations of all other applicable requirements of these Standards.

202.4 Wherever the terms "approve", "approval", "approved", etc., are used in Sargent & Lundy Standards in reference to Contractor's drawings and data, they shall mean "review", "reviewal", "reviewed", etc.

202.5 In the event of variation between the indicated Standards and this Project Specification or the Design Drawings, this Project Specification and the Design Drawings shall govern.

203. <u>DESIGN DRAWINGS (CONSULTING ENGINEERS')</u>

203.1 The following design drawings by the Consulting Engineers, dated or revised December 10, 1979 (unless otherwise indicated) form a part hereof:

a. Structural Design Drawings:

C-8 Site Plan General Arrangement (12-21-79) *

C-9 Site Clearing Plan

C-12 Grading, Roadwork and Drainage Plan - Sheet 2

C-16 Grading, Roadwork and Drainage Plan - Sheet 6

C-17 Grading, Roadwork and Drainage Plan - Sheet 7 (12-21-79) *

C-18 Grading, Roadwork and Drainage Plan - Sheet 8

C-19 Grading, Roadwork and Drainage Plan - Sheet 9

C-20	Grading, Roadwork and Drainage Plan - Sheet 10	
C-21	Grading, Roadwork and Drainage Plan - Sheet 11 (12-21-79)	*
C-22	Grading, Roadwork and Drainage Plan - Sheet 12	
C-24	Grading, Roadwork and Drainage Plan - Sheet 14	
C-26	Grading, Roadwork and Drainage Plan - Sheet 16	
C-29	Grading, Roadwork and Drainage Plan - Sheet 19 (12-21-79)	*
C-34	Miscellaneous Grading Sections and Details (12-21-79)	*
C-35	Road Profiles - Sheet 1	
C-36	Road Profiles - Sheet 2	
C-37	Road Profiles - Sheet 3	
C-38	Road Sections and Details - Sheet 1	
C-39	Road Profiles - Sheet 4	
C-40	Culvert & Storm Sewer Schedule	
C-41	Metal Cleaning Waste Ponds, Plan, Sections and Details (12-21-79)	*
C-42	Miscellaneous Sections and Details - Sheet 1 (12-21-79)	*
C-43	Miscellaneous Sections and Details - Sheet 2 (12-21-79)	*
C-45	Trackwork - Index Sheet	
C-46	Trackwork Plan & Profile - Sheet 1	
C-47	Trackwork Plan & Profile - Sheet 2	
C-48	Trackwork Plan & Profiles - Sheet 3	
C-52	Trackwork Sections & Details - Sheet 1 (12-21-79)	*
C-53	Trackwork Sections & Details - Sheet 2	
S-89	Miscellaneous Yard Foundations - Sheet 3	
S-90	Miscellaneous Yard Foundations - Sheet 4	
S-387	Standard Reinforcing Details at Openings (12-21-79)	*
S-388	Standard Slab Edge Details Embedded in Concrete (12-21-79)	*

203.2 The following drawings by the Consulting Engineers form a part hereof for reference only:

a. Structural Design Drawings:

C-11 Grading, Roadwork and Drainage Plan - Sheet 1

C-13 Grading, Roadwork and Drainage Plan - Sheet 3

C-14 Grading, Roadwork and Drainage Plan - Sheet 4

C-15 Grading, Roadwork and Drainage Plan - Sheet 5

C-23 Grading, Roadwork and Drainage Plan - Sheet 13

C-25 Grading, Roadwork and Drainage Plan - Sheet 15

S1 Soil Borings

S-383 Standard Slab Details and Typical Slab Reinforcing Schedule (12-21-79) *

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b. Mechanical Design Drawings:

M-1 Site Development

M-2 Property Development

M-3 Plant Development

M-4 Construction Access and Laydown

MS-97 General Arrangement - Waste Water Treatment Building

MS-98 General Arrangement - Bottom Ash Treatment Building

c. Electrical Design Drawings:

E-5 Conduits & Grounding in Substructure - Service Bldg. & Misc. Plans & Sections

E-8 Outdoor Duct Runs - Cooling Tower Area - Plans & Sections

E-10 Manhole Plans and Sections

E-14 Outdoor Duct Runs - Bottom Ash Area - Plans & Sections

203.3 The following Wisconsin Public Service Corporation design drawing forms a part hereof for reference only:

E-151 Plan of Temporary Electrical Service System

203.4 The following Warzyn Engineering Design Drawings form a part hereof:

a. Construction Drawings:

C7790-F5 Site Preparation *

C7790-F10 Drainage Ditch to River

C7790-F11 Cross Sections (12-21-79) *

C7790-F12 Details

C7790-F13 Details

b. Reference Drawings:

C7790-F2 Regional Topography and Vicinity and Land Ownership Maps

C7790-F3 Existing Site Topography

C7790-F4 Surface Water Drainage

C7790-F15 Soil Boring and Observation Well Locations

203.5 Logs of borings for the areas where the WORK is to be performed are available for inspection at either the offices of Purchaser or the Consulting Engineers.

204. <u>DRAWINGS AND DATA (CONTRACTOR'S)</u>

204.1 Submittal of Shop Drawings and Data shall conform to the applicable requirements of Form 1703, and to the requirements herein specified.

204.2 Submittal Distribution: Contractor shall address and submit all correspondence, shop drawings and data as follows:

a. Correspondence: All correspondence, except as specified in Paragraph 204.2b, shall be addressed and submitted to:

Mr. O. Zaben, Senior Structural Project Engineer
Mail Code: 29D56
Sargent & Lundy
55 East Monroe Street
Chicago, Illinois 60603

b. Shop drawings and data:

b1. Address and submit original copy of transmittal letter to:

Mr. S. Sen, Structural Project Engineer
Mail Code: 29E19
Sargent & Lundy
55 East Monroe Street
Chicago, Illinois 60603

FINAL SITE WORK
WESTON GENERATING STATION - UNIT 3

DIVISION 3 - TECHNICAL REQUIREMENTS

301. GENERAL

Conform to the applicable requirements of the Supplements and Standard Specifications indicated in Division 2 and to the requirements herein specified.

301.1 Services of Testing Laboratory: These services will be provided by Purchaser.

301.2 Soil Data and Topography: As specified in Form 1714, Article 2, and as follows: Logs of borings in the proximity of the areas where the WORK is to be performed are available for inspection at either the offices of Purchaser or the Consulting Engineers.

301.3 Dust Control: During the progress of the WORK, Contractor shall control dust within the work area by watering or any other means acceptable to Purchaser. Contractor shall be responsible for dust control within the work area from commencement of the WORK until the WORK is accepted. Contractor shall conform to all local regulations from governing bodies having jurisdiction in air pollution control.

302. EARTHWORK

302.1 Cleaning and Grubbing: As specified in Form 1714, Article 4.

302.2 Removal of Top Soil and Sod: As specified in Form 1714, Paragraph 4.4. Store on the Project Site as indicated or as directed by Purchaser.

302.3 Diversion and Care of Water:

a. Contractor shall construct, operate, maintain and be responsible for necessary channels, drains, sumps and pumps needed for diversion and care of water from any source so that Contractor's work can be performed in dry conditions.

b. Contractor's plans for diversion and care of water shall be subject to Purchaser's approval and shall be routed to the existing Construction Sedimentation Pond.

c. Contractor shall not place any fill across routes of natural drainage until provisions are made to drain surface runoff into drainage ditches as directed by Purchaser.

d. No surface runoff shall be ponded or restricted to a greater degree than would have occurred naturally before beginning of construction.

e. Should ponding or restriction of surface runoff result in water being backed up onto property not owned by Purchaser or onto Purchaser's property, all damages resulting therefrom shall be the responsibility of Contractor.

f. Dewatering System:

f1. Contractor shall provide a dewatering system as required to complete WORK in dry conditions.

f2. The entire system shall be removed on completion of the WORK unless otherwise requested by Purchaser.

302.4 Excavation:

a. General: Excavation shall conform to the applicable requirements of Form 1714, Article 5, and as follows:

b. Definitions:

b1. "Stripping" is defined as complete removal of sod, topsoil, organic matter and rubbish in areas indicated on Design Drawings and for areas to be used for borrow and stockpiling of fill materials. Stripped materials shall be separated from stumps, roots and other organic materials and such items shall be disposed of or stockpiled as indicated on the Design Drawings or as directed by Purchaser.

b2. Earth and rock excavation shall be as defined in Form 1714.

c. Procedures: Excavation may be accomplished by any method and by use of any excavation and hauling equipment best adapted to the WORK.

d. Limits: Excavation shall be performed to neat lines and grades indicated on the Design Drawings. Any over-excavation or excess excavation, not requested by Purchaser, shall be at Contractor's expense.

e. Over-excavation under areas to be occupied by Construction shall be filled with compacted granular fill, meeting the requirements as specified in Paragraph 302.5g.

f. Finished excavated surfaces shall be protected against damage by movements of construction equipment, rain, frost, or other causes which could impair the bearing capacity of the subgrade. Areas damaged due to such cause shall be repaired at the Contractor's expense.

g. If unsuitable soils are found during excavation, as determined by Purchaser, the Contractor may be requested to carry the excavation deeper to more suitable materials.

h. Granular material excavated by the Contractor, if found suitable by Purchaser, shall be used for fill and backfill.

h1. Such materials shall be stockpiled for future use, by placing in areas designated by the Purchaser or as indicated on the Design Drawings.

h2. Granular material shall be handled and stockpiled in such a manner to insure proper gradation within limits as established by the Consulting Engineers.

h3. Excavated material in excess of fill requirements will be stockpiled within a 1,000 foot scraper haul from point of excavation. *

h4. Areas approved for stockpiling backfill and fill material for future use shall be grubbed, cleared, and stripped of growth, debris and topsoil. *

h5. Contractor shall provide and maintain suitable drainage in the stockpile area to prevent excessive wetting of the fill. Stockpiled material shall be rolled with a plain smooth cylindrical roller to form a smooth surface with sufficient slope to cause rapid runoff of rainwater. *

i. Suitable Materials:

i1. Granular soils shall be considered as suitable for fill and backfill if they contain no organic materials, cobbles, or foreign deleterious materials, and are composed primarily of cohesionless materials.

i2. These materials shall be obtained from Contractor's excavation and grading operations or from approved existing previous excavated stockpile areas on the Project Site.

302.5 Compacted Fill:

a. A Testing Laboratory will be employed by the Purchaser to determine the conformance of compaction to the density requirements as herein specified and as specified in Form 1714.

b. Subgrade to receive compacted fill shall be inspected by the Consulting Engineers to determine if it is suitable and has sufficient bearing capacity for the fill material and loads to be placed on it. If subgrade is not suitable, as determined by the tests, Contractor may be requested to perform additional excavation.

c. Prior to placing compacted fill, strip the areas to be covered of vegetation, topsoil and organic material or other foreign or deleterious materials.

d. Fill all holes, ruts, and similar defects. All unstable areas, projecting stone or rock, and similar defects, shall be cut out and the areas filled.

e. Thoroughly break and turn soil underlying the filled area to depth of six inches before deposition of fill material. Break and turn ground no more than 200 feet in advance of placing fill.

f. Completed subgrade shall be true to alignment, grade and cross-section, including required slopes, indicated.

g. Compacted Densities:

g1. Place granular fill for support of construction of roads, trackwork, parking areas, etc., in loose thicknesses not exceeding six inches maximum thickness, compacted to a minimum relative density of 75 percent, as determined by ASTM D2049, Wet Method Test.

g1.1 Obtain not less than 95 percent of the maximum Modified Proctor density as determined by ASTM D1557, Method A. For cohesive material, compaction shall be performed to within two percent (±) of the optimum moisture content. *

g1.2 The required field dry density shall be the greater of the two values determined by the methods herein specified.

g2. Areas, other than herein specified, shall be treated as specified for RCF1 (Regular Compacted Fill) in Form 1714, with the maximum Modified Proctor density 90 percent, determined as specified in Paragraph 302.5g1.

302.6 Drainage Ditches:

a. Cut and/or fill to form drainage ditches to cross-sections and profiles indicated on the Design Drawings or as required by drainage requirements.

b. All surfaces of both cut and fill shall be well compacted, smooth and uniform.

302.7 Underground Culvert and Piping Backfilling:

a. General:

a1. Conform to Form 1714, Article 7.6 for corrugated culverts and storm drain piping.

b. Normally excavate trenches to match curve of pipe. Flat beds may be used if as economical as curved beds.

b1. Curved Beds: Bed pipe evenly and firmly for width of 100 percent of pipe breadth.

b2. After pipe is in place on flat bed, provide well compacted granular fill under corrugations. Use clean crushed stone, gravel or coarse sand, or other material, approved by the Purchaser, of 1-1/2 inches maximum size.

b3. Provide same granular fill up to center line of pipe. Place in layers not exceeding six inches, before compaction.

c. After pipe is placed on its bed, perform tests as specified in Form 1714. After tests are completed and piping runs have been approved fill around piping by placing granular fill simultaneously on both sides of the pipe in such manner as will not subject pipe to injurious side pressures.

c4.3 Top section shall be eccentric cone type with minimum wall thickness of 5 in. for 48 in. diameter manholes and catchbasins and 6 in. for 60 in. diameter manholes and catchbasins, or shall be flat slab type not less than 8 in. thick, as indicated on drawings or as required by manhole or catchbasin depth. Arrange both types for taking cast iron manhole frame and cover.

c4.4 Rings and top cone shall have precast openings for field installation of cast iron steps, and for all required drain pipes entering manholes.

c5. Joints: Rubber "O-Ring" or flat type rubber compression type, with manufacturer's standard rubber ring. Mortar joints may be used if specifically approved.

d. Corrugated metal pipe manhole and catchbasin, as indicated on the Design Drawings.

e. Installation of Catchbasins:

e1. Subgrade shall be level and free of projecting stones, rocks, etc.

e2. Place a layer of sand, not less than 4 in. thick, over subgrade before installing precast base. Exercise care to install base dead level and with full bearing throughout on sand cushion, to insure that completed catchbasins are plumb.

e3. Installation of sections, using rubber rings, in strict accordance with manufacturer's instructions, as approved.

304. RIPRAP

304.1 General: Provide and place riprap where indicated on the Design Drawings.

304.2 Materials:

a. Bedding for riprap: Two layers of crushed stone with the following gradations:

Sieve Size (inches)	Percent Passing by Weight
a1. Bedding Layer 1:	
2-1/2	100
2	90-100
1	60-90
1/2	35-65
#4	20-40
#16	5-35
#200	4-12

a2. Bedding Layer 2 Thickness of 8 inches:

8	100
6	85-100
4	20-100
3	0-90
2	0-50
1-1/2	0

b. Riprap:

b1. Riprap shall consist of quarried stone, or other stone, free from structural defects and of approved quality. Stone containing shale, unsound sandstone or any other material which will readily disintegrate under handling and placing or weathering, shall not be used. Any stone which is free from incipient fractures and seams and has given evidence of ability to withstand weathering after long exposure to the elements shall be considered suitable for this purpose. This criteria will be the primary factor in determining if the quarry stone is acceptable for riprap.

b2. In the case of quarried stone, the riprap shall be subject to the following tests as an indication of rock quality:

The sodium sulfate soundness test and the freezing and thawing test. The rock shall show a loss of not more than 25% after five cycles during the sodium sulfate and after 50 cycles during freeze and thawing tests.

b3. The ledge rock sections of soundness method AASHTO T-104, "Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate" and AASHTO T-103, "Soundness of Aggregates by Freezing and Thawing Procedure A" shall be used. Results for all samples tested shall be presented. The final determination of the suitability of any questionable stone for riprap material shall be made by Purchaser or the Consulting Engineers.

c. The moist unit weight of riprap shall not be less than 160 pounds per cubic foot.

d. Size and Gradation:

d1. The Riprap shall be reasonably well graded within the following limits for layers of 16 or more inches:

	Approximate Weight Per Piece Lbs.	Approximate Sieve Size (inches)	Percent Passing by Weight
d1.1	259	16	100
d1.2	150	13.5	85-100
d1.3	100	12	50-95
d1.4	73	10.5	15-85
d1.5	46	9	5-50
d1.6	13	6	0-15
d1.7	4	4	0

e. For layers of 8 to 12 inches as indicated on the design drawings the riprap shall have the gradation indicated in Paragraph 304.2a2 with bedding layer 1 only. *

f. The shortest dimension of any stone shall be not less than 1/3 of the longest dimension for at least 60 percent of the riprap. For the balance, the shortest dimension shall be not less than 1/5 of the longest dimensions.

304.3 Placing:

a. Bedding materials: Place by approved means to the minimum thickness indicated on the Design Drawings.

b. Riprap:

b1. Riprap shall be placed by equipment which shall be operated so as to place each load of material in approximately its final position without further reworking, and without excessive height of drop.

b2. Placement operations, including handling, stockpiling and transporting, shall be accomplished in such manner as to produce a reasonably well graded mass of rock with minimum percentage of voids, free from objectionable pockets of small stones and clusters of large stones and having a reasonable regular finished surface.

305. <u>ROADWORK AND PARKING AREA</u>

305.1 General

a. Conform to the applicable requirements of the 1975 Edition of State of Wisconsin Department of Transportation Division of Highways Standard Specifications for Road and Bridge Construction.

b. Finish: Hot-dipped galvanized per ASTM A525, 2.5 ounce coating for guardrail and ASTM A153 for bolts and accessories.

306.2 Installation: As indicated on the design drawings, in conformance with the manufacturer's approved instructions.

307. PARKING BARRIERS AND PAVEMENT MARKINGS

307.1 General: Provide parking barrier of the types herein specified, as indicated on the design drawings or approved by Purchaser.

307.2 Precast Concrete Type: *

a. Precast concrete barriers of dimensions and configurations as indicated on the design drawings.

b. Dowels: If not otherwise indicated, provide erect rods a minimum of 1/2 inch diameter by three foot long with flattened heads.

c. Installation of Precast Concrete Barriers: After dowels have been driven home, cap hole over each dowel with cement grout.

307.3 Treated Timber Type (Construction Parking Only): *

a. Preservative treated timber barriers of dimensions indicated, Douglas Fir or Yellow Pine, drilled at both ends and treated as follows:

a1. Preservative Treatment:

a1.1 Type: Creosote Type, Pressure Method.

a1.2 Preservative: Creosote oil conforming to applicable requirements of AWPA Standard P1.

b. Installation of Timber Barriers: As indicated on the design drawings.

307.4 Pavement Markings (Permanent Parking Area Only): *

a. General: Provide four inch yellow continuous pavement marking as indicated on the drawings.

b. Material and Installation: In strict accordance with the State of Wisconsin Department of Transportation Division of Highways Standard Specification.

308. SEEDING WORK

308.1 General:

a. Contractor shall furnish materials and perform seeding operations to produce a uniform stand of health grass where indicated on the design drawings as "seeded surfaces" or "seeded topsoil".

b. All areas subject to construction clearing and grading, with the exception of areas to be occupied by structures (permanent or temporary) and areas designated as storage, laydown or working areas, will be seeded at the earliest possible moment pending completion of these activities.

c. Seeding shall include seeding of all new ditches, completed slopes and embankments.

d. Conform to the applicable requirements of the 1975 Edition of State of Wisconsin Department of Transportation Division of Highways Standard Specifications for Road and Bridge Construction and to the requirements hereinafter specified.

e. Exceptions: All references in the State Specifications to methods of compensation shall not apply.

308.2 Liming and Fertilizing:

a. General: Contractor shall test the soils to determine the proper amount of pH and nutrient adjustment required. Test results and subsequent application rates of lime and fertilizer are subject to approval of the Purchaser and the Consulting Engineers.

b. Liming: Agricultural ground lime, conforming to requirements of Section 629.3.2 (Agricultural Lime Stone Treatment) of the State Specifications, shall be thoroughly mixed, at the rate of two tons per acre, with surface soil before completion of ground preparations.

c. Fertilizer:

c1. Fertilizer shall consist of Nitrogen, Phosphate and Potassium nutrients.

c2. Fertilizer shall be applied at such rate that each acre will receive the following amounts of available units:

c2.1 Nitrogen 60 pounds.

c2.2 Phosphate (P_2O_5) 100 pounds.

c2.3 Potassium (K_2O) 100 pounds.

c3. Fertilizer can be placed during ground preparation or mixed with, and placed with, seed and mulch during final seeding.

c4. Condition of fertilizer prior to placing shall be approved by Purchaser.

308.3 Seeding and Mulching:

a. Seed used shall conform to the requirements of Section 630 "SEEDS" of the State Specification and shall consist of a mixture of the following seeds in the amounts indicated:

	Type of Seed in Mixture	Pounds Per Acre
a1.	Fescue (Kentucky 31 or Alta)	60
a2.	Red top, Solid	24
a3.	Clover, Alsike (inoculated)	16

b. Seeding shall be performed in accordance with Section 630 of the State Specifications with the maximum depth of planting 1/2 inch.

c. Mulching: Immediately after seeding, cover seeded areas with sprayed asphalt straw mulch in accordance with the State Specifications.

d. Except as otherwise specified above, the methods of preparation of seed beds, fertilizing, mulching, seeding, sprinkling, maintaining, repair, and reseeding as required, will be at the option of Contractor. The WORK shall be considered completed after a uniform and dense stand of healthy perennial grass, free from bare spots and gullies formed by erosion, has been produced.

309. FENCE WORK

309.1 General:

a. Fence work includes the relocation of existing fence to new location, providing new fence, and installation of new fence, with fence materials supplied by Purchaser.

b. Requirements for Relocation of Existing Fence: Carefully remove existing fence fabric and posts and install as indicated. If damaged during removal, replace with new fabric and posts to match existing. Install as specificied in Form 1739.

309.2 Revision to Form 1739: Paragraph 10.7.3: Revise the existing dimension of four inches to read 1-3/4 inches $\pm$ 1/8 inch.

309.3 Soil Data and Topography: As specified in Form 1739, Article 5, except soil boring drawings are not included. Contractor may make his own soil investigations.

309.4 Fence Requirements (for new fence only):

	Item	Article No. in Form 1739
a.	Height: As indicated on the design drawings and as supplied by Purchaser.	

313. SEALING OF BASINS AND COAL PILE AREA

313.1 General:

a. The lining is intended to provide a watertight seal against ground-water contamination from the plant wastes stored in the basins indicated on the design drawings.

b. The following plant effluents will be discharged into the basins:

b1. Air Preheater Wash Water (see Table 313-1 for composition)

b2. Miscellaneous Metal Cleaning Wastes

b3. Miscellaneous Chemical Drains

b4. Makeup Demineralizer Regeneration Wastes (see Table 313-2 for composition)

b5. Condensate Polisher Regeneration Wastes (see Table 313-2 for composition)

b6. Precipitator Wash, primarily suspended solids.

b7. Coal Pile Runoff

b8. Bottom Ash and Accompanying Sluice Water

TABLE 313-1

PREDICTED AVERAGE AIR PREHEATER WASH ANALYSIS

Parameter	Concentration (in mg/l except pH)
Calcium, as Ca	175
Magnesium, as Mg	48
Hardness, as $CaCO_3$	637
Sodium, as Na	40
Iron (total), as Fe	2,400
Copper (total), as Cu	4.6
Methyl Orange Alkalinity, as $CaCO_3$	0
Sulfate, as SO_4	8,500
Chloride, as Cl	6
Silica, as SiO_2	59

TABLE 131-1 Cont.

pH	2.81
Total Suspended Solids	320
Total Dissolved Solids	20,400
Oil and grease	Intermittent

TABLE 313-2

PREDICTED AVERAGE MAKE-UP DEMINERALIZER AND CONDENSATE POLISHER REGENERATION WASTE ANALYSES

Parameter	Make-Up Demineralizer Regeneration Waste Concentration (in mg/l except pH)	Condensate Polisher Regeneration Waste Concentration (in mg/l except pH)
Calcium, as $CaCO_3$	307	112
Magnesium, as $CaCO_3$	213	68
Sodium, as $CaCO_3$	2120	848
Chloride, as $CaCO_3$	67	26
Sulfate, as $CaCO_3$	3160	2460
Alkalinity, as $CaCO_3$	0	0
pH	1-14	1-4
Total Dissolved Solids	4250	2840
Oil and Grease	Variance 100	100

c3. The protective racks and soil cover shall be stable when exposed to the elements.

313.2 Soil Bentonite Lining:

a. Material:

a1. Bentonite:

a1.1 Bentonite shall be free-flowing, high swelling pure, Wyoming-type bentonite, NL Baroid Material Standard 200 mesh or equivalent, as approved.

a1.2 Bentonite used in preparing the liner shall be pulverized natural Wyoming sodium cation bentonite and shall meet API Standard 13A dated February 1974, "API Specifications for Oil-Well Drilling-Fluid Materials." The use of so-called "peptized" or chemically treated bentonite shall not be permitted.

a2. Soil for Bentonite Soil Mixture and Protective Sand Layer:

a2.1 The soil shall be the onsite granular material as excavated from the basins or obtained from approved borrow or stockpile areas.

a2.2 The soil shall be free from all organic matter and shall have less than 10% passing a #200 sieve as determined by ASTM D1140.

a3. Protective Rock Layer (Crushed Stone or Crushed Gravel): *

a3.1 The rock shall be stable under chemical attack from the effluents discharged into the basins as defined in Paragraph 313.1.

a3.2 The rock shall be tested for quality by the sodium sulfate soundness test, AASHTO T104, and the freezing and thawing test, AASHTO T103. The rock shall indicate a loss of not more than 10% after five cycles during the sodium sulfate and 50 cycles during freezing and thawing tests.

a3.3 Results for all samples tested shall be submitted to the Consulting Engineers.

a3.4 The protective rock layer shall have the following gradation or an equivalent approved by Purchaser and the Consulting Engineers:

	Sieve	Percent Passing
a3.4.1	2-1/2 in.	100
a3.4.2	2 in.	90-100
a3.4.3	1 in.	60-90
a3.4.4	1/2 in.	35-65
a3.4.5	#4	20-40
a3.4.6	#16	5-35
a3.4.7	#200	4-12

b. Bentonite Soil Mixture:

b1. Prior to construction of the bentonite soil lining, Contractor shall determine the bentonite percentage by weight of sand needed to achieve a maximum hydraulic conductivity of 1×10^{-7} cm/sec.

b2. Contractor shall obtain representative samples of onsite sand to be mixed with bentonite for moisture-density, and permeability testing. Three sieve analysis shall be performed on portions of the sample in accordance with ASTM D 422.

b3. Contractor shall mix and test soil and bentonite batches at the following bentonite content by dry weight of soil; 12%, 15% and 18%. The batches shall be of sufficient size to perform Moisture Density relations in accordance with ASTM D 698 Method B. For each of the three mixtures a maximum density and optimum moisture content shall be determined by ASTM D 698 Method B.

b4. After completion of the moisture density relations, one six-inch diameter sample for each bentonite content shall be prepared in accordance with ASTM D 698 and compacted at approximately the optimum moisture content to approximately 90% of the maximum density. Two samples; two inches in diameter and four inches in length shall be trimmed from each of the six-inch diameter samples. All two-inch diameter samples shall be tested for permeability using the falling head procedure in a triaxial cell with backpressure to assure saturation. The permeability testing shall be done in accordance with the U.S. Army Corp of Engineers Manual, EM 1110-2-1906, "Laboratory Soils Testing".

b5. After completion of the permeability testing, the dry density of each two-inch diameter sample shall be determined.

b6. Based on the dry density determinations, and the permeability testing, Contractor shall recommend a bentonite application rate (as a percentage of dry weight of soil) to achieve a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec. If test results indicate hydraulic conductivities significantly different than 10^{-7} cm/sec, additional testing at different bentonite contents shall be required.

b7. Results from all sieve analyses, moisture-density relations, permeability and density tests shall be submitted to Purchaser and the Consulting Engineer for approval of the bentonite application rate.

c. Basin Preparation:

c1. The excavation for the basins shall be done in accordance with Paragraph 302.4.

c2. Fill for the dikes shall be CCF1 compacted in accordance with Paragraph 302.5

c3. The subgrade for the basin lining shall be compacted to 90% of the maximum Standard Proctor density as determined by ASTM D 698, Method B.

c4. Prior to placing the soil bentonite the basin bottom and sides must be drained and bladed smooth. Deleterious vegetation and boulders shall be removed. Holes resulting from the removal of vegetation or boulders shall be filled with a dry mixture, (by volume) of one part bentonite and four parts sand, blended dry.

c5. A stockpile of granular soil sufficient to form the one foot thick bentonite soil layer shall be made from material taken from the excavation or from other areas approved by Purchaser.

c6. The moisture content and gradation of the stockpiled material shall be determined for mixing quantities.

d. Preparation of Soil Bentonite Mixture:

d1. Mixing Plant:

d1.1 Use either a batch-type or a continuous-mixing-type plant for either weight or volume proportioning. Use a twin-shaft pug-mill type mixer.

d1.2 The plant shall be calibrated at the start of the construction, and the calibration shall be rechecked periodically as often as necessary, or as directed by Purchaser or whenever a change is noted in the soil-bentonite mixture or the stockpile.

d2. Special Requirements for Batch-type Plants: Include means for accurately weighing soil and bentonite, ample in size to hold a full batch without hand racking or running over.

d3. Special Requirements for Continuous-Mixing-Type Plants: Provide positive interlocking control of the flow of soil and bentonite from bins.

d4. Mixing Soil Bentonite:

d4.1 All ingredients shall be mixed for at least 30 seconds or longer as may be necessary to insure a uniform, intimate mix of soil and bentonite, until the resulting mixture is homogeneous and uniform in appearance. The mixing time shall be considered as the interval between the time the bentonite contacts the soil and the time the mixture leaves the mixing unit.

d4.2 The amount of bentonite shall be determined in advance by the methods described in Paragraph 313.2b. Water introduced during mixing shall be the difference between the stockpile moisture content and the optimum moisture content as determined in Paragraph 313.2b.

e. Placing of Soil Bentonite Liner:

e1. The soil-bentonite mixture shall be placed in two six inch compacted layers parallel to the prepared surface.

e2. Each successive layer in a section shall be placed as soon as practicable after the preceding layer is completed. Contractor shall avoid the deposition of untreated soil or foreign materials between layers of soil-bentonite.

e3. Soil-bentonite shall not be mixed and placed when the air temperature is below 40 degrees F, or in the opinion of Purchaser, weather conditions are such that the material being processed cannot be completely compacted and protected before the advent of freezing temperatures. Soil-bentonite shall also not be placed when the subgrade and the soil to be processed is frozen.

e4. Contractor shall take all necessary precautions to avoid damage to completed soil-bentonite by equipment. Equipment shall not be operated on a finished compacted layer of the soil-bentonite except for equipment necessary to lay and compact the succeeding lift. Damage to a finished compacted layer of soil-bentonite resulting from the operation of equipment over these layers shall be repaired at the expense of and by Contractor. Earth ramps crossing completed soil-bentonite shall be at least two feet compacted thickness and then be completely removed prior to placing protective layers.

f. Compaction of Soil Bentonite Liner:

f1. The soil bentonite liner shall be uniformly compacted in two six inch layers to a density not less than 90 percent of the Standard Laboratory Maximum Dry Density (ASTM D698) obtained in the laboratory on representative samples of soil bentonite obtained from behind the spreading equipment. The moisture content shall be maintained uniformly throughout the material being compacted.

f2. Contractor shall use compaction equipment that are suitable for the purpose approved by Purchaser.

f3. Compaction of the soil-bentonite material on the dike slope shall be accomplished by traversing the slope in a direction perpendicular to the center line of the dike.

f4. The second six-inch lift of soil-bentonite mixture shall not be placed until compaction of the first layer is complete.

g. Placement and Compaction of Protective Sand and Rock Layers:

g1. A one-foot protective sand layer compacted in two six-inch lifts shall be placed over the compacted soil bentonite liner.

g2. The sand shall be compacted to 90% of the maximum density as determined by the Standard Proctor Moisture Desity Relations, ASTM D 698 Method B.

g3. The protective rock layer shall be in thickness as indicated on the design drawings and compacted to a density of 90% of the standard Proctor Maximum density. The material shall be noncalcareous and stable under chemical attack as specified in Tables 313-1 and 313-2. *

g4. The protective rock layer shall be placed in a manner to minimize segregation and assure a uniform gradation of the rock on the slopes and bottom of the excavation.

h. Activation of the Soil Bentonite Layer:

h1. After completion of compaction of the protective rock layer, the basins shall be filled with water in order to hydrate the bentonite liner.

h2. The water used to fill the basins shall be clean and free from oil, acid, alkali, organic matter or other deleterious material.

h3. The water in the basins shall remain at a level of a minimum of one foot above the design fluid elevation in the basins for a period of not less than two-weeks.

h4. Steel splash pads covered with crushed rock shall be provided to prevent erosion of the protective rock layer and the protective sand layer during filling of the basins.

h5. The basins shall be drained after completion of the hydration.

i. Mixing Soil Bentonite Liner in Place: *

i1. The first six-inch layer of the soil bentonite liner may be mixed in place by spreading and discing the bentonite into the first six inches above the subgrade. The in-place mixing method may be used only if Contractor can demonstrate to Purchaser's Representative the ability to achieve a homogeneous six-inch layer of soil bentonite liner in a test section separate from ponds or coal pile. The method for spreading and discing shall be proposed in advance to the test section, documented during the placement of the test section and if the test section is acceptable to the Purchaser's Representative adhered to in the production phase.

i2. After an acceptable procedure is established in the test section, spreading and discing the bentonite shall be used to place only the first six-inch layer in the bottom of the ponds or in the first six-inch layer of the coal pile lining. At no time shall the spread-and-disc method be used on an inclined surface or on previously placed soil bentonite lining. Compaction requirements shall be as specified in Paragraph 313.2f.

313.3 Clay Lining:

a. Materials:

a1. Clay:

a1.1 The clay shall have a plasticity index (PI) greater than or equal to 15. More than 50% of the clay particles shall pass a #200 sieve as determined by ASTM D1140.

a1.2 The clay shall be free from roots, sticks, sod tufts and other organic matter. The clay shall be free from cobbles and boulders with less than 5% of the dry weight of soil retained on a #4 sieve.

a1.3 Contractor shall procure all clay material required for the WORK from off-site sources. All sources shall be approved by Purchaser.

a2. Protective Sand Layer: As specified in Paragraph 313.2a2.

a3. Protective Rock Layer: As specified in Paragraph 313.2a3.

b. Preparation of Basin Slopes and Bottom:

b1. The surface of the basin slopes and bottom, upon which the clay liner is to be placed shall be free from vegetative and foreign matter.

b2. The basin slopes and bottom where the clay lining is to be placed shall be compacted to a density not less than 90 percent of the Standard Laboratory Maximum Dry Density (ASTM D698) immediately before placement of the clay lining.

c. Placement of the Clay Lining:

c1. The clay shall be placed on the basin slopes or previously compacted clay, in stair-step horizontal layers, in such a manner that each succeeding layer will be stepped back. Lining in the pond shall be placed in succeeding six inch lifts until the grade elevation is reached.

c2. The equipment for spreading the clay shall be suitable for the purpose and as approved by Purchaser and the Consulting Engineers.

c3. Each successive layer in a section shall be placed as soon as practicable after the preceding layer is completed. Contractor shall avoid the deposition of uncontrolled fill or foreign materials between layers of clay.

c4. Clay shall not be placed when the air temperature is below 40 degrees F. Clay shall not be placed when the subgrade and the soil to be processed is frozen; or, in the opinion of the Consulting Engineers, weather conditions are such that the material cannot be completely compacted and protected before the advent of freezing temperatures.

d. Compaction of Clay Lining:

d1. The clay shall be compacted using kneading action by sheeps foot roller as approved by Purchaser and the Consulting Engineers.

d2. The clay shall be uniformly compacted to 95% of the Modified Laboratory Maximum Dry Density (ASTM D1557) obtained in the laboratory on representative samples from the approved borrow area.

d3. Compaction shall be on stair-step horizontal lifts in a manner that each succeeding layer will be stepped back on the slopes. The bottom lining will be compacted in six-inch layers to a total thickness of three feet.

e. Placement and Compaction of the Protective Sand and Rock Layers: As specified in Paragraph 313.2g.

e1. The protective rock layer shall be in thickness as indicated on the design drawings and compacted to a density of 90% of the standard Proctor Maximum density. The material shall be noncalcareous and stable under chemical attack as specified in Tables 313-1 and 313-2. *

e2. The protective rock layer shall be placed in a manner to minimize segregation and assure a uniform gradation of the rock on the slopes and bottom of the excavation.

~~313.4 Synthetic Liner:~~ *

a. Lining Material:

a1. The flexible membrane lining material shall conform to the requirements of ASTM D751, designed and manufactured specifically for the purpose of this or a similar installation, and which has been satisfactorily demonstrated by prior use to be suitable for this work.

a2. The liner shall be a minimum of 100 mils thick and be capable of withstanding the load from rubber tired cleaning vehicles without any protective cover.

a3. The liner shall be immune to the effects of ultraviolet radiation and resistant to the chemicals contained in the wastes that will be discharged into the ponds.

a4. The liner shall exhibit physical properties conducive to satisfactory performance under stress and over the temperature extremes experienced in Rothschild, Wisconsin.

a5. The liner shall be fabricated into as large sheets as can be conveniently handled to minimize the onsite joints.

a6. The joints shall be made by means of extruder welding, dielectric bonding or other accepted methods. The use of solvents or adhesives for joint sealing will be permitted ONLY if watertightness of the finished joint installation can be proven to the satisfaction of Purchaser by some nondestructive test examination.

a7. Quality and strength tests applicable to the usage as a liner shall be submitted to Purchaser and the Consulting Engineers for review and approval.

b. Installation

b1. The pond subgrade shall be prepared in accordance with Section 313.2c3.

b2. The liner sheets shall be carefully positioned, aligned and joined as quickly as practical to prevent damage and movement of the sheets.

b3. Lap joints shall be utilized for joining factory fabricated sheets. Mating surfaces of the lap joints shall be cleaned of debris.

b4. Sealing around pipe penetrations and other basin protrusions shall be Contractor's watertight design, subject to approval by the Consulting Engineers.

b5. ~~Damage to the lining in shipment or during installation shall be~~ repaired using parent material. The patch ~~shall overlap~~ the damaged area by a minimum ~~equal to that~~ used for other onsite joints. Joints ~~shall be executed~~ by the same methods utilized for joining ~~the original base sheets.~~ *

313.5 Testing:

a. Laboratory: A testing laboratory will be furnished by Purchaser to perform quality test indicated. Contractor shall cooperate with the testing laboratory at all times.

b. Frequency:

b1. The Purchaser's testing laboratory will perform the following tests, the indicated frequencies are provided as guidelines to Contractor and the actual frequencies shall be determined by Purchaser in the field:

b1.1	Density Test on Dike Fill (ASTM D1556 or D2922)	200 cy
b1.2	Density Test on Subgrade (ASTM D1556 or D2922)	200 sq ft
b1.3	Moisture Content on Granular Stockpile (ASTM D2216)	200 cy
b1.4	Gradation on Granular Stockpile (ASTM D422)	200 cy
b1.5	Density of Bentonite Liner and Clay Liner (ASTM D1556 or D2922)	200 cy
b1.6	Density of Protective Sand and Rock Layers (ASTM D1556 or D2922)	200 cy

314. <u>BITUMINOUS CONCRETE PAVED DITCHES</u>

314.1 General: Existing ditches shall be cleared, backfilled and dressed to proper grades and cross-sections as indicated on the design drawings, prior to placing bituminous concrete paving.

314.2 Products:

a. Tack Coat: Type CSS-1 or CSS1h emulsified asphalt mixed with equal parts of water.

b. Aggregate: Conform to the Wisconsin State Specification, with the following gradations:

LOG OF BORING NO. 313 (S1615.0 W 450.0)

OWNER	ARCHITECT-ENGINEER
Wisconsin Public Service Corporation	Sargent and Lundy
SITE	**PROJECT NAME**
Weston Generating Station	Weston - Proposed Unit 3

SURFACE ELEVATION 1177.0

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	DESCRIPTION OF MATERIAL
	1	SS	Silty topsoil-dark brown
	1A	SS	Silty fine sand-dark brown-loose-(SM)
	2	SS	Fine to medium sand, trace fine to coarse gravel-brown-medium dense-(SP-SM)
	3	SS	Fine to medium sand, trace to some gravel-trace silt-brown-dense (SP-GP)occasional cobbles from 4.5'
5	4	SS	
	5	SS	Silty fine to medium sand, trace gravel-occasional cobbles-very dense to medium dense-(SP-SM)
	6	SS	
10	7	SS	Fine to medium sand, trace to some gravel-brown medium dense to very dense-(SP) occasional cobbles
15	8	SS	
20	9	SS	Fine to medium sand, trace gravdl-brown-dense to medium dense-(SP)
25	10	SS	
30	11	SS	
35	12	SS	Very fine to fine sand-brown-medium dense-(SP)
40	13	SS	Fine to medium sand, trace gravel-brown-medium dense to dense-(SP)
45	14	SS	

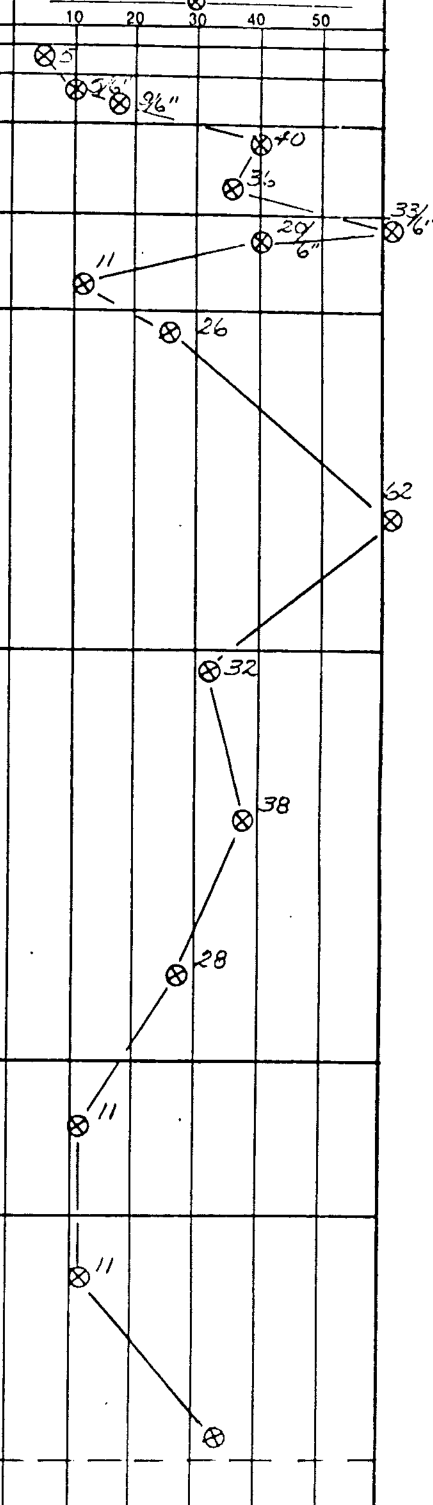
Continued

UNIT DRY WT. LBS./FT.3

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 — 1 2 3 4 5

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD "N" PENETRATION (BLOWS/FT) ⊗ — 10 20 30 40 50



WATER LEVEL OBSERVATIONS		
W.L.	Dry to 9.0' WD	
W.L.	B.C.R.	A.C.R.
W.L.		

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		5-12-76	
BORING COMPLETED		5-12-76	
RIG	W-8	FOREMAN	EVH
DRAWN	KO	APPROVED	ARP
JOB #	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 313 (continued)

OWNER	ARCHITECT-ENGINEER
Wisconsin Public Service Corporation	Sargent and Lundy
SITE	**PROJECT NAME**
Weston Generating Station	Weston - Proposed Unit 3

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² — 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
STANDARD "N" PENETRATION (BLOWS/FT.) — 10 20 30 40 50

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	STANDARD "N" PENETRATION
					SURFACE ELEVATION		
45					Continued		
46.5							
50	15	SS			Fine to medium sand, trace gravel-brown-medium dense to dense-(SP)		19
55	16	SS					13/6"
	16A	SS			Silty fine sand-grayish brown-dense-(SM)		20/6"
60	17	SS			Fine to coarse sand, trace gravel-brown-medium dense-(SW)		14

End of Boring
Boring advanced by power auger to a depth of 9.0 feet
Below 9.0 feet cutting bits and Revert drilling fluid used
58.5' of NX casing

Boring backfilled after completion

WATER LEVEL OBSERVATIONS		
W.L.	Dry to 9.0 WD	
W.L.	B.C.R.	A.C.R.
W.L.		

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED	5-12-76		
BORING COMPLETED	5-12-76		
RIG	W-8	FOREMAN	EVH
DRAWN	KO	APPROVED	ARP
JOB #	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 316 (S1150.0 W 70.0)

OWNER Wisconsin Public Service Corporation	ARCHITECT-ENGINEER Sargent and Lundy
SITE Weston Generating Station	PROJECT NAME Weston - Proposed Unit 3

SURFACE ELEVATION 1174.6

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.3	STANDARD "N" PENETRATION (BLOWS/FT)
	1	SS	Silty topsoil, dark brown		
	1A	SS	Silty fine sand-brown-loose-(SM)		4
	2	SS			7
	3	SS	Fine sand, trace gravel-brown-medium dense-(SP)		8/6" 29/6"
5	4	SS	Fine to medium sand, trace gravel-brown-dense-(SP)		45
	5	SS			31
	6	SS	Very fine to fine sand, trace gravel-brown-medium dense-(SP)		47
10	7	SS	Fine to medium sand, trace gravel-brown-medium dense		23
15	8	SS	Coarse gravel (2 pieces of gravel in split spoon) red-medium-dense-(GP)		28
20	9	SS	Fine to medium sand, trace gravel-brown-dense-(SP)		50
25	10	SS	Very fine to fine sand, trace gravel-brown-dense-(SP)		33
30	11	SS			30
35	12	SS	Very fine to medium sand, trace gravel-brown-medium dense to very dense-(SP)		24
40	13	SS			51

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 — 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
STANDARD "N" PENETRATION (BLOWS/FT) — 10 20 30 40 50

End of Boring
Boring advanced by power auger to a depth of 20 feet
Below 20 feet Revert drilling fluid and cutting bits used
20' of NX casing used

Boring backfilled after completion

WATER LEVEL OBSERVATIONS		
W.L.	Dry to 20' WD	
W.L.	B.C.R.	A.C.R.
W.L.		

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED			5-13-76
BORING COMPLETED			5-14-76
RIG	W-15	FOREMAN	RR
DRAWN	KO	APPROVED	ARP
JOB #	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 317 (S1300.0 E 50.0)

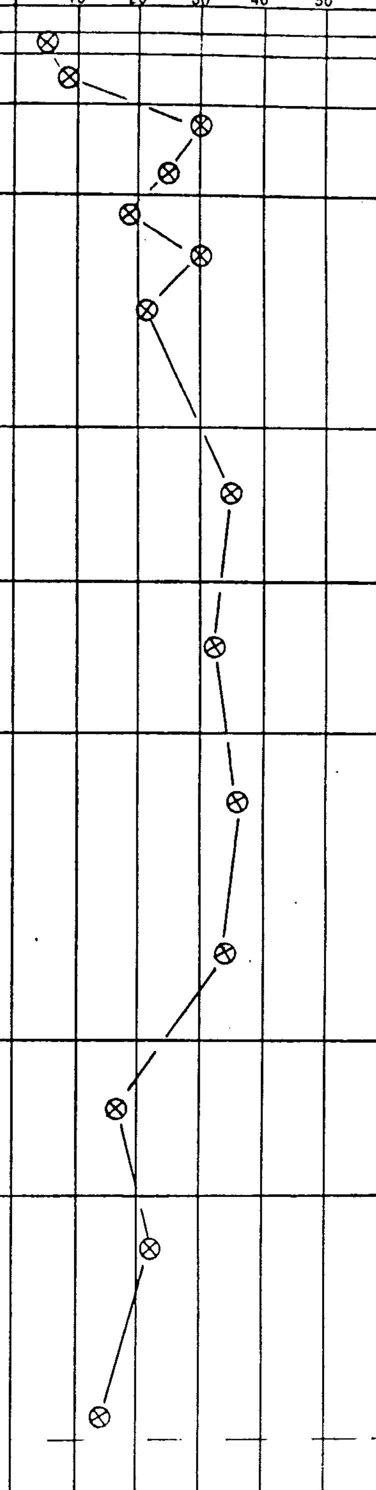
OWNER Wisconsin Public Service Corporation	ARCHITECT-ENGINEER Sargent and Lundy
SITE Weston Generating Station	PROJECT NAME Weston-Proposed Unit 3

SURFACE ELEVATION 1178.8

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
	1	SS			Topsoil	
	1A	SS			Fine sand, trace silt-brown-loose-(SM)	
	2	SS			Fine sand, trace silt-brown-loose-(SP-SM)	
	3	SS			Very fine to fine sand, trace gravel-brown-medium dense-(SP)	
5	4	SS				
	5	SS			Fine to medium sand, trace gravel-brown-medium dense-(SP)	
	6	SS				
10	7	SS				
15	8	SS			Very fine to fine sand, brown-dense-(SP)	
20	9	SS			Fine to coarse sand, trace to somd fine gravel-brown-dense-(SW)	
25	10	SS			Very fine to fine sand-brown-dense-(SP)	
30	11	SS				
35	12	SS			Fine to medium sand, brown medium dense-(SP)	
40	13	SS			Very fine to fine sand-brown-dense to medium dense-(SP)	
45	14	SS				

Continued

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
STANDARD "N" PENETRATION (BLOWS FT) 10 20 30 40 50



WATER LEVEL OBSERVATIONS	
W.L.	Dry to 10 WD
W.L.	B.C.R. A.C.R.
W.L.	

SOIL TESTING SERVICES OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED			5-13-76
BORING COMPLETED			5-13-76
RIG	8	FOREMAN	EVH
DRAWN	PH	APPROVED	DBE
JOB #	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 317 (continued)

OWNER	ARCHITECT-ENGINEER
Wisconsin Public Service Corporation	Sargent and Lundy
SITE	**PROJECT NAME**
Weston Generating Station	Weston-Proposed Unit 3

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1, 2, 3, 4, 5)
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
STANDARD "N" PENETRATION (BLOWS/FT) (10, 20, 30, 40, 50)

SURFACE ELEVATION

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³	N (BLOWS/FT)
45					Continued		
46.5					Very fine to fine sand-brown-dense to medium dense-(SP)		
50	15	SS					11
55	16	SS			Very fine to medium sand, trace gravel-brown-medium dense-(SP)		18
60	17	SS					5
65	18	SS		LS	Very fine to coarse sand, occasional cobbles, trace gravel-brown-medium dense-(SW)		26
70	19	SS					23
75	20	SS					11
80	21	SS			Very fine to coarse sand, trace gravel-brown-medium dense-(SW)		14
					End of Boring Boring advanced by power auger to a depth of 20 feet Wash boring Revert drilling fluid used below 9 feet 10' of 4" Casing used		

WATER LEVEL OBSERVATIONS		
W.L.	Dry to 10 WD	
W.L.	B.C.R.	A.C.R.
W.L.		

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED	5-13-76		
BORING COMPLETED	5-14-76		
RIG	W-8	FOREMAN	EVH
DRAWN	PH	APPROVED	DBE
JOB #	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 326 (S 650.0 W 465.0)

OWNER: Wisconsin Public Service Corporation	ARCHITECT-ENGINEER: Sargent and Lundy
SITE: Weston Generating Station	PROJECT NAME: Weston - Proposed Unit 3

SURFACE ELEVATION 1180.1

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	DESCRIPTION OF MATERIAL
	1	SS	Silty topsoil-dark brown
	2	SS	Silty fine sand, brown-loose-(SM)
	3	SS	Fine sand, trace silt-brown-loose-(SP-SM)
5	4	SS	Fine to medium sand, trace gravel-brown-medium dense-(SP)
	5	SS	Fine sand-brown-medium dense-(SP)
	6	SS	Fine to medium sand, trace gravel-brown-loose to dense-(SP)
10	7	SS	
15	8	SS	
20	9	SS	
25	10	SS	Fine to coarse sand, trace gravel-brown-medium dense to very dense-(SW)
30	11	SS	

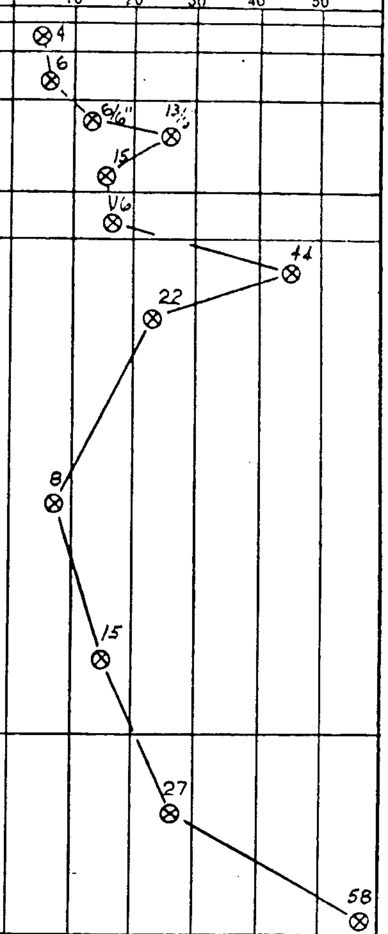
End of Boring
Boring advanced by power auger to a depth of 9 feet
Below 9 feet wash water and cutting bits were used
28.5' of NX casing used

UNIT DRY WT. LBS./FT. 3

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² — 1 2 3 4 5

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD "N" PENETRATION (BLOWS FT) ⊗ — 10 20 30 40 50



Borehole backfilled after completion

WATER LEVEL OBSERVATIONS		
W.L.	Dry to 10.5' WD	
W.L.	19.7' B.C.R.	A.C.R.
W.L.	27.2' AB	

SOIL TESTING SERVICES OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED			5-12-76
BORING COMPLETED			5-12-76
RIG	W-8	FOREMAN	EVH
DRAWN	PH	APPROVED	ARP
JOB =	7144	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 329 (S2185.0 W1420.0)

OWNER	ARCHITECT-ENGINEER
Wisconsin Public Service Corporation	Sargent and Lundy
SITE Weston Generating Station	PROJECT NAME Weston-Proposed Unit 3

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² — 1 2 3 4 5

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD "N" PENETRATION (BLOWS/FT.) ⊗ — 10 20 30 40 50

SURFACE ELEVATION 1168.6

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
					Topsoil	
	1	PA			Fine sand, trace silt and gravel-brown (SP-SM)	
5	2	PA				
	2A	PA			Fine to coarse sand, trace to some gravel-brown-(SW)	
10	3	PA				
15	4	PA				
	4A	PA			Fine to medium sand, trace gravel-brown-(SP)	
20					End of Boring Boring advanced by power auger No casing or wash water used Borehole backfilled	

WATER LEVEL OBSERVATIONS		
W.L.	Dry to 20.0' WD	
W.L.	B.C.R.	A.C.R.
W.L.		

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

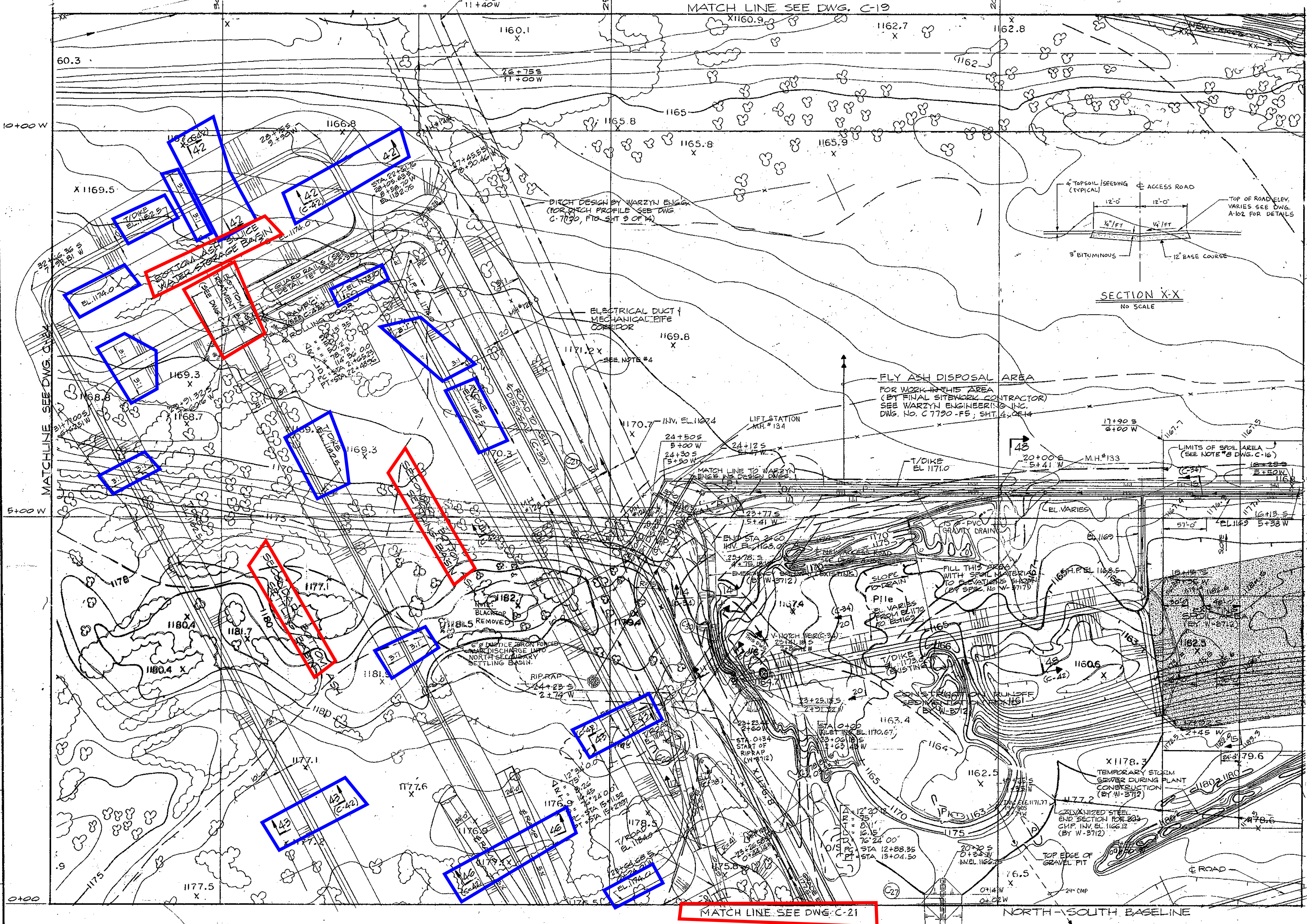
BORING STARTED	5-18-76		
BORING COMPLETED	5-18-76		
RIG	W-15	FOREMAN	RR
DRAWN	PH	APPROVED	DBE
JOB #	7144	SHEET	

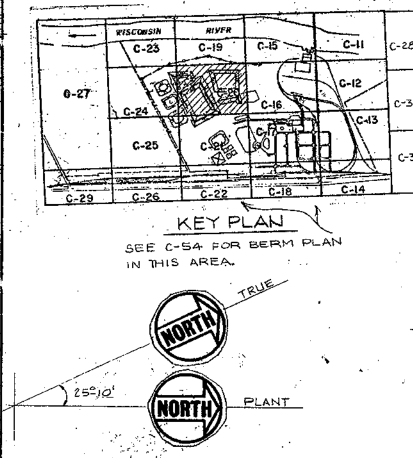
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

APPENDIX A

Document 4

Sargent & Lundy Drawing No. C-20, Grading, Roadwork, and Drainage Plan, Sheet 10





NOTES

1. FOR GENERAL NOTES & LEGEND SEE DWG. NO. C-8.
2. ALL WORK SHOWN ON THIS DRAWING SHALL BE DONE BY FINAL SITEWORK CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATION W-3717 UNLESS OTHERWISE NOTED.
3. USE COMPACTED FILL FOR CONSTRUCTION RUNOFF SEDIMENTATION POND BERM IN ACCORDANCE WITH PARAGRAPH 302.8, g 1., SPEC. W-3712.
4. THIS LINE REPRESENTS THE DESIGN INTERFACE BOUNDARY FOR ON-SITE FLY ASH DISPOSAL AREA. WARZYN ENGINEERING INC. SHALL BE RESPONSIBLE FOR FINAL ENGINEERING DESIGN INSIDE THIS AREA. ALSO SEE DWG. NO. C-16 & C-19.

REFERENCE DRAWINGS

C-8	SITE PLAN - GENERAL ARRANGEMENT
C-16	GRADING, ROADWORK & DRAINAGE PLAN-SHT. 6
C-19	GRADING, ROADWORK & DRAINAGE PLAN-SHT. 9
C-21	GRADING, ROADWORK & DRAINAGE PLAN-SHT. 11
C-24	GRADING, ROADWORK & DRAINAGE PLAN-SHT. 14
C-34	MISCELLANEOUS GRADING SECTIONS
C-42	MISCELLANEOUS SECTIONS & DETAILS ~ SHEET 1
C-43	MISCELLANEOUS SECTIONS & DETAILS ~ SHEET 2
A-102	FLY ASH / BOTTOM ASH GRADING PLAN

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
G	1-22-80	Wm. L. Volk	Rashiddery	[illegible]	FOR D.N.R. PERMIT	
G	2-22-80	Wm. L. Volk	Rashiddery	[illegible]	FOR CONSTRUCTION TO W.P.S.C., SPEC. No. W-3717	X
G	3-10-80	D. Quijano	Rashiddery	[illegible]	FOR FINAL SITEWORK CONSTRUCTION, SPEC. No. W-3717	
H	4-14-80	D. Quijano			FOR BID SPEC. NO. W-3729	
J	4-29-80	[illegible]	Rashiddery	[illegible]	RECORD REVISION, ADDED C-27 & REVISED CORRIDOR SPEC. No. W-3717	
K	6-12-80	[illegible]	Rashiddery	[illegible]	FOR CONSTRUCTION, SPEC. No. W-3729	X
K	7-14-80	Wm. L. Volk	Rashiddery	[illegible]	REISSUED TO FINAL SITEWORK CONTRACTOR. SPEC. No. W-3717	X
L	7-31-80	[illegible]	Rashiddery	[illegible]	REMOVED DRAINAGE DITCH & PIPELINES, ADDED RAMP 'C' SPEC NO. W-3717	

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
M	12-5-80	[illegible]	Rashiddery	[illegible]	DELETED GUARDRAIL SPEC. No. W-3717	
N	8-13-81	[illegible]	[illegible]	J. M. Kurtin	RECORD DRAWING	
N	6-20-82	Wm. L. Volk			SENT TO CLIENT	
P	6-18-86	S. SCHANEN	[illegible]	JM/KMU	UPDATED KEY PLAN	7/23/86
Q	8-12-86	S. SCHANEN	[illegible]	JM/KMU	REVISED KEY PLAN: C-28 WAS C-34	12-86
R	7-23-91	MJR	[illegible]	[illegible]	ADDED 24" CMP TO MH #131 DCF 1509	4-89
R	3-3-92	P.G. DEBAUCHE	[illegible]	[illegible]	ADDED LIFT STATION, M.H. #133, #134, 6" IRONPIPE AT C5 AND 15" PVC AT D1-D5	4-89
S	12-21-95	B. TROTTER		[illegible]	ADDED ACCESS ROAD, SECTION X-X AND REF. NOTES PER PIP 604 (DCF 2665)	2-79

WISCONSIN ROBERT J. SMALL No. E-14342 LA GRANGE, ILLINOIS PROFESSIONAL ENGINEER

SCALE 1" = 50'-0"

PROJECT NUMBER 4872-03

GRADING, ROADWORK & DRAINAGE
PLAN - SHEET 10
WESTON GENERATING STATION
UNIT 3
WISCONSIN PUBLIC SERVICE CORPORATION
WAUSAU, WISCONSIN

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. C-20 REV S

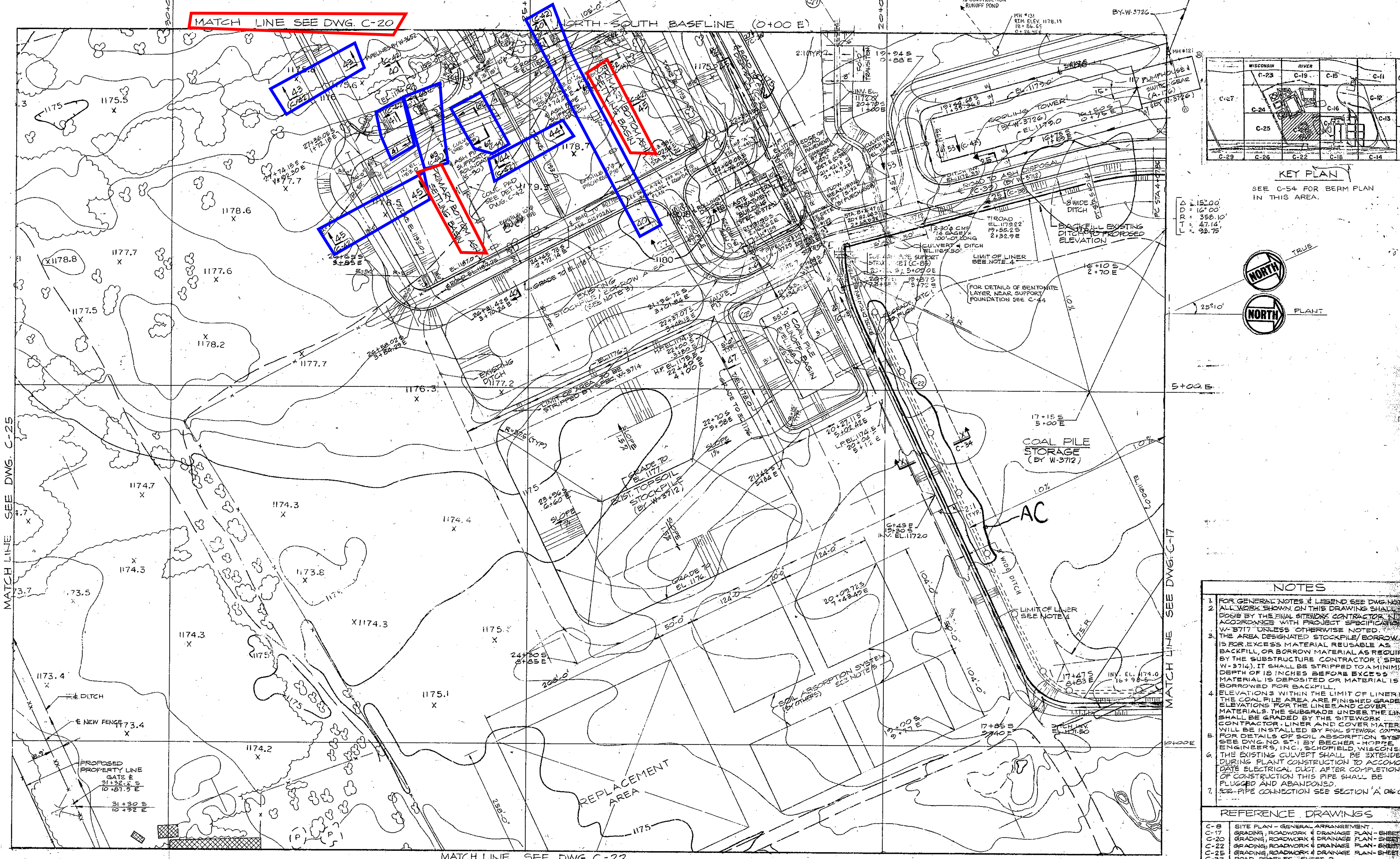
SHEET OF

APPENDIX A

Document 5

Sargent & Lundy Drawing No. C-21, Grading, Roadwork, and Drainage Plan, Sheet 11

C-21



NOTES

1. FOR GENERAL NOTES & LEGEND SEE DWG. NOTE 8.
2. ALL WORK SHOWN ON THIS DRAWING SHALL BE DONE BY THE FINAL SITEWORK CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATION W-3717 UNLESS OTHERWISE NOTED.
3. THE AREA DESIGNATED STOCKPILE/BORROW AREA IS FOR EXCESS MATERIAL REUSABLE AS BACKFILL, OR BORROW MATERIAL AS REQUIRED BY THE SUBSTRUCTURE CONTRACTOR (SPEC. W-3714). IT SHALL BE STRIPPED TO A MINIMUM DEPTH OF 18 INCHES BEFORE EXCESS MATERIAL IS DEPOSITED OR MATERIAL IS BORROWED FOR BACKFILL.
4. ELEVATIONS WITHIN THE LIMIT OF LINER FOR THE COAL PILE AREA ARE FINISHED GRADE ELEVATIONS FOR THE LINER AND COVER MATERIALS. THE SUBGRADE UNDER THE LINER SHALL BE GRADED BY THE SITEWORK CONTRACTOR - LINER AND COVER MATERIALS WILL BE INSTALLED BY FINAL SITEWORK CONTRACTOR.
5. FOR DETAILS OF SOIL ABSORPTION SYSTEM, SEE DWG. NO. ST-1 BY BECHER - HOPPE ENGINEERS, INC., SCHOFIELD, WISCONSIN.
6. THE EXISTING CULVERT SHALL BE EXTENDED DURING PLANT CONSTRUCTION TO ACCOMODATE ELECTRICAL DUCT. AFTER COMPLETION OF CONSTRUCTION THIS PIPE SHALL BE PLUGGED AND ABANDONED.
7. FOR PIPE CONNECTION SEE SECTION "A" DWG C-43

REFERENCE DRAWINGS

C-8	SITE PLAN - GENERAL ARRANGEMENT.
C-17	GRADING, ROADWORK & DRAINAGE PLAN - SHEET 7
C-20	GRADING, ROADWORK & DRAINAGE PLAN - SHEET 10
C-22	GRADING, ROADWORK & DRAINAGE PLAN - SHEET 12
C-25	GRADING, ROADWORK & DRAINAGE PLAN - SHEET 15
C-37	ROAD PROFILES - SHEET 3
C-38	ROAD SECTIONS & DETAILS
C-39	ROAD PROFILES - SHEET 4
C-40	CULVERT & STORM SEWER SCHEDULE
C-55	VALVE PITS, MH A&B AND BOTTOM ASH PIPE SUPPORT STRUCTURES
S-90	MISCELLANEOUS YARD FOUNDATION SHT. 4
A-176	COOLING TOWER PUMPHOUSE
C-42	MISCELLANEOUS SECTIONS & DETAILS - SHEET 1
C-43	MISCELLANEOUS SECTIONS & DETAILS - SHEET 2

GRAPHIC SCALE 50' 0 50' 100'

DRAWING RELEASE RECORD

REV.	SPEC. NO.	DATE	DRAWN	CHECKED	ENGR. APPROVAL	DESCRIPTION	FILM
W	—	6-18-86	S. SCHANEN		JM/KMD	UPDATED KEY PLAN	7-2-86
X		8-12-86	S. SCHANEN			REVISED KEY PLAN: C-28 WAS C-34.	9-2-86
Y		1-9-87	S. SCHANEN			ADDED PIPE TO SETTLING BASIN	2-3-87
Z		2-19-87	R. Seroogy	B Trotter	J Wessley	ADDED REFERENCE NOTE FOR HCL ACID TANK (DCF 567)	4-9-87
AA	DCF 1509	7-23-91	MJR			ADDED MH #131 & CORRESPONDING RUNOFF	4-8-92
AB		1-12-94	P G DeBAUCHE	R J SEROOGY		ADDED DRAIN PIPE & DRAIN TILE DCF 2203	3-11-94
AC		4-5-95	R J SEROOGY	R J SEROOGY		ADDED DRAIN PIPE & DRAIN TILE (PIP 533) DCF 2499	4-12-95

DRAWING RELEASE RECORD

REV.	SPEC. NO.	DATE	DRAWN	CHECKED	ENGR. APPROVAL	DESCRIPTION	FILM
N	W-3729	6-12-80				FOR CONSTRUCTION	X
P	W-3717	7-31-80	Wm. L. Volk			REMOVED DRAINAGE DITCH, REVISED PIPELINES & ADDED RAMP	
R	W-3717	9-15-80	Wm. L. Volk			ADDED NOTE	
S	W-3717	11-14-80				ADDED DIMENSIONS FOR RAMP, REV. DITCH & DELETED CULVERT C-12	X
T	W-3717	12-5-80				ADDED RIPRAP AT END OF ASH PIPE & DELETED GUARDRAIL	X
U	W-3717	5-22-81				ADDED FLOW MEASURING PIT & GUARDRAIL	X
V	W-3729	8-19-81				RECORD DRAWING	X
	—	6-30-82	Wm. L. Volk			SENT TO CLIENT	X

WISCONSIN ROBERT J. SMALL No. E-14342 LA GRANGE, ILLINOIS PROFESSIONAL ENGINEER

DRAWN M. Alcala SCALE 1" = 50'-0"
CHECKED DATE 03-31-78
DATE 3-31-78
APPROVED DATE 3/31/78

PROJECT NUMBER 4872-03

GRADING, ROADWORK & DRAINAGE
PLAN - SHEET 11
WESTON GENERATING STATION
UNIT 3
WISCONSIN PUBLIC SERVICE CORPORATION
WAUSAU, WISCONSIN

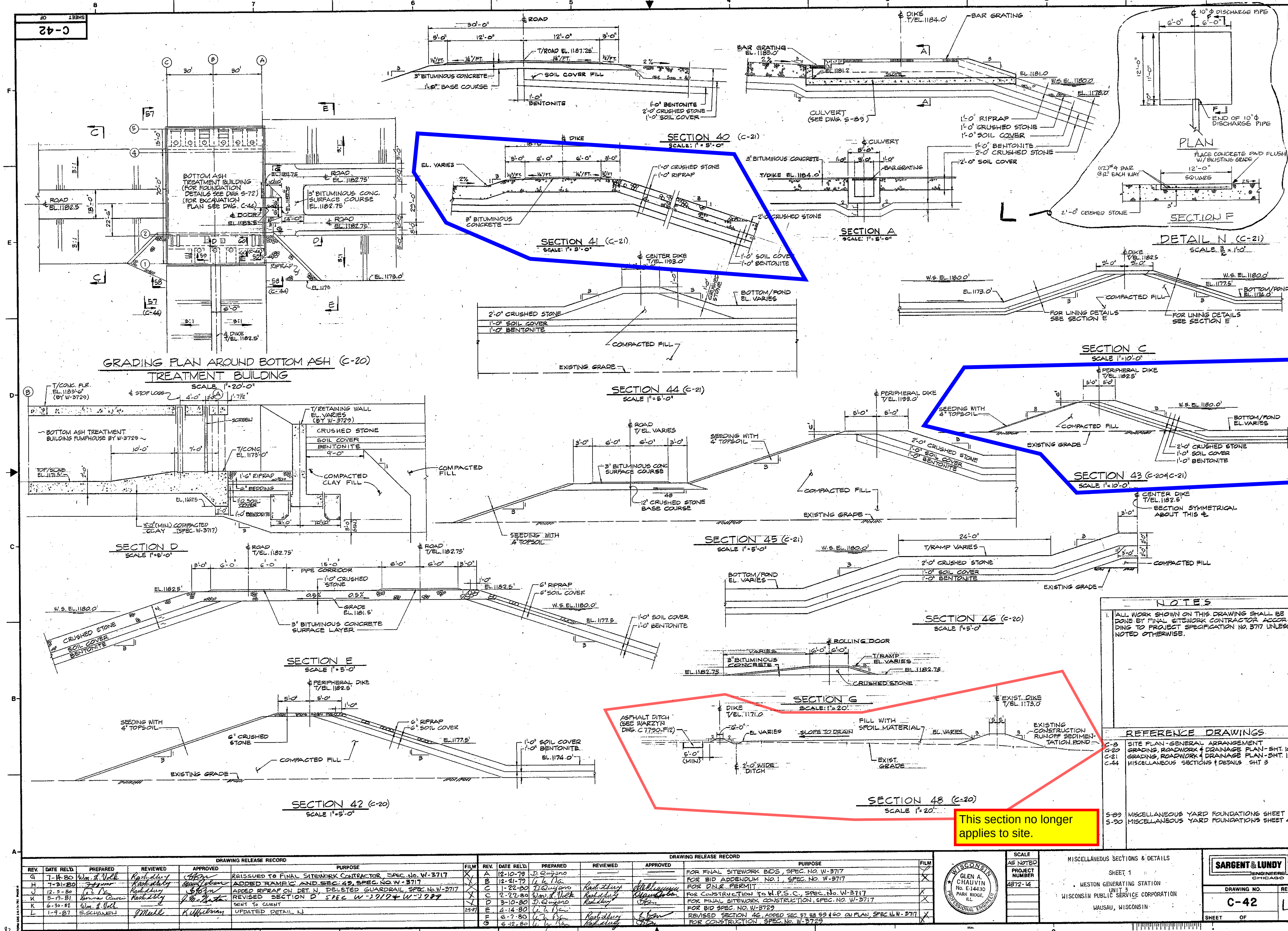
SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. C-21 AC

APPENDIX A

Document 6

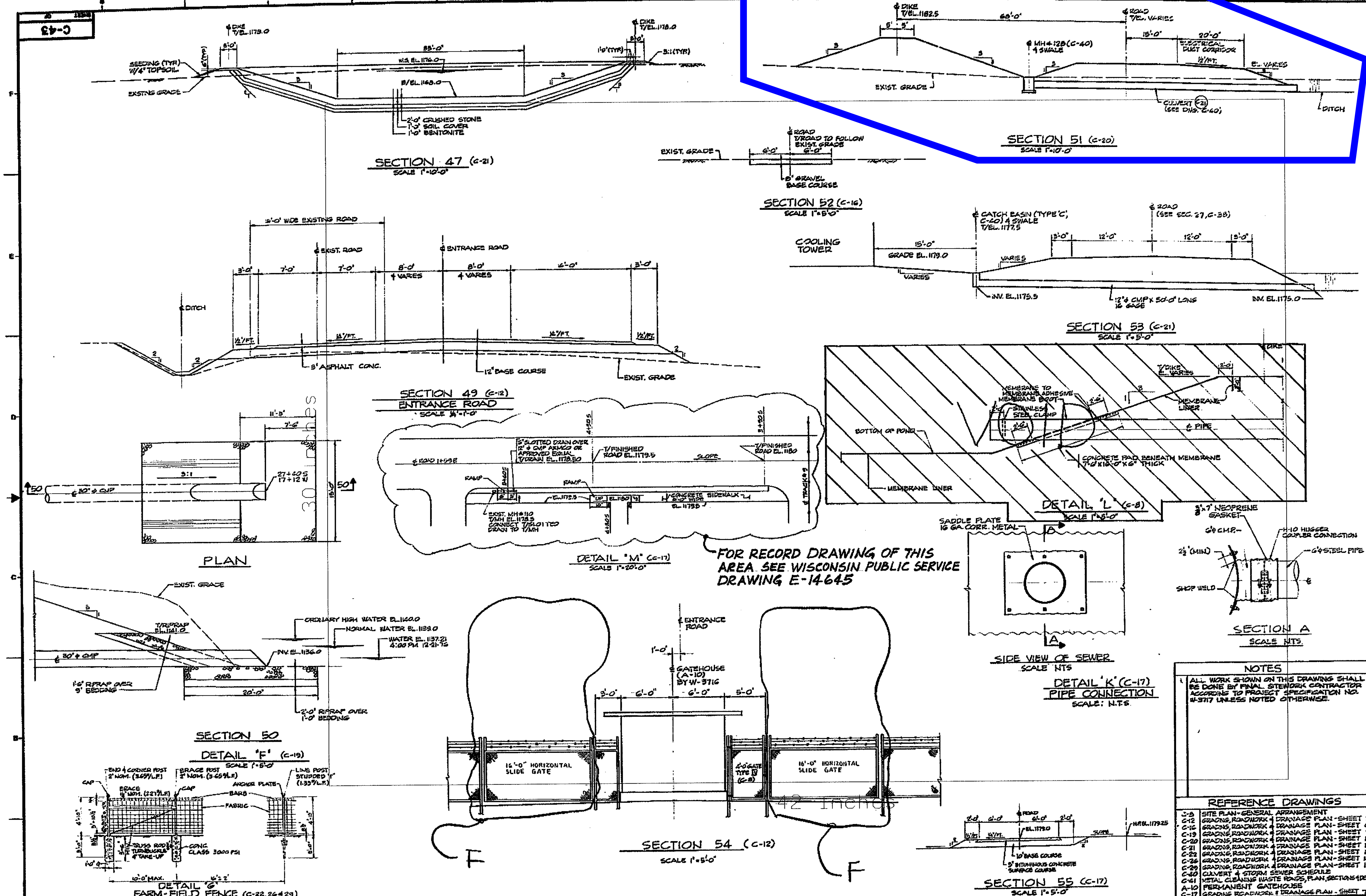
Sargent & Lundy Drawing No. C-42, Miscellaneous Sections and Details, Sheet 1


C-42
GRADING PLAN AROUND BOTTOM ASH TREATMENT BUILDING (C-20)
SCALE 1"=20'-0"
SECTION 40 (C-21)
SCALE: 1"=5'-0"
SECTION 41 (C-21)
SCALE: 1"=5'-0"
SECTION A
SCALE: 1"=5'-0"
PLAN
SECTION F
DETAIL N (C-21)
SECTION C
SCALE 1"=10'-0"
SECTION 44 (C-21)
SCALE 1"=5'-0"
SECTION 43 (C-20)(C-21)
SCALE 1"=10'-0"
SECTION D
SCALE 1"=5'-0"
SECTION 45 (C-21)
SCALE 1"=5'-0"
SECTION E
SCALE 1"=5'-0"
SECTION 46 (C-20)
SCALE 1"=5'-0"
SECTION G
SCALE: 1"=20'
SECTION 42 (C-20)
SCALE 1"=5'-0"
SECTION 48 (C-20)
SCALE 1"=20'
This section no longer applies to site.
NOTES
1. ALL WORK SHOWN ON THIS DRAWING SHALL BE DONE BY FINAL SITEWORK CONTRACTOR ACCORDING TO PROJECT SPECIFICATION NO. 3717 UNLESS NOTED OTHERWISE.
REFERENCE DRAWINGS
C-8 SITE PLAN-GENERAL ARRANGEMENT
C-20 GRADING, ROADWORK & DRAINAGE PLAN-SHT. 10
C-21 GRADING, ROADWORK & DRAINAGE PLAN-SHT. 11
C-44 MISCELLANEOUS SECTIONS & DETAILS SHT 3
S-89 MISCELLANEOUS YARD FOUNDATIONS SHEET 3
S-90 MISCELLANEOUS YARD FOUNDATIONS SHEET 4
DRAWING RELEASE RECORD
G 7-18-80 REISSUED TO FINAL SITEWORK CONTRACTOR, SPEC. NO. W-3717
H 7-31-80 ADDED RAMP 'C' AND SEC. 49, SPEC. NO. W-3717
J 12-5-80 ADDED RIPRAP ON DET. N, DELETED GUARDRAIL, SPEC. NO. W-3717
K 5-19-81 REVISED SECTION D SPEC W-2917 & W-3729
K 6-30-82 SENT TO CLIENT
L 1-9-87 UPDATED DETAIL N
A 12-10-79 FOR FINAL SITEWORK BIDS, SPEC. NO. W-3717
B 12-21-79 FOR BID ADDENDUM NO. 1, SPEC. NO. W-3717
C 1-22-80 FOR D.N.R. PERMIT
C 2-22-80 FOR CONSTRUCTION TO W.P.S.C., SPEC. NO. W-3717
D 3-10-80 FOR FINAL SITEWORK CONSTRUCTION, SPEC. NO. W-3717
E 4-14-80 FOR BID SPEC. NO. W-3729
F 6-7-80 REVISED SECTION 46, ADDED SEC. 57, 58, 59 & 60 ON PLAN, SPEC. NO. W-3717
G 6-12-80 FOR CONSTRUCTION SPEC. NO. W-3729
WISCONSIN GLEN A. CHAUVIN No. E-14430 PARK RIDGE, ILL. PROFESSIONAL ENGINEER
SCALE AS NOTED
PROJECT NUMBER 4872-14
MISCELLANEOUS SECTIONS & DETAILS
SHEET 1
WESTON GENERATING STATION UNIT 3
WISCONSIN PUBLIC SERVICE CORPORATION
WAUSAU, WISCONSIN
SARGENT & LUNDY ENGINEERS CHICAGO
DRAWING NO. C-42
REV. L

APPENDIX A

Document 7

Sargent & Lundy Drawing No. C-43, Miscellaneous Sections and Details, Sheet 1



NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE DONE BY FINAL SITEWORK CONTRACTOR ACCORDING TO PROJECT SPECIFICATION NO. W-3717 UNLESS NOTED OTHERWISE.

REFERENCE DRAWINGS

- C-9 SITE PLAN-GENERAL ARRANGEMENT
- C-12 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 2
- C-16 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 6
- C-19 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 9
- C-20 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 10
- C-21 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 11
- C-22 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 12
- C-26 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 16
- C-29 GRADING, ROADWORK & DRAINAGE PLAN-SHEET 19
- C-40 CULVERT & STORM SEWER SCHEDULE
- C-61 METAL CLEANING WASTE PONDS, PLAN, SECTIONS & DETAILS
- A-10 PERMANENT GATEHOUSE
- C-17 GRADING ROADWORK & DRAINAGE PLAN-SHEET 7

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
D	5-17-81	[illegible]	[illegible]	[illegible]	VOIDED DETAIL 'L' SPEC. W-3717 & W-3729	X
E	1-15-82	[illegible]	[illegible]	[illegible]	ADDED RECORD DRAWING REFERENCE NOTE	X
E	6-30-82	[illegible]			SENT TO CLIENT	X
F	3-26-87	[illegible]	[illegible]	[illegible]	REVISED GATE IN SECTION 54 (DCF 552)	

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	12-10-79	D. Quijano			FOR FINAL SITEWORK BIDS	X
A	12-14-79	[illegible]			FOR W.P.S.C. USE	X
B	12-21-79	D. Quijano			FOR BID ADDENDUM NO. 1, SPEC. W-3717	
B	1-22-80	D. Quijano	[illegible]	[illegible]	FOR D.N.R. PERMIT	
B	2-22-80	[illegible]	[illegible]	[illegible]	FOR CONSTRUCTION TO W.P.S.C., SPEC. No. W-3717	X
C	3-10-80	D. Quijano	[illegible]	[illegible]	FOR FINAL SITEWORK CONSTRUCTION, SPEC. NO. W-3717	
C	4-14-80	D. Quijano			FOR BID SPEC. NO. W-3729	X
C	6-18-80	[illegible]	[illegible]	[illegible]	FOR CONSTRUCTION SPEC. No. W-3729	X

WISCONSIN GLEN A. CHAUVIN No. E-14430 PARK RIDGE, ILL. PROFESSIONAL ENGINEER

SCALE: AS NOTED
PROJECT NUMBER: 4872-14

MISCELLANEOUS SECTIONS & DETAILS
SHEET 2
WESTON GENERATING STATION
UNIT 3
WISCONSIN PUBLIC SERVICE CORPORATION
WAUSAU, WISCONSIN

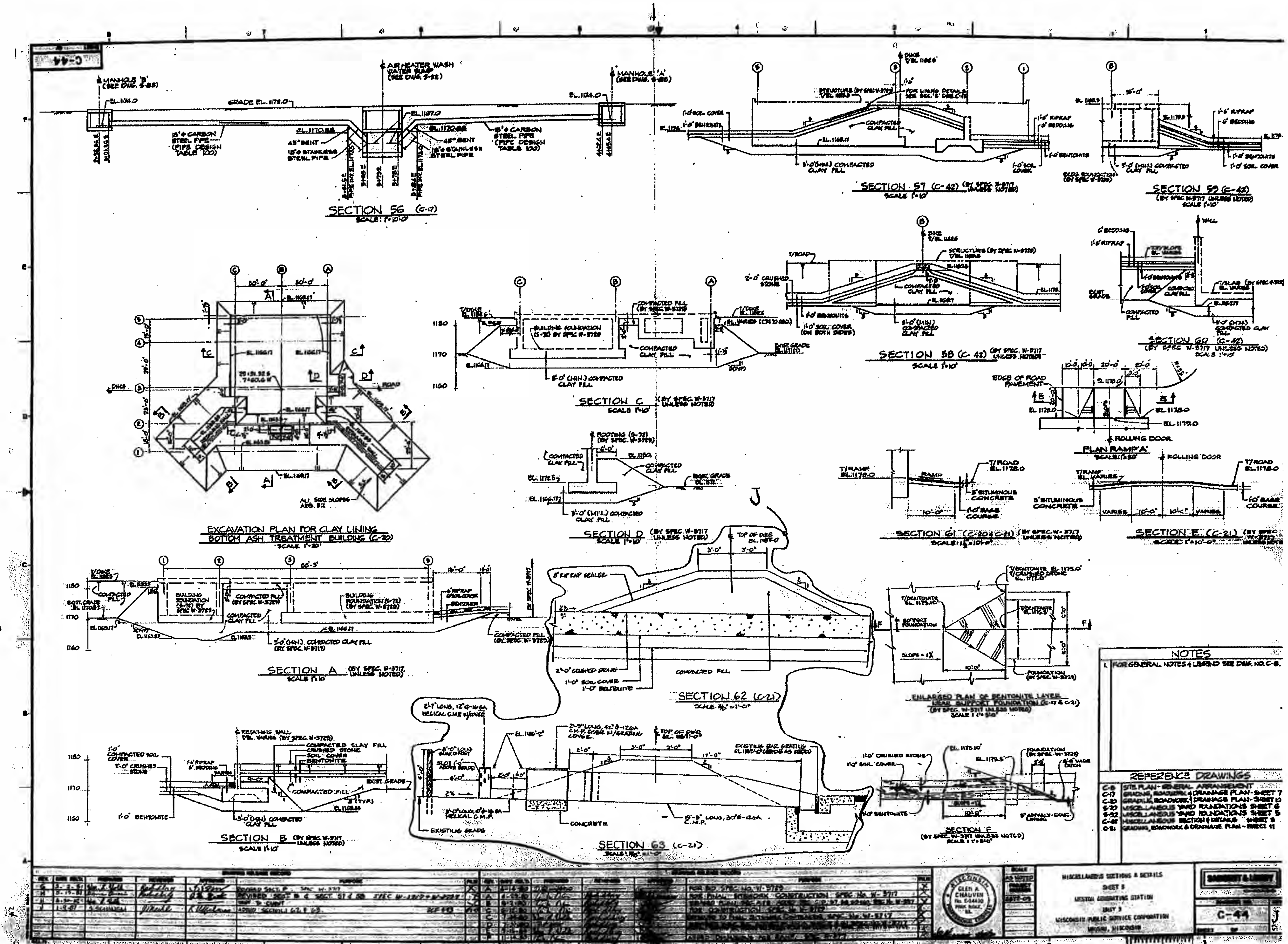
SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. C-43 REV. F

APPENDIX A

Document 8

Sargent & Lundy Drawing No. C-44, Miscellaneous Sections and Details, Sheet 3


C-44
SECTION 56 (C-17)
SCALE: 1"=10'-0"
SECTION 57 (C-42) (BY SPEC. W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 59 (C-42) (BY SPEC W-3717 UNLESS NOTED)
EXCAVATION PLAN FOR CLAY LINING BOTTOM ASH TREATMENT BUILDING (C-20)
SCALE 1"=20'
SECTION C (BY SPEC W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 58 (C-42) (BY SPEC. W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 60 (C-42) (BY SPEC W-3717 UNLESS NOTED)
PLAN RAMP 'A'
SECTION D (BY SPEC W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 61 (C-20 & C-21)
SECTION E (C-21)
SECTION A (BY SPEC W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 62 (C-21)
ENLARGED PLAN OF BENTONITE LAYER NEAR SUPPORT FOUNDATION (C-17 & C-21)
SECTION B (BY SPEC W-3717 UNLESS NOTED)
SCALE 1"=10'
SECTION 63 (C-21)
SECTION F (BY SPEC. W-3717 UNLESS NOTED)
NOTES
1. FOR GENERAL NOTES & LEGEND SEE DWG. NO. C-8.
REFERENCE DRAWINGS
C-8 SITE PLAN - GENERAL ARRANGEMENT
C-17 GRADING, ROADWORK & DRAINAGE PLAN - SHEET 7
C-20 GRADING, ROADWORK & DRAINAGE PLAN - SHEET 10
S-70 MISCELLANEOUS YARD FOUNDATIONS SHEET 6
S-32 MISCELLANEOUS YARD FOUNDATIONS SHEET 5
C-42 MISCELLANEOUS SECTION & DETAILS SHEET 8
C-21 GRADING, ROADWORK & DRAINAGE PLAN - SHEET 11
MISCELLANEOUS SECTIONS & DETAILS
SHEET 9
WESTON GENERATING STATION
UNIT 3
WISCONSIN PUBLIC SERVICE CORPORATION
WAUSAU, WISCONSIN
SARGENT & LUNDY
C-44
J

APPENDIX A

Document 9

Merrill Sand & Gravel Company, Laboratory Test Results, Proposed Soil Bentonite Liner, July 16, 1980

MERRILL GRAVEL & CONSTRUCTION COMPANY

LABORATORY TEST RESULTS

PROPOSED SOIL-BENTONITE LINER

WISCONSIN PUBLIC SERVICE

WESTON UNIT 3 PLANT EXPANSION

WESTON, WISCONSIN

BY

SOIL TESTING SERVICES OF WISCONSIN, INC.

GREEN BAY, WISCONSIN

JULY 16, 1980

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WIS. 54303

July 14, 1980

Merrill Gravel & Construction Company
Sturtevant Street
Merrill, Wisconsin 54452

Attention: Mr. Dick Schumitsch

STS Job W 10247

RE: Laboratory test results for the proposed soil-bentonite liner at the Wisconsin Public Service, Weston Unit 3 Plant Expansion in Weston, Wisconsin.

Gentlemen:

The laboratory test program for the above referenced project has been completed. This work was authorized by execution of our April 8th proposal. The work plan was described in our April 4th letter to Sargent & Lundy Engineers. An interim report was submitted to you on June 3rd which presented a portion of the results herein. Three copies of this report have been sent to the above address. Report copies have also been forwarded to Dan Bodine and Sid Sen of Sargent & Lundy, and Tom Lynch of Wisconsin Public Service.

TESTING PROCEDURES

The test procedures for this project have been done in general accordance with the U. S. Army Corps of Engineers Manual EM1110-2-1906 "Laboratory Soils Testing". The general laboratory program was also described in our April 4th letter to Sargent & Lundy Engineers. Significant amendments or changes in our test program are described below:

GREEN BAY PHONE (414) 494-9656
WAUSAU, WISCONSIN - 715—845-8386
MARQUETTE, MICHIGAN - 906—225-1417
MILWAUKEE, WISCONSIN - 414—354-1100
SUPERIOR, WISCONSIN - 715—392-9006
OSHKOSH, WISCONSIN - 414—235-0270
KENOSHA, WISCONSIN - 414—657-1211

WILLIAM M. PERPICH, P.E.
JOHN P. GNAEDINGER, P.E.
CLYDE N. BAKER, P.E.
MERLE E. BRANDER, P.E.
DOUGLAS J. HERMANN, P.E.

JAMES J. BOTZ, P.E.
JAMES A. SENGER
JON D. MUELLER
THOMAS W. WOLF
JACK J. AMAR, P.E.

1. The application rates for dry benonite were revised to 5, 7, and 10 percent on a dry soil basis. Mr. Sen (Sargent & Lundy) suggested in an April 8th letter that application rates less than 7 percent be considered (Item 3).

2. All bentonite percentages are based on dry bentonite to dry soil weights.

3. The natural water content of the Barroid 200 bentonite received ranged from 12 to 13 percent.

4. Hydration periods following compaction ranged from 4 to 6 days.

5. The permeability of the soil-bentonite samples was quite low which extended the period of saturation prior to permeability testing.

6. Originally it was planned to limit the hydraulic pressures to less than 10 psi or to hydraulic gradients less than 70. In the interest of scheduling, it was necessary to increase gradients above this level, however, this was done in an incremental fashion by adding no more than 2 psi additional pressure on a daily basis if saturation was incomplete. This procedure was intended to minimize the potential for hydraulic fracturing of the sample.

7. High permeameter flows were observed for the 7 percent soil bentonite samples for both the coarse and fine sand materials tested. Two additional samples were prepared and tested for the coarse sand, since this was likely the most permeable material.

8. The samples were prepared with potable water from the Green Bay water system.

TEST RESULTS

Gradations

Seven sand samples were collected by Mr. Dick Kirchner of Soil Testing Services under the direction of Mr. Dick Schumitsch of Merrill Gravel & Construction. These samples have been considered representative of the range of gradations that may be encountered during construction. The results of the gradation tests are presented in Table 1 and the individual gradation curves are attached. In order to bound the range of gradations, the coarsest and finest materials were selected for testing. A soil sample taken from the east face and north end of the existing sand stockpile was considered to be the finest material and the secondary ash pond elevation 1170-1171 was considered to be the coarsest material. This selection was based primarily on the P200 content of the sample, and the D_{10} and D_{30} particle size. The natural water content of the samples taken in March, 1980 generally ranged from 3 to 7 percent (see Table 1).

Proctor Curves

The moisture-density relationships determined in general accordance with ASTM D 698 for the soil-bentonite mixtures were similar for the same sand borrow material. The maximum dry density for the secondary ash pond material ranged from 116.7 to 117.8 pounds per cubic foot (pcf) for 5 percent through 10 percent bentonite. For the stockpile material, the densities ranged from 119.2 to 119.9 pcf for the range of 5 to 10 percent bentonite. The optimum water content for all soil-bentonite samples ranged from 11.0 to 13.0 percent. These water contents represent a partially hydrated bentonite fraction. Fully hydrated bentonite will likely yield a lower density and higher water content, but these conditions are not likely unless the liner areas are inundated during construction.

Hydration Records

Following moisture-density (Proctor curves) testing, permeameters were prepared to simulate the specified compaction density (90 percent of the maximum dry density determined from ASTM D 698) and inundated to simulate pond saturation. The volumetric swell was measured on a daily basis up to 4 to 6 days. The plotted curves are attached. The hydration records illustrated the volumetric swell and decrease in dry density of the soil-bentonite samples as full hydration was achieved.

The higher bentonite fractions exhibited more swell as was expected. The finer sand material also exhibited more swell than expected. It also appears that this swell may progress several days beyond the 4 to 6 day hydration period. Generally the observed swell ranged from 2 percent upwards to 5 or 6 percent after 4 to 6 days. The actual swell in the field may be greater than measured since side friction restricts vertical swell in the permeameters. This side friction is caused by the swell pressure (normal force) on the permeameter wall and the ϕ friction developed from the sand. This side friction may be determined but it was not deemed necessary for this study.

Permeability Testing

The measured permeability for each permeameter is presented on Table 2. Relatively high flows were observed for the secondary ash pond 7B sample and the stockpile 7A sample. We anticipate that these flows were the result of poor mixing of the soil-bentonite prior to hydration. Two additional samples of secondary ash pond sand were prepared and tested which proved successful. Results of the different materials and bentonite percents are plotted in Figures 1 and 2. Although the limited number of data points are scattered, a trend of decreasing permeability with a higher bentonite fraction is indicated. This corroborated the hydration records presented early.

In interpreting the results, it is also important to consider the threshhold gradient phenomona the soil-bentonite may exhibit. Samples tested at high gradients may exhibit a lower permeability at a lower gradient. This effect may be significant especially for the secondary ash pond sand results.

RECOMMENDATIONS

Based on the test results available, we recommend a minimum 7 to 8 percent dry bentonite similar to the quality submitted for testing be added to all sands bounded by the fine and coarse gradation which were tested for permeability. These mixtures should be determined by the dry weight of both sand and bentonite. Any sands coarser than the secondary ash pond elevation 1170-1171 sample should be tested and reviewed before mixing with bentonite.

Although the construction specification a 2.2 limits the fine material passing the No. 200 sieve to 10 percent, we suggest that you pursue a waiver and utilize any silty materials available for the bentonite liner. The presence of the silt in the soil will enhance the effectiveness of the bentonite percent to give a more uniform product.

In order for the 7 to 8 percent bentonite mixture to be effective, the bentonite must be thoroughly mixed with the soil, on the subgrade or in a pug mill-type mixer. Even under laboratory conditions, thorough mixing was difficult. For subgrade mixing, we recommend a power driven rotary tiller be used for mixing both water and bentonite.

Before adding bentonite to sand, we recommend that the water content be raised to approximately 8 to 10 percent to wet all sand particle surfaces. For the pug mill, this water should be a added in advance of the bentonite and sprayed as a uniform fine mist or thoroughly mixed in a pug mill. For the subgrade, the moisture should be added and mixed thoroughly with the tiller immediately before applying and mixing bentonite. Proper overlap should be provided for both water and bentonite applications. Tilling should be performed in alternate orthogonal directions.

Specifications for the pug mill were not available for this report, but we anticipate that some experimentation may be necessary to determine a suitable mixing procedure. We anticipate that careful control and adjustment of water content for both bentonite and sand during construction will be necessary. Wet bentonite will not be conducive to pug mill or subgrade mixing. After pug mill mixing, the materials should be immediately placed and compacted in as thin a lift as practical (probably 4 inches), or protected from weather. During construction, we advise placing several lifts in as thin a compacted lift as possible in as small an area as possible. Thin lifts decrease the possibility of a window occurring and small work areas reduce exposure to changing weather conditions. If work areas become wet before complete placement of the liner, it may be necessary to remove the wet soil-bentonite material before placing or mixing additional lifts.

Any roots greater than 1/4-inch diameter present in the sand materials should be removed as they will affect the mixing procedure and compacted permeability. Materials with fine roots should also be rejected as this will affect the water content of the materials for bentonite proportioning.

Prior to beginning liner construction, we suggest the placement of a test pit to evaluate the field construction procedures and pug mill operation. This pad should be tested in the field at numerous locations for permeability after it is soaked or inundated. We request an opportunity to observe the mixing and placing techniques to have a better understanding of your equipment and pug mill operation.

GENERAL QUALIFICATIONS

The analyses and recommendations submitted in this report were based on the bentonite sand samples submitted for testing. The sand materials not bounded by the coarse and fine fractions should be submitted for review before mixing is performed. Careful control of sand gradations and water content for both bentonite and sand are extremely important during construction so any variations in the overall product are immediately identified. We recommend that a test pad be placed prior to initiating earthwork to understand your equipment and pug mill operation. It may also be necessary to make additional on-site observations and tests during construction, determine the characteristics of these variations and make a re-evaluation of the recommendations of this report. This report was prepared based on our understanding of the construction specifications and procedures described in the U. S. Army Corps of Engineers Manual EM1110-2-1906. It was necessary to make a number of assumptions regarding proposed hydraulic gradients, moisture contents, and densities of the compacted materials. It is recommended that we be provided an opportunity to briefly review all field operations on an interim basis to confirm that these procedures are consistent with the test results contained herein.

The long term performance of the soil-bentonite has not been assessed in this study. Soil-bentonite materials are known to deteriorate in an adverse chemical environment. Low or high pH conditions may affect bentonite performance. Brine solutions are also known to cause bentonite deterioration. Knowledge of the long term environmental exposure of the soil-bentonite was not available for this report, however, we recommend that these conditions be characterized by the consulting engineer.

We have appreciated the opportunity to provide testing and engineering services for you. If we may be of further assistance in discussing this report or in providing testing or inspection services during construction, please do not hesitate to contact us.

Yours very truly,

SOIL TESTING SERVICES OF WISCONSIN, INC.

Douglas J. Hermann

Douglas J. Hermann, P. E.
Senior Project Engineer

William M. Perpich, P. E.
President

DJH/cs

Encl:

1. Table 1: Sand Borrow Material Gradation Summary
2. Table 2: Soil-Bentonite Permeameter Test Results
3. Figure 1: Permeability vs. Bentonite %, Secondary Ash Pond
4. Figure 2: Permeability vs. Bentonite %, East Face, North End Storage Pond
5. Hydration Records
6. Gradation Curves
7. Proctor Curves
8. Permeability Test Results

cc: Sargent & Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603
Attn: Mr. Dan Bodine
Location 28F02

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Chicago, Illinois 60603
Attn: Mr. Sid Sen
Location 29H16

Wisconsin Public Service Corporation
Weston Site No. 3
Weston, Wisconsin 54471
Attn: Mr. Tom Lynch

Richard Kirchner
Soil Testing Services of Wisconsin, Inc.

TABLE 1

SAND BORROW MATERIAL GRADATION SUMMARY

Sample	P gravel	P200	D_{60}	D_{50}	D_{30}	D_{10}	Cu	Cc	Natural Water Content 3-80
Coal Storage Area (NW Area) Elev. 1175	17	2.3	0.71	0.49	0.39	0.25	2.84	0.86	-
Coal Storage Area (East Area) Elev. 1175-1176	8	0.4	0.52	0.48	0.42	0.28	1.86	1.21	-
Coal Storage Area (South Center) Approx. Elev. 1177	14	1.8	0.80	0.55	0.40	0.25	3.20	0.80	-
Existing Stockpile East Face (north end)	15	3.9	0.67	0.49	0.40 (finest)	0.20	3.25	1.19	6.6
Secondary Ash Pond Elev. 1170-1171	13	0	0.81	0.66	0.52 (coarsest)	0.35	2.31	0.95	3.2
Existing Stockpile East Face (center)	10	1.4	0.58	0.51	0.37	0.20	2.90	0.90	5.4
Secondary Ash Pond Elev. 1176-1173	17	3.2	0.75	0.55	0.42	0.26	2.88	0.90	5.3

STS Job 10247

Table 2

SOIL-BENTONITE PERMEAMETER TEST RESULTS

Sample	Percent Bentonite	ASTM D 698 d max.PCF	ASTM D 698 Opt.WC,%	Permeameter density before hydration,PCF	Projected Permeameter Density After Hydration,PCF	Average Hydraulic Gradient	Average Permeability cm/sec.	Remarks
Secondary	5A	117.8	11.9	106.4(90%)	104.0	17	$1.4x10^{-8}$	
Ash Pond	5B	117.8	11.9	106.4(90%)	103.5	17	$7.8x10^{-8}$	
Sand	7A	116.7	13.0	106.5(91%)	103.2	17	$2.4x10^{-7}$	
	7B	116.7	13.0	104.4(89%)	100.0	17	$2.9x10^{-4}$	Developed small leak
	7C	116.7	13.0	107.0(92%)	103.0	85	$1.3x10^{-8}$	
	7D	116.7	13.0	106.1(91%)	102.0	85	$1.6x10^{-8}$	
	10A	117.2	11.0	104.7(89%)	99.3	47	$3.1x10^{-8}$	
	10B	117.2	11.0	105.5(90%)	100.6	112	$1.1x10^{-8}$	
East Face	5A	119.2	11.5	107.9(91%)	105.0	17	$2.7x10^{-8}$	
North End	5B	119.2	11.5	108.9(91%)	105.3	17	$2.0x10^{-8}$	
Stockpile	7A	119.4	11.0	107.3(90%)	103.0	16	Sample developed leak	
Sand	7B	119.4	11.0	107.5(90%)	103.0	46	$4.7x10^{-8}$	
	10A	119.9	11.5	107.1(89%)	102.0	46	$8.8x10^{-9}$	
	10B	119.9	11.5	107.8(90%)	103.0	47	$6.6x10^{-10}$	

Figure 1

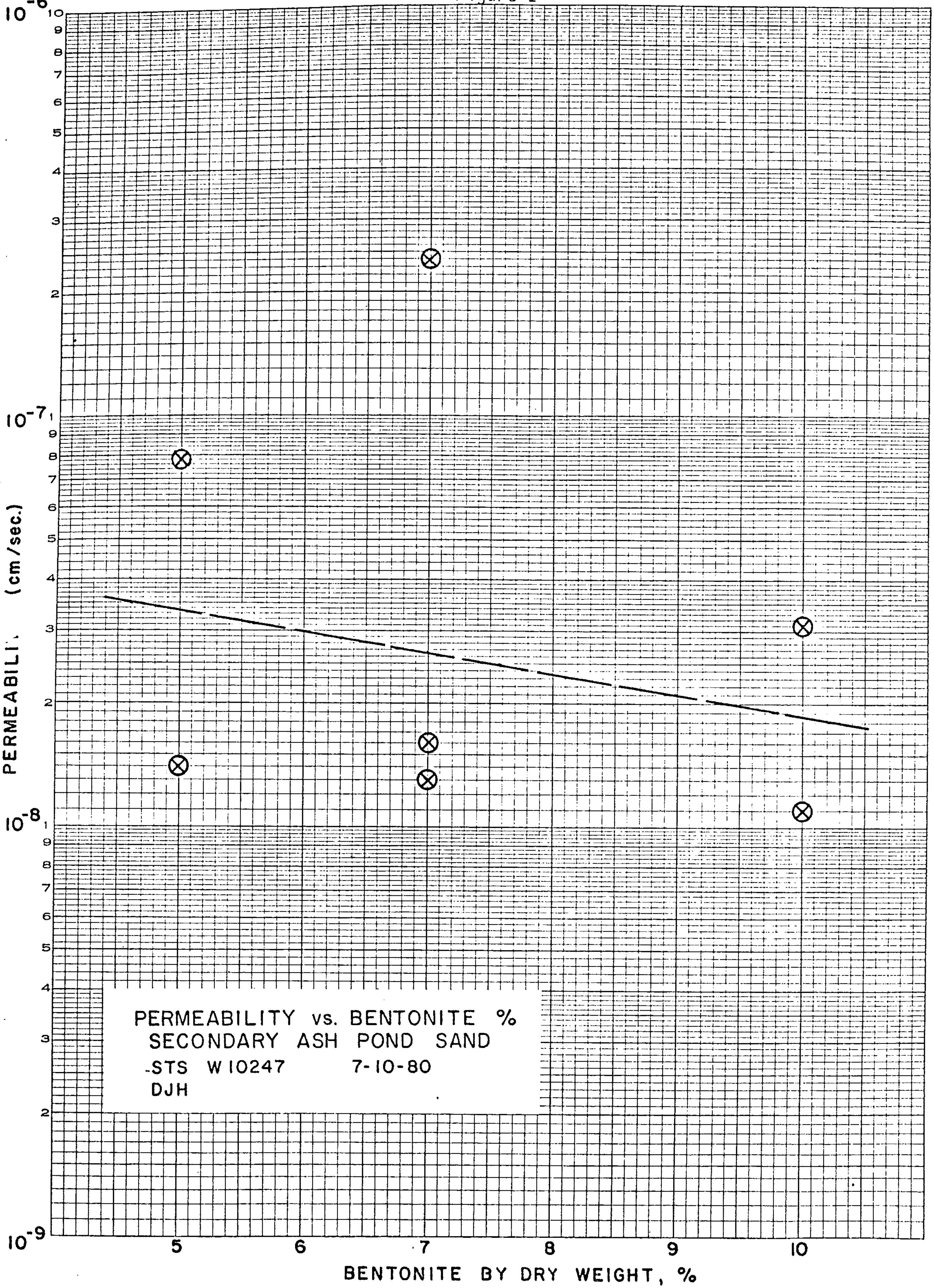
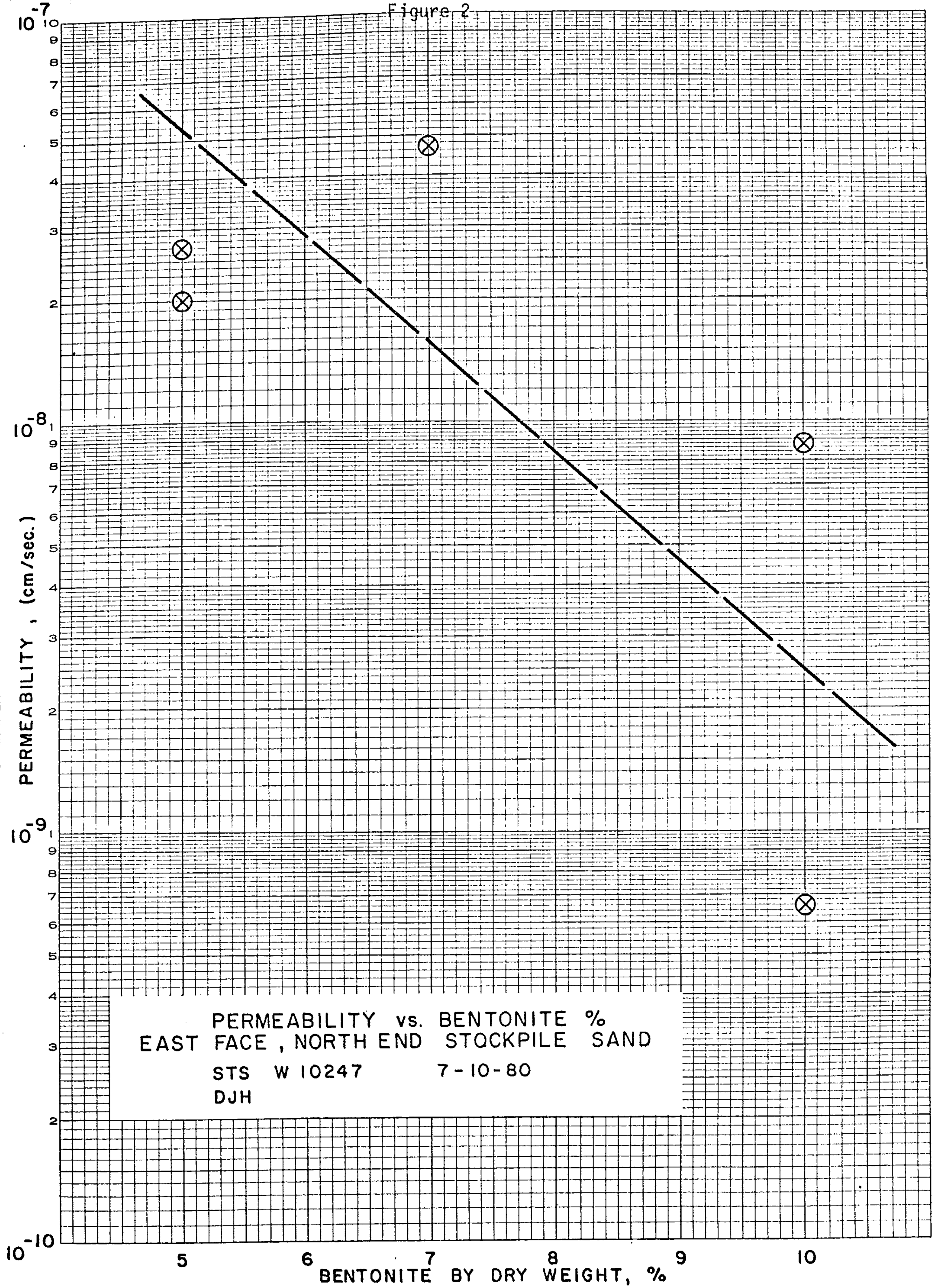
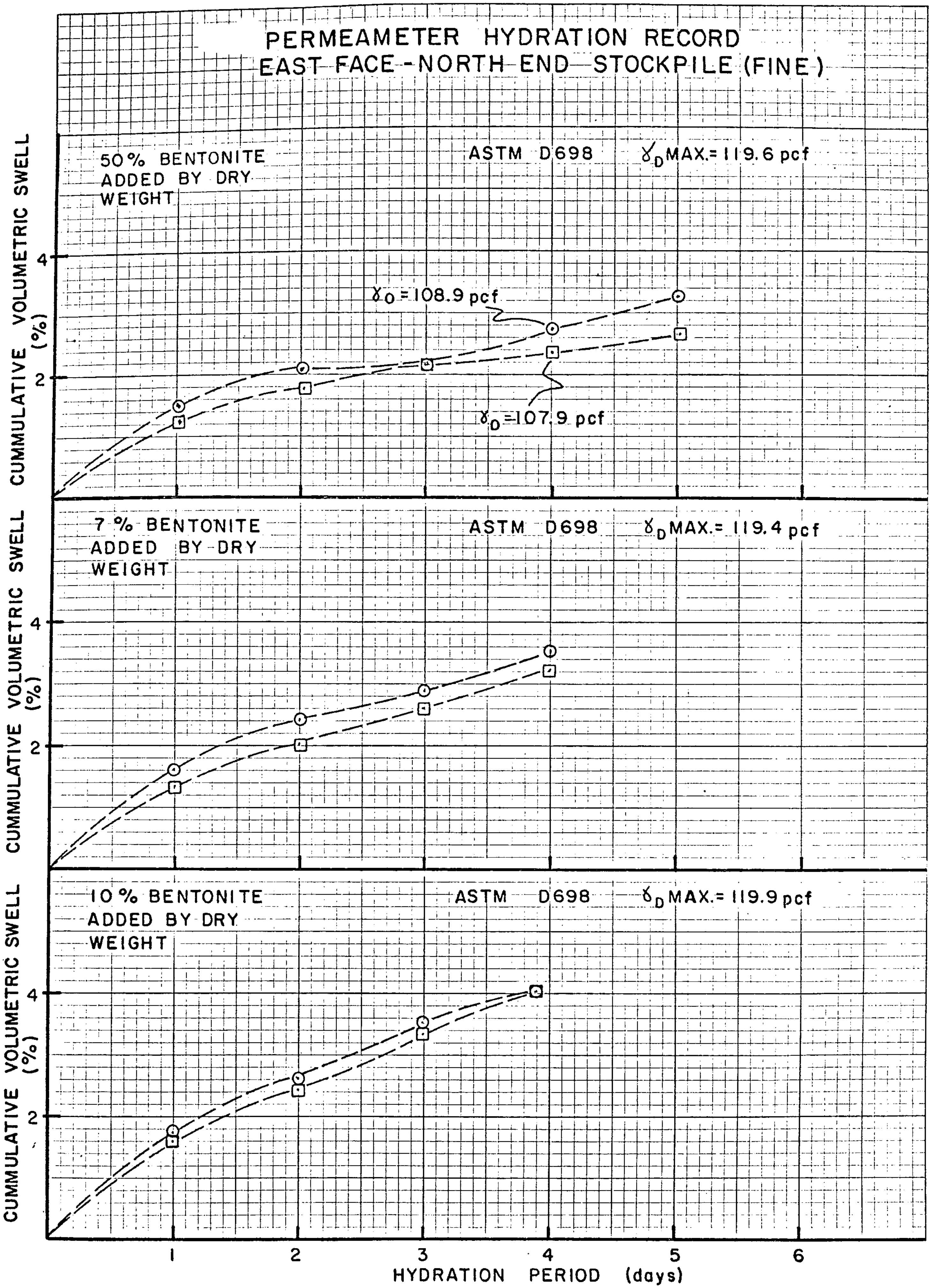
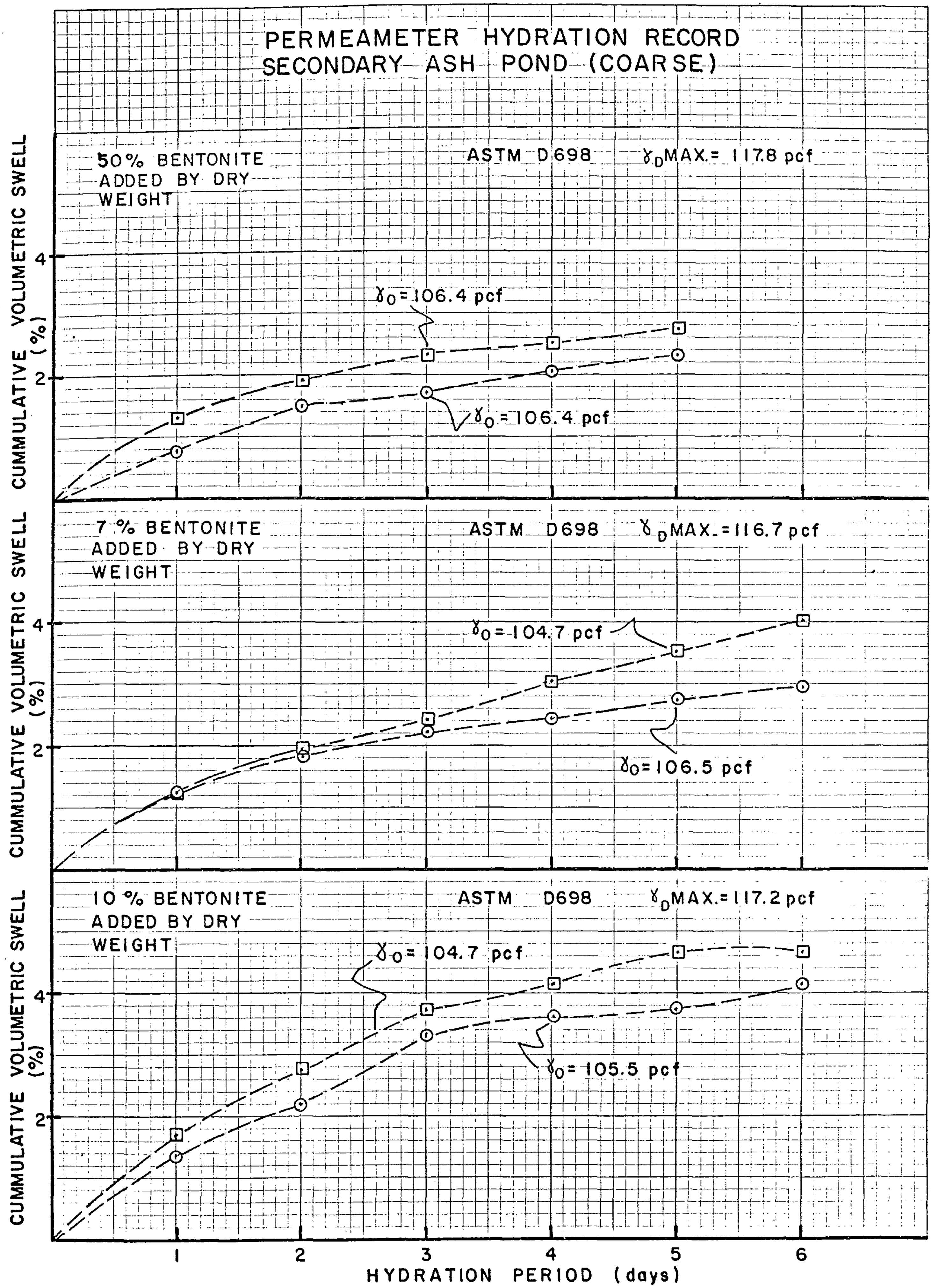
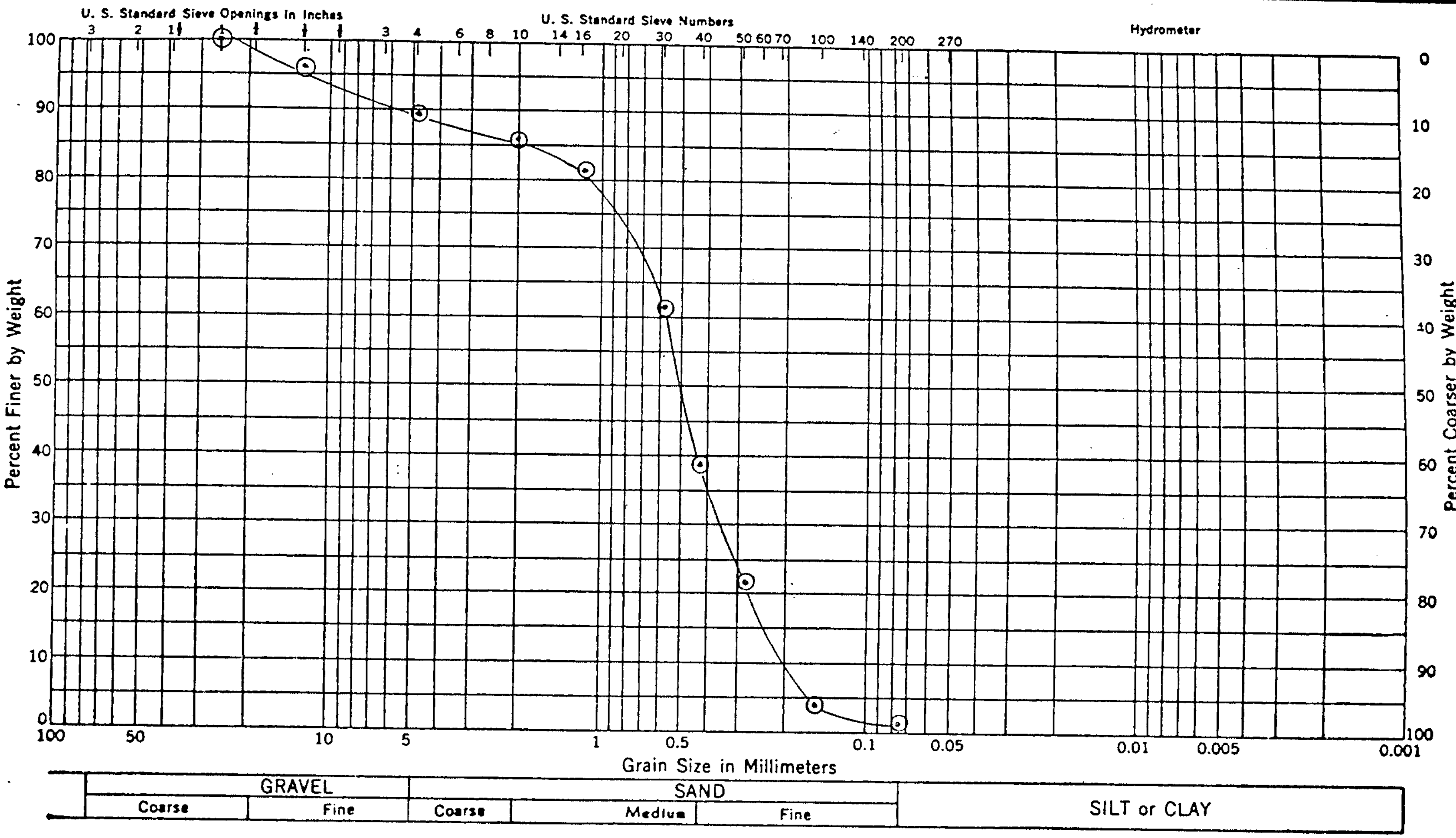

PERMEABILITY vs. BENTONITE %
SECONDARY ASH POND SAND
STS W10247 7-10-80
DJH
PERMEABILITY (cm/sec.)
BENTONITE BY DRY WEIGHT, %

Figure 2


PERMEABILITY vs. BENTONITE %
EAST FACE, NORTH END STOCKPILE SAND
STS W 10247 7-10-80
DJH
PERMEABILITY, (cm/sec.)
BENTONITE BY DRY WEIGHT, %
10^{-7}
10^{-8}
10^{-9}
10^{-10}
5
6
7
8
9
10
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
MADE IN U. S. A.


PERMEAMETER HYDRATION RECORD
EAST FACE - NORTH END STOCKPILE (FINE)
50% BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γD MAX.= 119.6 pcf
γD = 108.9 pcf
γD = 107.9 pcf
7 % BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γD MAX.= 119.4 pcf
10 % BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γD MAX.= 119.9 pcf
CUMMULATIVE VOLUMETRIC SWELL (%)
2
4
1
2
3
4
5
6
HYDRATION PERIOD (days)


PERMEAMETER HYDRATION RECORD
SECONDARY ASH POND (COARSE)
50% BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γ_DMAX.= 117.8 pcf
γ_0= 106.4 pcf
γ_0= 106.4 pcf
7 % BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γ_DMAX.= 116.7 pcf
γ_0= 104.7 pcf
γ_0= 106.5 pcf
10 % BENTONITE ADDED BY DRY WEIGHT
ASTM D698
γ_DMAX.= 117.2 pcf
γ_0= 104.7 pcf
γ_0= 105.5 pcf
CUMMULATIVE VOLUMETRIC SWELL (%)
HYDRATION PERIOD (days)



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.20	0.36	0.58	2.9	1.12	

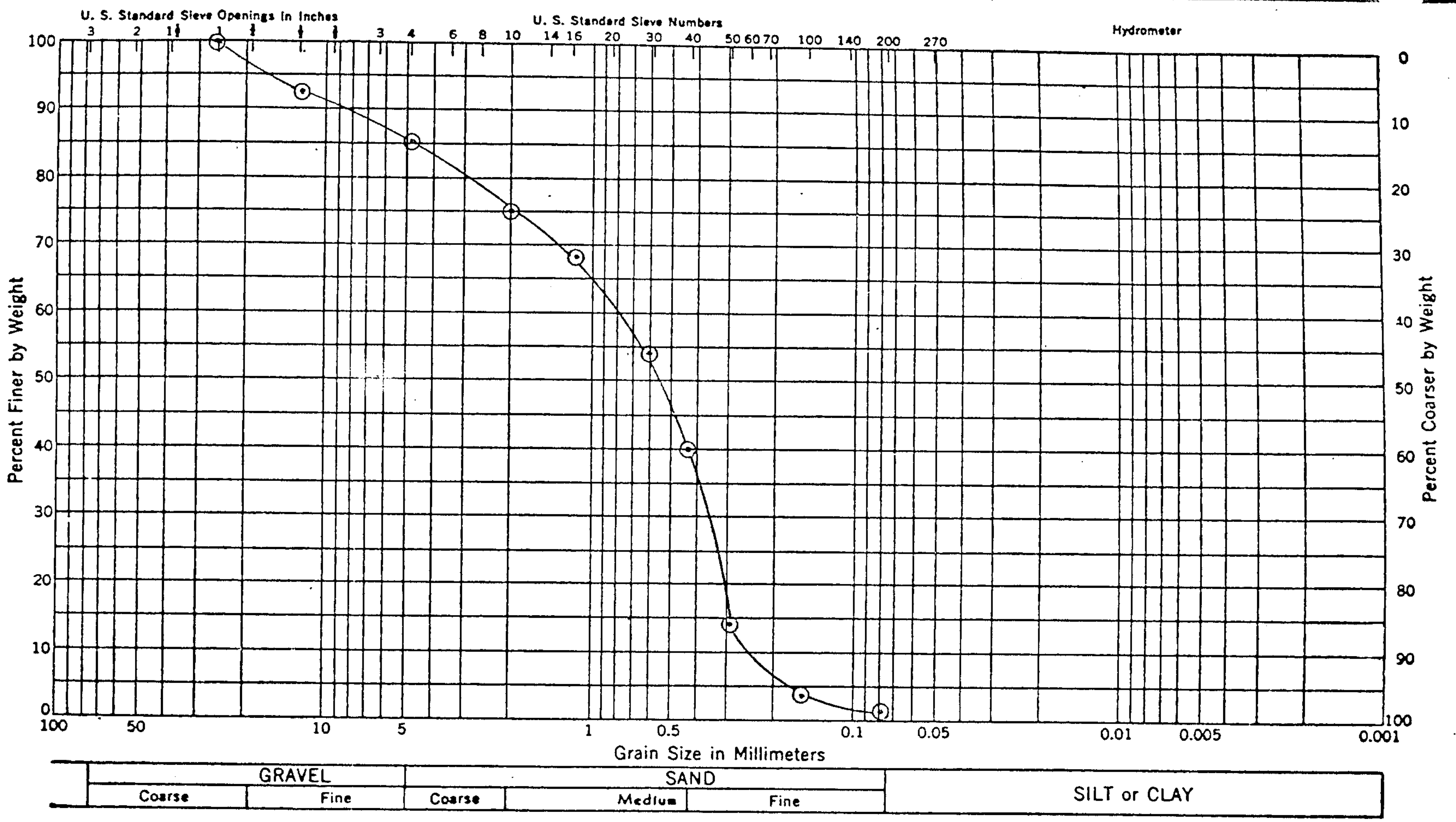
FINE TO MEDIUM SAND, TRACE FINE GRAVEL, TRACE SILT
1.4 % PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM EXISTING STOCKPILE EAST-FACE CENTER

SOIL TESTING SERVICES OF WISCONSIN, INC.

DRAWN	APPROVED	DATE	JOB No.
		4-14-86	10247

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.25	0.40	0.80	3.20	0.80	SP

FINE TO MEDIUM SAND, LITTLE FINE GRAVEL, TRACE SILT, BROWN (SP)

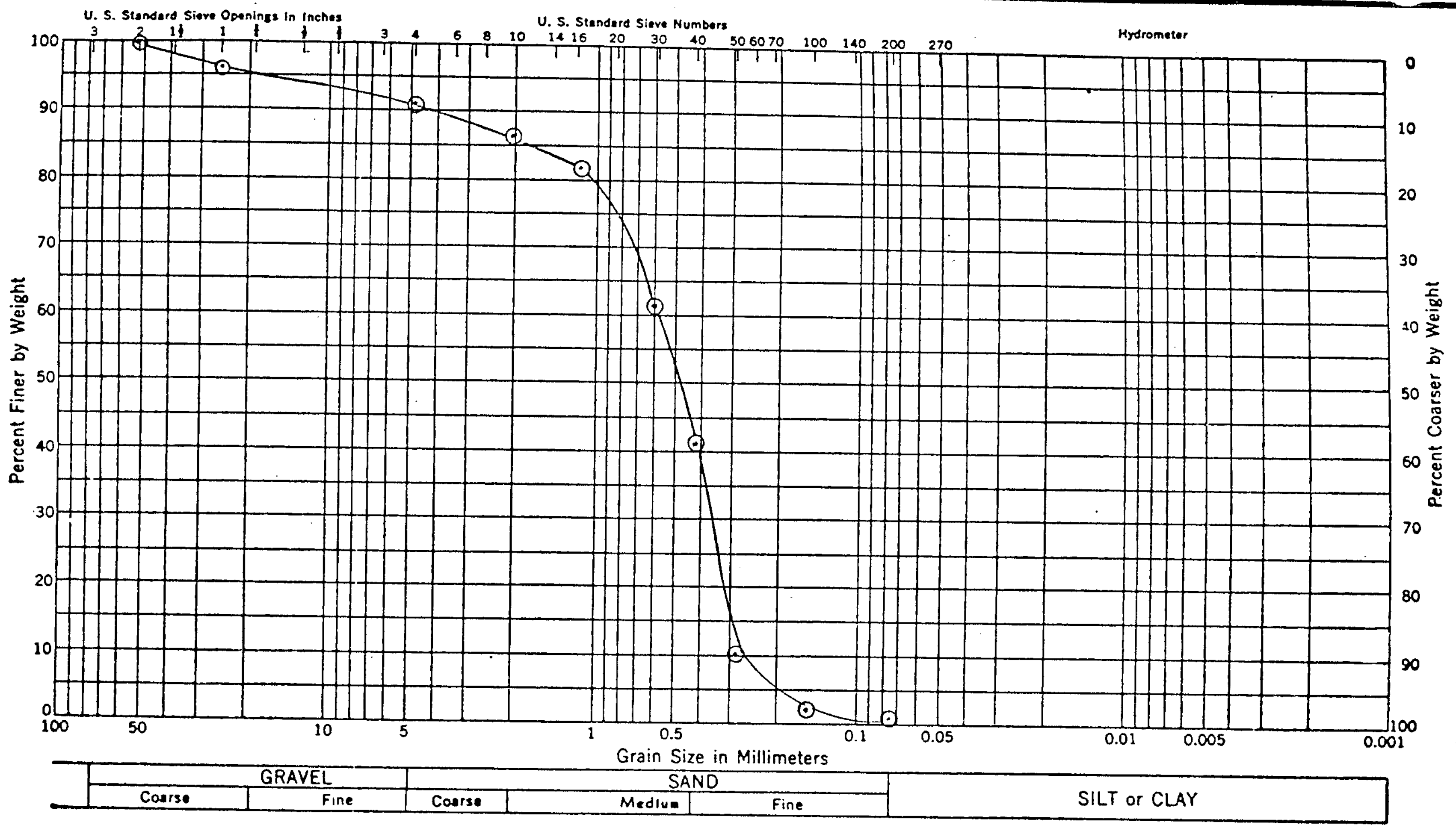
1.8% PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM COAL STORAGE
AREA (SOUTH CENTER)
APPROX. EL. +1177

SOIL TESTING SERVICES
OF WISCONSIN, INC.

DRAWN	APPROVED	DATE	JOB No.
		4-8-80	10247

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.28	0.42	0.52	1.86	1.21	SP

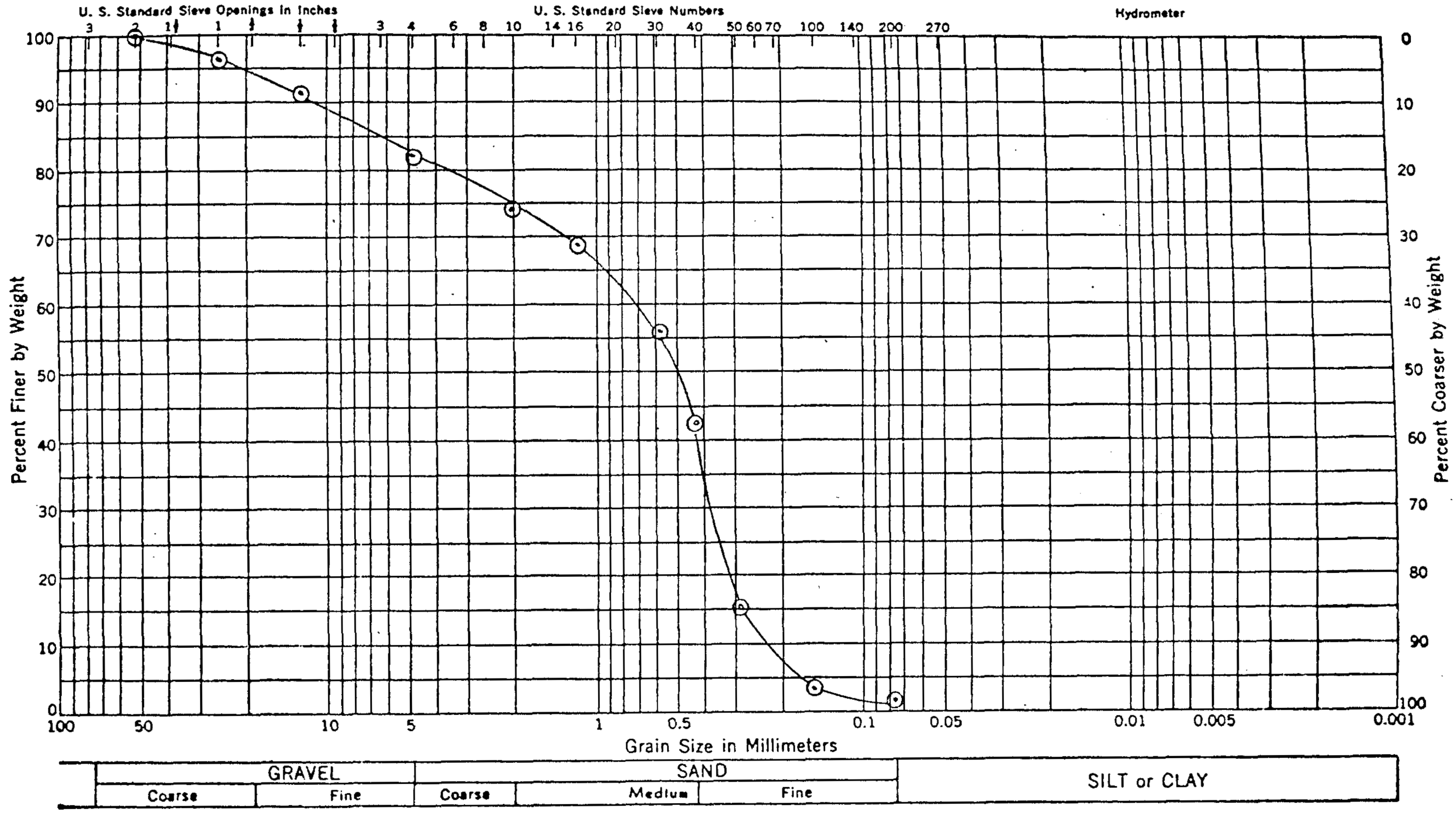
FINE TO MEDIUM SAND, LITTLE FINE TO MEDIUM GRAVEL, TRACE SILT, BROWN (SP) 2.3% PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM COAL STORAGE AREA (EAST AREA)
APPROX. EL+1175 to 1176

SOIL TESTING SERVICES OF WISCONSIN, INC

DRAWN	APPROVED	DATE	JOB No.
		4-8-80	

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.25	0.39	0.71	2.84	0.86	SP

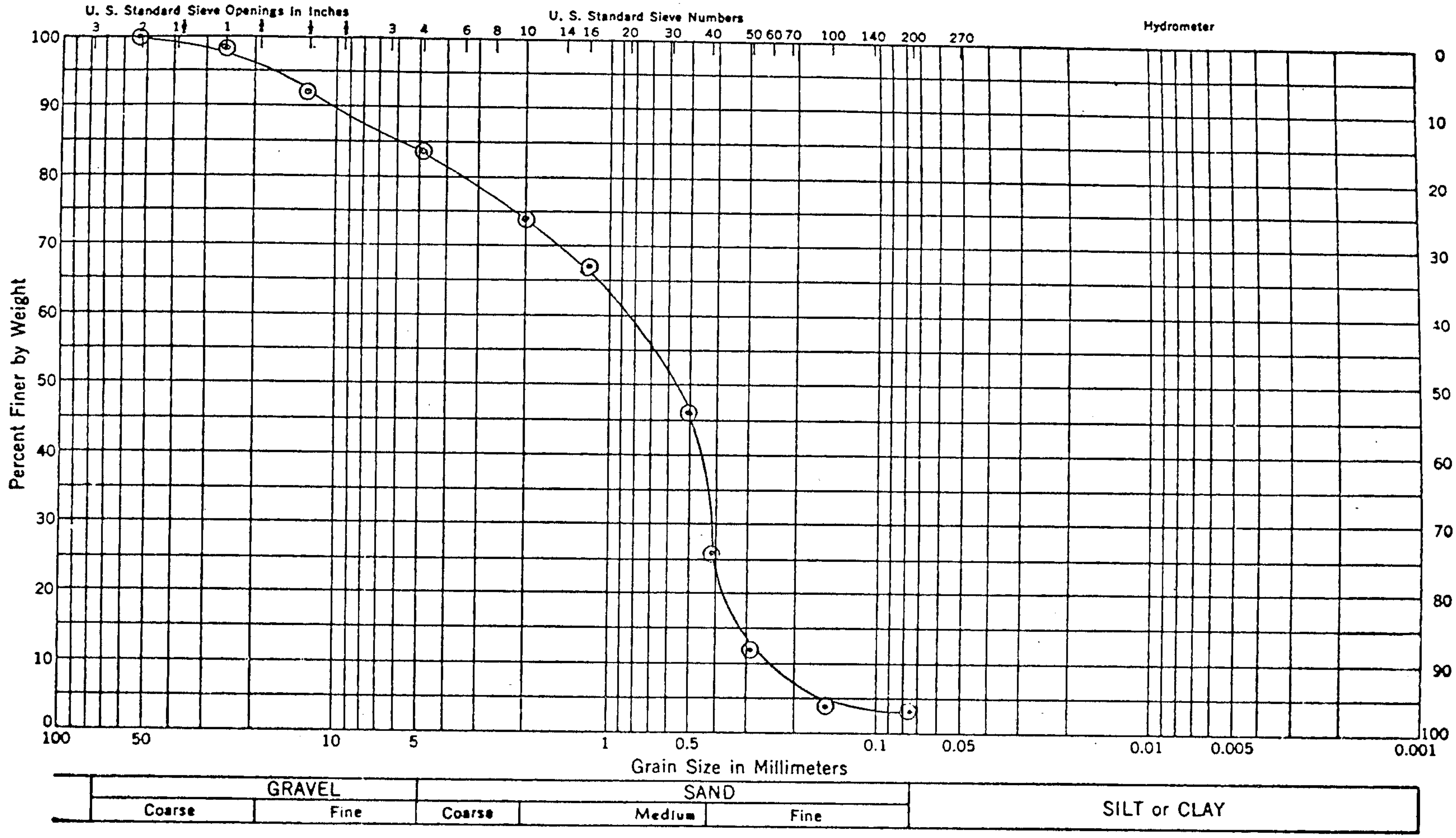
FINE TO MEDIUM SAND, LITTLE
FINE TO MEDIUM GRAVEL,
TRACE SILT, BROWN (SP)
2.3 % PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM COAL
STORAGE AREA (NW AREA)
APPROX. EL. +1175

SOIL TESTING SERVICES
OF WISCONSIN, INC.

DRAWN	APPROVED	DATE	JOB No.
		4-8-80	10247

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.26	0.41	0.76	2.92	0.85	

FINE TO MEDIUM SAND, LITTLE FINE TO MEDIUM GRAVEL - TRACE SILT

3.2% PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM COAL
STORAGE AREA
ELEV. +1176 - 1173

SOIL TESTING SERVICES
OF WISCONSIN, INC.

DRAWN	APPROVED	DATE	JOB No.
		4-4-80	10247

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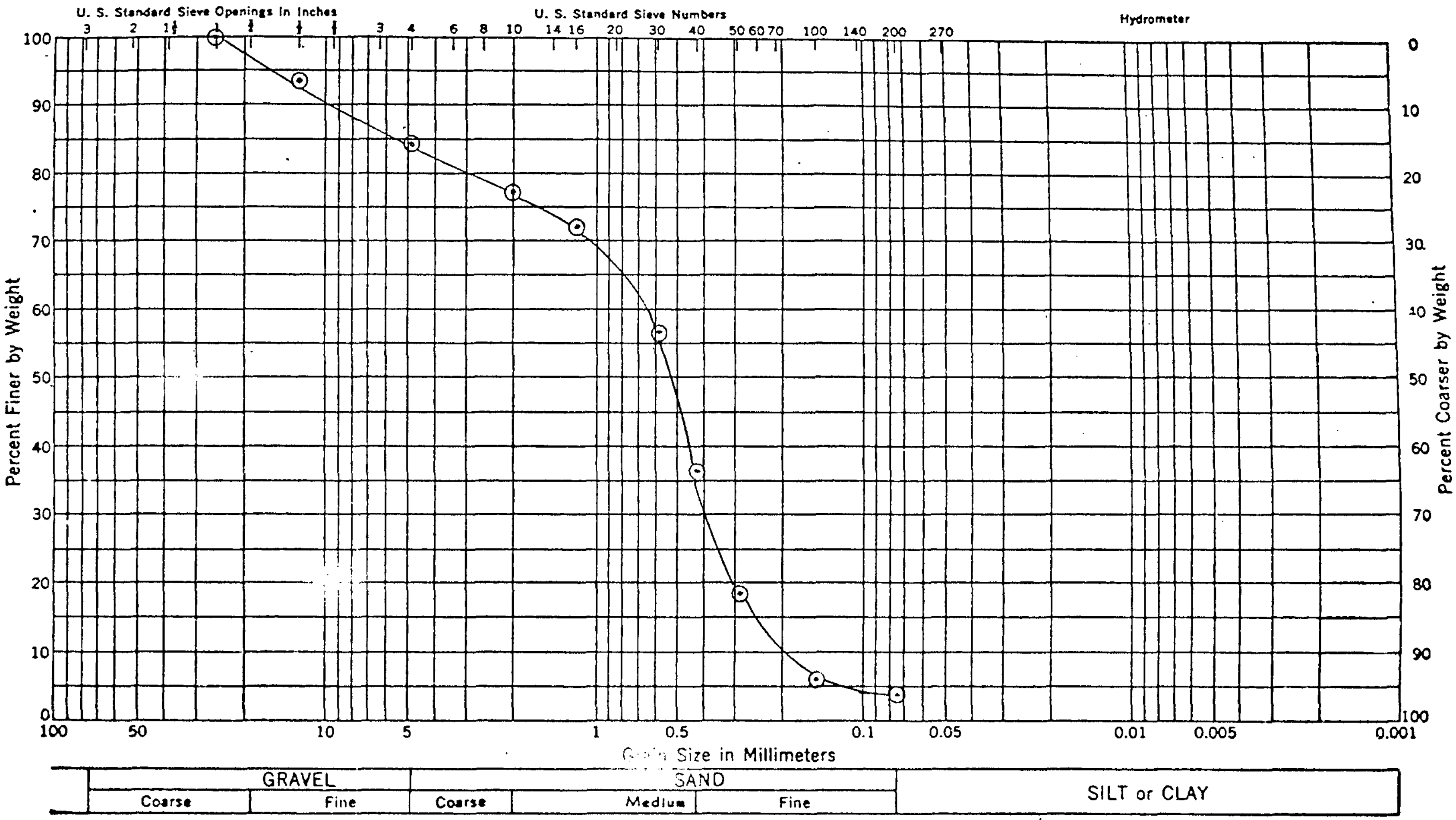


BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.20	0.40	0.66	3.3	1.21	SP

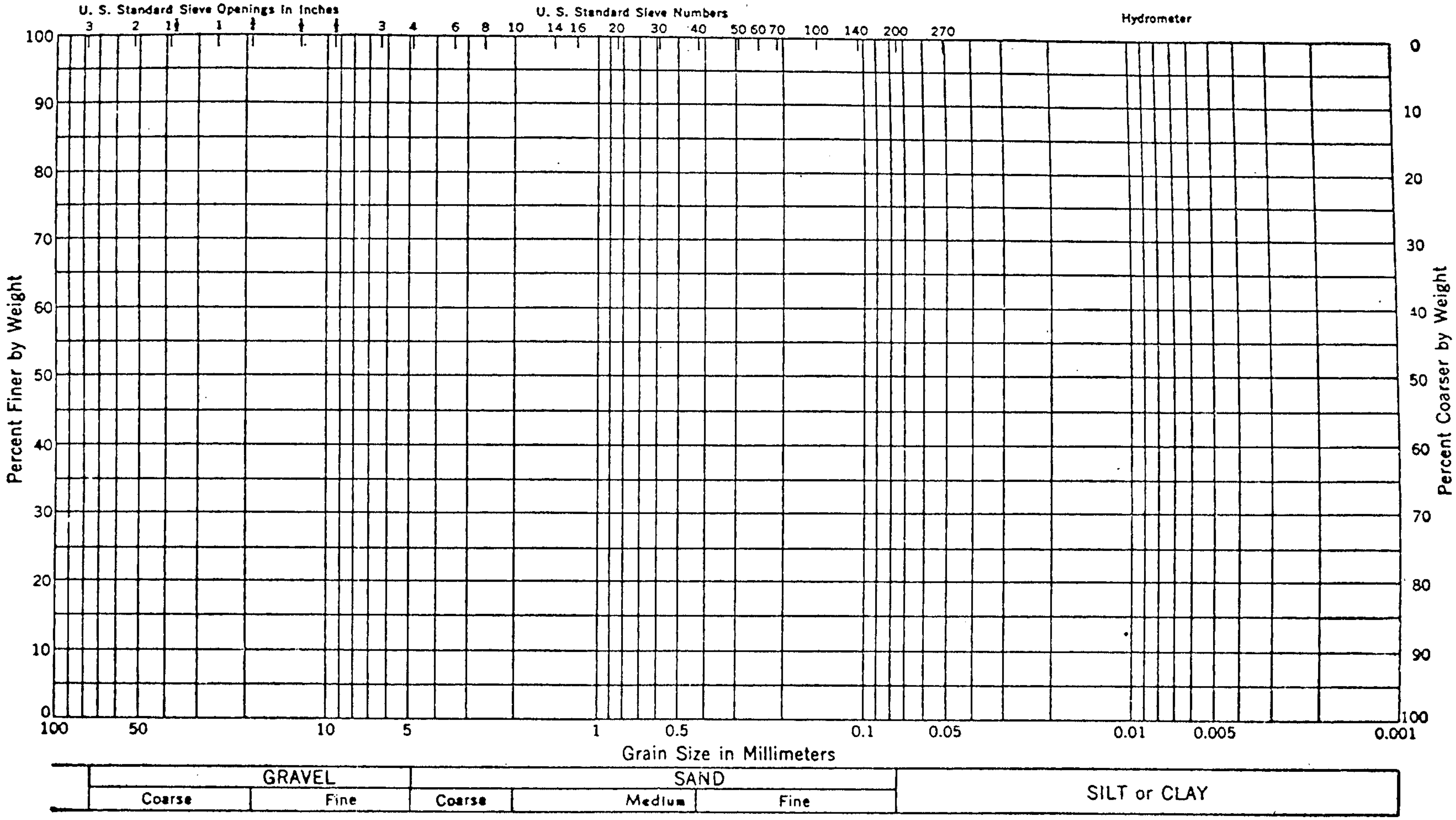
FINE TO MEDIUM SAND (SP)
LITTLE FINE TO MEDIUM
GRAVEL, TRACE SILT
3.9 % PASSING No. 200
SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM EXISTING
STOCKPILE - EAST FACE
NORTH END

SOIL TESTING SERVICES
OF WISCONSIN, INC.

DRAWN	APPROVED	DATE	JOB No.
		4-14-80	10247

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
				0.33	0.51	0.80	2.42	.99	SP

FINE TO MEDIUM SAND (SP)
LITTLE FINE TO MEDIUM
GRAVEL
0% PASSING No. 200 SIEVE

SOIL BENTONITE LINING
WESTON UNIT-3
SAMPLE FROM
SECONDARY ASH POND
ELEV. 1170-1171

SOIL TESTING SERVICES
OF WISCONSIN, INC

DRAWN	APPROVED	DATE	JOB No.
		4-14-80	10247

BBS12478

SOIL TESTING SERVICES OF WISCONSIN, INC.

540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-2-80 Job No. W-10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE - MEDIUM SAND (SP) LITTLE FINE GRAVEL - TRACE SILT WITH 5% BENTONITE ADDED

Material Mark _____ Classification SP AASHO BPR

Source of Material EAST FACE - NORTH END STOCKPILE SAND AND BENTONITE

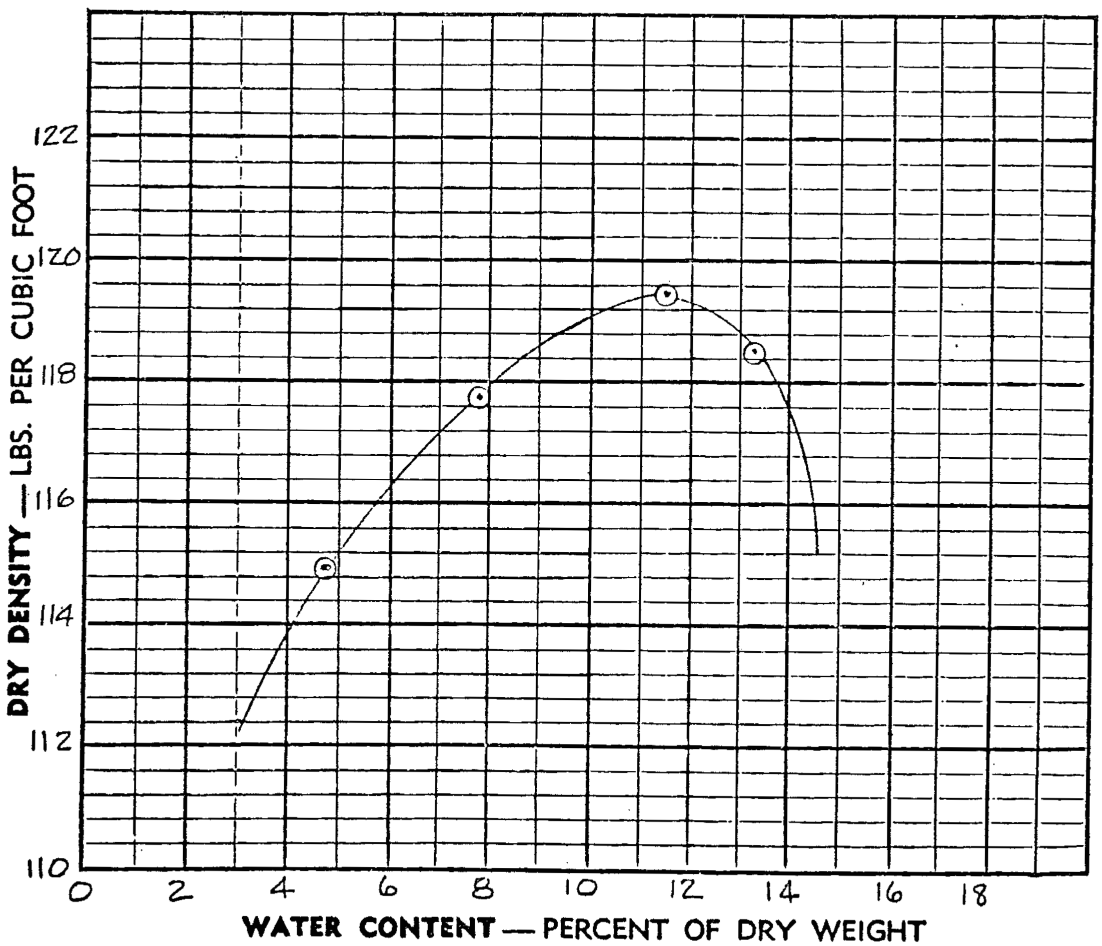
Natural Water Content _____ % Natural Dry Density _____ PCF Specific Gravity _____

Liquid Limit _____ % Plastic Limit _____ % Plasticity Index _____

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 11.5 %

Maximum Dry Density 119.6 PCF (at a Wet Density of 133.4 PCF)



BBS92268

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-2-80 Job No. W 10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE-MEDIUM SAND (SP) LITTLE FINE GRAVEL - TRACE SILT WITH 7% BENTONITE ADDED

Material Mark ______ Classification ______ AASHO BPR

Source of Material EAST FACE - NORTH END STOCKPILE SAND-BENTONITE

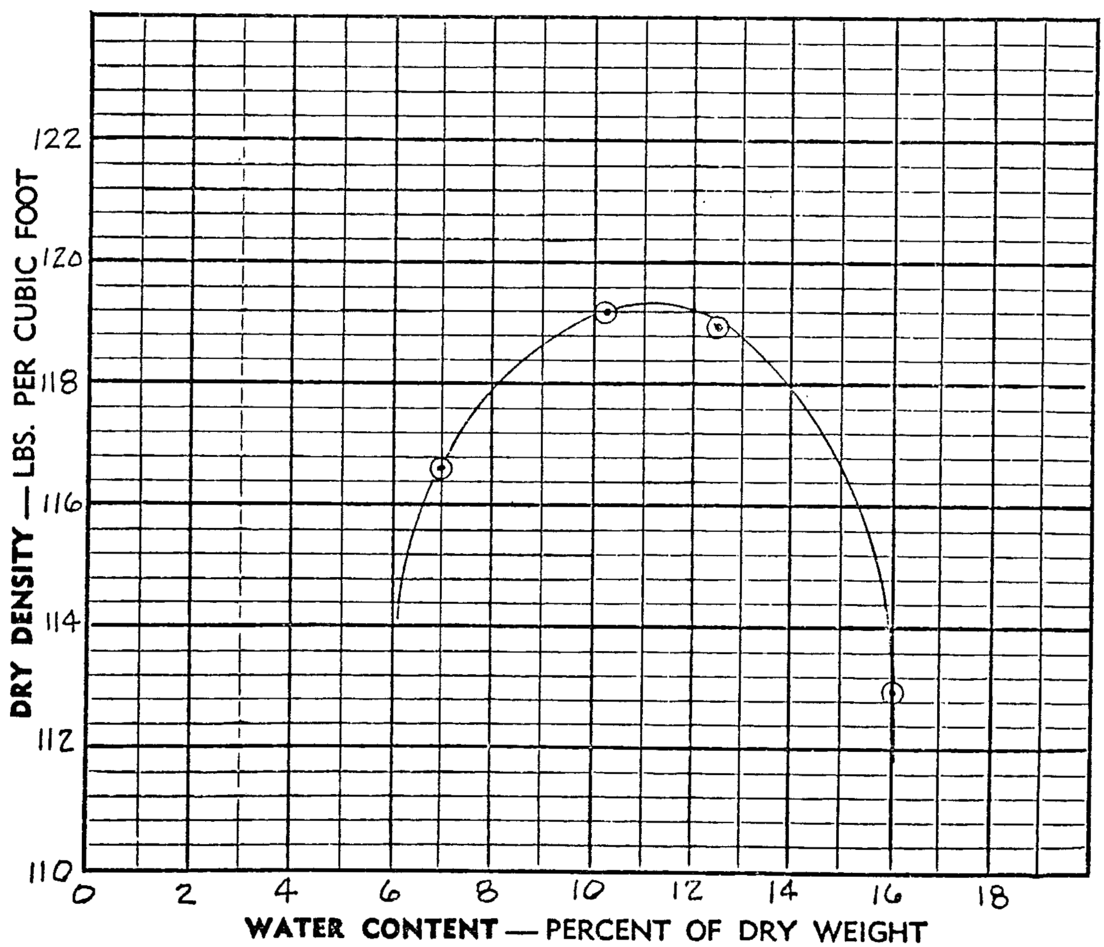
Natural Water Content ______% Natural Dry Density ______PCF Specific Gravity ______

Liquid Limit ______ % Plastic Limit ______ % Plasticity Index ______

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 11.0 %

Maximum Dry Density 119.4 PCF (at a Wet Density of 132.5 PCF)



BBS92268

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-3-80 Job No. W 10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE TO MEDIUM SAND (SP) LITTLE FINE GRAVEL - TRACE SILT WITH 10% BENTONITE ADDED

Material Mark ______ Classification ______ AASHO BPR

Source of Material EAST FACE - NORTH END - STOCKPILE SAND-BENTONITE

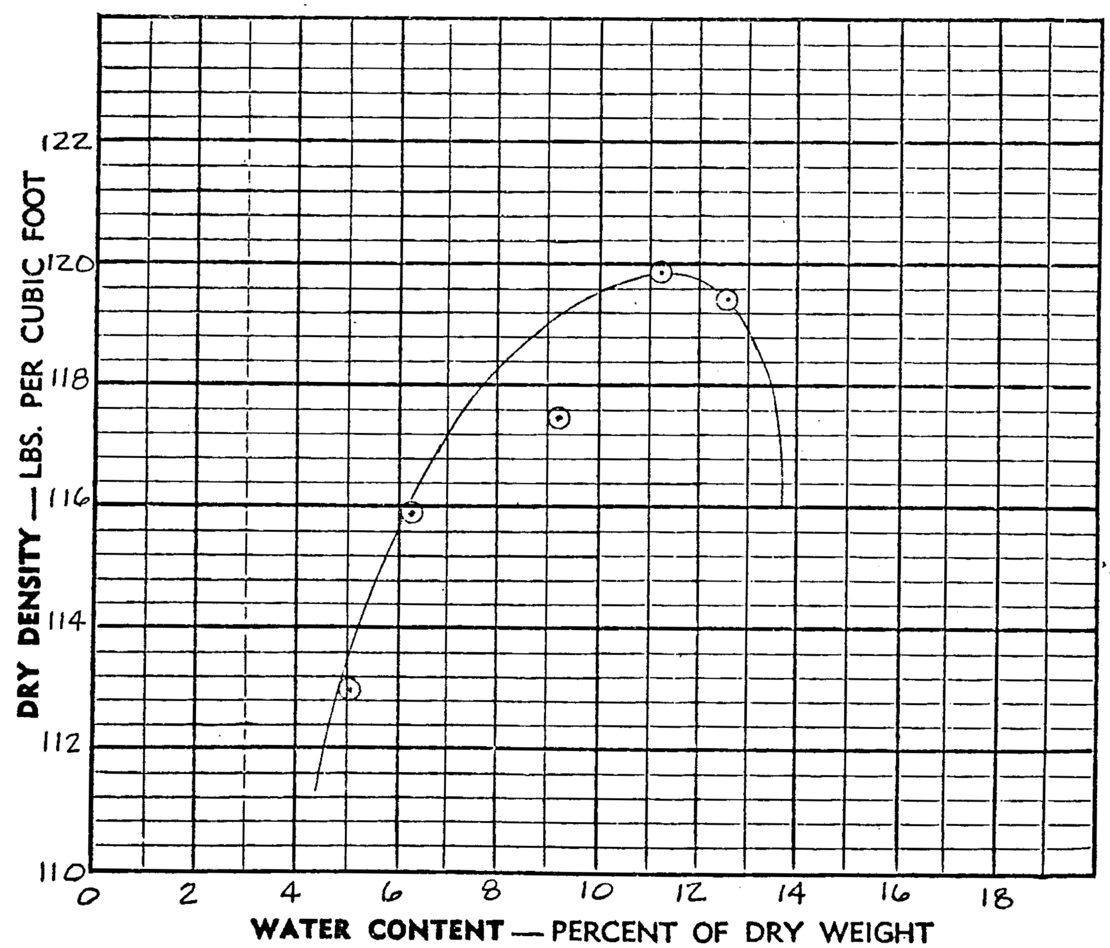
Natural Water Content ______% Natural Dry Density ______PCF Specific Gravity ______

Liquid Limit ______ % Plastic Limit ______ % Plasticity Index ______

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 11.5 %

Maximum Dry Density 119.9 PCF (at a Wet Density of 133.7 PCF)



BBS92268

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-7-80 Job No. W 10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE TO MEDIUM SAND (SP) LITTLE FINE GRAVEL WITH 5% BENTONITE ADDED

Material Mark ______ Classification SP AASHO BPR

Source of Material SECONDARY ASH POND SAND - BENTONITE

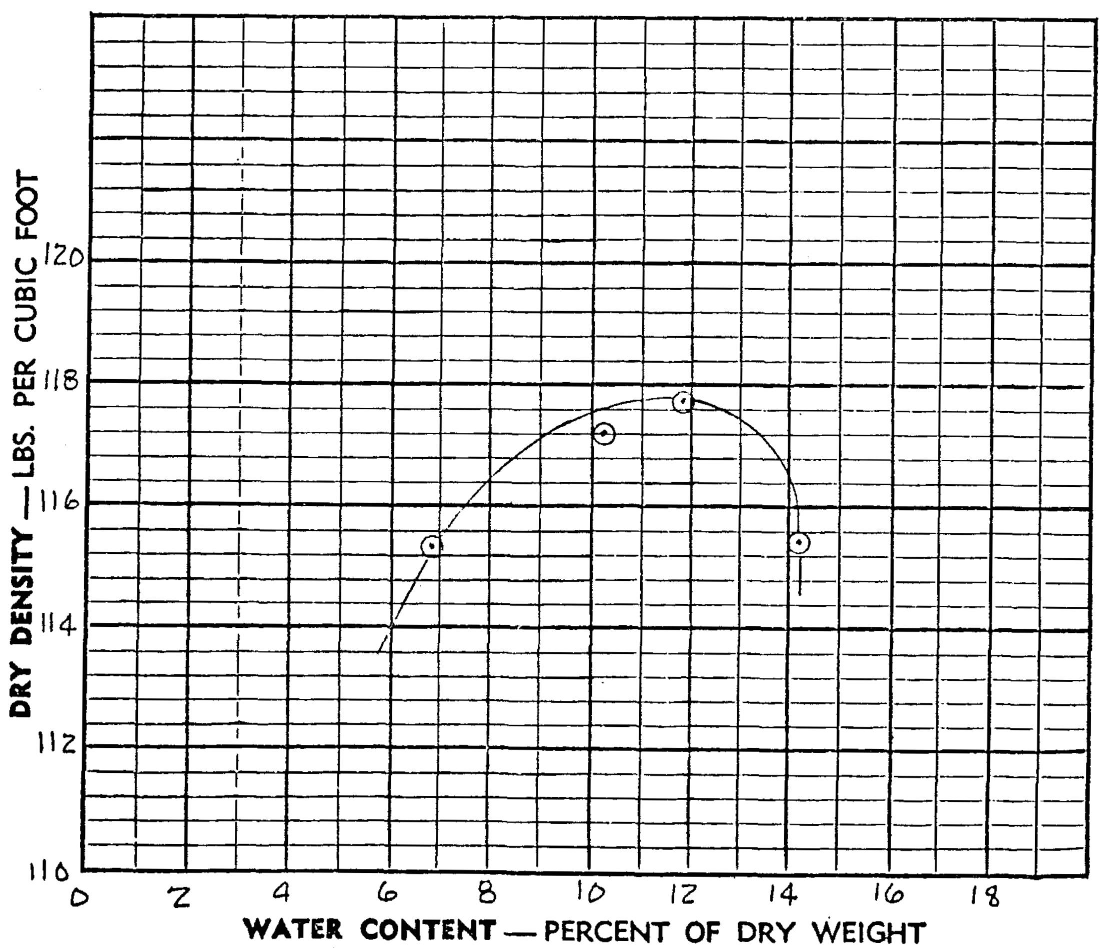
Natural Water Content ______ % Natural Dry Density ______ PCF Specific Gravity ______

Liquid Limit ______ % Plastic Limit ______ % Plasticity Index ______

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 11.9 %

Maximum Dry Density 117.8 PCF (at a Wet Density of 131.8 PCF)



BBS92268

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-7-80 Job No. W-10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE TO MEDIUM SAND (SP) LITTLE FINE GRAVEL WITH 7% BENTONITE ADDED

Material Mark ______ Classification ______ AASHO BPR

Source of Material SECONDARY ASH POND SAND-BENTONITE

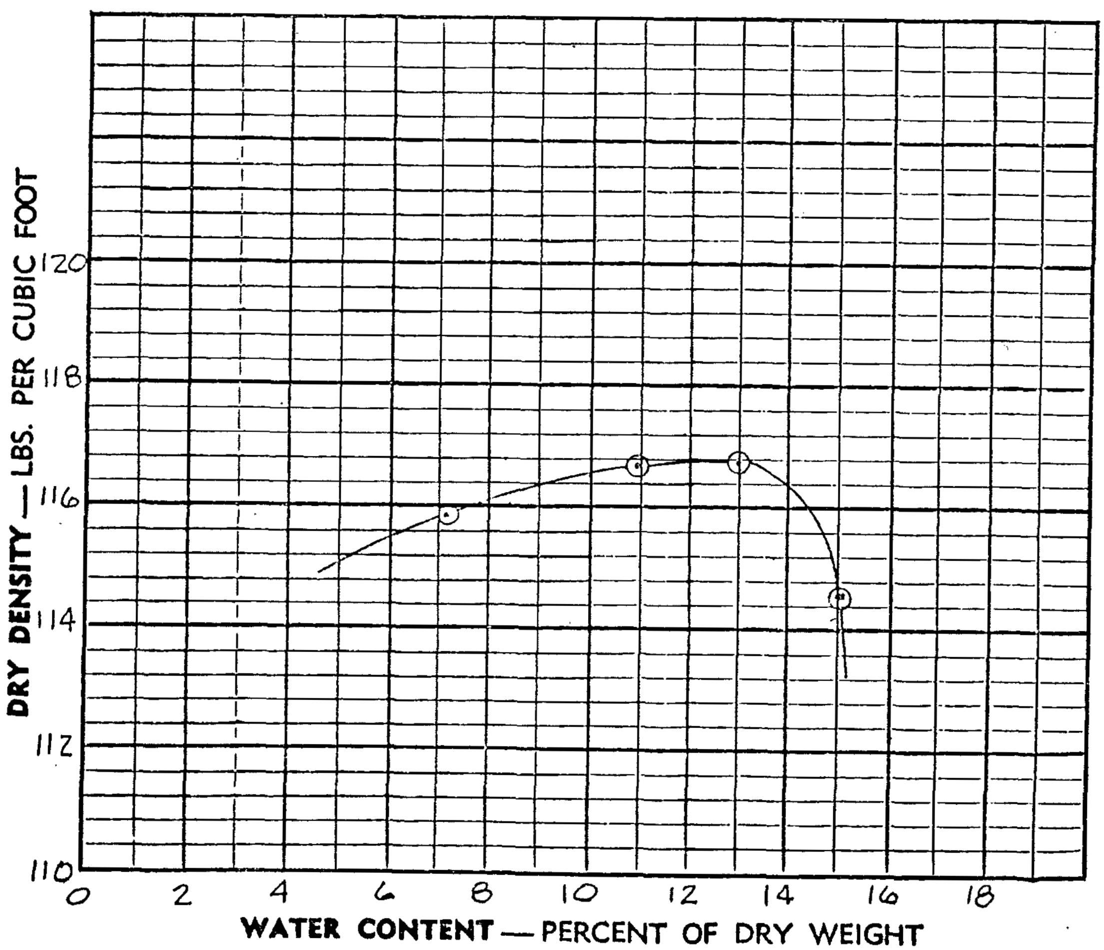
Natural Water Content ______% Natural Dry Density ______PCF Specific Gravity ______

Liquid Limit ______ % Plastic Limit ______ % Plasticity Index ______

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 13.0 %

Maximum Dry Density 116.7 PCF (at a Wet Density of 131.9 PCF)



BBS92268

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST., GREEN BAY, WIS. 54303
PHONE (414) 494-9656

Date 5-7-80

Job No. W 10247

COMPACTION CONTROL REPORT

1. Laboratory Compaction Test Data

A. Description of Soil: BROWN FINE TO MEDIUM SAND (SP) LITTLE FINE GRAVEL WITH 10% BENTONITE ADDED

Material Mark ______ Classification (SP) AASHO BPR

Source of Material SECONDARY ASH POND SAND-BENTONITE

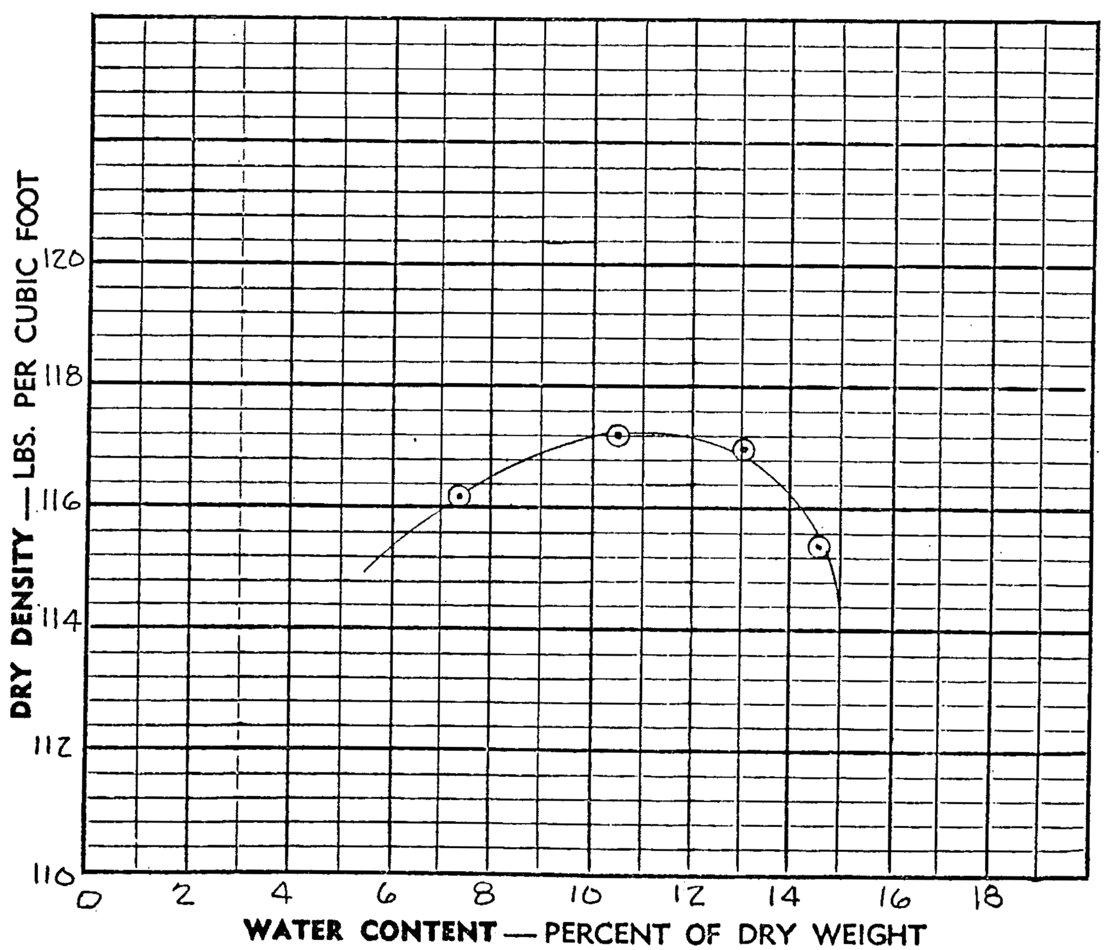
Natural Water Content ______% Natural Dry Density ______PCF Specific Gravity ______

Liquid Limit ______% Plastic Limit ______% Plasticity Index ______

B. Test Procedure Used: ASTM D-698 METHOD "B"

C. Test Results: Optimum Water Content 11.0 %

Maximum Dry Density 117.2 PCF (at a Wet Density of 130.1 PCF)



BBS92268

SOIL TESTING SERVICES, OF WIS., INC.

Project No.

STS Job No. W10247

Date 7-10-80

Report No.

PERMEABILITY TEST

Constant Head

Sample A-7% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/7% P200 bentonite

Mark No. 7%A, Secondary Ash Pond

Compacted Dry Density = 106.5 PCF Six day hydrated dry density = 103.2 PCF

Moisture 6.6% "During Compaction"

Sample Diameter = 4.0" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	74	1305	3.3×10^{-7}	
2	72	1460	2.0×10^{-7}	
3	71	1440	1.8×10^{-7}	
		Average =	2.4×10^{-7} cm/sec	Possible small wall leak.

SOIL TESTING SERVICES, OF WIS., INC.

PERMEABILITY TEST

Constant Head

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

Sample B-5% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/5% P200 bentonite

Mark No. 5% B, Secondary ash pond

Compacted Dry Density = 106.4 PCF   Five day hydrated dry density=103.5 PCF

Moisture 7.0% "During compaction"

Sample Diameter = 4.0   Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	72	1350	1.8×10^{-7}	
2	71	1470	3.9×10^{-8}	
3	71	1440	1.7×10^{-8}	

Average = 7.8×10^{-8} cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No.
STS Job No. W10247
Date 7-10-80
Report No.

PERMEABILITY TEST

Constant Head

Sample A-, 5 % bentonite mixed with secondary ash pond sand

Soil Description Brown fine to med. sand (SP) little fine gravel with 5% P200 bentonite

Mark No. 5% A, Secondary Ash Pond

Compacted Dry Density = 106.4 PCF   Five Day hydrated dry density=104.0PCF

Moisture 7.0 % "During compaction"

Sample Diameter = 4.0"   Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	72	1350	1.4×10^{-8}	
2	71	1470	1.9×10^{-8}	
3	71	1440	1.0×10^{-8}	
		Average =	1.4×10^{-8} cm/sec	

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

PERMEABILITY TEST

Constant Head

Sample B-7% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/7% P200 bentonite

Mark No. 7% B, secondary ash pond

Compacted Dry Density = 104.4 Six day hydrated dry density=100.0 PCF

Moisture 6.6% "During Compaction"

Sample Diameter = 4.0" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	75	5	2.1×10^{-4}	
2	72	3	2.8×10^{-4}	
3	71	8	2.9×10^{-4}	
4	68	3	3.6×10^{-4}	
		Average =	2.9×10^{-4} cm/sec	

Another sample remixed hydrated and compacted.

SOIL TESTING SERVICES, OF WIS., INC.

Project No.

STS Job No. W10247

Date 7-10-80

Report No.

PERMEABILITY TEST

Constant Head

Sample C-7% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/7% P200 bentonite

Mark No. 7% C, Secondary Ash pond

Compacted Dry Density = 107.0 PCF Five day hydrated dry density= 103 PCF

Moisture 7.9% "During Compaction"

Sample Diameter = 4.0" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	362" (Bilpsi)	106	2.1×10^{-8}	
2	362"	278	1.7×10^{-8}	
3	362"	1219	1.3×10^{-8}	
4	361"	4224	1.1×10^{-8}	
5	361"	173	1.1×10^{-8}	
6	361"	326	1.1×10^{-8}	
7	361"	833	9.0×10^{-9}	
8	360"	325	9.7×10^{-9}	
9	360"	283	1.0×10^{-8}	
		Average =	1.3×10^{-8} cm/sec	

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

PERMEABILITY TEST

Constant Head

Sample D-7% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/7% P200 bentonite

Mark No. 7% D, secondary ash pond

Compacted Dry Density = 106.1 PCF

Five day hydrated dry density approximately 102.0 PCF

Moisture 6.1% "During Compaction"

Sample Diameter = 4.0"

Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	362	110	2.6×10^{-8}	
2	362	275	2.1×10^{-8}	
3	362	1220	1.8×10^{-8}	
4	361	4225	1.6×10^{-8}	
5	361	173	1.4×10^{-8}	
6	361	326	1.6×10^{-8}	
7	361	834	1.1×10^{-8}	
8	360	324	1.3×10^{-8}	
9	360	283	1.3×10^{-8}	

Average = 1.6×10^{-8} cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

PERMEABILITY TEST

Constant Head

Sample A-10% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/10% P200 bentonite

Mark No. 10% A, secondary ash pond

Compacted Dry Density = 104.7 PCF Six day hydrated dry density = 99.3 PCF

Moisture 7.4 % "During Compaction"

Sample Diameter = 4.0" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
	180	315	1.3×10^{-7}	
1	180	1005	4.5×10^{-8}	Saturation Complete
2	180	515	3.1×10^{-8}	
3	235	970	3.9×10^{-8}	
4	235	425	2.9×10^{-8}	
		Average =	3.6×10^{-8} cm/sec	

SOIL TESTING SERVICES, OF WIS., INC.

Project No.
STS Job No. W10247
Date 7-10-80
Report No.

PERMEABILITY TEST

Constant Head

Sample B-10% bentonite mixed with secondary ash pond sand

Soil Description Brown fine to medium sand (SP) little fine gravel w/10% P200 bentonite

Mark No. 10% -B, secondary ash pond

Compacted Dry Density = 105.5 PCF Six day hydrated dry density = 100.6 PCF

Moisture 7.4% "During Compaction"

Sample Diameter = 4.0"

Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	478	88	2.2×10^{-8}	
2	478	261	1.1×10^{-8}	
3	478	1244	8.8×10^{-9}	
4	423	4228	8.5×10^{-9}	
5	421	164	7.5×10^{-9}	
6	477	324	9.6×10^{-9}	
7	476	831	7.5×10^{-9}	
8	476	327	1.3×10^{-8}	
9	476	285	1.3×10^{-8}	
10	476	770	1.1×10^{-8}	

Average = 1.1×10^{-8} cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No.

STS Job No. W10247

Date 7-10-80

Report No.

PERMEABILITY TEST

Constant Head

Sample A-5% bentonite mixed with east face, north end stock pile

Soil Description Brown fine to medium sand (SP) little fine gravel with trace of silt with 5% P-200 bentonite

Mark No. 5% A, East face, North end

Compacted Dry Density = 107.9 PCF Five day hydrated dry density = 105.0 PCF

Moisture 7.0 % "During Compaction"

Sample Diameter = 4" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability $^{cm}/_{sec}$	Remarks
1	72.0	1110	4.6×10^{-8}	
2	71.0	1470	1.8×10^{-8}	
3	71.0	1440	1.8×10^{-8}	
		Average=	2.7×10^{-8} cm/sec	

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ____________

STS Job No. W10247

Date 7-10-80

Report No. ____________

PERMEABILITY TEST

Constant Head

Sample B-5% bentonite mixed with east face, north end stockpile

Soil Description Brown fine to medium sand (SP) little fine gravel trace silt with 5% P-200 bentonite

Mark No. 5% B, East face, North end

Compacted Dry Density = 108.9 PCF   Five day hydrated dry density= 105.3PCF

Moisture 7.0 % "During Compaction"

Sample Diameter = 4.0"   Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	1110	72	3.0×10^{-8}	
2	1470	71	1.8×10^{-8}	
3	1440	71	1.3×10^{-8}	

Average = 2.0×10^{-8} cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

PERMEABILITY TEST

Constant Head

Sample A-7% bentonite mixed with East face, North end stockpile sand

Soil Description Brown fine to medium sand (SP) little fine gravel with trace silt with 7% P200 bentonite

Mark No. 7% A, East face, north end

Compacted Dry Density = 107.3 PCF   Five day hydrated dry density-approximately 103. PCF

Moisture 6.3% "During Compaction"

Sample Diameter = 4.0"   Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks

Sample leaked through small void in internal part of sample.

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ____

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Date 7-10-80

Report No. ____

PERMEABILITY TEST

Constant Head

Sample B-7% bentonite mixed with east face, north end stockpile sand

Soil Description Brown fine to medium sand (SP) little fine gravel trace silt with 7% P200 bentonite

Mark No. 7% B, east face north end

Compacted Dry Density = 107.5 PCF Five day hydrated dry density-approximately 103. PCF

Moisture 6.3% "During Compaction"

Sample Diameter = 4.0" Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	187	190	8.4×10^{-8}	
2	187	695	8.4×10^{-8}	
3	201	4224	2.7×10^{-8}	
4	199	162	1.4×10^{-8}	
5	199	325	3.0×10^{-8}	
6	199	833	5.3×10^{-8}	
7	192	325	4.8×10^{-8}	
8	192	284	4.8×10^{-8}	
9	192	771	3.6×10^{-8}	

Average = 4.7×10^{-8} cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No. ______

STS Job No. W10247

Date 7-10-80

Report No. ______

PERMEABILITY TEST

Constant Head

Sample A=10% bentonite mixed with east face, north end stockpile sand

Soil Description Brown fine to medium sand (SP) little fine gravel-trace silt w/10% P-200 bentonite

Mark No. 10% A, east face, north end

Compacted Dry Density = 107.1 PCF Five day hydrated dry density approximately 102 PCF

Moisture 6.3% "During Compaction"

Sample Diameter = 4.0"

Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
	187	92	2.2×10^{-7}	
1	187	263	2.1×10^{-8}	Saturation complete
2	201	1244	1.1×10^{-8}	
3	199	4244	6.0×10^{-9}	
4	199	487	6.3×10^{-9}	
5	192	832	6.4×10^{-9}	
6	192	326	7.0×10^{-9}	
7	192	285	9.6×10^{-9}	
8	192	770	3.6×10^{-9}	

Average = $8.8. \times 10^{-9}$ cm/sec

SOIL TESTING SERVICES, OF WIS., INC.

Project No.

STS Job No. W10247

Date 7-10-80

Report No.

PERMEABILITY TEST

Constant Head

Sample B-10% bentonite mixed with east face, north end stockpile sand

Soil Description Brown fine to medium sand (SP) little fine gravel-trace silt with 10% P200 bentonite

Mark No. 10% B, east face, north end

Compacted Dry Density = 107.8 PCF

Five day hydrated dry density-approximately 103 PCF

Moisture 6.3% "During Compaction"

Sample Diameter = 4.0"

Sample Height = 4¼"

Run No.	Head, inches	Duration, minutes	Permeability cm/sec	Remarks
1	187	1604	8.8×10^{-10}	
2	201	4225	8.2×10^{-10}	
3	199	486	2.7×10^{-10}	
		Average	6.6×10^{-10} cm/sec	

APPENDIX A

Document 10

WPSC Correspondence to WDNR, regarding Modification of Bottom Ash Storage Lagoons, Dated February 21, 2005

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

February 21, 2005

Mr. Jeffrey W. Brauer
Bureau of Watershed Management
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53707

Dear Mr. Brauer:

RE: Plan Approval Application under NR 213
Modification of Bottom Ash Treatment Storage Lagoons

As part of the Weston Power Plant Unit 4 addition, a letter dated September 7, 2004 was submitted that indicated that the existing bottom ash wastewater storage lagoons at the site would be modified due to the construction of a railroad loop track on the site. Although the overall capacity of these lagoons will decrease, by letter dated September 8, 2003, information was provided to demonstrate that the settling capacity of the bottom ash lagoons would remain adequate following the size reduction resulting from this modification. Approval is requested to proceed with the work as described in this document and attached in duplicate for the modification of the bottom ash wastewater storage lagoons to accommodate bisection resulting from the railroad track installation.

To demonstrate compliance with NR 213.09 General submittal requirements, additional information is attached. An Engineering Report is included which details the project and includes information on subsurface site conditions, waste sources, waste analysis and waste volumes. Also included in this approval request are the specifications on the bentonite liner to be used (in a manner similar and compatible with the existing bentonite liner), confirmation from the supplier of the liner compatibility for this application, and the Geotechnical Report containing the results of the subsurface investigation conducted at the site. Finally, a series of site and construction drawings are included for your review.

Please do not hesitate to contact me with any questions that may arise during your review of this information. It is our hope that this is a comprehensive Plan Approval request so that the Department has the information needed to complete the necessary review and approval. Pease contact me at (920) 433-1395 with any questions or comments.

Sincerely,

Randal G. Oswald

Randal G. Oswald
Manager Environmental Programs

cc - Mr. Eric J. Donaldson
State of Wisconsin
Department of Natural Resources
5301 Rib Mountain Drive
Wausau, WI 54401

ENGINEERING REPORT

Engineering Report
For
Bottom Ash Ponds Modification

1. Purpose

This report and referenced information are intended to fulfill the requirements of the Wisconsin Department of Natural Resources Chapter NR 213, Section 213.09. The engineering report covers the proposed modifications intended to the existing bottom ash ponds at the Weston Power Plant, Rothschild, Marathon County, Wisconsin.

2. Description of Lagoons

The two existing bottom ash ponds act as separate but redundant collection lagoons for various plant wastestreams resulting from the operation of the Weston Power Plant. Pressurized drainlines from various facilities throughout the plant, both existing Unit 3 facilities and new Unit 4 facilities, are routed to one or the other bottom ash pond as a common collector. The collected byproducts and waste are then treated for suspended solids reduction and disposed of in accordance with existing permits and applicable regulations.

Location and general size of the bottom ash ponds are detailed as Item R on Drawing 133116-4SR-S1000 (Reference 1). The two ponds, as existing, are located side by side and are designed to allow use of one pond for wastewater collection while the other is being cleaned. The major physical modification intended to both ponds is the addition of a railway crossing to allow crossing of coal trains through the area. The modification will divide each of the two ponds into two sub-ponds. Flow from the east sub-pond to its corresponding western component will be through redundant concrete pipes routed beneath the railway crossing. The berms added on either side of the railway crossing will be lined with the same soil-bentonite liner design as currently exists in the remainder of the ponds. The intent is to replace like-for-like with regard to berm and liner construction.

The full surface area of each bisected pond (measured at the top of berm) after completion of the crossing is approximately 3.2 acres. The terrain surrounding the ponds varies in elevation, resulting in the top of berm being approximately three feet above natural grade on the south side of the ponds and seven feet above grade along the north side. The bottom of each pond is located approximately eight feet below the top of the berm.

Water from the west end of either pond enters the Bottom Ash Treatment Facility to receive additional solids settling and pH control as needed. After treatment water is discharged to a tertiary pond from where it is either discharged to the Wisconsin River via existing Outfall 002 after combination with other facility wastewater or reused for additional bottom ash sluicing.

3. Waste Sources and Waste Volumes

The effluent being directed to the bottom ash ponds consists of wastestreams from several operations, both existing and planned, at the Weston Power Plant. The sources and a description of the wastestreams are as follows.

- Precipitation runoff from the temporary ash storage area (existing input).
- Effluent water from the Unit 3 oil/water separator (existing input).
- Process water from the Unit 3 bottom ash sluicing (existing input).
- Reverse osmosis (RO) concentrate from the Unit 3 Cycle Makeup Treatment System (existing input).

- Filter backwash water from the Unit 4 River Water Treatment System (new input).
- Effluent water from the Unit 4 oil/water separator sump (new input).
- Filter backwash water and reverse osmosis (RO) concentrate from the Unit 4 Cycle Makeup Treatment System (new input).
- Overflow from clarifiers during startup (new input).
- Filtrate water from the Unit 4 filter press (new input).
- Lime and recycle wastewaters and lime preparation area drains from the Unit 4 Air Quality Control System (new input).

The two ponds were originally designed to treat the effluent from two plants the size of Unit 3. Unit 4 bottom ash handling will not be by a sluice system, as is used for Unit 3, therefore the relatively large amount of effluent generated by such a system will thus never be directed to the pond system. The volumes and lengths of the pond remaining after installation of the railway crossing have been checked and confirmed as adequate to allow sufficient time for treatment of suspended solids for the effluent volumes expected (Reference 2). In addition, an existing sand filter, currently unused, located in the Bottom Ash Treatment Facility is available for additional treatment should that be necessary.

4. Waste Analysis

The expected quality of the combined wastewaters in the Bottom Ash Ponds based on expected existing and new flows and concentrations is as follows:

Calcium, mg/l as $CaCO_3$	157
Magnesium, mg/l as $CaCO_3$	105
Sodium, mg/l as $CaCO_3$	56
Potassium, mg/l as $CaCO_3$	3
M-alkalinity, mg/l as $CaCO_3$	168
Sulfate, mg/l as $CaCO_3$	50
Chloride, mg/l as $CaCO_3$	102
Nitrate, mg/l as $CaCO_3$	3
Silica, mg/l as SiO_2	36
pH	6.0 – 9.0
Total Dissolved Solids, mg/l	488
Total Suspended Solids, mg/l	30
Aluminum, mg/l as Al	0.0695
Arsenic, mg/l as As	0.00028
Cadmium, mg/l as Cd	0.00002
Chromium, mg/l as Cr	0.00011
Copper, mg/l as Cu	0.00209
Cyanide, mg/l	0.00035
Iron, mg/l as Fe	0.6624
Lead, mg/l as Pb	0.00011
Manganese, mg/l as Mn	0.00465
Zinc, mg/l as Zn	0.00327

5. Subsurface Site Conditions

An extensive geotechnical investigation was completed in 2003 for the Weston Unit 4 Project (Reference 3) under the direction of Black & Veatch. This investigation consisted of 50 soil borings, 4 test pits, and other test locations within the general area of new construction at Unit 4. As part of this investigation, a soil boring was completed on either side of the existing bottom ash ponds (BV-3 and BV-4), with several other borings completed in the general surrounding area. Copies of Boring Logs BV-3, BV-4, BV-07, BV-8, and BV-9 are attached to this report.

The subsurface conditions beneath the ponds consist of alluvial sands and gravels. Grain size varied from gravels to fine sands, with a gradation ranging from well- to poorly-graded with little or no fines present. Although minor variations in the alluvium with depth were observed, overall the alluvial deposit is relatively homogeneous. N-counts in the soil in the area of the ponds varied from a minimum of 6 to a maximum of 40.

Based on other borings completed as part of this study, the depth to bedrock is expected to be approximately 85 feet below grade in this area. The bedrock is granite with a weathered surface. Soils and bedrock engineering properties were developed in the investigation and the results summarized in the attached Table 6-1 from Reference 3.

Groundwater was not encountered on any of the borings completed in the immediate area of the proposed pond. Other borings indicate that ground water elevation will be at approximately Elevation 1,146 or 28 feet below the bottom of the ponds.

6. Proposed Method of Lagoon Construction and Components

Modifications to the pond for the railway crossing will be completed one pond at a time to allow one pond to always remain in service. The areas to receive the crossing will be cleaned and excavated to a subgrade with a tested minimum field density of 90% of maximum dry density. Roadbed fills and the pond berms on either side of the railway will be constructed of onsite material compacted to at least 90% of maximum dry density. The top six inches of surfaces to receive the liner will be compacted to 95% of maximum dry density. The pond side of each new berm will then be lined with 12 inches of a soil-bentonite liner that will be protected with 12 inches of compacted native material and 24 inches of compacted crushed rock. Properties and installation requirements for the various subgrades, soil-bentonite liner, and crushed rock surfacing are contained in Specification 133116.71.0201, Section 02220 (Reference 4).

The soil-bentonite mix upon which the design of the liner has been based has been confirmed to consist of 9% (by weight) Envirogel 200 sealant and 91% (by weight) native soil. The native soil is an onsite sand screened to 3/8 inch minus. Details of construction and geometry of the pond construction itself are detailed on the construction drawings (References 5-9).

The general sequence of construction will be as follows.

a. The first pond will be isolated and drained. Particulate in the area to receive the crossing will be removed and disposed of in a manner required by existing permits and as indicated in WPSC submittal dated September 7, 2004 (Attachment 2).
b. The area of the crossing in the first pond will be excavated to acceptable subgrade and as required to install the RCP pipe for under-railway connection between the divided portions of the pond. The concrete inlet/outfall structures at either end of the pipes will also be constructed.
c. Compacted fill will then be placed over the pipe as a base for the track roadbed and the berm located on either side of the railway. In-place density testing in accordance with ASTM D1557 will be completed on the compacted fill to confirm compaction to 90% of maximum dry density with water content at -3% to +2% of optimum. A minimum of one compaction test per 1,000 sqyd of surface area and no less than three tests will be required. Compacted fill will be used to construct the remainder of the berms to the level detailed on the drawings.

d. The top six inches of subgrade to receive the liner will be compacted to 95% of maximum dry density (ASTM D1557) with water content at -0% to +2% of optimum. A minimum of one compaction test per 1,000 sqyd of surface area and no less than three tests will be required.

e. A 12-inch thick soil-bentonite liner will then be placed on the pond side of each berm. The bentonite liner will consist of a mix of 9% (by weight) Envirogel 200 sealant and 91% (by weight) native soil. Native soil will consist of onsite sand screened to 3/8 inch minus. The new liner will be thoroughly mixed and tied into the existing liner at the ends and the toe of the new berms. In-place density testing in accordance with ASTM D698 will be completed on the soil-bentonite to confirm compaction to 85% of maximum dry density with water content at -0% to +3% of optimum. A minimum of one test per 1,000 sqyd of surface area and no less than three tests will be required. In addition, a minimum of five samples will be taken for testing in accordance with NR 213.12(2)(b).

f. After confirmation of the acceptability of the soil-bentonite liner, a 12-inch layer of compacted native material will be placed over the liner as protection. Material will be deposited in layers with each layer compacted to 95% of maximum dry density (ASTM D1557) with water content at -3% to +2% of optimum. A minimum of one test per 500 cuyd of fill and no less than three tests will be required.

g. The pond-side surface of the new berms will then be provided with a protective layer of 24 inches of compacted crushed rock. In-place density testing in accordance with ASTM D4253 and D4254 will be completed on the rock surfacing to confirm compaction to 70% of relative density with water content at -3% to +2% of optimum. A minimum of one test per 200 cuyd of material placed and no less than three tests will be required.

h. The first pond will then be placed in service and the second pond drained. The above process will be completed again for the second pond.

7. Liner and Waste Compatibility

As specified in Section 02220 of the attached specification, the liner at the modifications to the existing ponds will be a soil-bentonite mixture containing at least 5 percent bentonite by dry weight. Testing has been completed to optimize the mix and confirm the permeability properties required. The testing resulted in a design mix of 9% (by weight) Envirogel 200 sealant and 91% (by weight) native soil.

The permeability of the design mix was tested by Maxim Technologies with the results reviewed by an expert retained by Wyo-Ben, Inc., supplier of the bentonite sealant (see attached letter, Reference 10). The testing was completed with actual effluent samples taken from the existing bottom ash ponds, which are comparable in constituents and concentrations to the effluent streams expected upon addition of Unit 4 wastestreams. The tested permeability of the sample mix varied between 2.0×10^{-8} centimeters per second (cm/sec) and 6.7×10^{-9} cm/sec, with an average of 1.8×10^{-8} cm/sec. In all cases the tests values were less than the limit of 1.0×10^{-7} cm/sec set by NR 213.10.7.b. Therefore, the required permeability of the design mix has been confirmed by test.

The design liner mix was also reviewed for compatibility with the expected effluent. As noted in Item 1 of the attached Wyo-Ben letter, the permeability testing confirmed that the proposed "bentonite sealant is compatible with the... pond water sample used in the testing."

The Wyo-Ben letter goes on to say that, assuming the design mix is installed and maintained correctly and the effluent being retained matches that expected, the life of the liner is essentially indefinite; i.e. the properties of the liner will not degrade over time.

This would indicate that the life of the lagoon would be as long as or longer than the design life of the power plant (40 years) for which it is being modified.

References

1. Drawing 133116-4SR-S1000, Rev. 2 – Site Plot Plan (copy attached)
2. E-mail, "(Unit) 3 Ash Pond Capacity", O'Brien to Hayes, dated April 9, 2003 (partial copy attached)
3. WPSC Weston North Unit 4, Geotechnical Report, Rev. 0 (with copies of the following information therein attached)
    - Drawing 133116-SS-0001, Rev. 1 – Subsurface Investigation Location Plan
    - Boring Log BV-3
    - Boring Log BV-4
    - Boring Log BV-7
    - Boring Log BV-8
    - Boring Log BV-9
    - Table 6-1, Soils and Bedrock Engineering Properties
4. Specification 133116.71.0201, Section 02220 – Earthwork (copy attached with pertinent sections noted)
5. Drawing 133116-4SD-S3000, Rev. 2 – Grading and Drainage – Site, Key Plan, General Notes & Legend (copy attached)
6. Drawing 133116-4SD-S3002, Rev. 1 – Grading and Drainage – Site, Area 2 - Plan (copy attached)
7. Drawing 133116-4SD-S3050, Rev. 1 – Grading and Drainage – Site, Typical Sections (copy attached)
8. Drawing 133116-4SD-S3051, Rev. 1 – Grading and Drainage – Site, Typical Sections and Details (copy attached)
9. Drawing 133116-4SD-S3902, Rev. 3 – Grading and Drainage – Site, Typical Containment Details (copy attached)
10. Wyo-Ben, Inc., letter dated February 17, 2005 (copy attached.)

MODIFICATION SUBMITTAL REQUEST

SEPTEMBER 7, 2004

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001

September 7, 2004

Mr. Jeffrey W. Brauer
Bureau of Watershed Management
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53707

Dear Mr. Brauer:

RE: Abandonment/modification of Wastewater Storage Lagoons
Abandonment Plan Approval Application under NR 213.07

As part of the Weston Power Plant Unit 4 addition, a letter dated September 8, 2003 was submitted that indicated that existing wastewater storage lagoons at the site would be abandoned. This action is necessary due to the enlargement of the coal storage yard requiring that both the metal cleaning waste basins and the coal pile runoff basin be removed and replaced with new wastewater storage lagoons. The two existing metal cleaning waste basins will be replaced with a single lagoon sized for the effluent from both Unit 3 and Unit 4. The existing coal pile runoff basin will be replaced with a lagoon sized to capture and hold the runoff from the enlarged coal yard. In addition to the abandonment of these lagoons, the existing Bottom Ash Treatment wastewater storage lagoons will need to be modified to accommodate bisection resulting from the construction of a railroad loop track on the site. This plan identifies the actions that will be taken for the abandonment of three wastewater lagoons and the modification of two additional lagoons. Approval is requested to proceed with the work as described in this document.

Due to the use of each lagoon and the conditions that will exist following the completion of construction at the site, the methods for abandoning each lagoon, including the disposition of excavated materials, does vary. Abandonment will be carried out as follows:

Metal Cleaning Waste Basins

The combined surface area of the two existing metal cleaning waste basins is approximately 56,000 square feet. The lagoons are lined with six inches of crushed stone protecting three feet of compacted bentonite clay on a prepared subgrade. The expanded coal pile will utilize approximately forty percent of the surface area currently occupied by these lagoons. A bentonite liner to prevent infiltration of coal pile runoff underlies the existing coal pile. The expansion of the coal storage area includes extending the coal pile liner by expanding the bentonite liner or installing an HDPE liner beneath the area that will be occupied by the coal pile.

Two alternatives are under consideration for the disposition of the residual materials at the bottom of the existing metal cleaning waste basins. The following actions will be taken during the abandonment process:

1. Following construction of an approved replacement lagoon, the metal cleaning waste basins will be drained to the maximum extent possible using the existing pumping system.
2. Six soil samples will be composited from the residual materials remaining in the lagoon bottoms. Analysis results will be compared against the residual contaminant levels in Table 2 of s. NR 720.11(5).
3. Should the sample results confirm that any residual contamination is below the criteria identified in this table, the sediment characterization data will be submitted to the Department to obtain approval to leave this sediment in place.
4. Should sample results exceed the criteria in Table 2 of s. NR 720.11(5) the residual material will be excavated along with the crushed stone plus a nominal amount of the liner material (approximately 3-6 inches) to ensure that no waste material remains behind.
5. The excavated material would be stored for dewatering and stabilization either within the coal storage area or the onsite temporary ash storage area.
6. This material would be disposed at the Marathon County Landfill. If necessary, additional analysis of the excavated material would be conducted to satisfy disposal requirements of the landfill.
7. Whichever alternative is used for the disposition of this material, once a course of action is determined, the area not otherwise occupied by the expanded coal pile would be filled to grade, graded to provide proper drainage, and seeded or otherwise protected to prevent erosion.
8. As noted, the expanded coal storage area will cover approximately forty percent of the current surface area of the existing lagoons. In those areas where the expanded coal pile will cover portions of the abandoned lagoons, the new liner for the coal pile will be installed on the compacted fill in accordance with the design of the coal pile.

Coal Pile Runoff Lagoon

The existing coal pile runoff lagoon has a surface area of approximately 17,000 square feet. The lagoon is lined with three feet of crushed rock and soil protecting a twelve-inch layer of compacted bentonite clay. The expanded coal pile and runoff collection ditch will utilize approximately ninety-five percent of the surface area currently occupied by this lagoon. A bentonite liner to prevent infiltration of coal pile runoff underlies the existing coal pile. The expansion of the coal storage area includes extending the coal pile liner by expanding the bentonite liner or installing an HDPE liner beneath the area that will be occupied by the coal pile.

The following actions will be taken during the abandonment process for this lagoon:

1. Following construction of an approved replacement lagoon, the coal pile runoff lagoon will be drained to the maximum extent possible using the existing pumping system.
2. Since this basin primarily contains fine coal material, the excavated material would be stored for dewatering in the coal storage area prior to being conveyed into the plant for combustion.
3. The very small area outside the expanded coal liner and runoff collection lagoon would be filled to grade, graded to provide proper drainage, and seeded or otherwise protected to prevent erosion.
4. As noted, the expanded coal storage area and runoff collection ditch will cover approximately ninety-five percent of the current surface area of this lagoon. In those areas where the expanded coal pile will cover portions of the abandoned lagoons, the new liner for the coal pile will be installed on the compacted fill in accordance with the design of the coal pile.

<u>Bottom Ash Lagoons</u>

The existing Bottom Ash Treatment wastewater settling lagoons will need to be modified to accommodate bisection resulting from the construction of a railroad loop track on the site. The loop-track intended to be installed for this project will improve site operations by minimizing the blockage of area roads by rail cars and reduce the noise caused by coupling and uncoupling rail cars from the ladder tracks utilized under the current site configuration. By letter of September 8, 2003, information was submitted that provided the engineering basis for concluding that the reduction in the size of these settling basins would not have a significant affect on the ability of the settling lagoon/treatment system to adequately manage the solids generated by the bottom ash sluicing process at this facility.

The existing Bottom Ash Treatment settling lagoons consist of two parallel and redundant primary ash settling basins each decanting to a dedicated secondary ash settling basin. Water from the secondary settling basin is recovered through a pump structure located at the end of the ponds. A 0.45 mm anthracite/sand filter arrangement exists at the pump structure but is currently not used because the existing settling basins deliver effluent of acceptable quality without its use. The coal delivery rail loop will be routed to cross through both secondary settling lagoons. The rail bed will be below the lagoon operating level requiring a watertight berm be installed across the basins on both sides of the track crossing. Each secondary settling basin will therefore be divided into two components, one component each side of the tracks.

Although these lagoons will be modified rather than abandoned, the following describes the actions to be taken during the process to install the railroad loop track through this area:

1. One Bottom Ash Lagoon will be taken out of service at a time to allow continued plant operation. The out of service lagoon will be drained to the maximum extent possible using the existing pumping system.
2. Any residual bottom ash in the basin, crushed stone used as protection for the bentonite liner, and the bentonite liner itself will be removed to enable proper subbase compaction in preparation for the installation of the railroad bed. All excavated material would be stored for dewatering and stabilization within the temporary ash storage area that is onsite.
3. This material would be disposed at the Marathon County Landfill. If necessary, additional analysis of the excavated material would be conducted to satisfy disposal requirements of the landfill.
4. Installation/restoration of lagoon sidewalls along the railroad loop track slope will be done in conformance with the requirements of s. NR 213. Should any area currently used for the Bottom Ash settling basins not be used for the installation of the loop track or modified lagoon perimeter, this area will be graded to provide proper drainage, seeded or otherwise protected to prevent erosion.

Under separate cover, an application requesting approval for the construction of new wastewater lagoons will be submitted.

If you have any questions about this information, please contact me at (920) 433-1395.

Sincerely,

Randal G. Oswald

Randal G. Oswald
Manager Environmental Programs

cc - Mr. Eric J. Donaldson
State of Wisconsin
Department of Natural Resources
5301 Rib Mountain Drive
Wausau, WI 54401

BENTONITE LINER SPECIFICATION

02220 - Earthwork

02220.1 General

02220.1.1 Scope of Work
Scope of Work shall include completing earthwork and shall include other services as specified under these technical specifications.

02220.1.2 Items Furnished by Others and Interfaces
Items furnished by others and not in this Scope of Work include the following:

Excavations and backfill for foundations and underground utilities will be performed under specification 71.0402.

02220.1.3 Performance and Design Requirements
Performance and design requirements for earthwork are indicated in the following table and Article 02220.3.

Component	Design Parameter	Design
Fly ash stabilized (FAS) material	7 day unconfined compressive strength	400 psi
Soil or Soil-Bentonite Liner	Coefficient of Permeability	1×10^{-7} cm/sec

02220.1.4 Codes and Standards
Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Company's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)	ASTM D2487
Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)	ASTM D2488
Placement of Fly Ash Stabilized Soil	Wisconsin Administrative Code Chapter NR 538 *Beneficial Use of Industrial Byproducts*
Placement and Testing of Soil or Soil-Bentonite Liner	Wisconsin Administrative Code Chapter NR 213 *Lining of Industrial Lagoons and Design of Storage Structures*

02220.1.5 Materials

The following materials shall be used:

General	
Component	**Material**
Standard Specification for Concrete Aggregates	ASTM C33
Compacted Sand Fill	Grade 1 per Section 209 of Wisconsin DOT Construction and Materials Manual
Controlled low strength material (CLSM) cement	Portland cement conforming to the provisions of Section 03311 - Cast-in-Place Concrete
CLSM water	Water free from oil, salts, and other impurities which would have an adverse effect on the quality of the CLSM
CLSM aggregate shall meet the following grading as defined by ASTM C-30 for fine aggregate (sieve size)	Percentage passing
3/8 No. 4 No. 8 No. 16 No. 30 No. 50 No. 100	100 95 to 100 80 to 100 50 to 85 25 to 60 5 to 30 0 to 10
Bentonite	Wisconsin Administrative Code Chapter NR 213 *Lining of Industrial Lagoons and Design of Storage Structures*

02220.1.6 Approved Manufacturers of Components

For the following components, only the listed manufacturers are recognized as maintaining the level of quality of workmanship required by these specifications. If the Subcontractor wants to propose a nonlisted manufacturer that is considered to provide an equivalent level of quality, this manufacturer must be identified and supporting testimony provided. Acceptance of the manufacturer as a substitute is at the discretion of the Company:

Component	Manufacturer
None specified	

02220.1.7 Test Requirements

The following testing shall be conducted in accordance with the specified source. Material, compaction, and testing requirements are found on Table 1.

Tests	In Accordance With	Conducted By
Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 5.5 lb (2.5 kg) Rammer and 12 in. (305 mm) Drop	ASTM D698 (Standard Proctor)	Company
Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb (4.5 kg) Rammer and 18 in. (457 mm) Drop	ASTM D1557 (Modified Proctor)	Company
Standard Test Methods for Maximum Index Density Using a Vibratory Table	ASTM D4253	Company
Standard Test Methods for Minimum Index Density of Soils and Calculation of Relative Density	ASTM D4254	Company
Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method	ASTM D1556	Company
Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Method (Shallow Depth)	ASTM D2922	Company
Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method	ASTM D2167	Company
Standard Test Method for Field Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)	ASTM D3017	Company
Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes	ASTM D1587	Company
Standard Test Method for Particle Size Analysis of Soils	ASTM D422	Company
Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D4318	Company
Standard Practice for Characterizing Fly Ash for Use in Soil Stabilization	ASTM D5239	Company

Tests	In Accordance With	Conducted By
Standard Specification for Fly Ash and Other Pozzolans for Use with Lime	ASTM C593	Company
Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders	ASTM D1633	Company
Standard Guide for Coring and Logging Cement – or Lime-Stabilized Soil	ASTM D6236	Company
Test Methods for Unconfined Compressive Strength of Cohesive Soil	ASTM D2166	Company
Standard Test Method for Lime Content of Uncured Soil-Lime Mixtures	ASTM D3155	Company

02220.1.8 Technical Attachments
The following attachments accompany these specifications in either paper or electronic format. The information contained in these documents constitutes requirements under the defined Scope of Work:

Document Number/Description	Title	Revision
None specified		

02220.1.9 Supplemental Specifications
The following technical supplemental specifications, included in Section 01400, contain additional requirements applicable to the work covered under this section:

Number	Title
D100	Site Meteorological and Seismic Data
D200	Design Ambients

02220.2 Products
Not used.

02220.3 Execution

02220.3.1 General
This article covers general earthwork; removal and disposal of debris; excavation; the handling, storage, transportation, and disposal of excavated material; sheeting, shoring, and protection work; preparation of subgrades; dewatering; protection of adjacent construction; backfill; construction of fills, compacted liners, and embankments; surfacing and grading; and other appurtenant work.

All excavations, sheeting, shoring, and temporary excavation support shall be performed in accordance with OSHA 29CFR Part 1926, Subpart P, "Excavations."

02220.3.2 Sheeting and Shoring
The stability of previously constructed structures and facilities shall not be impaired or endangered by excavation work. Previously constructed structures and facilities include both structures and facilities existing when this construction began and structures and facilities already provided under these specifications.

Adequate sheeting and shoring shall be provided to protect and maintain the stability of previously constructed structures and facilities and the sides of excavations until they are backfilled. Sheeting, bracing, and shoring shall be designed and built to withstand all loads and restrain all settlement caused by earth movement or pressure, and shall maintain the shape of the excavation.

02220.3.3 Removal of Water
Dewatering due to groundwater is not anticipated during the work performed under this specification. Adequate dewatering equipment shall be provided to remove and dispose of all surface water entering excavations and other parts of the work. Each excavation shall be kept dry. Dewatering shall continue until the construction is no longer affected by surface water. The dewatering system shall only pump water that is clear and free of fines, with a sand content less than 20 ppm. The discharge shall be arranged so that samples can be collected.

Surface water shall be diverted and prevented from entering excavations.

Pipe or conduit used for drainage purposes shall be kept clean and free of sediment. Temporary drainage piping that is not a part of the permanent construction shall be removed at the completion of the work.

When the work is completed, all parts of the permanent plant drainage system used for water disposal shall be returned to the original condition. Dewatering work shall not overload the plant drainage system. Dewatering discharge shall be routed to a location specified by the Company.

Header systems may be laid on top of the ground provided they do not obstruct plant operations, construction activity, or traffic.

Proposed dewatering systems shall be submitted to the Company for review.

02220.3.4 Blasting
Blasting or other use of explosives for excavation will not be permitted.

02220.3.5 Classification of Excavated Materials
Classification of excavated materials shall be made as follows:

> Rock. Rock shall be defined as limestone, hard shale, or similar material in masses more than 1/2 cubic yard (0.38 m^3) in volume, or in ledges 4 inches (102 mm) or more in thickness that require percussive methods for excavation.
>
> Earth. All material not classified as rock.

Boulders over 12 inches in diameter shall be kept separate from other excavated materials. Disposal of boulders shall be as directed by the Company.

Rock that cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill, fill, or embankment materials.

Soil identification shall be in accordance with ASTM D2487, Table 1, Soil Classification Chart. Identification and classification shall be based upon visual examination and simple manual tests performed by qualified personnel in accordance with ASTM D2488. Classification of material shall be acceptable to the Company.

02220.3.6 Freezing Weather Restrictions
Backfill and fill shall not be placed during freezing weather unless acceptable to the Company. Earth material shall not be placed on frozen surfaces, and frozen materials, snow, or ice shall not be placed in any fill or backfill. Placement of Fly Ash Stabilized material shall not be mixed or placed when the air temperature is below 40°F, unless the temperature is at least 35°F and rising.

02220.3.7 Preservation of Trees
Trees shall be preserved and protected as much as possible. Unless specifically authorized by the Company, trees shall be removed only from areas within the construction limits. Removal of additional trees may be permitted by the Company when necessary for the effective execution of the work.

Trees left standing shall be protected from permanent damage. Construction equipment and vehicles shall be parked outside the dripline of trees designated to remain. Trimming of standing trees shall be as directed by the Company.

02220.3.8 Maintenance of Traffic
The Contractor shall conduct his work with as little interference as possible with the work of other suppliers. Whenever it is necessary to cross, obstruct, or close roads, driveways, parking areas, and walks, the Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients at his own expense.

02220.3.9 Unauthorized Excavation
Material excavated below the bottom of concrete structures to be supported on the subgrade shall be replaced with concrete placed monolithically with the concrete above. Rock fill or lean concrete may be used, if acceptable to the Company. Material excavated below structures supported on piles or piers shall be replaced with crushed rock or gravel. The crushed rock or gravel shall be compacted to a density equal to or greater than the density of the adjacent undisturbed soil.

02220.3.10 Testing
Field and laboratory testing required to determine compliance with the compaction requirements will be provided by the Company. Assistance shall be provided to the Company's field testing representative upon request. The Contractor will be furnished one copy of the test results.

All test holes in the soil–bentonite liner shall be backfilled using material identical to the liner design materials and compaction.

The terms "maximum density" and "optimum moisture content" shall be as defined in ASTM D1557.

Relative density for compacted crushed rock materials shall be determined in accordance with ASTM D4253 and D4254. The term "relative density" shall be as defined in ASTM D4254.

02220.3.11 Site Preparation
Subgrades for permanent construction, including subgrades for liners, fills and embankments, shall be stripped of surface vegetation, sod, debris, and organic topsoil. Surface vegetation shall be removed complete with roots to a depth of not less than 4 inches (102 mm) below the ground surface.

All combustible and other waste materials shall be removed from the construction areas. Disposal shall be as specified in Section 02223, Clearing and Grubbing. Open burning is not permitted at the site.

Organic topsoil that is free of trash, vegetation, rocks, and roots shall be stockpiled for later use under separate specifications.

02220.3.12 Overexcavation and Fly Ash Stabilization
Overexcavation and soil improvement shall include mix design preparation, excavation, subgrade preparation, mixing, placement, and testing of fly ash stabilized (FAS) mat beneath the generating building foundation. Additional soil improvement shall also include FAS subgrade for the ponds. The extent of the overexcavation and soil improvement shall be as indicated on the drawings.

Use of the fly ash shall be in accordance with Wisconsin Administrative Code Chapter NR 538 *Beneficial Use of Industrial Byproducts*. It will be the responsibility of the Contractor to fulfill the requirements of the code.

02220.3.12.1 Materials. Fly ash to be used shall be obtained from the onsite Unit 3 fly ash storage silo provided by the Company. All fly ash used for soil improvement shall be initially approved based in the requirements of ASTM D 5239, Standard Practice for Characterizing Fly Ash for Use in Soil Stabilization. Fly ash provided by the Company shall be considered "prequalified" by ASTM D5239. If fly ash other than that supplied by the Company is required, the Contractor shall be responsible for providing initial fly ash characterization.

02220.3.12.2 Design Proportion Testing. Prior to placement of FAS material, a mix design shall be prepared by the Contractor. The mix design shall be subject to approval by the Company. The mix design shall fulfill the design requirements in Article 02220.1.3. The mix design shall include the following:

> Optimum moisture content and maximum dry density for the FAS material as determined by ASTM D 1557. The test shall be performed on sampled compacted 2 hours after mixing with water. The delayed compaction is meant to simulate the delay between mixing and compaction in the field.
>
> Fly ash, water, and base material proportions by weight required to meet the design requirement in Article 02220.1.3. The design strength requirements shall be determined by ASTM D 1633 Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders. The samples for testing shall be prepared using the same 2 hour delay time as the compaction samples.
>
> Lime content of the design mixture shall be determined in accordance with ASTM D3155. A calibration curve shall be prepared for field verification.
>
> As part of the mix design, the Contractor shall provide description of the proposed mixing and placement methods.

If retarders are used to increase the delay time between mixing and compaction, testing shall be performed to verify that the strength requirements are met.

02220.3.12.3 Overexcavation. Overexcavation beneath the generating building foundation shall be completed in accordance with Articles 02220.3.2 and 02220.3.14 and as shown on drawings.

02220.3.12.4 Weather Restrictions. Unless otherwise approved by the Company, placement shall not be permitted when the subgrade or surface on which the base is to be placed is frozen.

02220.3.12.5 Subgrade Preparation. The subgrade shall be leveled and compacted. The subgrade surface shall be well bonded to the previous layers of fill.

The subgrade shall be kept moist until the next lift is placed. If the subgrade surface becomes dry, prior to the placement of additional lifts, the subgrade shall be moistened to allow proper bonding.

02220.3.12.6 Mixing. The aggregate shall be mixed with the proper amount of fly ash until a thorough and uniform mixture is obtained. Retarders shall only be used upon approval by the Company. The aggregate and FAS material shall be handled in a manner in which will prevent contamination and segregation. The mix equipment will be capable of discharging the mixture without undue segregation.

If mixing plants are used, the mixing equipment shall be equipped so as to permit the Company to verify the component percentages at any time. Mixing plants shall be equipped with batching devices and scales for proportioning the individual components by weight and shall be of such accuracy that the percentages based on the total dry weight will be maintained with the following tolerances:

Fly ash ± 0.25 percent
Water ± 2.0 percent

An approved method of checking and calibrating the weighing system shall be located within easy access on the plant or mixing area. If water is added during mixing, the flow of water in to the mixer shall be controlled by a meter or other approved regulating device to positively maintain uniform moisture content in the mixture.

If mixing is completed in-place, aggregate and fly ash shall be placed in uniform layers with proper thickness to produce the design mixture. The fly ash shall be applied with such accuracy that the percentage based on the total dry weight will be maintained with the following tolerances:

Fly ash ± 1.0 percent

The depth of the mixing shall be sufficient to provide uniform mixing of each lift. Unless otherwise approved by the company, the thickness of each mixed, uncompacted lift shall be limited to the maximum thickness of the lift allowed in Table 1. The depth of the mixing shall also not exceed the maximum allowed lift thickness. Water shall be uniformly applied to ensure sufficient moisture content in accordance with Table 1.

The amount of lime in the mixture shall be verified by ASTM D3155 using the calibration curve determined for the design mix. The frequency of the testing shall be every 2,000 cubic yards for the first 10,000 cubic yards then every 5,000 cubic yards thereafter. The lime content of the mixture shall not be less than 2 percent of the design optimum lime percentage.

02220.3.12.7 Placement and Compaction. FAS shall be placed in approximately horizontal layers. Material deposited in piles or windrows shall be spread and leveled before compaction. If the material fails to meet the specified density, compaction methods shall be altered.

The compaction shall be completed and tested within two hours of mixing the FAS material. If for any reason construction operations are delayed or suspended and the Company orders any loose or uncompacted material removed or disposed of, the Contractor shall perform this work at his own expense. No FAS material may be salvaged or recycled into new FAS material.

02220.3.12.8 Testing. Field and laboratory testing required to determine compliance with the compaction requirements will be provided by the Company. Assistance shall be provided to the Company's field testing representative upon request. Field testing of the FAS material shall include in-place density and moisture content. Laboratory testing shall include unconfined compression testing to verify the FAS material strength requirements. The Contractor will be furnished one copy of the test results.

Upon completion of every two feet of compacted FAS material, cores shall be collected and logged from at least two separate locations within the fill. The frequency of the testing may adjusted by the Company depending on the progress of the FAS placement. The intent of the sampling is to field verify the compacted FAS material strength. Core samples will not be required when the FAS material is specified less than 12 inches in thickness. The core shall be collected in accordance with ASTM D6236 Standard Guide for Coring and Logging Cement- or Lime-Stabilized Soil. The purpose of the testing is to determine the quality, curing progress, bonding, and total thickness of the FAS material lifts. At least one section of the each core shall be tested by ASTM D2166 to verify the design requirements.

02220.3.12.9 Finishing. After compaction is completed to the required grade, the cement-stabilized soil surface shall be shaped to the required lines, grades, and cross section. The subgrade shall be checked by the use of elevation stakes or other means acceptable to the Company. The resulting surface shall be compacted to the specified density. Rolling shall continue until the entire grade conforms to the specified density requirements.

During the finishing operation, the moisture content of the surface material shall be maintained at not less than two percentage points below its specified optimum moisture content. Surface compaction and finishing shall produce a smooth, dense surface, free of compaction planes, cracks, ridges, and loose material.

02220.3.13 Roadway and Railroad Roadbeds
Roadway and railroad roadbed construction shall include excavation, subgrade preparation, and construction of fills and embankments. In excavated roadbed areas, overburden shall be removed and the subgrade shaped to line, grade, and cross section. Soft, organic, and other unacceptable material shall be removed from the subgrade and replaced. The replacement material shall meet the requirements of Article 02220.3.17, Structural Fill.

The subgrade shall be compacted and finished to a uniform surface without depressions that hold water or prevent proper drainage. The subgrade shall be finished to within 0.1 foot (0.03 m) of the elevation indicated on the drawings. Deviations of the subgrade surface in excess of 0.1 foot (0.03 m) as indicated by a 16 foot (5 m) straightedge, or template cut to typical section, shall be corrected.

Ditches and drains along the subgrade shall be maintained for effective drainage. When ruts of 2 inches (51 mm) or more in depth are formed, the subgrade shall be reshaped and recompacted.

Materials shall not be stored or stockpiled on subgrades.

02220.3.14 Fills and Embankments
Fills and embankments shall be constructed to lines and grades indicated on the drawings.

02220.3.14.1 Materials. To the maximum extent available, earth materials obtained from excavation shall be used for the construction of fills and embankments. Additional material shall be obtained from borrow areas.

Fill and embankment material shall be earth only and shall be free from brush, stumps, logs, roots, debris, and organic or other deleterious materials. Fill and embankment material obtained from off-site sources shall be free of contamination. The fill/embankment material supplier shall provide documentation that the material is free of contamination.

02220.3.14.2 Subgrade Preparation. The subgrade shall be leveled and compacted. The subgrade surface shall be well bonded to the previous layers of fill.

02220.3.14.3 Placement and Compaction. Fill and embankment materials shall be placed in approximately horizontal layers. Material deposited in piles or windrows shall be spread and leveled before compaction.

Water shall be added and worked into each layer using harrow, disk, blade, or other acceptable equipment to provide a uniform moisture content. If the material fails to meet the specified density, compaction methods shall be altered.

02220.3.14.4 Borrow Areas. Material necessary to complete fills and embankments shall be excavated from borrow areas and hauled to the fill or embankment site.

02220.3.15 Structure Excavation
Excavation for structures shall be completed to the designated lines and elevations. Machine excavation shall be controlled to prevent undercutting the subgrade elevations indicated on the drawings.

Construction areas shall be kept as free as possible from obstructions. Work shall not interfere with the transportation, storage, or handling of materials. Excavated materials that meet the specified requirements may be used for the fills, embankments, and backfills.

Vertical faces of excavations shall not be undercut to provide for extended footings.

02220.3.16 Structure Subgrades
Subgrades for structures shall be firm, dense, free from mud, thoroughly compacted to the specified density, and sufficiently stable to remain firm and intact.

Structure subgrades that can not achieve the required density shall be over-excavated to 2 feet below the structure, and replaced with structural fill.

Subgrades that are otherwise solid, but become mucky on top due to construction operations, shall be stabilized by reinforcing them with one or more layers of crushed rock or gravel.

The finished elevation of stabilized structure subgrades shall not be above the subgrade elevations indicated on the drawings.

02220.3.17 Structural Fill
Structural fill is fill placed beneath roads and structures. Structural fill shall be mechanically compacted. Structural fill requirements are provided in Table 1.

Particular care shall be taken to compact structural fill beneath pipes, drives, roads, or other surface construction. When a trench passes through structural fill, the fill shall be placed and compacted to at least 12 inches (305 mm) above the top of the pipe elevation before the trench is excavated.

02220.3.18 Structure Backfill
Backfill around and outside of structures shall be deposited in horizontal layers. Backfill shall be mechanically compacted. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

Backfill material shall be composed of earth only and shall not contain wood, grass, roots, broken concrete, stones, trash, or debris of any kind.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose earth having a moisture content required to obtain the specified density of the compacted soil. Moisture content shall be distributed uniformly. Water added for correction of moisture content shall be distributed uniformly prior to compaction. Granular material shall be wet, not just damp, when compacted.

02220.3.19 Geosynthetic Liner Subgrades
Preparation of the subgrade for geosynthetic liner including FAS subgrade for the ponds shall be completed to the designated lines and elevations.

Surfaces prepared for geotextile/geomembrane installation will be smooth and free of debris, roots, and angular or sharp rocks larger than 3/8 inch (10 mm) in diameter. No sharp stones or other hard objects that will not pass through a 3/8 inch (10 mm) screen will be present in the top 6 inches (152 mm) of the surface to be lined. The subgrade will be protected from erosion. Any areas of the subgrade that are soft, weak; maintain inadequate moisture conditioning; contain ruts, stones, sharp breaks, or holes; or are otherwise unacceptable will be removed or repaired prior to releasing the subgrade for liner installation.

Approval of the subgrade shall be subject to walk-through inspection by the Company and geotextile/ geomembrane supplier. Once approved, it will be the responsibility of the Contractor to keep the previously prepared subgrade in the accepted condition until the geotextile and geomembrane installations are complete.

02220.3.20 Compacted Rock Fill
Compacted rock fill shall consist of crushed rock. Compaction shall be performed with vibrating mechanical compactors.

Crushed rock for compacted fill shall be handled and placed in a manner that will prevent segregation of sizes. The fill material shall have the best practicable moisture content to achieve specified density.

If concrete is to be placed on the compacted rock fill, the fill shall be finished with a thin layer of clean concrete sand to fill all voids and interstices and to obtain the required subgrade elevation.

02220.3.21 Compacted Sand Fill
Compacted sand fill material shall consist of clean, natural sand.

Sand fills shall be placed on undisturbed subgrade. Sand shall be compacted using mechanical vibrators. Moisture content shall be adjusted for maximum density.

02220.3.22 Soil or Soil Bentonite Liner
Soil or soil-bentonite liner shall be installed in the locations indicated on the drawings. Bentonite shall be applied at a rate recommended by the manufacturer or independent soil expert. Completed soil-bentonite liners shall have a minimum of 5 percent bentonite by dry weight. Bentonite shall be thoroughly admixed with the soil throughout the entire thickness of each lift.

02220.3.23 Drainage Fills
Sand drainage fills and drainage filter material shall be as indicated on the drawings. Unwashed material is unacceptable.

Sand drainage fill and drainage filter material shall be compacted with a vibrating compactor. Moisture content shall be adjusted to achieve maximum density.

02220.3.24 Controlled Low Strength Material
Controlled low strength material (CLSM) shall be installed in the locations shown on the drawings or may be used in locations acceptable to the Company.

CLSM shall consist of a fluid, workable mixture of aggregate, cement, and water. Mix designs for review and approval by the Company shall be prepared and submitted prior to use.

02220.3.24.1 Materials. The aggregate, cement, and water shall be proportioned either by mass or by volume. Not less than 130 pounds of cement shall be used for each cubic yard of material produced. The water content shall not exceed 600 pounds per cubic yard, and shall be a workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

CLSM shall be placed in a uniform manner that will prevent voids in or segregation of the backfill, and will not float or shift the pipe when used as trench backfill. Foreign material which falls into the trench prior to or during placing of the CLSM shall be immediately removed.

02220.3.24.2 Placement. Backfilling over or placing any material over CLSM shall not commence until 4 hours after the slurry cement backfill has been placed.

02220.3.24.3 Testing. Field and laboratory testing required to determine compliance with the specification requirements will be provided by the Company. Assistance shall be provided to the Company's field testing representative upon request. The Contractor will be furnished one copy of the test results.

At least four 6 inch diameter cylinders shall be molded from the first batch of CLSM provided for the project. Two cylinders shall be tested at an age of 7 days and the other two at an age of 28 days. The grout samples shall have a minimum compressive strength of 100 psi at the age of 28 days. Additional testing will be at the discretion of the Engineer and Construction Manager.

02220.3.25 Maintenance and Restoration of Fills, Embankments, and Backfills
Fills, embankments, and backfills that settle or erode before final acceptance of the work, and pavement, structures, and other facilities damaged by such settlement or erosion, shall be repaired. The settled or eroded areas shall be filled, compacted, and graded to conform to the elevation indicated on the drawings or to the elevation of the adjacent ground surface. Damaged facilities shall be repaired in a manner acceptable to the Company.

Earth slopes of the roads and railroads constructed under these specifications shall be maintained to the lines and grades indicated on the drawings until the final acceptance of the work.

02220.3.26 Final Grading
In areas where final grading is required, all ground surface areas disturbed by construction or construction plant and operations shall be graded. The grading shall be finished to the contours and elevations indicated on the drawings or, if not indicated, to the matching contours and elevations of the original, undisturbed ground surface. The final grading shall provide smooth uniform surfaces and effective drainage of the ground areas.

02220.3.27 Disposal of Materials
Surplus earth and materials not suitable for the work shall be spoiled on the site in a manner and location designated by the Company. Offsite disposal may be used, if allowed by the Company. Disposal shall be in accordance with all federal, state, and local requirements.

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Fly Ash Stabilized (FAS) Material	-	3 inch max ≤85 percent minus No. 200	ASTM D1557, Method C	3 initial tests, further tests as directed	95% Max. Dry Density	ASTM D2922; and ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 cy, or as required	-1% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in uncompacted	Additional testing shall be performed in accordance with Article 02220.3.12.2.
Fill and embank-ment subgrade	-	-	ASTM D1557, Method C	3 initial tests; further tests as directed	90% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 1,000 sy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	6 in. depth	Scarified and rolled

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Fills and embank-ments	-	6 inch max; 3 inch max in upper 18 inches	ASTM D1557, Method C	3 initial tests, further tests as directed	95% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	-
Structure subgrade	-	-	ASTM D1557, Method C	1 initial test; further tests as directed	95% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 1,000 sy, or as required. Min one per foundation for foundations over 10 sy	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	6 in. depth	-

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Liner subgrade	LL <50 PI <15	3/8" max	ASTM D1557, Method C	3 initial tests, further tests as directed	95% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 1,000 sy, or as required	0% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	6 in. depth	No sharp stones, sticks or other hard objects that will not pass through a 3/8 inch (10 mm) screen will be present in the top 6 inches (152 mm)
Structural fill (Fills beneath structures)	LL <50 PI <15	3 inch max ≤85 percent minus No. 200	ASTM D1557, Method C	3 initial tests, further tests as directed	95% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	-

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Structure backfill	Structure backfill placed against below grade walls shall be non-swelling material with a liquid limit (LL) less than 50. Backfill containing cohesive material shall be classified as a CL or ML, according to the Unified Soil Classification System (USCS).	3 inch max ≤85 percent minus No. 200	ASTM D1557, Method C	3 initial tests; further tests as directed	95% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 200 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	Compaction by inundation with water will not be permitted.

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Roadway roadbed	-	-	ASTM D1557, Method C	3 initial tests; further tests as directed	90% Max. Dry Density	ASTM D2922; and ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 sy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. depth	-
Compacted rock fill	Non-plastic	1-1/2 in. (38 mm) max. to crusher fines ASTM C33	ASTM D4253 and D4254	3 initial tests; further tests as directed	70% Relative Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 200 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	-

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Compacted sand fill	Non-plastic	Grade1 per Section 209 of Wisconsin DOT	ASTM D1557, Method C	3 initial tests; further tests as directed	90% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 200 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	-
Compacted Soil Liner	Plasticity Index>12	>50% passing No. 200 sieve & <5% retained on No.4 sieve <2% organic material	ASTM D698	3 initial tests; further tests as directed	95% max Dry Density	ASTM D2992 or ASTM D2937	One test per 500 sy, minimum of 2 tests per lift per area, or as required	0 to +3% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	Minimum of five permeability tests shall be completed as required in Wisconsin Administrative Code NR213

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Compacted Soil-Bentonite Liner	Plasticity Index>12	>30% passing No. 200 sieve & <5% retained on No.4 sieve	ASTM D698	3 initial tests; further tests as directed	85% max Dry Density	ASTM D2992 or ASTM D2937	One test per 500 sy, minimum of 2 tests per lift per area, or as required	0 to +3% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	8 in. uncompacted	Minimum of five permeability tests shall be completed as required in Wisconsin Administrative Code NR213
Surplus earth and materials not suitable for the work	-	-	ASTM D1557, Method C	As directed	Compaction shall be by not less than three passes of a bull-dozer.or 90% Max. Dry Density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 1,000 cy, or as required	-3% to +2% of optimum water content	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	12 in. uncompacted	Spoil in a manner and location designated by Company. Disposal shall be in accord-ance with all federal, state, and local requirements pertaining to construction landfills.

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks
Sand drainage fill	Non-plastic	Uniformly graded from No. 4 to No. 100 sieve	ASTM D4253 and D4254	3 initial tests; further tests as directed	65% relative density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 cy, or as required	As required	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	4 in. compacted	Clean concrete sand
Drainage filter material	Non-plastic	Uniformly graded from 1-1/2 inch to No. 4	ASTM D1557, Method C or ASTM D698, Method C	1 initial test; further tests as directed	65% relative density	ASTM D2922; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM S1556 or ASTM D2167)	One test per 500 sy, or as required	As required	ASTM D3017; ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D 1556 or ASTM D 2167)	4 in. compacted	Washed rock or crushed gravel

Table 1

Materials, Compaction, and Testing Requirements

Material	Plasticity Require-ments	Gradation Require-ments	Maximum Density	Maximum Density Test Frequency	Required Field Density	Field Density Test	Field Density Test Frequency	Required Field Water Content	Field Water Content Test	Required Lift Thickness	Remarks

ASTM C33 = Standard Specification for Concrete Aggregates.
ASTM D698 = Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft-lb/ft³).
ASTM D1556 = Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
ASTM D1557 = Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lb/ft³)
ASTM D2167 = Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber-Balloon Method.
ASTM D2922 = Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D4253 = Standard Test Methods for Maximum Index Density and Unit Weight of Soils using a Vibratory Table.
ASTM D4254 = Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

CERTIFICATION OF LINER COMPATIBILITY

Wyo-Ben

WYO-BEN, INC.

February 17, 2005

Mr. Jeff Peterson
N2251 Gibson Drive
P.O. Box 120
Medford, WI 54451

Re: Wisconsin Public Service Weston 4 Ash Ponds Liner

Dear Mr. Peterson:

Previously, you have asked us to provide you with a letter responding to the following questions regarding this project:

1. The compatibility of the Envirogel™ bentonite sealant to be used in the ash ponds liner with the waste water to be contained in the ash ponds.
2. The design mix for the ash pond liners.
3. The design life of the ash pond liners.

This letter responds to these questions.

1.) As of this date the permeability test results obtained by Maxim Technologies, Wausau, Wisconsin, over a test period of 501.9 hours (20.9 days) show a range of permeability between $2.9x10^{-8}$ cm/sec. and $6.7x10^{-9}$ cm/sec. with an average of $1.8x10^{-8}$ cm/sec. These test data also show a curious cyclic pattern of variability within this range with an approximate cycle period of 7 days where the highest test values are obtained on Sundays and then drop steadily through the week with the lowest values occurring on Fridays. Over the entire test period the trend of the permeability test results is, however, essentially flat with neither an apparent upward or downward movement of the results. Although no specific basis for the cyclic pattern has yet been found it is my opinion that it is an artifact of the testing method and equipment used. There is no evidence from the test data to suggest that it indicative of the response of the Envirogel™ 200 bentonite sealant to the pond water used for the test. Although only longer term testing will confirm this, the lack of any upward or downward trend in permeability during the test period makes it appear likely that equilibrium or near equilibrium conditions have been achieved. As a result, I believe that the permeability test results obtained to date show that the Envirogel™ 200 bentonite sealant is compatible with the Weston 4 pond water sample used in the testing. The extent to which this pond water sample is representative of the quality of the water in the ponds will define the in place compatibility of the Envirogel™ 200 sealant in the liners. The long term compatibility of the Envirogel™ 200 sealant with the pond water will be dependent upon the constancy of the chemical environment in which it is required to operate. Changes in the pond water quality over time that result in either increased concentration of chemical contaminants or the addition of chemical contaminants may alter this situation and reduce the operational capability of the sealant resulting in increased liner leakage.

2.) The permeability testing conducted by Maxim Technologies at a design mix of 9% Envirogel™ 200 sealant (wt : wt), based on the maximum dry density of the soil with which it was mixed, yielded permeability values that are sufficiently below the required permeability of $1x10^{-7}$ cm/Sec to enable a permeability less than or equal to the required permeability to be achieved in the field provided that the sealant is homogenously mixed into the soil and compacted to a minimum 90% standard Proctor at a moisture content 2% over the Proctor optimum for the mixture. It should be specifically noted that the applicability of this design mix is contingent upon the use of soil having characteristics, such as particle size gradation, Proctor values, Atterberg values, organic content and chemistry, that are the same as the soil used in the laboratory permeability testing. The use of soil having different characteristics than the permeability test soil, or the use of compaction or moisture levels other than those previously, or the containment of pond water with a chemical makeup different than that used in the laboratory testing may require a change in the design mix.

3.) The design life of the Envirogel™ 200 sealant in the pond liners will, essentially, be indefinite if the following assumptions remain true:

1. the physical and chemical characteristics of the soil used in the liner are the same as those of the test soil used in the laboratory permeability testing and they do not change over time.
2. the chemical characteristics of the pond water contained in the ash ponds is the same as that used in the permeability testing and it does not change over time.

The design life of the liner will be dependent upon its construction and its operational environment over time. Assuming the use of soil that has the same characteristics as that used in the laboratory permeability testing, and the use of construction practices that result in placement of the liner on a subgrade compacted to a minimum of 90% standard Proctor, and the use of a homogenous blend of soil and bentonite and a homogenously moistened soil-bentonite mixture, and that the mixture is homogenously compacted to a minimum of 90% standard Proctor at a moisture 2% over optimum using clean potable water into lifts of no greater thickness than 6 inches, and that the completed compacted liner is then immediately covered with a protective cover layer sufficient to prevent it from drying out and to prevent it from being damaged mechanically or from freezing through out its life, and that the chemistry of the water contained in the ponds remains constant then, the design life of the liner should, essentially, be indefinite.

These responses are based upon test data provided to Wyo-Ben, Inc. by third parties. While we have no reason to doubt their accuracy or completeness Wyo-Ben, Inc. did not conduct the testing that produced these results and can not be held responsible for them. It should be explicitly understood that, in providing this information, neither Wyo-Ben, Inc. nor its employees are providing engineering advice or engineering services of any kind.

If you should have any questions about any if the information presented here please don't hesitate to contact me at your convenience.

Sincerely,

Richard K. Brown

Richard K. Brown
Vice President, Resources

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WYO-BEN 1345 Discovery Drive • Billings, Montana 59102 • P.O. Box 1979 • Billings, Montana 59103 • Telephone 406-652-6351 • Telefax 406-656-0748

SUBSURFACE INVESTIGATION

Wisconsin Public Service Corporation
Weston North Unit 4
Rothschild, Wisconsin

Geotechnical Report
Revision 0

B&V Project 133116
B&V File No. 41.0403

January 14, 2004

BLACK & VEATCH CORPORATION
Overland Park, Kansas

BLACK & VEATCH

BORING LOG

BORING NO. BV-03

SHEET 1 OF 1

CLIENT: Wisconsin Public Service Corp.	PROJECT: Weston North Unit 4		PROJECT NO.: 133116
PROJECT LOCATION: Rothschild, WI	COORDINATES: N -3216.9' E -448.3'	GROUND ELEVATION (DATUM): 1180.4 ft (NGVD29)	TOTAL DEPTH: 25.0 (feet)
SURFACE CONDITIONS: Sloping, undulating grass cover, adjacent to trees	COORDINATE SYSTEM: Plant	DATE START: 9/23/03	DATE FINISHED: 9/23/03
LOGGED BY: J. Liljegren JAL	CHECKED BY: E. Meyer EWM	APPROVED BY: M. Petersen MMP	

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
							0	Silty CLAY; dark brown; soft; moist; high plasticity; w/ roots in top 4" [Topsoil]	Boring advanced w/3 1/4" ID; 6 1/2" OD hollow stem auger w/ center plug. Sampler driven w/auto hammer.
SPT	1	1	1	2	3	1.0	0.5	SAND; light brown; very loose; moist; fine grained; well graded [Alluvium]	
SPT	2	2	3	7	10	1.0		grades medium dense	
SPT	3	6	18	21	39	1.0		grades dense; medium grained; w/some fine gravel	
SPT	4	8	11	14	25	1.0	7.0	Gravelly SAND; brown; medium dense; moist; coarse grained; well graded [Alluvium]	
SPT	5	5	6	7	13	1.0	9.5	SAND; brown; medium dense; moist; medium grained; well graded; w/trace fine gravel	
SPT	6	3	4	6	10	1.0		gravel grades out	
SPT	7	5	6	8	14	1.0		grades w/trace fine gravel	
SPT	8	4	5	8	13	1.0	25.0		Bottom of boring @ 25.0'. Water not encountered. Boring backfilled w/cement/ bentonite grout using tremie on 9/23/03.

CORING: CORE SIZE | RUN NUMBER | RUN LENGTH | RUN RECOVERY | RQD RECOVERY | PERCENT RECOVERY | RQD

Depth scale (feet): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30. Elevation (feet): 1180, 1178, 1176, 1174, 1172, 1170, 1168, 1166, 1164, 1162, 1160, 1158, 1156, 1154, 1152.

BLACK & VEATCH

BORING LOG

BORING NO. BV-04
SHEET 1 OF 1

CLIENT	PROJECT	PROJECT NO.
Wisconsin Public Service Corp.	Weston North Unit 4	133116

PROJECT LOCATION	COORDINATES	GROUND ELEVATION (DATUM)	TOTAL DEPTH
Rothschild, WI	N -1949.0' E -549.5'	1170.1 ft (NGVD29)	25.0 (feet)

SURFACE CONDITIONS	COORDINATE SYSTEM	DATE START	DATE FINISHED
Sloping, within v-ditch, grass cover	Plant	9/24/03	9/24/03

LOGGED BY	CHECKED BY	APPROVED BY
J. Liljegren SDL	E. Meyer EWM	M. Petersen MMP

SAMPLING: SAMPLE TYPE, SAMPLE NUMBER, SET 6 INCHES, 2ND 6 INCHES, 3RD 6 INCHES, N VALUE, SAMPLE RECOVERY
CORING: CORE SIZE, RUN NUMBER, RUN LENGTH, RUN RECOVERY, RQD RECOVERY, PERCENT RECOVERY, RQD

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	ELEVATION (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
SPT	1	3	4	6	10	1.5	0	1170	Silty SAND; dark brown; loose; moist; fine grained; well graded; w/roots in top 3" [Topsoil] (0.8) SAND; brown; loose; moist; fine grained; well graded; w/trace silt [Fill]	Boring advanced w/3 1/4" ID; 6 1/2" OD hollow stem auger w/ center plug. Sampler driven w/auto hammer.
SPT	2	3	4	4	8	1.0	2–4	1168–1166		
SPT	3	5	7	7	14	1.0	6	1164	(5.2) SAND; light brown; medium dense; moist; medium grained; well graded [Alluvium]	
SPT	4	5	7	7	14	1.0	8	1162	grades coarse grained; w/trace fine gravel	
SPT	5	11	11	12	23	0.0	10	1160		
SPT	6	8	12	20	32	1.0	14–16	1156–1154	grades dense; fine grained; gravel grades to occasional	
SPT	7	7	10	10	20	1.0	20	1150	grades medium dense; coarse grained; gravel grades to some 20.0' - grades medium grained; gravel grades out	
SPT	8	4	6	10	16	1.5	24	1146	(25.0)	Bottom of boring @ 25.0'. Water not encountered. Boring backfilled w/cement/ bentonite grout using tremie on 9/24/03.

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30
Elevation scale: 1170, 1168, 1166, 1164, 1162, 1160, 1158, 1156, 1154, 1152, 1150, 1148, 1146, 1144, 1142

11/05/2003 8:53 AM Weston North Unit 4

BLACK & VEATCH

BORING LOG

BORING NO. BV-07

CLIENT: Wisconsin Public Service Corp.	PROJECT: Weston North Unit 4		PROJECT NO.: 133116
PROJECT LOCATION: Rothschild, WI	COORDINATES: N -3595.7' E 489.5'	GROUND ELEVATION (DATUM): 1175.0 ft (NGVD29)	TOTAL DEPTH: 25.0 (feet)
SURFACE CONDITIONS: Flat, level, grass cover, open pasture	COORDINATE SYSTEM: Plant	DATE START: 9/23/03	DATE FINISHED: 9/23/03
LOGGED BY: J. Liljegren JAL	CHECKED BY: E. Meyer EWM	APPROVED BY: M. Petersen MMP	

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	ELEVATION (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
SPT	1	1	3	4	7	0.5	0	1175	Silty SAND; dark brown; loose; moist; fine grained; well graded; w/roots in top 6" [Topsoil]	Boring advanced w/3 1/4" ID; 6 1/2" OD hollow stem auger w/ center plug. Sampler driven w/auto hammer.
							1.0		SAND; light brown; loose; moist; fine grained; well graded [Alluvium]	
SPT	2	3	3	4	7	1.5				
SPT	3	4	10	12	22	1.5			grades medium dense; medium grained	
SPT	4	3	7	8	15	1.5			grades fine grained	
SPT	5	5	5	7	12	1.5			grades medium grained; w/trace fine gravel	
SPT	6	4	8	10	18	1.0			gravel grades to some	
SPT	7	6	12	14	26	0.5			grades coarse grained; gravel grades coarse, rounded	
SPT	8	4	9	9	18	1.5			grades medium grained; gravel grades to trace, fine	
							25.0	1150		Bottom of boring @ 25.0'. Water not encountered. Boring backfilled w/cement/ bentonite grout using tremie on 9/23/03.

CORING: CORE SIZE | RUN NUMBER | RUN LENGTH | RUN RECOVERY | RQD RECOVERY | PERCENT RECOVERY | RQD

Depth scale (feet): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30

Elevation scale (feet): 1174, 1172, 1170, 1168, 1166, 1164, 1162, 1160, 1158, 1156, 1154, 1152, 1150, 1148, 1146

BLACK & VEATCH

BORING LOG

BORING NO. BV-08

SHEET 1 OF 1

CLIENT	PROJECT	PROJECT NO.
Wisconsin Public Service Corp.	Weston North Unit 4	133116

PROJECT LOCATION	COORDINATES		GROUND ELEVATION (DATUM)	TOTAL DEPTH
Rothschild, WI	N -2637.5'	E 497.4'	1180.3 ft (NGVD29)	20.0 (feet)

SURFACE CONDITIONS	COORDINATE SYSTEM	DATE START	DATE FINISHED
Flat, level, sand surface	Plant	9/22/03	9/22/03

LOGGED BY	CHECKED BY	APPROVED BY
J. Liljegren SAL	E. Meyer EWM	M. Petersen MMP

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	ELEVATION (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
SPT	1	2	4	6	10	1.5	0	1180	SAND; dark brown; loose; moist; medium grained; well graded; w/some fine gravel [Alluvium]	Boring advanced w/3 1/4" ID; 6 1/2" OD hollow stem auger w/ center plug. Sampler driven w/auto hammer.
SPT	2	8	10	13	23	1.0	2	1178	grades medium dense	
SPT	3	5	13	27	40	1.0	4	1176	grades dense; gravel grades to trace	
SPT	4	7	16	17	33	1.5	6	1174	grades light brown; coarse grained; gravel grades out	
SPT	5	4	6	10	16	1.5	8	1172	grades medium dense; fine grained	
SPT	6	4	7	8	15	1.0	14	1166	grades coarse grained; w/some fine gravel	
SPT	7	3	3	5	8	1.5	18	1162	grades loose; medium grained; gravel grades out	
							20.0	1160		Bottom of boring @ 20.0'. Water not encountered. Boring backfilled w/cement/ bentonite grout using tremie on 9/22/03.

CORING: CORE SIZE | RUN NUMBER | RUN LENGTH | RUN RECOVERY | RQD RECOVERY | PERCENT RECOVERY | RQD

SAMPLE TYPE | GRAPHIC LOG

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30

Elevation scale: 1180, 1178, 1176, 1174, 1172, 1170, 1168, 1166, 1164, 1162, 1160, 1158, 1156, 1154, 1152

BLACK & VEATCH

BORING LOG

CLIENT	PROJECT	PROJECT NO.
Wisconsin Public Service Corp.	Weston North Unit 4	133116

PROJECT LOCATION	COORDINATES		GROUND ELEVATION (DATUM)	TOTAL DEPTH
Rothschild, WI	N -2333.8'	E 232.5'	1188.3 ft (NGVD)	36.0 (feet)

SURFACE CONDITIONS	COORDINATE SYSTEM	DATE START	DATE FINISHED
Flat, top of slope	Plant	9/22/03	9/22/03

LOGGED BY	CHECKED BY	APPROVED BY
J. Liljegren JDL	E. Meyer EWM	M. Petersen MMP

SAMPLING: SAMPLE TYPE / SAMPLE NUMBER / SET 6 INCHES / 2ND 6 INCHES / 3RD 6 INCHES / N VALUE / SAMPLE RECOVERY
CORING: CORE SIZE / RUN NUMBER / RUN LENGTH / RUN RECOVERY / RQD RECOVERY / PERCENT RECOVERY / RQD

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	ELEVATION (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
SPT	1	1	2	2	4	1.5	0	1188	Silty SAND; black; loose; moist; fine grained; well graded; w/organics & roots in top 2" [Topsoil]	Boring advanced w/3 1/4" ID; 6 1/2" OD hollow stem auger w/ center plug. Sampler driven w/auto hammer.
							2	1186	2.0 — SAND; brownish orange; loose; moist; medium grained; well graded; w/some fine rounded gravel [Fill]	
SPT	2	4	3	3	6	1.5	4	1184		
SPT	3	3	8	8	16	1.5	6	1182	grades dark brown; medium dense	
SPq	4	2	3	3	6	1.0	8	1180	grades loose; fine grained	
SPT	5	3	4	4	8	1.0	10	1178	grades medium grained; gravel grades to trace	
							12	1176	12.0 — SAND; light brown; dense; moist; medium grained; well graded w/some fine gravel [Alluvium]	
							14	1174		
SPT	6	5	16	17	33	1.0	16	1172		
							18	1170		
SPT	7	5	7	7	14	1.0	20	1168	grades medium dense; gravel grades to trace	
							22	1166		
SPT	8	4	7	8	15	1.5	24	1164	grades coarse grained; gravel grades to some	
							26	1162		
							28	1160		
							30		gravel grades fine to coarse	

Table 6-1
Soils and Bedrock Engineering Properties

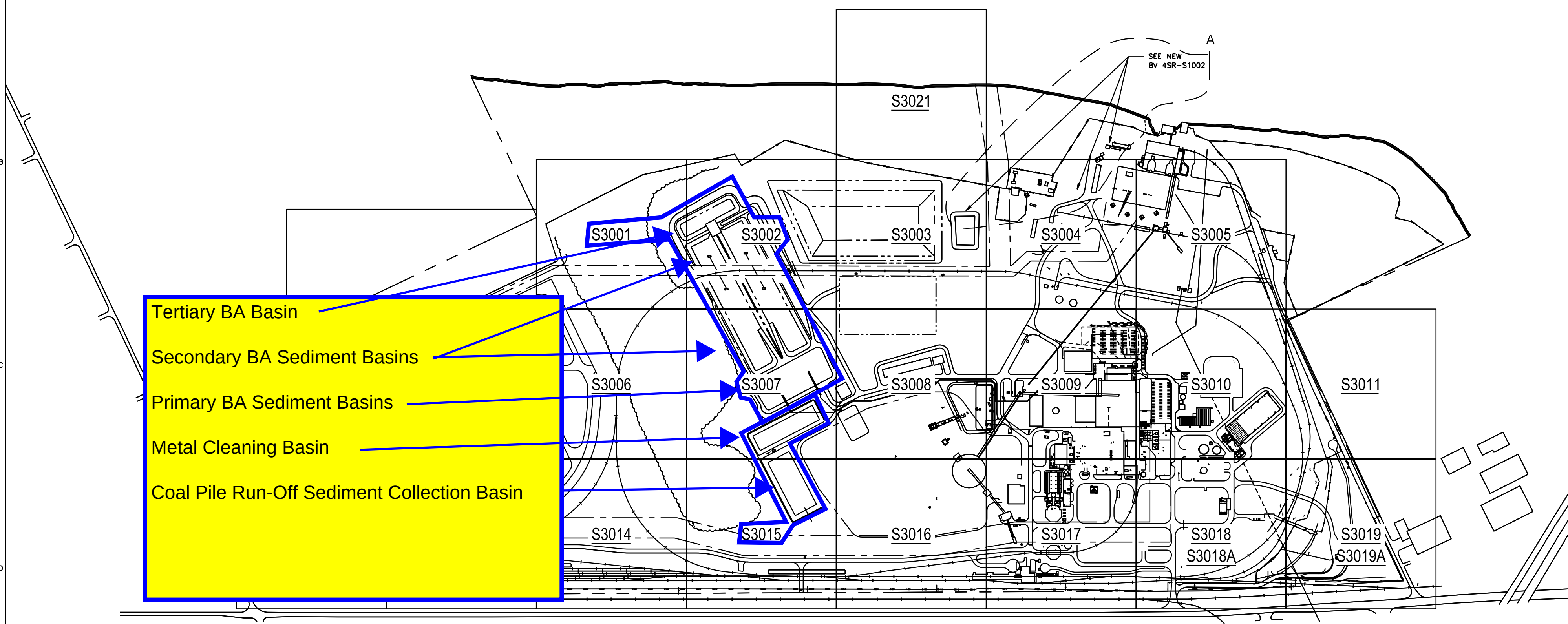
Geologic unit type	Alluvium	Bedrock
Depth to top of unit (feet) [1]	Ground Surface	~95
Unit thickness (feet)	~95	Not Known
Elevation of top of unit (feet NGDV29)	1,180	1,085
Average $N_{spt\ field}$ (blows/foot)	20	NA
Average N_{60} (blows/foot)	27	NA
Relative density (percent)	65	NA
Total moist unit weight, γ_m (pcf)	120	165
Total saturated unit weight γ_{sat} (pcf)	130	165
Effective unit weight γ' (pcf)	70	105
In situ moisture content (percent)	3.5	NT
Static stress-strain modulus, E_s (ksf)	1,000	1.2×10^6
Constrained static modulus, M (ksf)	1,350	-
Poisson's ratio	0.3	0.25
Angle of internal friction (degrees)	35	NT
Percent fines (percent)	2.4	NA
Hydraulic conductivity (cm/sec)	5.8×10^{-2}	NT
Unconfined compressive Strength (ksf)	NA	2,100

Abbreviations:
pcf – pounds per cubic foot
ksf – kips per square foot
cm/sec – centimeters per second
NA – Not applicable.
NT – Not tested.
Note:
The unit thickness and depth to top of bedrock values are limited to the area of the proposed Unit 4. Since the bedrock generally appears to dip to the northeast, others areas should evaluated on a case to case basis.

APPENDIX A

Document 11

Black & Veatch Drawing S3000, Grading & Drainage, Site Key Plan, General Notes & Legend



KEY PLAN
SCALE: 1"=300'

GENERAL NOTES

1. PLANT GRID COORDINATE N 10,000 E 10,000 EQUALS UNIT 3 SITE GRID COORDINATE 0+00 N, 0+00 E. PLANT GRID COORDINATE N 10,000 E 10,000 IS EQUIVALENT TO NAD 27 WISCONSIN STATE PLANE, CENTRAL ZONE, FEET, N 374,611.6, E 2,090,770.04. ELEVATIONS SHOWN ARE NGVD29 FEET. THE GROUND GRID FACTOR IS 0.99988520. PLANT NORTH IS ROTATED 25° 10' CLOCKWISE FROM TRUE NORTH.
2. GENERAL NOTES APPLICABLE TO ALL S3000 SERIES DRAWINGS.
3. SEE DWG 133116-4SR -S1000 FOR OVERALL SITE PLOT PLAN.
4. SEE DWG 133116-4SR -S1001 FOR SITE ARRANGEMENT.
5. COORDINATES SHOWN ARE BASED ON THE PLANT GRID SYSTEM.
6. THE LOCATIONS OF THE EXISTING FACILITIES AND UNDERGROUND UTILITIES SHOWN ON THIS SERIES OF DRAWINGS REPRESENT THE BEST KNOWLEDGE OF THE ENGINEER. BEFORE ANY WORK IS STARTED IN THE AREA OF EXISTING FACILITIES AND UNDERGROUND UTILITIES, THE SUBCONTRACTOR SHALL CONFIRM THEIR LOCATIONS AND NOTIFY THE OWNER THAT WORK IS PLANNED IN THIS AREA.
7. GRADE SHALL SLOPE UNIFORMLY BETWEEN FINISH SPOT ELEVATIONS AND CONTOURS SHOWN ON THE PLANS.
8. A SMOOTH VERTICAL TRANSITION SHALL BE PROVIDED AT ROAD INTERSECTIONS.
9. ALL SLOPES SHALL BE 2.5(H):1(V) OR FLATTER, UNLESS NOTED OTHERWISE.
10. THE SUBCONTRACTOR IS RESPONSIBLE FOR TYING FINISHED CONTOURS INTO EXISTING CONTOURS IN AREAS WHERE THERE IS INSUFFICIENT SURVEY DATA OF THE EXISTING GRADE.
11. ALL DISTURBED AREAS NOT RECEIVING AGGREGATE, ASPHALT, OR CONCRETE SURFACING SHALL BE SEEDED PER EROSION CONTROL PLAN DWG.
12. SEE DWGS 133116-4SR -S3200 AND 133116-4SR -S3250 FOR SITE FENCING AND SURFACING PLAN AND DETAILS.
13. SEE DWGS 133116-4SR -S3400, 133116-4SR -S3910 AND 133116-4SR -S3911 FOR PLANT ROAD PLANS AND DETAILS.
14. SEE DRAWING 133116-4SD -S3900, S3901 AND S3902 FOR GRADING AND DRAINAGE DETAILS.
15. SPOT ELEVATIONS AND CONTOURS ON THESE DRAWINGS ARE TOP OF FINISHED GRADE. SUBTRACT FINISH SURFACING MATERIAL THICKNESS TO OBTAIN TOP OF SUBGRADE. CONTOURS IN AREAS OF NEW RAILWAY REPRESENT TOP OF SUBBALLAST. SEE DRAWINGS 133116-4SR -S3600 THROUGH 133116-4SR -S3607 FOR RAILWAY ALIGNMENT.
16. ALL AREAS OUTSIDE OF POWER BLOCK DISTURBED DURING CONSTRUCTION SHOULD BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITIONS, AND STABILIZED UNLESS NOTED OTHERWISE.
17. ALL UNDERGROUND UTILITIES INCLUDING THE CIRCULATING WATER PIPE SHOULD HAVE A MINIMUM OF 2 FEET OF 95% COMPACTED EARTH COVER BEFORE BEING SUBJECTED TO ANY CONSTRUCTION TRAFFIC, UNLESS NOTED OTHERWISE. IF CONSTRUCTION TRAFFIC EXCEEDS 2700 PSF (EQUIVALENT TO THE TRACK LOAD OF A MANITOWOC M888 CRANE IN TRANSIENT CONDITION WITH NO BOOM LOAD), ONCE THE COVER REQUIREMENT IS MET, THEN THE LOAD MUST BE SPREAD OUT TO 2700 PSF OR LESS USING MATS OR CRIBBING.
18. SLOPE GRADE TO DRAIN IN DIRECTON OF FLOW ARROWS.
19. SEE DRAWING 133116-4SD -S3901 FOR CULVERT SCHEDULE AND DETAILS.
20. THE FINISHED GRADE SHALL BE SET 6 INCHES BELOW TOP OF CONCRETE UNLESS NOTED OTHERWISE. FINISHED GRADE SHOULD SLOPE AWAY FROM THE STRUCTURE AT A MINIMUM SLOPE OF 5% FOR THE FIRST FIVE FEET AND 2% FOR THE NEXT FIVE FEET.
21. EXISTING CULVERTS THAT INTERFERE WITH THE NEW DRAINAGE PLAN SHALL BE REMOVED.
22. ALL WORK DETAILED ON S3000 SERIES DRAWINGS SHALL BE COMPLETED UNDER CONTRACT 71.0201 EXCEPT AS NOTED OTHERWISE.

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

- PROPERTY LINE
- LIMIT OF RIGHT-OF-WAY (R/W)
- PERMANENT SECURITY FENCE
- TEMPORARY CONSTRUCTION FENCE (PHASE 1)
- TEMPORARY CONSTRUCTION FENCE (PHASE 2)
- 99 — NEW CONTOUR
- AREA INLET
- NEW STORM WATER SYSTEM
- NEW CULVERT
- DITCH/SWALE FLOW INDICATOR
- GRADE SURFACE FLOW INDICATOR
- 123.45 + — NEW SPOT ELEVATION
- SURVEY CONTROL MONUMENT
- EXISTING FENCE
- 99 — EXISTING CONTOUR
- 99 — NEW CONTOUR (PHASE 1)
- EXISTING TREELINE
- ASPHALT SURFACING
- AGGREGATE SURFACING
- CONCRETE
- EARTH
- RIPRAP
- SAND/BEDDING MAT'L
- GRASS
- WETLANDS
- 1 — SECTION OR DETAIL NUMBER
- S3000 — DRAWING DESIGNATION NUMBER

PROJECT SURVEY CONTROL

EXISITNG CONTROL MONUMENT LOCATIONS

MONUMENT NO.	PLANT GRID COORDINATES		ELEVATION	DESCRIPTION	COMMENTS
	NORTHING	EASTING			
222	7265.00	10468.25	1178.77	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
223	8369.18	11306.00	1171.14	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
225	9256.00	11112.00	1179.44	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
227	9650.00	11112.00	1179.08	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
228	10000.00	10474.00	1179.09	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
232	10360.00	11009.50	1177.92	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
287	9400.00	11112.00	1178.90	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
289	10310.00	10606.50	1180.00	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
290	10310.00	10766.00	1179.16	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
291	9138.00	11340.00	1173.60	CONCRETE MON. W/ ALUMINUM CAP	NEW MONUMENT
A East	9650.00	11471.10	1174.46	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
E East	9540.00	11471.10	1174.81	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
L East	9380.00	11471.10	1174.25	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
ADJ TRANS. LEVEL	9336.08	11471.10	1173.97	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
BM 6	10000.00	11471.10	1175.85	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
12	10350.00	10469.00	1179.96	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
8	10350.00	10373.00	1180.86	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
5	10350.00	10285.00	1180.66	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
1	10350.00	10185.00	1182.52	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
BM 4	10350.00	10000.00	1184.76	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
BM 1	10000.00	10000.00	1184.86	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
A West	9650.00	10000.00	1177.37	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
E West	9540.00	10000.00	1181.78	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT
L West	9380.00	10000.00	1182.52	CONCRETE MON. W/ ALUMINUM CAP	EXISTING MONUMENT

NOTE:

1. PUBLISHED COORDINATES FOR ADJ TRANS. LEVEL WERE NOT AVAILABLE. COORDINATES SHOWN ARE MEASURED.

ABBREVIATIONS APPLICABLE TO ALL S3000 DRAWINGS

A	ARC LENGTH	LS	LIFT STATION
AGG	AGGREGATE	LTR	LATER
APPROX	APPROXIMATE	MATL	MATERIAL
ASPH	ASPHALT	MH	MANHOLE
AVG	AVERAGE	MSL	MEAN SEA LEVEL
BLDG	BUILDING	MW	MONITORING WELL
B/MH	BOTTOM OF MANHOLE ELEVATION	N	NORTH
BOD	BOTTOM OF ELECTRICAL DUCT BANK	NO.	NUMBER
BOP	BOTTOM OF PIPE	NTS	NOT TO SCALE
BU	BELL UP	OD	OUTSIDE DIAMETER
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	OWS	OIL/WATER SEPARATOR
CJ	CONTRACTION JOINT	PC	POINT OF CURVATURE
CL	CENTERLINE	PE	PLAIN END
CMP	CORRUGATED METAL PIPE	PI	POINT OF INTERSECTION
CO	CLEAN OUT	PL	PROPERTY LINE
D	DEGREE OF CURVE	PLCS	PLACES
Δ	DELTA ANGLE OF HORIZONTAL CURVE	PRC	POINT OF REVERSE CURVE
DI	DUCTILE IRON	PT	POINT OF TANGENT
DIA	DIAMETER	PVC	POINT OF VERTICAL CURVE
DIM	DIMENSION	PVI	POINT OF VERTICAL INTERSECTION
DWG	DRAWING	PVT	POINT OF VERTICAL TANGENT
E	EAST	R	RADIUS
EA	EACH	RCP	REINFORCED CONCRETE PIPE
EF	EACH FACE	RD	ROOF DRAIN
EGP	EDGE OF PAVEMENT	RED	REDUCER
EGS	EDGE OF SHOULDER	REQ'D	REQUIRED
EHH	ELECTRICAL HANDHOLE	REV	REVISION
EL	ELEVATION	R/W	RIGHT-OF-WAY
EJ	EXPANSION JOINT	S	SOUTH
EW	EACH WAY	SE	SUPERELEVATION
EXP	EXPANSION	SIM	SIMILAR
FD	FLOOR DRAIN	STA	STATION
FDN	FOUNDATION	T	TANGENT LENGTH
FF	FINISHED FLOOR	TMH	TOP OF MANHOLE
FG	FINISHED GRADE	TOC	TOP OF CONCRETE
FRP	FIBER REINFORCED PIPE	TOG	TOP OF GRATING
FT	FOOT	TOP	TOP OF PAVEMENT
HC	HANDICAPPED	TYP	TYPICAL
HDPE	HIGH DENSITY POLYETHYLENE	UNO	UNLESS NOTED OTHERWISE
HVCM	HORIZ & VERT CONTROL MONUMENT	V	DESIGN SPEED
HP	HIGH POINT	VERT	VERTICAL
ID	INSIDE DIAMETER	W	WEST
IN	INCH	W/	WITH
INV	INVERT	W/O	WITHOUT
L	LENGTH	WP	WORK POINT
LC	LENGTH OF VERTICAL CURVE		

REV	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
A	08/23/12	REVISED PER ECR #293370, DCF 6486	CMF	JD(JACOBS)			
4	08/20/08	CONFORMED TO CONSTRUCTION RECORDS - NIC	MRR	EX	MJS	MEH	JAH
3	03/07/07	REVISED PER ECN N-S-0215	MRR	EX	MJS	MEH	JAH
2	10/19/04	REVISED PER ECN N-S-0012	MRR	ACM	RLH	MEH	JAH
1	09/15/04	APPROVED FOR CONSTRUCTION	MRR	ACM	MJS	MEH	JAH
0	08/03/04	ISSUED FOR BIDS	WG	ACM		MEH	JAH

TRUE NORTH
25°10'
PLANT NORTH
300' 150' 0 300' 600'
SCALE: 1"=300'

I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E-36488

BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN WG
CHECKED MJS DATE 09/15/04

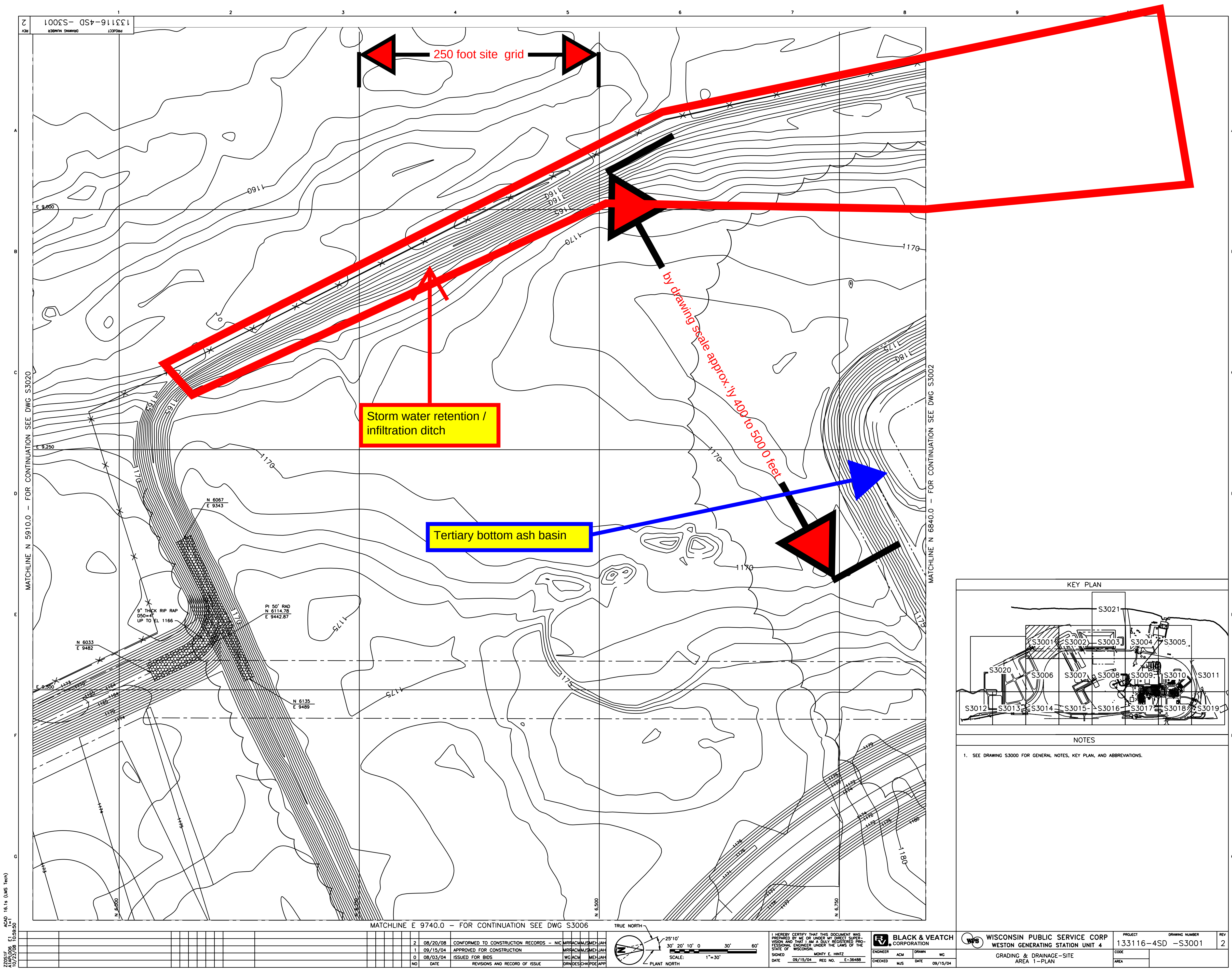
WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4
GRADING & DRAINAGE-SITE
KEY PLAN, GENERAL NOTES & LEGEND

PROJECT / DRAWING NUMBER: 133116-4SD -S3000
REV: A
CODE
AREA

APPENDIX A

Document 12

Black & Veatch Drawing S3001, Grading & Drainage, Site Area 1 Plan

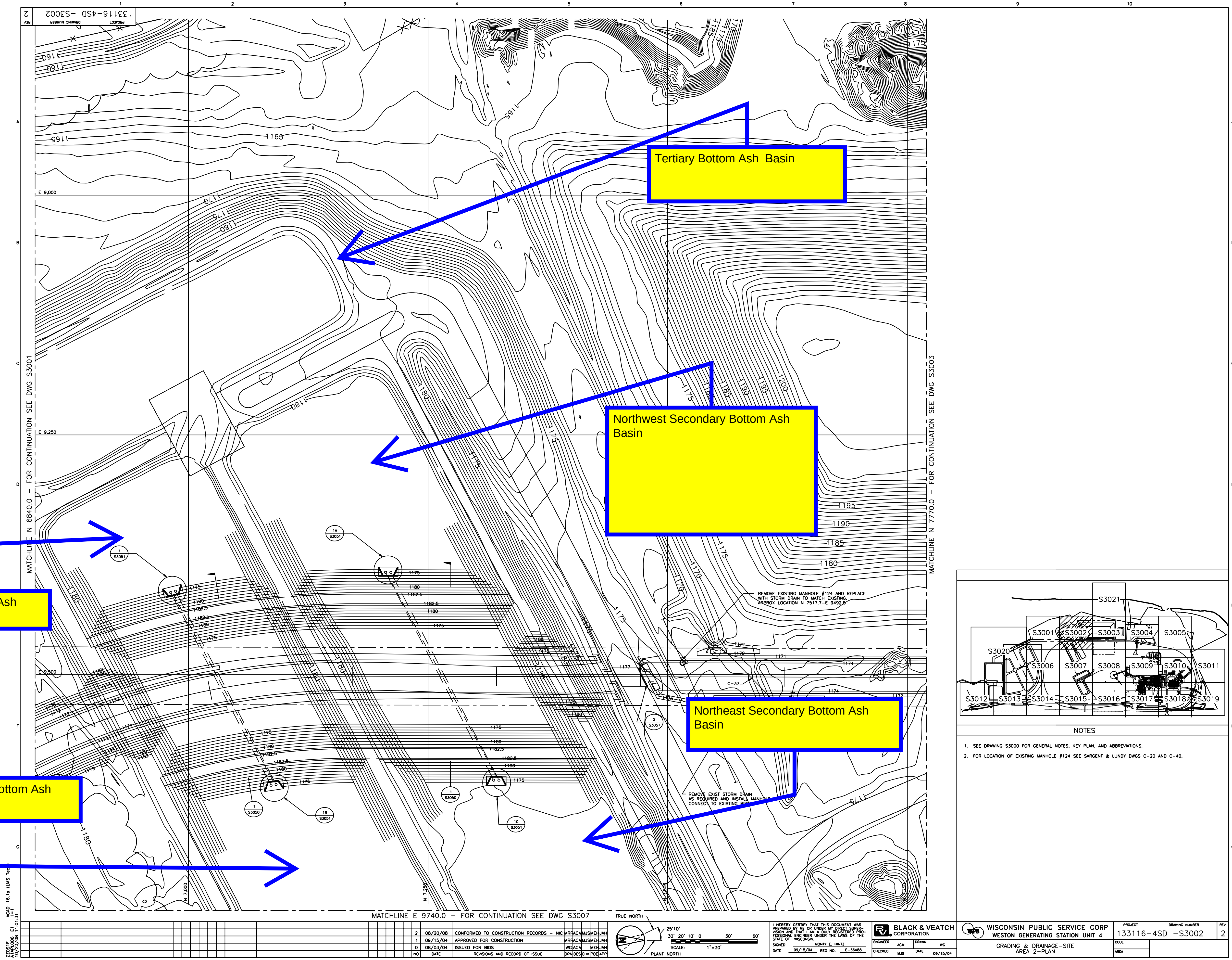


250 foot site grid
Storm water retention / infiltration ditch
by drawing scale approx.'ly 400 to 500 0 feet
Tertiary bottom ash basin
MATCHLINE N 5910.0 – FOR CONTINUATION SEE DWG S3020
MATCHLINE N 6840.0 – FOR CONTINUATION SEE DWG S3002
MATCHLINE E 9740.0 – FOR CONTINUATION SEE DWG S3006
KEY PLAN
NOTES
1. SEE DRAWING S3000 FOR GENERAL NOTES, KEY PLAN, AND ABBREVIATIONS.
2 08/20/08 CONFORMED TO CONSTRUCTION RECORDS
1 09/15/04 APPROVED FOR CONSTRUCTION
0 08/03/04 ISSUED FOR BIDS
NO DATE REVISIONS AND RECORD OF ISSUE
I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E-36488
BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN WG
CHECKED MJS DATE 09/15/04
WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4
GRADING & DRAINAGE-SITE
AREA 1-PLAN
PROJECT DRAWING NUMBER 133116-4SD -S3001 REV 2

APPENDIX A

Document 13

Black & Veatch Drawing S3002, Grading & Drainage, Site Area 2 Plan

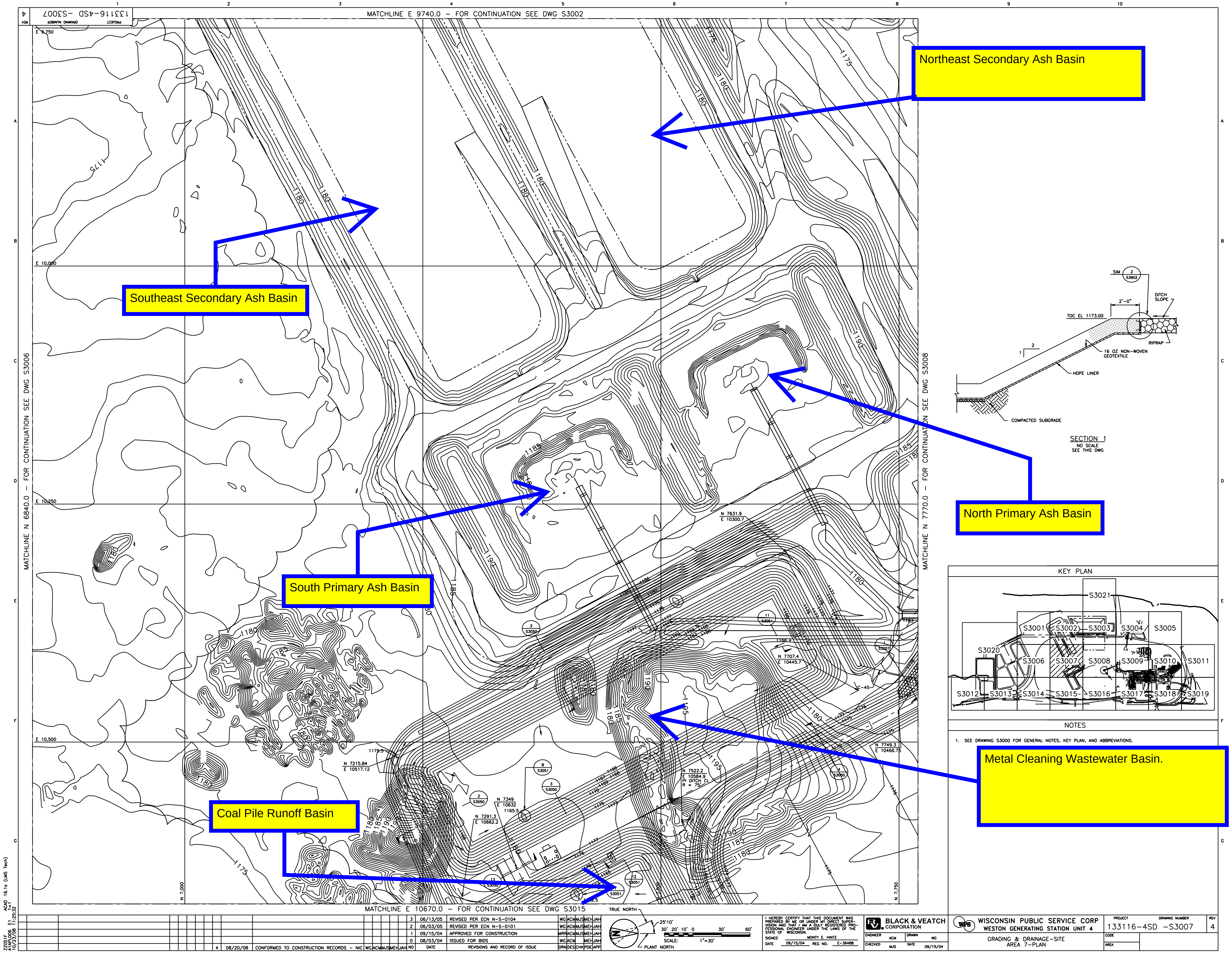


Tertiary Bottom Ash Basin
Northwest Secondary Bottom Ash Basin
Southwest Secondary Bottom Ash Basin
Southeast Secondary Bottom Ash Basin
Northeast Secondary Bottom Ash Basin
MATCHLINE N 6840.0 – FOR CONTINUATION SEE DWG S3001
MATCHLINE N 7770.0 – FOR CONTINUATION SEE DWG S3003
MATCHLINE E 9740.0 – FOR CONTINUATION SEE DWG S3007
REMOVE EXISTING MANHOLE #124 AND REPLACE WITH STORM DRAIN TO MATCH EXISTING. APPROX LOCATION N 7517.7–E 9492.8
NOTES
1. SEE DRAWING S3000 FOR GENERAL NOTES, KEY PLAN, AND ABBREVIATIONS.
2. FOR LOCATION OF EXISTING MANHOLE #124 SEE SARGENT & LUNDY DWGS C–20 AND C–40.
2 08/20/08 CONFORMED TO CONSTRUCTION RECORDS
1 09/15/04 APPROVED FOR CONSTRUCTION
0 08/03/04 ISSUED FOR BIDS
NO DATE REVISIONS AND RECORD OF ISSUE
TRUE NORTH
PLANT NORTH
SCALE: 1"=30'
I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E–36488
BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN WG
CHECKED MJS DATE 09/15/04
WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4
GRADING & DRAINAGE–SITE
AREA 2–PLAN
PROJECT DRAWING NUMBER 133116–4SD –S3002
REV 2

APPENDIX A

Document 14

Black & Veatch Drawing S3007, Grading & Drainage, Site Area 7 Plan

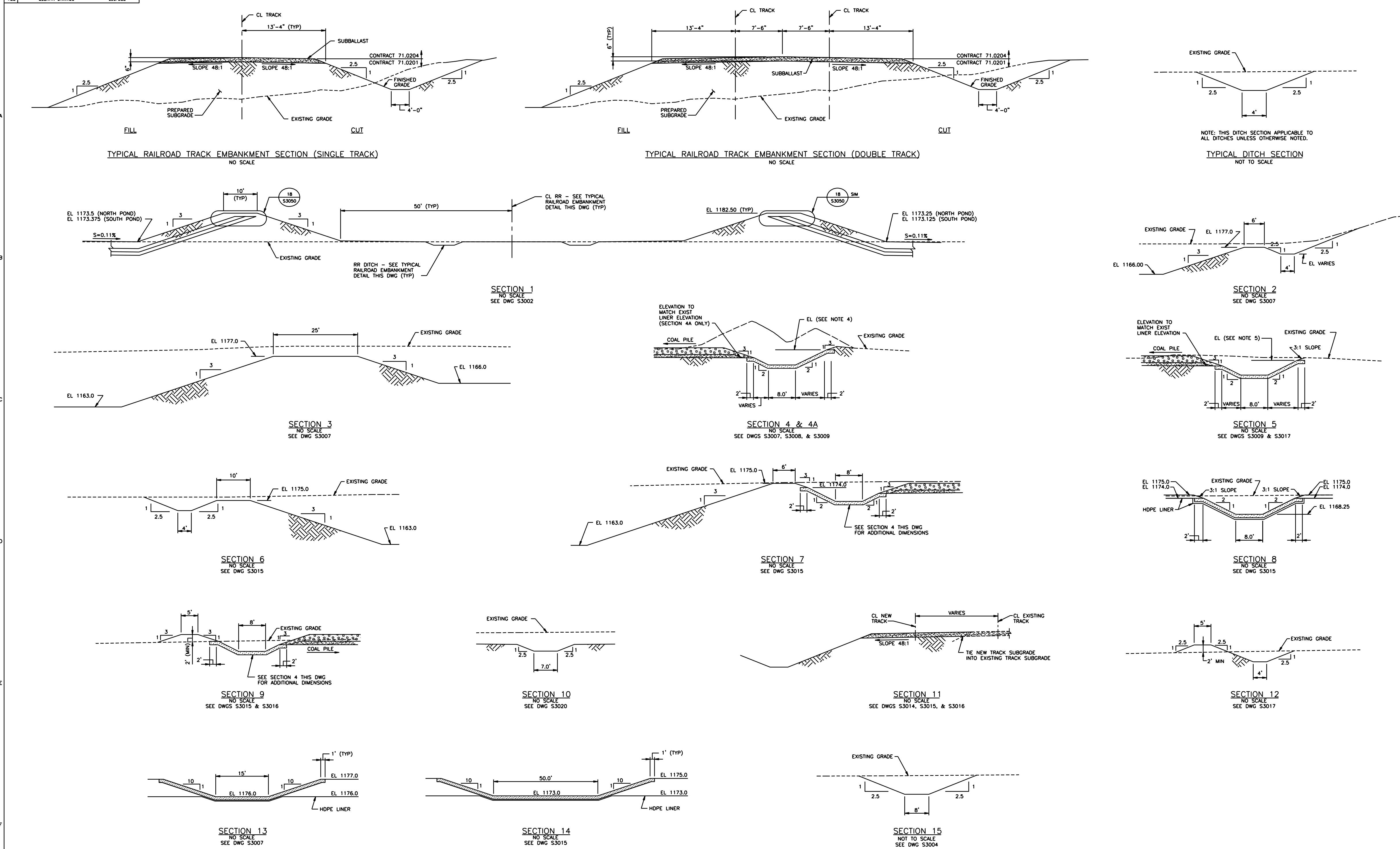


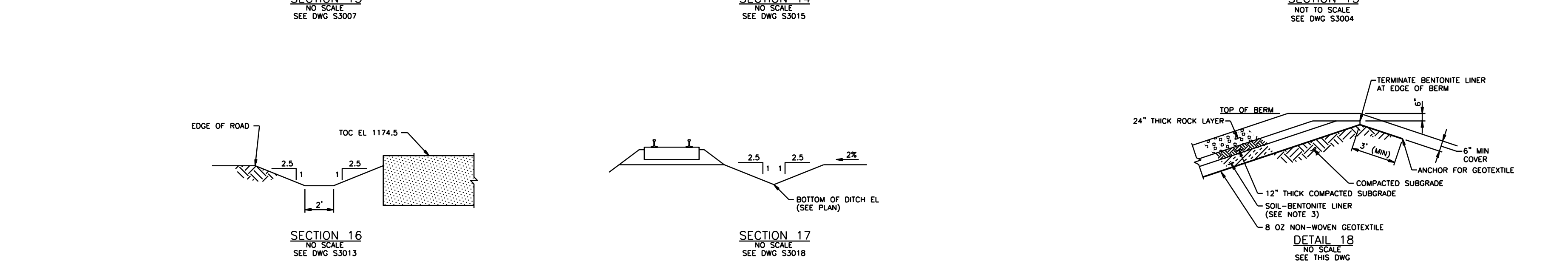
Northeast Secondary Ash Basin
Southeast Secondary Ash Basin
North Primary Ash Basin
South Primary Ash Basin
Metal Cleaning Wastewater Basin.
Coal Pile Runoff Basin
MATCHLINE E 9740.0 – FOR CONTINUATION SEE DWG S3002
MATCHLINE E 10670.0 – FOR CONTINUATION SEE DWG S3015
MATCHLINE N 6840.0 – FOR CONTINUATION SEE DWG S3006
MATCHLINE N 7770.0 – FOR CONTINUATION SEE DWG S3008
SECTION 1
NO SCALE
SEE THIS DWG
TOC EL 1173.00
DITCH SLOPE
RIPRAP
16 OZ NON-WOVEN GEOTEXTILE
HDPE LINER
COMPACTED SUBGRADE
KEY PLAN
NOTES
1. SEE DRAWING S3000 FOR GENERAL NOTES, KEY PLAN, AND ABBREVIATIONS.
3 06/13/05 REVISED PER ECN N-S-0104
2 06/03/05 REVISED PER ECN N-S-0101
1 09/15/04 APPROVED FOR CONSTRUCTION
0 08/03/04 ISSUED FOR BIDS
4 08/20/08 CONFORMED TO CONSTRUCTION RECORDS – NIC
NO DATE REVISIONS AND RECORD OF ISSUE
DRN DES CHK PDE APP
TRUE NORTH
PLANT NORTH
25°10'
SCALE: 1"=30'
I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E-36488
BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN WG
CHECKED MJS DATE 09/15/04
WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4
GRADING & DRAINAGE-SITE
AREA 7-PLAN
PROJECT 133116-4SD
DRAWING NUMBER -S3007
REV 4

APPENDIX A

Document 15

Black & Veatch Drawing S3050, Grading & Drainage, Site Typical Sections





NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS.
2. SEE DWG S3902 FOR CONCRETE DITCH LINER AND CONCRETE SPILLWAY LINER DETAILS.
3. SOIL BENTONITE LINER SHALL BE 12" THICK FROM EL 1182.0' (TOP OF LINER) TO EL 1178.5 AND SHALL INCREASE UNIFORMLY THEREAFTER TO A 20" THICK SECTION AT THE BASE OF THE BERM.
4. THE TOP OF CONCRETE ELEVATION ON THE OUTSIDE OF THE DITCH SHALL BE MAINTAINED 30" ABOVE THE TOP OF LINER ELEVATION ON THE INSIDE OF THE DITCH.
5. THE TOP OF CONCRETE ELEVATION ON THE OUTSIDE OF THE DITCH SHALL BE MAINTAINED 24" ABOVE THE TOP OF LINER ELEVATION ON THE INSIDE OF THE DITCH.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
5	08/20/08	CONFORMED TO CONSTRUCTION RECORDS - NIC	SLS	ACM	MJS	MEH	JAH
4	10/05/05	REVISED PER ECN-N-S-0139	SLS	ACM	MJS	MEH	JAH
3	06/03/05	REVISED PER ECN-N-S-0101	MJW	ACM	MJS	MEH	JAH
2	05/18/05	REVISED PER ECN-N-S-0088	MDS	ACM	JLL	MEH	JAH
1	09/15/04	APPROVED FOR CONSTRUCTION	MRR	ACM	MJS	MEH	JAH
0	08/03/04	ISSUED FOR BIDS	WG	ACM		MEH	JAH

I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E-36488

BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN WG
CHECKED MJS DATE 09/15/04

WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4

GRADING & DRAINAGE-SITE
TYPICAL SECTIONS

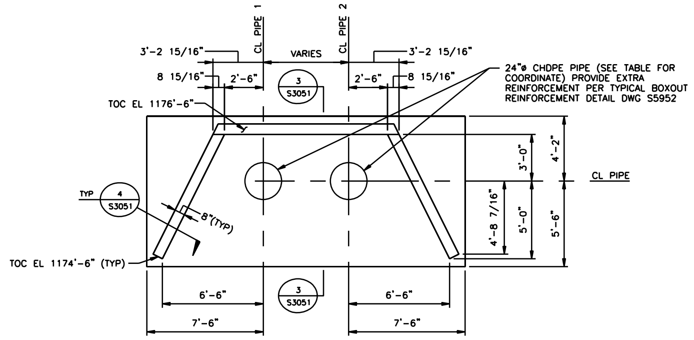
PROJECT / DRAWING NUMBER: 133116-4SD -S3050
REV: 5
CODE
AREA

ZZ051F
ATAFU056 E1
10/23/08 12:19:28
ACAD 16.1s (LMS Tech)
2=1

APPENDIX A

Document 16

Black & Veatch Drawing S3051, Grading & Drainage, Site Typical Sections & Details



DETAIL 1, 1A, 1B, 1C
SEE DWG S3002
SCALE: 1/4"=1'-0"

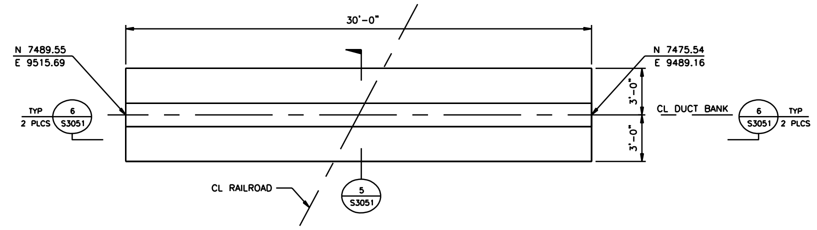
BILL OF QUANTITY TABLE*			
ITEM	CONCRETE (CY)	ESTIMATED REBAR (TNS)	EMBEDMENTS (LBS)
FND/MATS	58.8	1.40	0
PED/WALLS/ EQUIP BASES	8.0	0.48	0
ELEVATED CONCRETE	0	0	0

* BILL OF QUANTITY IS FOR ALL 4 FOUNDATIONS

NOTES:

1. FOR AS-BUILT REINFORCING QUANTITIES REFER TO REINFORCING STEEL SHOP DRAWINGS.
2. CONCRETE QUANTITIES ARE "NEAT" QUANTITIES.
3. QUANTITIES INDICATED ARE FOR CONSTRUCTION PLANNING PURPOSES ONLY. ALL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO PURCHASING MATERIALS FOR FORMWORK AND CONCRETE PLACEMENT.
4. ESTIMATED REINFORCING QUANTITIES DO NOT INCLUDE STANDEES, CHAIRS OR SUPPLEMENTAL REINFORCEMENT.

SECTION	PIPE 1		PIPE 2	
	NORTHING	EASTING	NORTHING	EASTING
1	6986.50	9413.00	6981.50	9414.25
1A	7211.25	9393.25	7205.75	9393.25
1B	7086.25	9615.25	7091.50	9614.50
1C	7318.50	9610.00	7324.00	9610.00

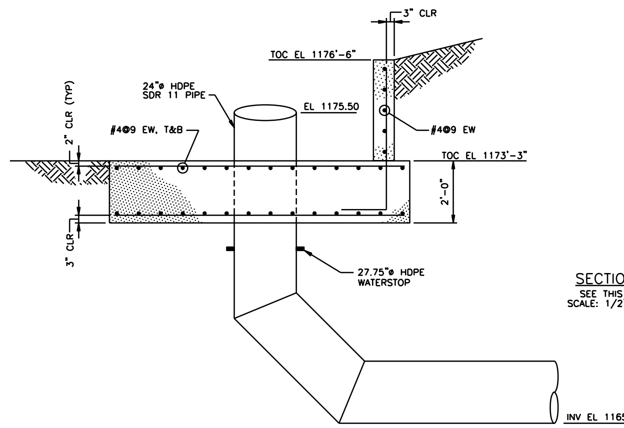


DETAIL 2
SEE DWG S3002
SCALE: 1/4"=1'-0"
(SEE NOTE 4)

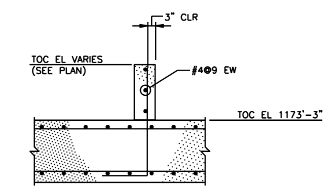
BILL OF QUANTITY TABLE			
ITEM	CONCRETE (CY)	ESTIMATED REBAR (TNS)	EMBEDMENTS (LBS)
FND/MATS	13.6	1.17	0
PED/WALLS/ EQUIP BASES	0	0	0
ELEVATED CONCRETE	0	0	0

NOTES:

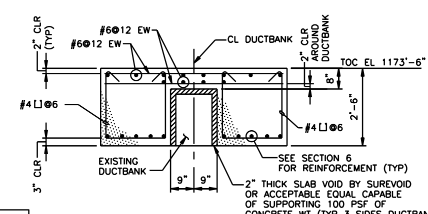
1. FOR AS-BUILT REINFORCING QUANTITIES REFER TO REINFORCING STEEL SHOP DRAWINGS.
2. CONCRETE QUANTITIES ARE "NEAT" QUANTITIES.
3. QUANTITIES INDICATED ARE FOR CONSTRUCTION PLANNING PURPOSES ONLY. ALL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO PURCHASING MATERIALS FOR FORMWORK AND CONCRETE PLACEMENT.
4. ESTIMATED REINFORCING QUANTITIES DO NOT INCLUDE STANDEES, CHAIRS OR SUPPLEMENTAL REINFORCEMENT.



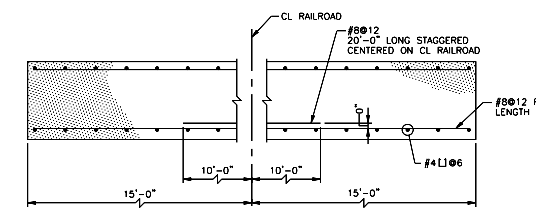
SECTION 3
SEE THIS DWG
SCALE: 1/2"=1'-0"



SECTION 4
SEE THIS DWG
SCALE: 1/2"=1'-0"



SECTION 5
SEE THIS DWG
SCALE: 1/2"=1'-0"

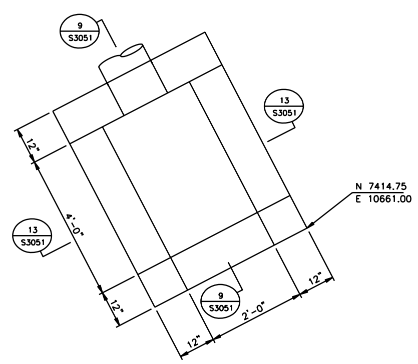


SECTION 6
SEE THIS DWG
SCALE: 1/2"=1'-0"

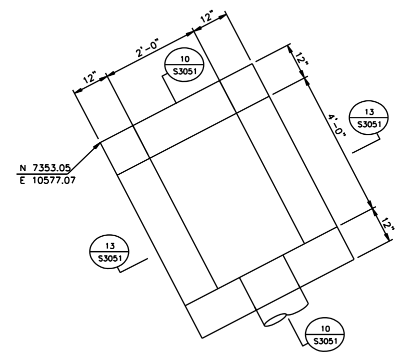
BILL OF QUANTITY TABLE			
ITEM	CONCRETE (CY)	ESTIMATED REBAR (TNS)	EMBEDMENTS (LBS)
FND/MATS	1.6	0.08	0
PED/WALLS/ EQUIP BASES	1.6	0.04	0
ELEVATED CONCRETE	0	0	0

NOTES:

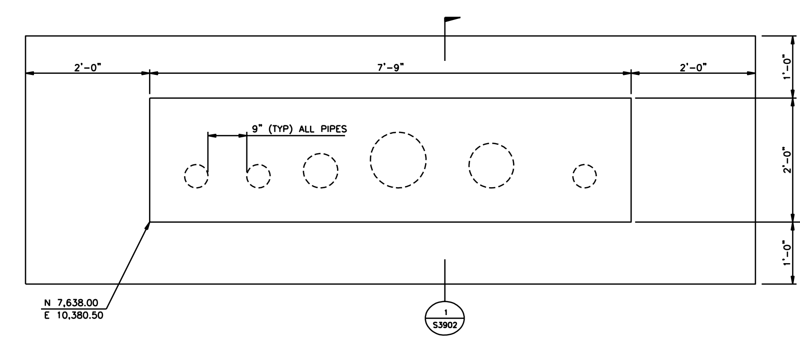
1. FOR AS-BUILT REINFORCING QUANTITIES REFER TO REINFORCING STEEL SHOP DRAWINGS.
2. CONCRETE QUANTITIES ARE "NEAT" QUANTITIES.
3. QUANTITIES INDICATED ARE FOR CONSTRUCTION PLANNING PURPOSES ONLY. ALL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO PURCHASING MATERIALS FOR FORMWORK AND CONCRETE PLACEMENT.
4. ESTIMATED REINFORCING QUANTITIES DO NOT INCLUDE STANDEES, CHAIRS OR SUPPLEMENTAL REINFORCEMENT.



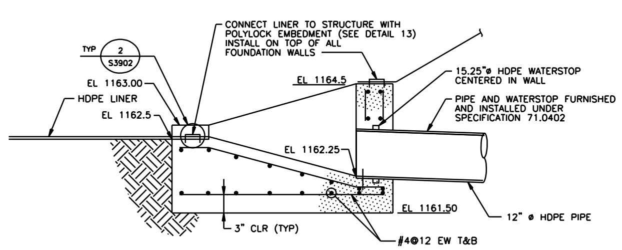
DETAIL 7
COAL RUN-OFF POND SUMP DETAIL
NO SCALE
SEE DWG S3007



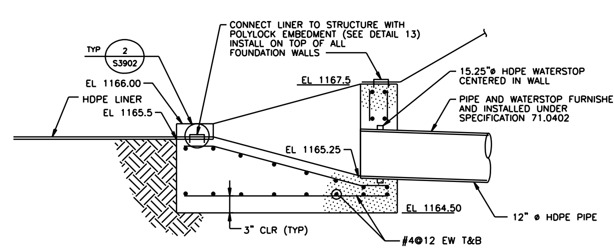
DETAIL 8
METAL WASTE CLEANING POND SUMP DETAIL
NO SCALE
SEE DWG S3007



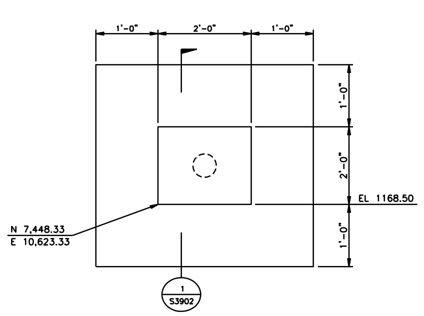
SECTION 11
NO SCALE
SEE DWG S3007



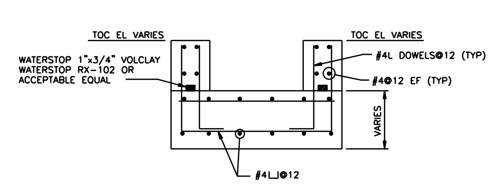
SECTION 9
NO SCALE
SEE THIS DWG



SECTION 10
NO SCALE
SEE THIS DWG



SECTION 12
NO SCALE
SEE DWG S3007



SECTION 13
NO SCALE
SEE DWG S3051

NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS.
2. CONCRETE SHALL BE MIX CLASS B1.
3. ALL WORK ON THIS DRAWING SHALL BE PERFORMED UNDER SPECIFICATION 71.0201 UNLESS NOTED OTHERWISE.
4. LOCATION OF EXISTING DUCTBANK SHALL BE FIELD VERIFIED.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
4	08/20/08	CONFORMED TO CONSTRUCTION RECORDS – NIC	MJW	TLK	ACM	MEH	JAH
3	04/06/05	REVISED PER ECN N-S-0071	MJW	TLK	ACM	MEH	JAH
2	03/02/05	ISSUED PER ECN-N-S-0056	MJW	TLK	ACM	MEH	JAH
1	09/15/04	APPROVED FOR CONSTRUCTION	MRR	ACM	MJS	MEH	JAH
0	08/03/04	ISSUED FOR BIDS	MJW	ACM		MEH	JAH

I HEREBY CERTIFY THAT THIS DOCUMENT 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.
SIGNED MONTY E. HINTZ
DATE 09/15/04 REG NO. E-36488

BLACK & VEATCH CORPORATION
ENGINEER ACM DRAWN MJW
CHECKED MJS DATE 09/15/04

WISCONSIN PUBLIC SERVICE CORP
WESTON GENERATING STATION UNIT 4
GRADING & DRAINAGE-SITE
TYPICAL SECTIONS & DETAILS

PROJECT / DRAWING NUMBER: 133116-4SD -S3051
REV 4
CODE
AREA

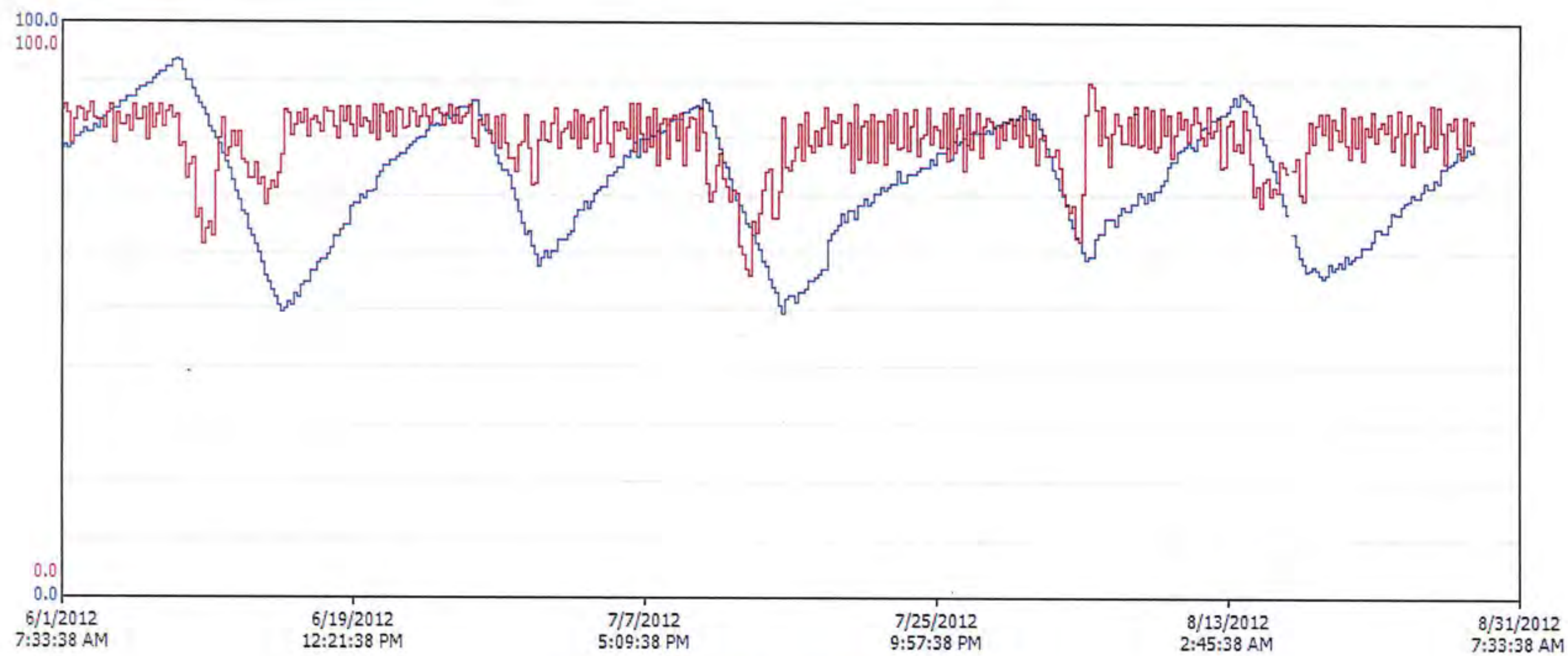
133116-4SD -S3051 REV 4

APPENDIX A

Document 17

Typical Pond Water Level Report

BAT Pond Levels



Tag Name	Description	Server	Color	Units	Minimum	Maximum	IO Address	Time Offset
CWT90I.B...	BOTTOM ASH TREATMENT SECONDARY SETTLING POND LEVEL	4024AW		in	0.0	100.0	\\4024AW\InSQL_MDA...	0:00:00....
CWT90I.B...	BOTTOM ASH TREATMENT WATER STORAGE POND LEVEL	4024AW		in	0.0	100.0	\\4024AW\InSQL_MDA...	0:00:00....

8/28/2012 2:33:00 PM
\\integrys\data\users\BBEATY\ActiveFactoryTrends\BAT Pond Levels.aaTrend

APPENDIX A

Document 18

Preventive Management Procedure (Draft)

Wisconsin Public Service Corporation **Weston Power Plant** Preventative Maintenance Procedure	No: PMP-W00-WT-001	REV: 0
	Subject: Waste Treatment Pond Impoundment Inspection	
	Date:	Page 1 of 5
Reviewed By:	Approved By:	

1.0 PURPOSE

1.1 This procedure provides instruction for performing visual inspections of the Units 3 & 4 waste water treatment ponds for embankment integrity. This inspection will allow for the identification of potential problems and resolution in a timely manner.

2.0 PREPARATION

2.1 PREREQUISITES

1. TOOLS AND SUPPLIES

   a. None

2. PERMITS, FORMS, CHECKLISTS REQUIRED

   a. Inspection checklist forms for documenting observations

2.2 PRECAUTIONS AND LIMITATIONS

1. AVOID walking though poisin ivy

2. AVOID walking into thistles

3.0 INITIAL CONDITIONS

3.1 None

4.0 PROCEDURE

4.1 Conducting Inspections

1. The inspections will consist of a visual overview of the embankments conducted from the embankment crest or access road, concentrating on unusually or hazardous conditions and for appearances of possible embankment instability which warranted the implementation of additional inspections. It is expected that such weekly inspections will be conducted from a vehicle or walking the embankment crest and shall record all issues identified.

4.2 **NORTH PRIMARY BASIN**

1. VERIFY water elevation is below X. NOTIFY Shift Manager immedately if water level is above XX indicated elevation.

2. VERIFY all visible slopes of embankment are free of erosion, cracks, seepage, bulges, animal holes or other signs of instability. RECORD all identified discrepancies.

4.2 (Continued)

3. VERIFY no trees or woody vegetation is growing in the embankment. RECORD all identified discrepancies.

4. VERIFY no cracks, scarps or settlement on crest. RECORD all identified discrepancies.

5. VERIFY inlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

6. VERIFY outlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

7. VERIFY no "Boils" beneath ponded water. RECORD all OBSERVED "Boils".

8. VERIFY there are no "wet areas" or sinkholes outside of the embankment. Any observed wet areas could indicate leakage and must be investigated further. RECORD all OBSERVED "wet areas" or sinkholes.

4.3 **SOUTH PRIMARY BASIS**

1. VERIFY water elevation is below X. NOTIFY Shift Manager immedately if water level is above XX indicated elevation.

2. VERIFY all visible slopes of embankment are free of erosion, cracks, seepage, bulges, animal holes or other signs of instability. RECORD all identified discrepancies.

3. VERIFY no trees or woody vegetation is growing in the embankment. RECORD all identified discrepancies..

4. VERIFY no cracks, scarps or settlement on crest. RECORD all identified discrepancies.

5. VERIFY inlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

6. VERIFY outlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

7. VERIFY no "Boils" beneath ponded water. RECORD all OBSERVED "Boils".

8. VERIFY there are no "wet areas" or sinkholes outside of the embankment. Any observed wet areas could indicate leakage and must be investigated further. RECORD all OBSERVED "wet areas" or sinkholes.

4.4 **NORTH SECONDARY BASIN**

1. VERIFY water elevation is below X. NOTIFY Shift Manager immedately if water level is above XX indicated elevation.

2. VERIFY all visible slopes of embankment are free of erosion, cracks, seepage, bulges, animal holes or other signs of instability. RECORD all identified discrepancies.

4.4 (Continued)

3. VERIFY no trees or woody vegetation is growing in the embankment. RECORD all identified discrepancies.
4. VERIFY no cracks, scarps or settlement on crest. RECORD all identified discrepancies.
5. VERIFY inlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.
6. VERIFY outlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.
7. VERIFY no "Boils" beneath ponded water. RECORD all OBSERVED "Boils".
8. VERIFY there are no "wet areas" or sinkholes outside of the embankment. Any observed wet areas could indicate leakage and must be investigated further. RECORD all OBSERVED "wet areas" or sinkholes.

4.5 **SOUTH SECONDARY BASIN**

1. VERIFY water elevation is below X. NOTIFY Shift Manager immedately if water level is above XX indicated elevation.
2. VERIFY all visible slopes of embankment are free of erosion, cracks, seepage, bulges, animal holes or other signs of instability. RECORD all identified discrepancies.
3. VERIFY no trees or woody vegetation is growing in the embankment. RECORD all identified discrepancies.
4. VERIFY no cracks, scarps or settlement on crest. RECORD all identified discrepancies.
5. VERIFY inlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.
6. VERIFY outlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.
7. VERIFY no "Boils" beneath ponded water. RECORD all OBSERVED "Boils".
8. VERIFY there are no "wet areas" or sinkholes outside of the embankment. Any observed wet areas could indicate leakage and must be investigated further. RECORD all OBSERVED "wet areas" or sinkholes.

4.6 **SLUICE WATER STORAGE BASIN**

1. VERIFY water elevation is below X. NOTIFY Shift Manager immedately if water level is above XX indicated elevation.
2. VERIFY all visible slopes of embankment are free of erosion, cracks, seepage, bulges, animal holes or other signs of instability. RECORD all identified discrepancies.

4.6 (Continued)

3. VERIFY no trees or woody vegetation is growing in the embankment. RECORD all identified discrepancies.

4. VERIFY no cracks, scarps or settlement on crest. RECORD all identified discrepancies.

5. VERIFY inlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

6. VERIFY outlet culvert is not clogged and water is able to flow freely. RECORD all identified discrepancies.

7. VERIFY no "Boils" beneath ponded water. RECORD all OBSERVED "Boils".

8. VERIFY there are no "wet areas" or sinkholes outside of the embankment. Any observed wet areas could indicate leakage and must be investigated further. RECORD all OBSERVED "wet areas" or sinkholes.

5.0 RELINE UP

5.1 None

6.0 POST MAINTENANCE TEST/RETEST

6.1 None

7.0 REFERENCES

ATTACHMENT A - INSPECTION CHECKLIST
(Page 1 of 1)

	North Pri Basin	South Pri Basin	North Sec Basin	South Sec Basin	Sluice Water Storage Basin
Water Elevation above indicated level					
Any signs of bank instability, animal holes, seepage					
Any woody trees or vegetation in enbankment					
Any cracks, scraps or settlement on crest					
Inlet culvert clogged with debris material					
Outlet culvert clogged with debris material					
Any "Boils" beneath ponded water					
Any "wet areas" or sinkholes outside of embankment					
Comments					

APPENDIX B

Document 19

Dam Inspection Check Lists

Site Name:	Weston Power Plant	Date:	8/21/12
Unit Name:	Northwestern Secondary Pond	Operator's Name:	
Unit I.D.:		Hazard Potential Classification:	High ☐ Significant ☐ Low ☒
Inspector's Name:		Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented, but draft of documentation to be used in future internal inspections is currently in the process of being finalized.
2	Documentation provided by Utility.
3	Documentation provided by Utility.
4	"Not Applicable"
5	Documentation provided by Utility.
6	"Not Applicable"
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	"Not Applicable"
20	"Not Applicable"

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives water from Northeastern Secondary Pond via 2 submerged 24" CDHP pipes (under the railroad tracks separating the two ponds). This pond continues with the same function as the Northeastern Secondary Pond, collecting bottom ash residuals via settling only. Water is then pumped from the pond through the treatment center, followed by the Tertiary Pond.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	15	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	26	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resources

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.

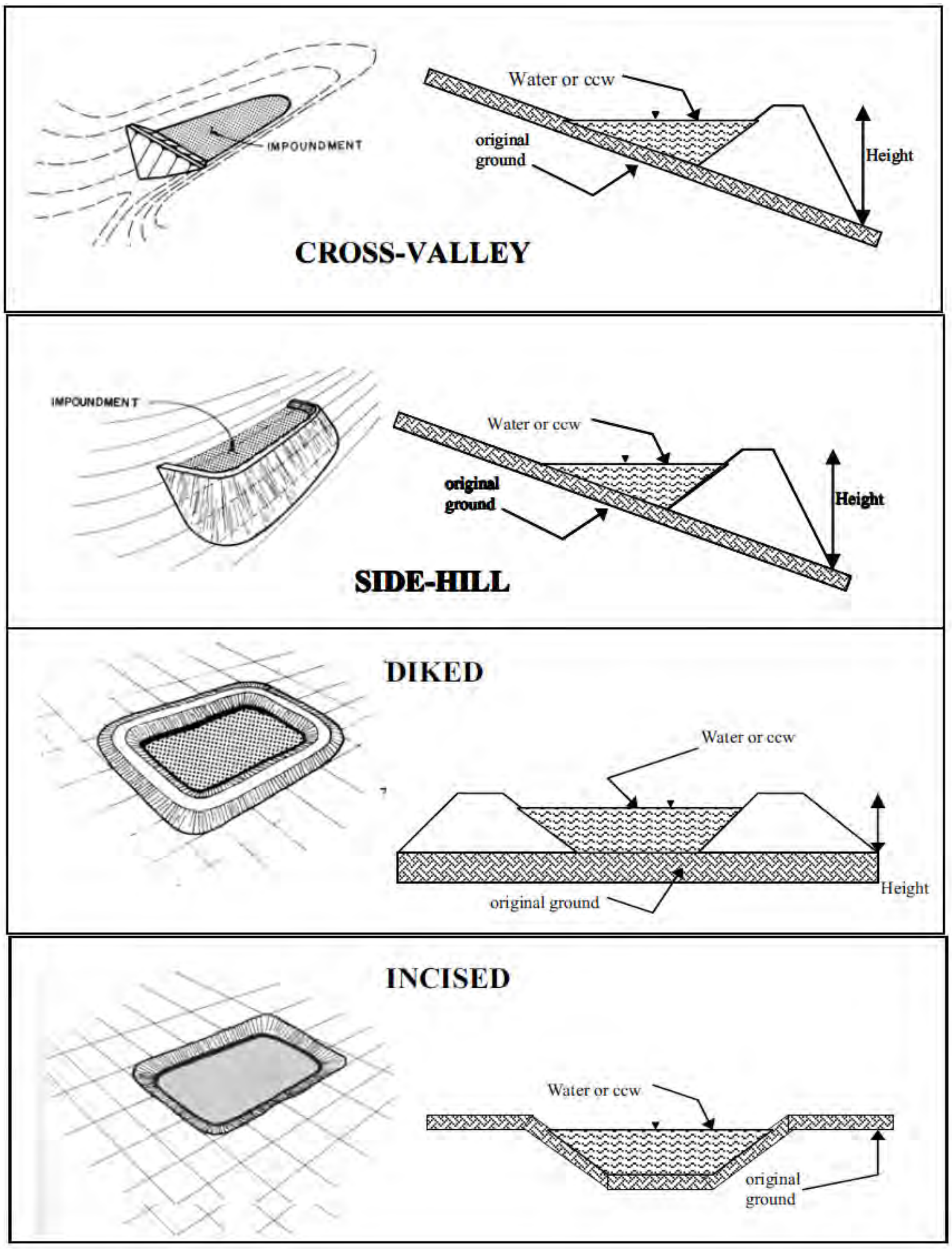
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would either go West into the Tertiary Pond, skipping the Treatment Center, East down the embankment and then South, or directly South into the Southwestern Secondary Pond, followed by approximately125± yards South to a perimeter ditch which encompasses the entire plant. If the discharge overtopped that ditch it would then travel a variable distance South and West, where it would then reach the Wisconsin River. If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "**low**" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds and Treatment Center for purification.

CONFIGURATION:



☒ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	Not available at this time	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	Not available at this time	**Liner**	Bentonite Clay
Current Freeboard (ft)	Not available at this time	**Liner Permeability**	Not available at this time.

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

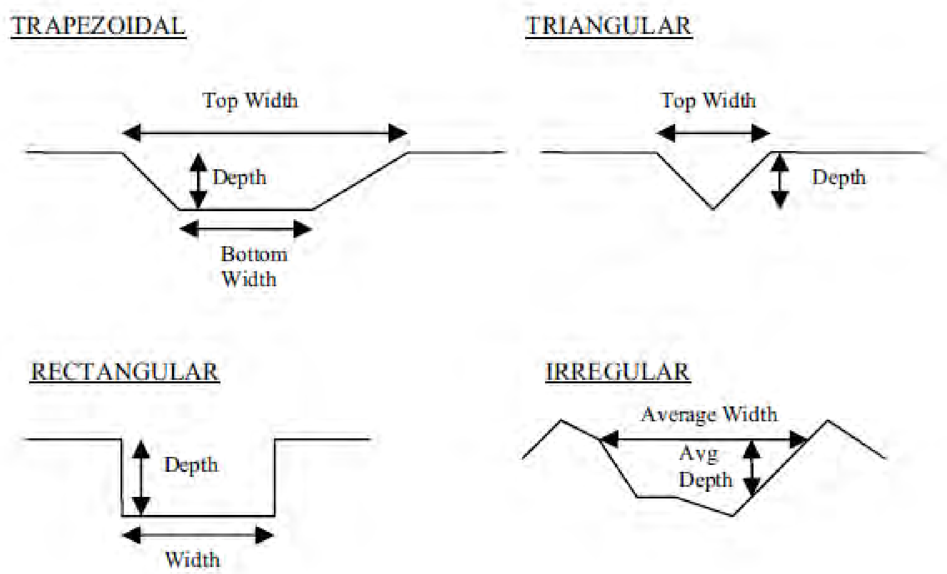
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

10” diameter

steel pipe which pumps water from a sump, shared with the SW Secondary Pond and located beneath the Treatment Center, up to and through the Treatment Center.

Material

☐ corrugated metal

☒ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	**Weston Power Plant**	**Date:**	**8/21/12**
Unit Name:	**Northeastern Secondary Pond**	**Operator's Name:**	
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented.
2	Documentation provided by Utility.
3	Documentation provided by Utility.
4	“Not Applicable”
5	Documentation provided by Utility.
6	“Not Applicable”
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	“Not Applicable”
20	“Not Applicable”

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives sluiced water and fines carried from the Northern Primary Pond. The CCR is then passed through a series of 2 silt curtains to facilitate settling of CCRs. Water then drains into the Northwestern Secondary Pond via 2 24" CDHPE pipes submerged beneath the railroad tracks separating the two ponds.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	15	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	18	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resources

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.

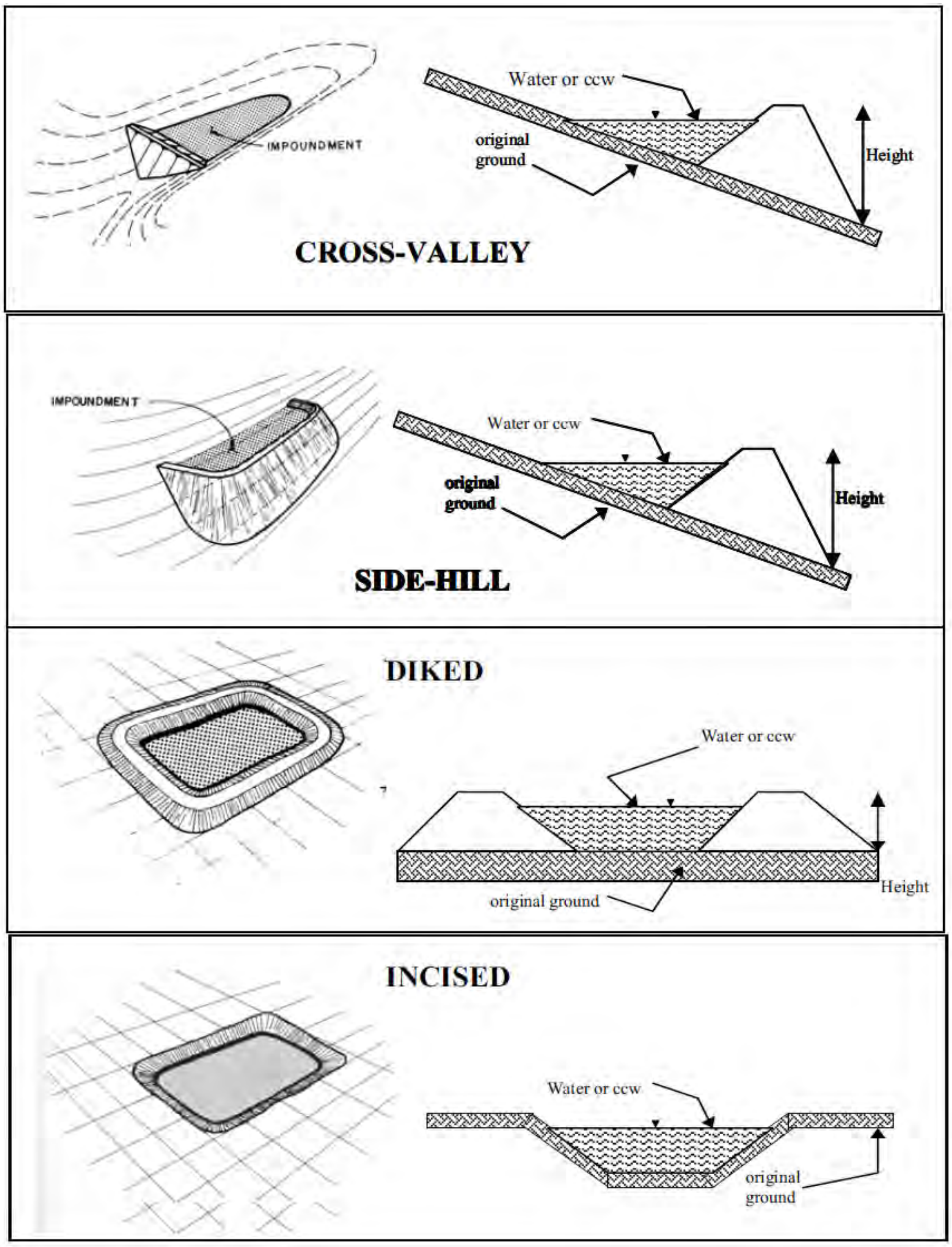
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would either go West down the embankments, travel approximately 10 yards West across railroad tracks to the toe of the Northwestern Secondary Pond or South approximately150± yards to a perimeter ditch which encompasses the entire plant. If the discharge overtopped that ditch it would then travel a variable distance South and West, where it would then reach the Wisconsin River. The discharge that had reached the toe of the Northwestern Secondary Pond would then presumably climb up the embankment into the Northwestern Secondary Pond or drain South to that same perimeter ditch. If the discharge did enter the Northwestern Secondary Pond, it would then enter the Tertiary Pond, where the water is received post-treatment and is either recirculated to the plant or discharged to the Wisconsin River (permitted by WPDES Permit No. WI-0042765-07-0). If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "**low**" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds or the Treatment Center for purification.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	Not available at this time.	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	Not available at this time.	**Liner**	Clay
Current Freeboard (ft)	Not available at this time.	**Liner Permeability**	Not available at this time.

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

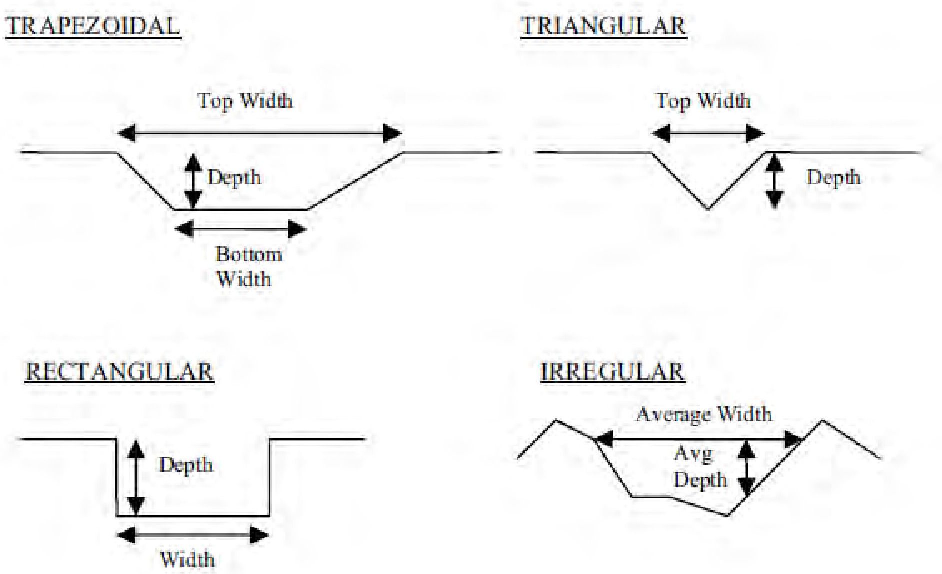
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

(2) 24" diameter

submerged pipes balanced by water pressure between the Northeastern and Northwestern Secondary Ponds.

Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☒ other (specify): CDHPE

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	**Weston Power Plant**	**Date:**	**8/21/12**
Unit Name:	**Northern Primary Pond**	**Operator's Name:**	
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	N/A		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented, but draft of documentation to be used in future internal inspections is currently in the process of being finalized.
2	“Not Applicable” as pool elevation for the primary ponds continually changes due to gravity settling.
3	Documentation provided by Utility.
4	“Not Applicable”
5	Documentation provided by Utility.
6	“Not Applicable”
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	“Not Applicable”
20	“Not Applicable”

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives sluiced CCR directly from the plant. The Northern Primary and Southern Primary Ponds are identical. The two are not used simultaneously. The Northern Primary pond discharges to the series of Northern Secondary Ponds.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	15	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	13	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resrouces

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.

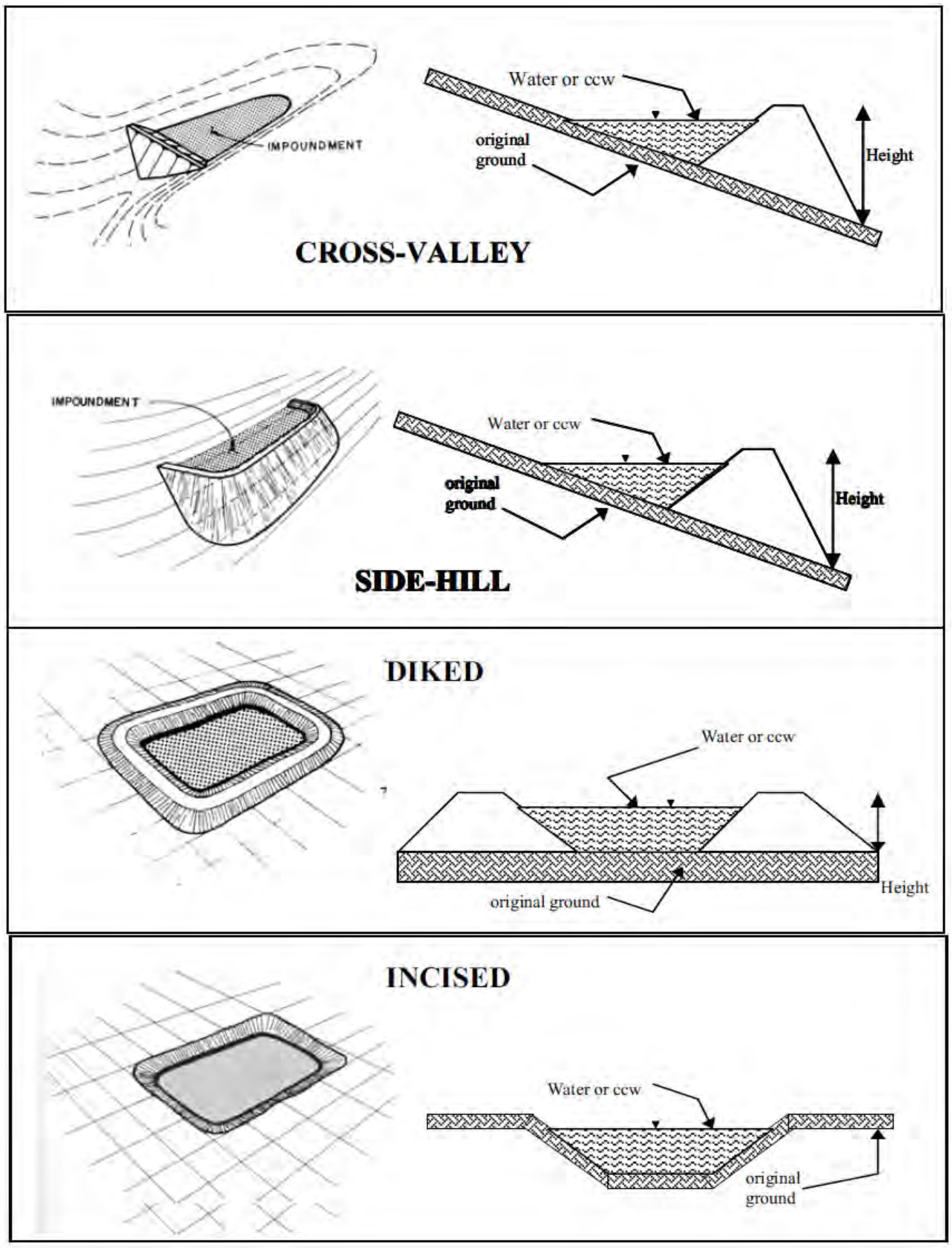
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would first go down the embankments, travel approximately 5 yards West to the Northeastern Secondary Pond or South into the Southern Primary Pond and then if that overtopped, approximately150± yards further South to a perimeter ditch which encompasses the entire plant. The discharge that had entered the Northeastern Secondary Pond would then go to the Northwestern Secondary Pond and then the Tertiary Pond, where the water is received post-treatment and either recirculated to the plant or discharged to the Wisconsin River, which is permitted with WPDES Permit No. WI-0042765-07-0. If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "low" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds and Treatment Center for purification.

CONFIGURATION:



- [ ] Cross-Valley
- [ ] Side-Hill
- [x] Diked
- [ ] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft) 3.5

Pool Area (ac) .19

Current Freeboard (ft) 2.5

Embankment Material Native fill (documents provided by Utility)

Liner Bentonite Clay

Liner Permeability Not available at this time.

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

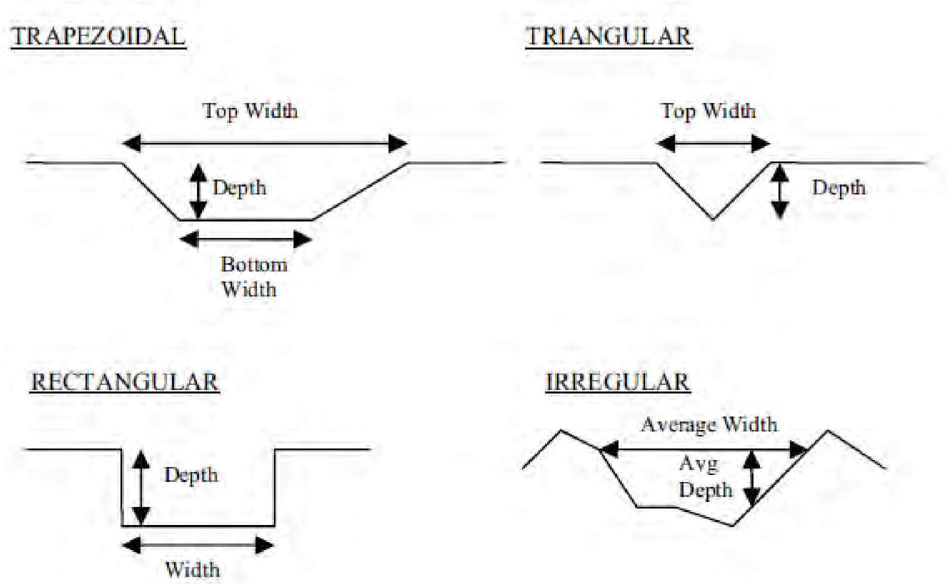
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

30” diameter pipe

Material

☒ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	**Weston Power Plant**	**Date:**	**8/21/12**
Unit Name:	**Southeastern Secondary Pond**	**Operator's Name:**	
Unit I.D.:		**Hazard Potential Classification:**	High ☐ Significant ☐ Low ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented.
2	Documentation provided by Utility.
3	Documentation provided by Utility.
4	“Not Applicable”
5	Documentation provided by Utility.
6	“Not Applicable”
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	“Not Applicable”
20	“Not Applicable”

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the “Weston Units 3 & 4” (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives sluiced water and fines carried from the Southern Primary Pond. The CCR is then passed through a silt curtain to facilitate settling of CCRs. Water then drains into the Southwestern Secondary Pond via 2 24” CDHPE pipes submerged beneath the railroad tracks separating the two ponds.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	13	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	18	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resources

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.

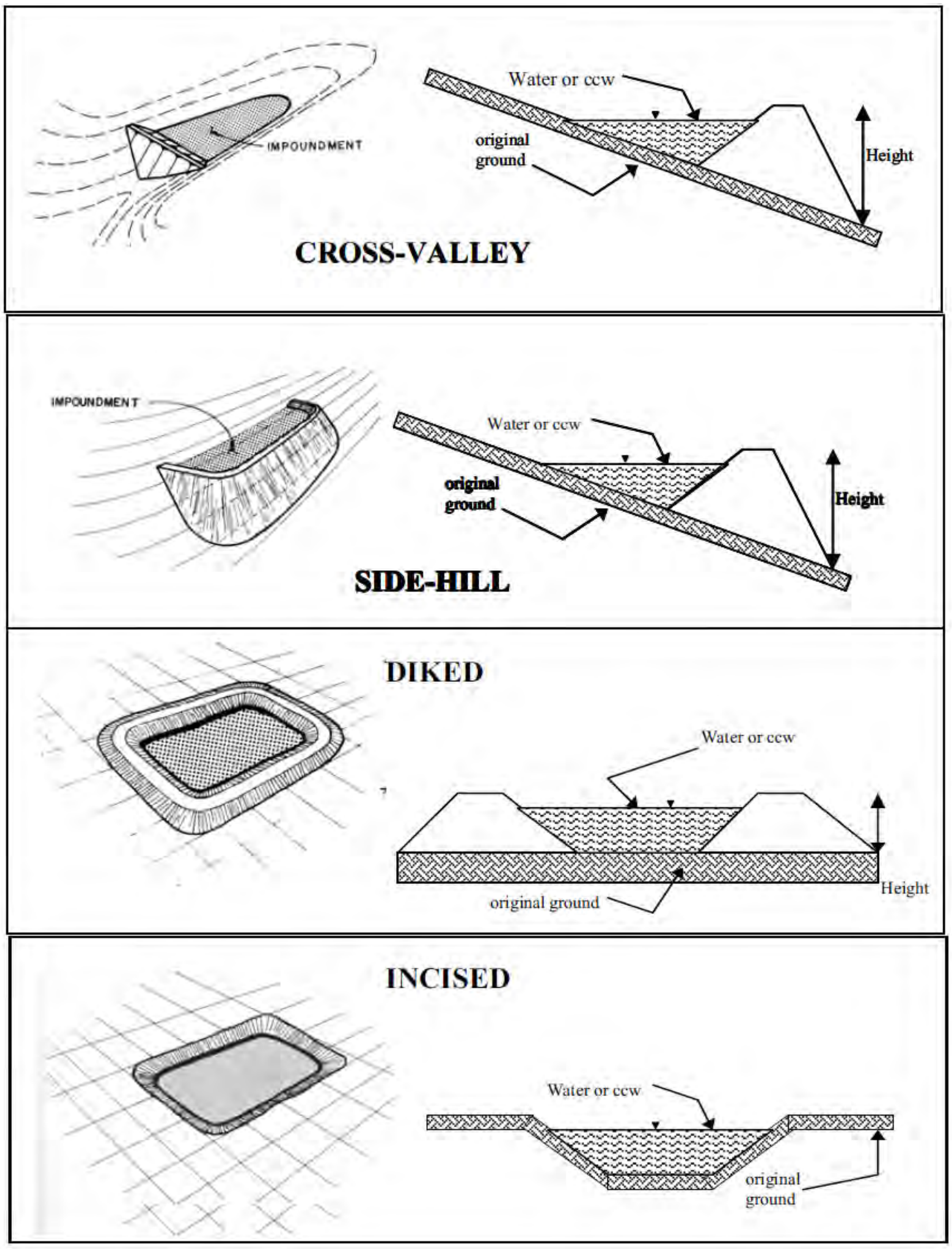
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would either go West down the embankments, travel approximately 10 yards West across railroad tracks to the toe of the Southwestern Secondary Pond or South approximately125± yards to a perimeter ditch which encompasses the entire plant. If the discharge overtopped that ditch it would then travel a variable distance South and West, where it would then reach the Wisconsin River. The discharge that had reached the toe of the Southwestern Secondary Pond would then presumably climb up the embankment into the Southwestern Secondary Pond or drain South to that same perimeter ditch. If the discharge did enter the Southwestern Secondary Pond, it would then enter the Tertiary Pond, where the water is received post-treatment and is either recirculated to the plant or discharged to the Wisconsin River (permitted by WPDES Permit No. WI-0042765-07-0). If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "**low**" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds or Treatment Center for purification.

CONFIGURATION:



- [ ] Cross-Valley
- [ ] Side-Hill
- [x] Diked
- [ ] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft)	Not available at this time.	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	Not available at this time.	**Liner**	Clay
Current Freeboard (ft)	Not available at this time.	**Liner Permeability**	Not available at this time.

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

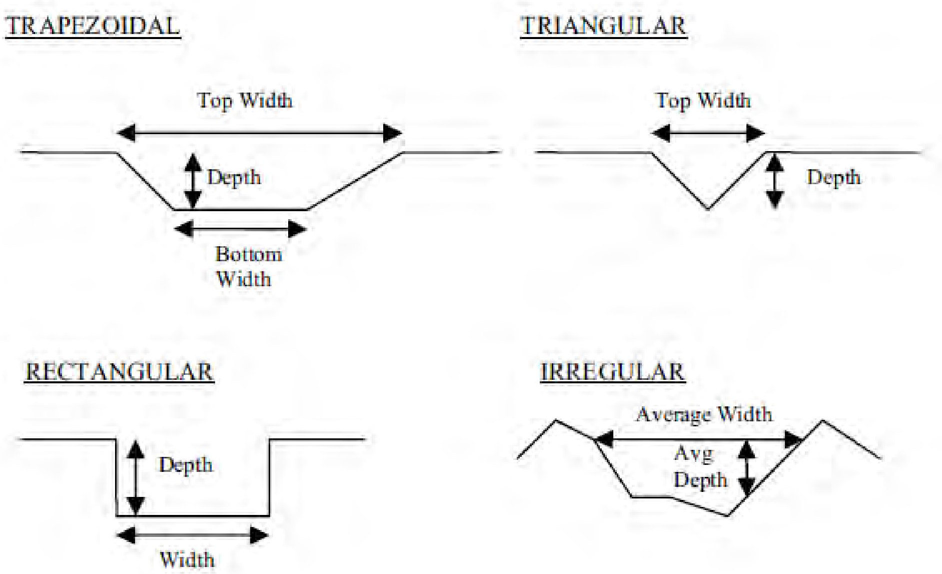
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

(2) 24" diameter
submerged pipes balanced by water pressure between the Southeastern and Southwestern Secondary Ponds.

Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☒ other (specify): CDHPE

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	**Weston Power Plant**	**Date:**	**8/21/12**
Unit Name:	**Southern Primary Pond**	**Operator's Name:**	
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	N/A		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented.
2	"Not Applicable" as pool elevation for the primary ponds continually changes due to gravity settling.
3	Documentation provided by Utility.
4	"Not Applicable"
5	Documentation provided by Utility.
6	"Not Applicable"
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	"Not Applicable"
20	"Not Applicable"

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives sluiced CCR directly from the plant. The Southern Primary and Northern Primary Ponds are identical. The two are not used simultaneously. The Southern Primary pond discharges to the series of Southern Secondary Ponds.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	13	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	13	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resrouces

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.

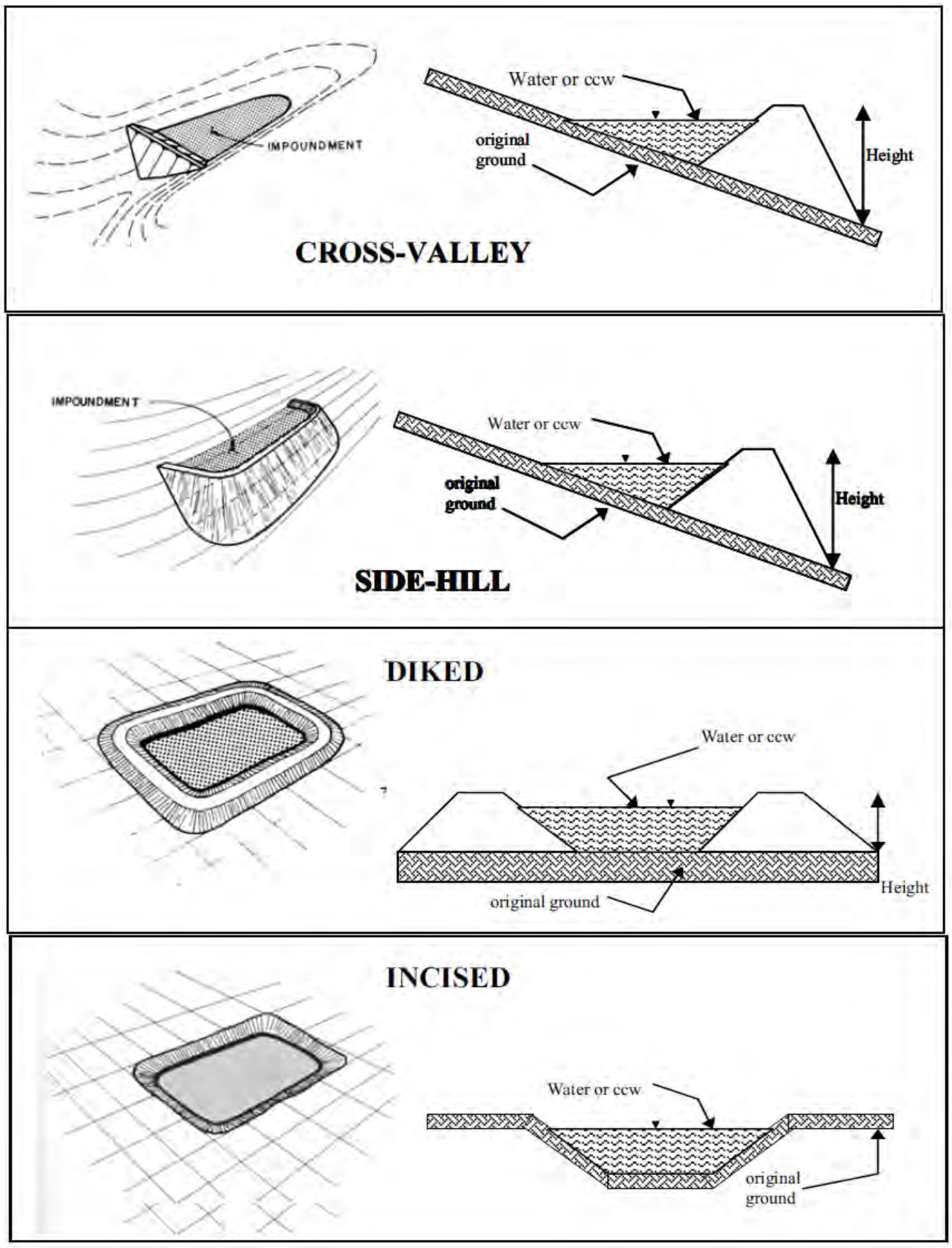
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would either go West down the embankments, travel approximately 5 yards West to the Southeastern Secondary Pond or South approximately150± yards to a perimeter ditch which encompasses the entire plant. If the discharge overtopped that ditch it would then travel a variable distance South and West, where it would then reach the Wisconsin River. The discharge that had entered the Northeastern Secondary Pond would then enter the Northwestern Secondary Pond and then the Tertiary Pond, where the water is received post-treatment and is either recirculated to the plant or discharged to the Wisconsin River (permitted by WPDES Permit No. WI-0042765-07-0). If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "low" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds and Treatment Center for purification.

CONFIGURATION:



☐ Cross-Valley	☐ Side-Hill	☒ Diked
☐ Incised (form completion optional)		☐ Combination Incised/Diked

Embankment Height (ft)	1	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	.19	**Liner**	Bentonite Clay
Current Freeboard (ft)	2	**Liner Permeability**	Not available at this time.

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

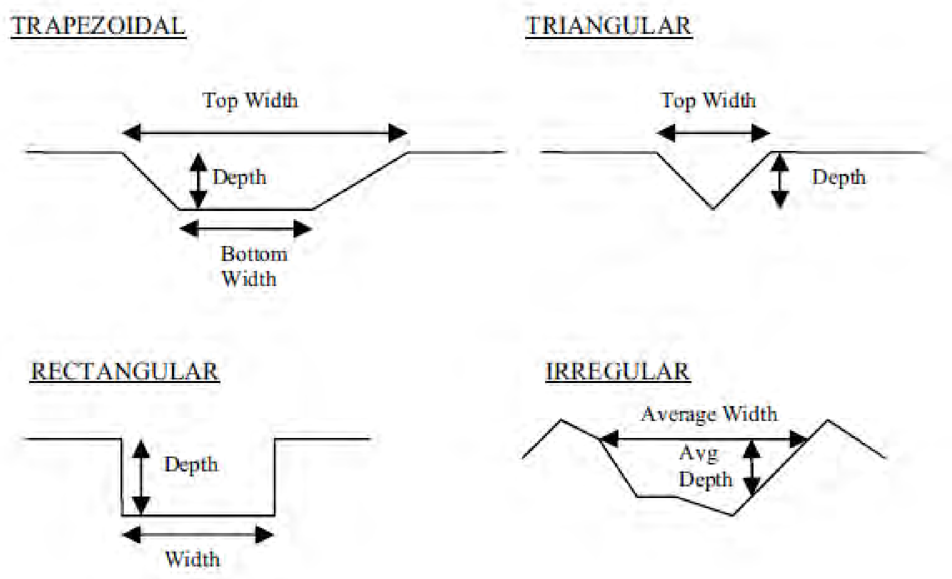
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

30” diameter pipe

Material

☒ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	Weston Power Plant	Date:	8/21/12
Unit Name:	Southwestern Secondary Pond	Operator's Name:	
Unit I.D.:		Hazard Potential Classification:	High ☐ Significant ☐ Low ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented, but draft of documentation to be used in future internal inspections is currently in the process of being finalized.
2	Documentation provided by Utility.
3	Documentation provided by Utility.
4	“Not Applicable”
5	Documentation provided by Utility.
6	“Not Applicable”
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	“Not Applicable”
20	“Not Applicable”

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives water from Southeastern Secondary Pond via 2 submerged 24" CDHP pipes (under the railroad tracks separating the two ponds). This pond continues with the same function as the Southeastern Secondary Pond, collecting bottom ash residuals via settling only. Water is then pumped from the pond through the treatment center, followed by the Tertiary Pond.

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	13	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	26	Seconds	**W**

State Wisconsin **County** Marathon

Does a state agency regulate this impoundment? ☒ Yes ☐ No

If So Which State Agency? Wisconsin Department of Natural Resources

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.

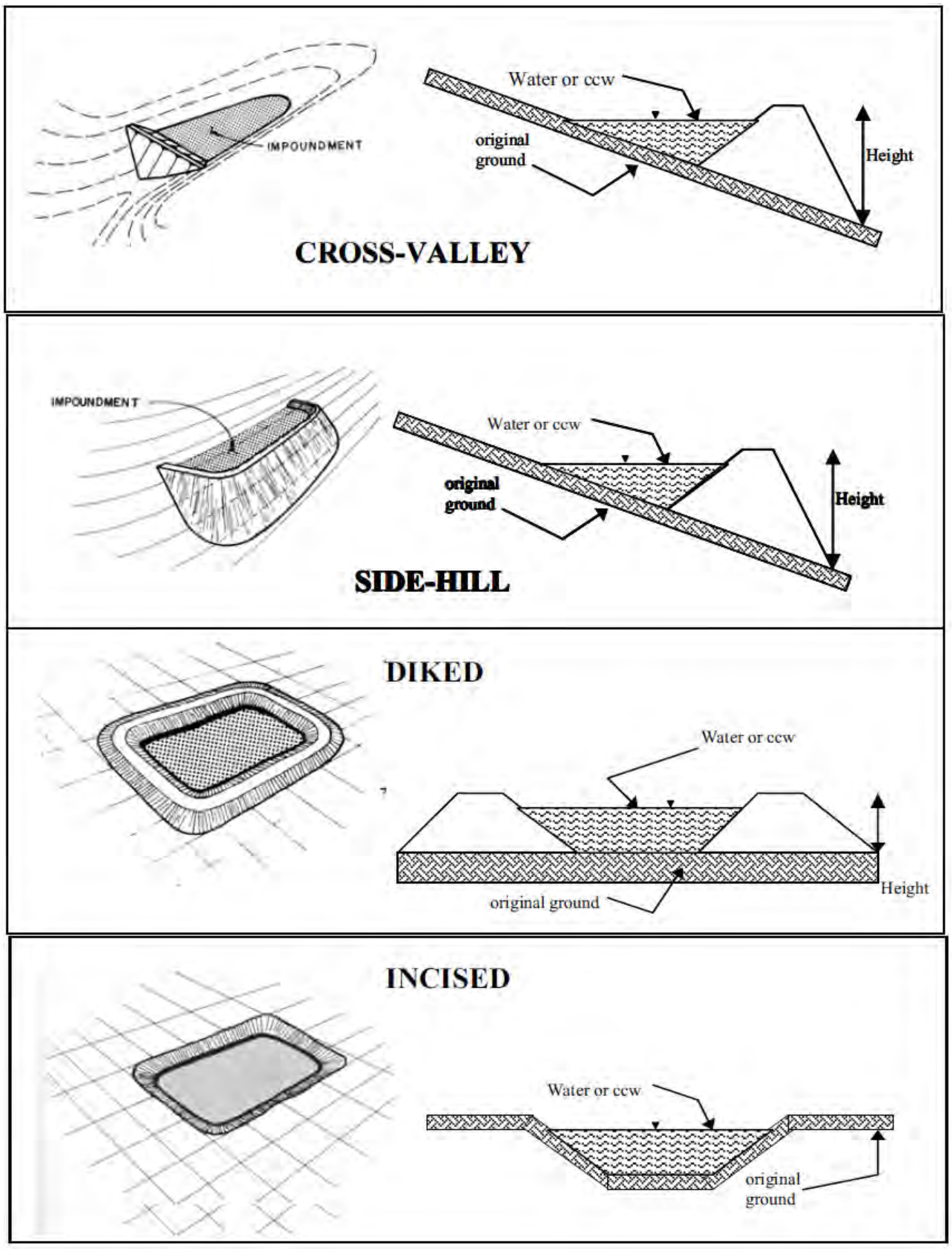
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides. If there were to be a failure at this location, the discharge would either go West into the Tertiary Pond, skipping the Treatment Center, East or South down the embankment, followed by approximately125± yards South to a perimeter ditch which encompasses the entire plant. If the discharge overtopped that ditch it would then travel a variable distance South and West, where it would then reach the Wisconsin River. If all ponds were to overtop, the discharge would travel approximately 150± yards West beyond the Tertiary Pond to the perimeter ditch and then another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance where it would reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "**low**" in the rare circumstance that the discharge from the pond would ever reach the River without first going through the series of Secondary ponds and Treatment Center for purification.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	Not available at this time	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	Not available at this time	**Liner**	Bentonite Clay
Current Freeboard (ft)	Not available at this time	**Liner Permeability**	Not available at this time

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

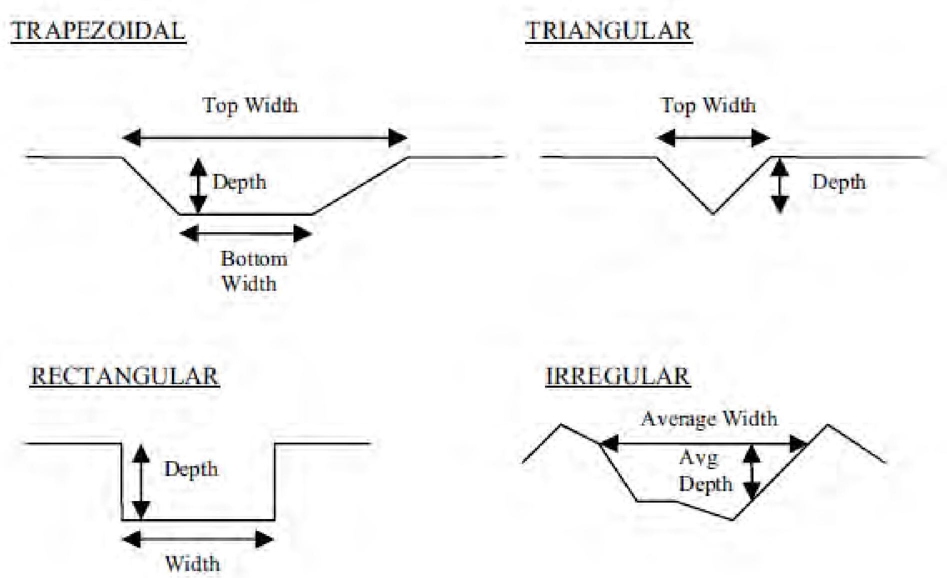
☐ Rectangular

☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)



☒ **Outlet**

10" diameter

steel pipe which pumps water from a sump, shared with the NW Secondary Pond and located beneath the Treatment Center, up to and through the Treatment Center.

Material

☐ corrugated metal

☒ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	Weston Power Plant	Date:	8/21/12
Unit Name:	Tertiary Pond	Operator's Name:	
Unit I.D.:		Hazard Potential Classification:	High ☐ Significant ☐ Low ☒
	Inspector's Name:	Cleighton Smith and Lauren Ohotzke	

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?	N/A		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
1	Inspections are done periodically; not currently documented, but draft of documentation to be used in future internal inspections is currently in the process of being finalized.
2	Documentation provided by Utility.
3	Documentation provided by Utility.
4	“Not Applicable”
5	Documentation provided by Utility.
6	“Not Applicable”
8	Information regarding foundation prep is not currently available, but not problems were seen while on site.
12	“Not Applicable”
20	“Not Applicable”

Coal Combustion Waste (CCW)

Impoundment Inspection:

There is currently a WPDES Permit issued for the discharge of the "Weston Units 3 & 4" (power units); however, this permit does not address the impoundments and is therefore not applicable here.

Impoundment NPDES Permit **INSPECTOR**

Date
Impoundment Name

Impoundment Company
EPA Region

State Agency
(Field Office) Address
Name of Impoundment

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☐

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

IMPOUNDMENT FUNCTION: Receives post-treatment water from the Treatment Center which is either recirculated to the plant for sluicing or discharged to the Wisconsin River (permitted by WPDES Permit No. WI-0042765-07-0).

Nearest Downstream Town Name: Mosinee, WI

Distance from the impoundment: Approx. 4.5 miles

Location:

Latitude	44	Degrees	51	Minutes	14	Seconds	**N**
Longitude	-89	Degrees	39	Minutes	28.5	Seconds	**W**

State Wisconsin **County** Marathon

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Wisconsin Department of Natural Resouces

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.

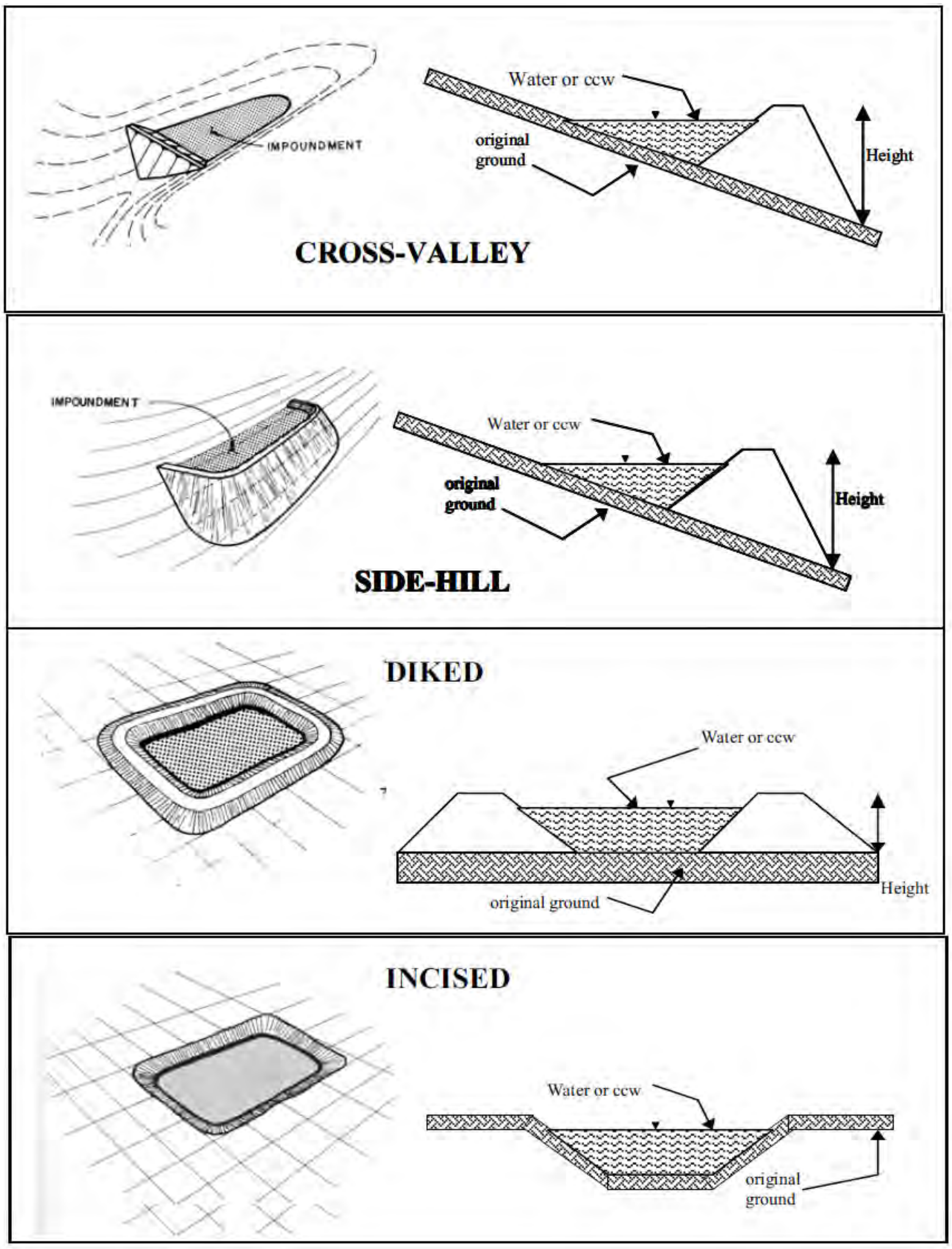
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This unit is diked on all sides and the water it is receiving has already passed through a series of secondary ponds, each containing silt fences, collecting the CCR, thereby "purifying" the water. This water is either recirculated to the plant or discharged into the Wisconsin River (which has been permitted by WPDES Permit No. WI-0042765-07-0). If there were to be a failure at this location, the discharge would first go down the embankments, travel approximately 150± yards West to a perimeter ditch which encompasses the entire plant. Next the discharge would travel another approximate 100± yards West where it would reach a naturally occurring ditch, then travel another variable distance West where it would then reach the Wisconsin River. It is not likely, given the amount of storage within the pond that this discharge would ever reach the River. The pond has been given the "low" rating and not the "less than low" rating, only because it is closest in proximity to the River than any of the other ponds on site.

CONFIGURATION:



- [ ] Cross-Valley
- [ ] Side-Hill
- [x] Diked
- [ ] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft)	15	**Embankment Material**	Native fill (documents provided by Utility)
Pool Area (ac)	1.04	**Liner**	Clay
Current Freeboard (ft)	1	**Liner Permeability**	Not available at this time

TYPE OF OUTLET (Mark all that apply)

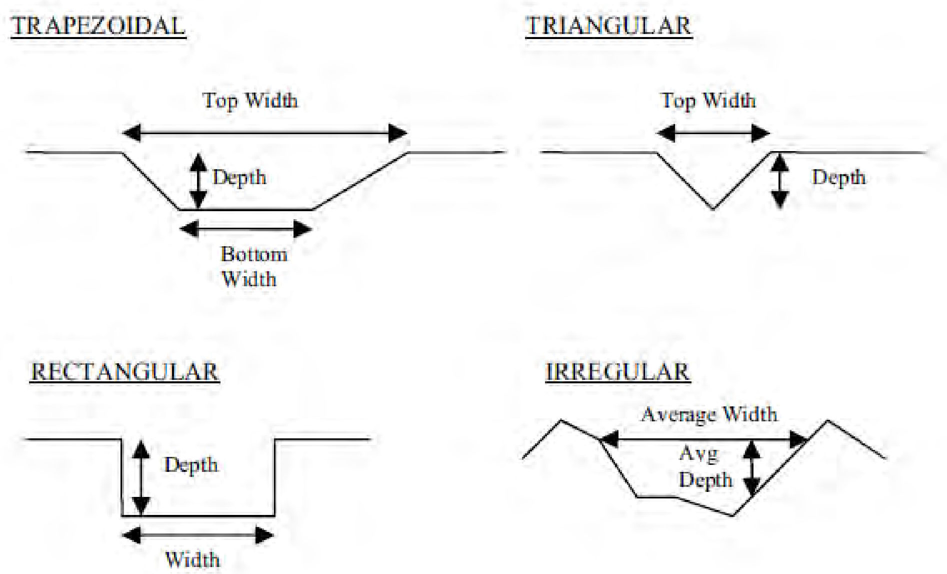
☐ **Open Channel Spillway**

☐ Trapezoidal
☐ Triangular
☐ Rectangular
☐ Irregular

depth (ft)

average bottom width (ft)

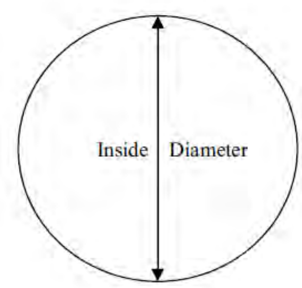
top width (ft)



☒ **Outlet**

6” diameter
pipe pumps water from the pond, over the embankment down to a manhole at the toe of the embankment which then recirculates the water to the plant for sluicing.

A second pipe pumps water to the Wisconsin River (permited by WPDES permit No. WI-0042765-07-0.



Material

☐ corrugated metal
☒ welded steel-pipe recirculating water back to plant.
☐ concrete
☐ plastic (hdpe, pvc, etc.)
☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By	Original design done by Sargent & Lundy. Secondary basin modifications designed by Black & Veatch.

Yes **No**

Has there ever been a failure at this site? ☐ ☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Yes.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

APPENDIX C

Document 20

Photographs

Photo 1. Silver silo to store fly ash _Weston Generating Station _082112

Photo 2. Temporary fly and bottom ash storage _Weston Generating Station _082112

Photo 3. Looking SE at sluicing at S Primary Pond _Weston Generating Station _082112

Photo 4. Looking NW from midpoint of NE Secondary Pond's S embankment (note silt curtain in foreground) _Weston Generating Station _082112

Photo 5. Looking NW from midpoint of NE Secondary Pond's S embankment (note silt curtain in foreground) _Weston Generating Station _082112

Photo 6. Looking S at location where sluicing coming out and sometimes boiler room drains combined combustion waste, bottom ash to the right (note silt curtain method being used here) _Weston Generating Station _082112

Photo 7. Water level monitoring point _Weston Generating Station _082112

Photo 8. Looking S at pipe leading from secondary to tertiary incisions if necessary _Weston Generating Station _082112

Photo 9. Looking S from berm between secondary and tertiary incisions _Weston Generating Station _082112

Photo 10. Looking NE at tertiary incision _Weston Generating Station _082112

Photo 11. Looking SW from berm between secondary and tertiary incisions; looking at Tertiary incision _Weston Generating Station _082112

Photo 12. Looking N at Tertiary incision from berm between secondary and tertiary incisions _Weston Generating Station _082112

Photo 13. Looking S at Secondary incisions from berm between Secondary and Tertiary incisions _Weston Generating Station _082112

Photo 14. Looking W, from SW toe of Tertiary Pond; looking toward woods/perimeter ditch _Weston Generating Station _082112

Photo 15. Looking W from SW Secondary Pond _Weston Generating Station _082112

Photo 16. Looking W, along perimeter ditch; this location is approximately 150 yds SW of Tertiary Pond _Weston Generating Station _082112

Photo 17. Looking S, along perimeter ditch; this location is approximately 150 yds SW of Tertiary Pond _Weston Generating Station _082112

APPENDIX D

Document 21

Comments on Draft Dam Assessment Report – Weston Generating Station, April 21, 2014

Wisconsin Public Service Corporation
700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001
www.wisconsinpublicservice.com

April 21, 2014

Mr. Stephen Hoffman
US Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Dear Mr. Hoffman:

Draft Coal Combustion Residue Impoundment
Round 12 - Dam Assessment Report, Weston Generating Station

Reference: 1) Email to Mr. H Giesler from Ms. J Englander dated February 27, 2014

This letter and attachment hereto provides the Wisconsin Public Service Corporation (WPSC) comments on the draft Coal Combustion Residue Impoundment Round 12 - Dam Assessment Report prepared by Dewberry Consultants, LLC. This report documents the results of the August 21, 2012 inspection of the waste water treatment basins (management units) at the Weston Generating Station (Weston). After reviewing the draft report we question the appropriateness of assessing the Weston plant wastewater treatment basins against the 2004 Federal Guidelines for Dam Safety. We acknowledge that these plant management units may not meet all the dam inspection criteria used by the EPA for conducting the inspection but also recognize that these management units are not dams. WPSC believes that a clear distinction exists between a dam and the onsite management units and applying Federal Guidelines for Dam Safety is inappropriate due to the significant differences. The following provides a discussion of the Weston management units against how a dam is defined along with additional enhancements in design and operating characteristics that should be taken into consideration in their performance safety rating.

FEMA Definition of a Dam

WPSC believes the assessment of the management units at the Weston plant against dam safety requirements is inappropriate based upon the Federal Guidelines cited within the report. According to the 2004 Federal Guidelines for Dam Safety published by the Federal Emergency Management Agency (FEMA), a dam is defined as the following:

> *Any artificial barrier, including appurtenant works, which impounds or diverts water, and which (1) is twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum water storage elevation or (2) has an impounding capacity at maximum water*

> *storage elevation of fifty acre-feet or more.* *__These guidelines do not apply to any such barrier which is not in excess of six feet in height regardless of storage capacity, or which has a storage capacity at maximum water storage elevation not in excess of fifteen acre-feet regardless of height__* *(*emphasis added*). This lower size limitation should be waived if there is a potentially significant downstream hazard.*

As described in report Section 2.4, the impoundments evaluated have storage capacities of less than fifteen acre-feet. Further, the design documentation contained in Appendix A, Document 4, shows that the elevation between the maximum water storage elevation and lowest barrier elevation (i.e., toe of the embankment) is less than 25 feet. Lastly, with regards to potentially significant downstream hazards, the report acknowledges that "critical infrastructure within five miles downstream is nearly non-existent". Therefore, the impoundments at the Weston plant do not meet the criteria to be considered a dam.

<u>Additional Enhancements in Design and Operating Characteristics</u>

These management units were designed and constructed in 1981 as wastewater treatment settling basins that receive minor amounts of coal combustion residuals (CCR) fines that carry over from the primary bottom ash settling basins. These basins were design and are operated significantly different from the impoundments that have recently failed since they do not provide long term storage and/or disposal of CCR slurry. There are numerous design and operating characteristics that must be taken into account when evaluating these management units prior to determining a safety rating. They include;

1) The structural soundness and hydrologic/hydraulic safety standards identified in the report do not apply to the wastewater treatment system basins under State of Wisconsin regulations or other Federal regulations. They were not designed to nor do they serve as CCR storage or disposal impoundments, but instead only receive incidental amounts of CCRs.
2) These management units were constructed in 1981, and were designed by Sargent and Lundy, a reputable engineering firm that would have followed the industry standards in effect for this type of structure at the time of construction.
3) There are multiple water level sensors that alarm in the Weston control room should the management unit approach an overfill situation.
4) The management units are more than seven hundred feet away from the river.
5) The "toe" of the embankment is approximately 20 feet above both the 100 and the 500 year Wisconsin River flood stage.
6) Given the topography and soil conditions of the site, it is extremely unlikely that any discharge due to a failure of the management units would reach the Wisconsin River. The soil type in the area of the embankment is primarily sand. Thus most water would infiltrate the ground. If not, the water would travel towards the perimeter ditch where it would be contained. Furthermore, there is a natural low area adjacent to the river which would prevent a release to the river (unless flooding is occurring). Monthly inspections are conducted of each embankment and dike to observe conditions of the downstream slopes and toes, animal burrows, excess vegetation and other issues.

7) In addition, after extreme rainfall events the facility performs an additional visual inspection of the embankments and water levels.
8) The design of the management units was approved by the Wisconsin Department of Natural Resources (WDNR) since it met the applicable regulatory requirements.
9) An extensive geotechnical investigation was completed in 2003 for the Weston Unit 4 Project consisting of 50 soil borings, 4 test pits, and other test locations within the general area of new construction at Unit 4. As part of this investigation, a soil boring was completed on either side of the existing bottom ash management units (BV-3 and BV-4), with several other borings. The investigation verified subsurface soil conditions are suitable for construction of the management units and that no critical hydrogeologic conditions are present at the site.
10) At the time of the inspection by Dewberry, the facility had an informal inspection program for monitoring of the management units. The monitoring program in place was deemed "adequate" for small, low hazard impoundments. The facility continues to monitor the management units on a monthly basis.

<u>Management Unit Rating</u>

As previously stated, WPSC does not believe that the State and Federal criteria for dam safety apply to the wastewater basins at the Weston plant. Since these management units do not meet the regulatory definition of a dam and would otherwise not be regulated as such by a state or federal agency, we believe that these basins should be unrated. However, if they must be rated, WPSC strongly believes the rating should be modified from a "Poor" rating to a "Fair" rating. WPSC believes a "fair" rating is warranted for the embankments because of their proven historical performance, current physical condition, low embankment height, shallow side slopes, pond level instrumentation/alarms, and monthly visual inspections.

After reviewing the draft report we conclude that the four CCR management units are each rated Poor for continued safe and reliable operation due to the lack of sufficient engineering and structural stability analysis documentation. In light of recent failures of coal combustion residual (CCR) impoundment WPSC understands and supports the need for diligence in ensuring the integrity of coal combustion surface management units. WPSC is committed to the proper operation of management units at our generating facilities to prevent accidental releases of wastewater that could impact the environment. To show our commitment to resolving this issue, we believe that a structural stability analysis under static conditions is an appropriate analysis to demonstrate stability and safety of the management units. Since the original design data documentation could not be found, WPSC is willing to conduct a static stability analysis of the embankments around the basins in 2014. WPSC would be willing to share this analysis with USEPA when it becomes final and believe this analysis will warrant a "satisfactory" rating for the management units.

We appreciate the opportunity to review and provide comment on the content and technical conclusions of the draft report. If you have any questions regarding this submission, please contact Mr. Mark Metcalf at (920) 433-1833.

Sincerely,

Howard Giesler

Howard R. Giesler
General Manager - Weston

MWM

Enc: Comments on Draft Coal Combustion Residue Impoundment Assessment Report

ATTACHMENT 1

Comments on the Draft Coal Combustion Residue Impoundment

Round 12 - Dam Assessment Report

Weston Generating Station (Site 26)

Comments on the Draft Assessment

General Comment:
WPSC believes the assessment of the wastewater treatment basins at the Weston plant against dam safety requirements is inappropriate based upon the Federal Guidelines cited within the report. As described in the draft report, the management units at the Weston plant are being evaluated, in part, against the 2004 Federal Guidelines for Dam Safety published by the Federal Emergency Management Agency (FEMA). Within this document, a dam is defined as the following:

> *Any artificial barrier, including appurtenant works, which impounds or diverts water, and which (1) is twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum water storage elevation or (2) has an impounding capacity at maximum water storage elevation of fifty acre-feet or more. <u>These guidelines do not apply to any such barrier which is not in excess of six feet in height regardless of storage capacity, or which has a storage capacity at maximum water storage elevation not in excess of fifteen acre-feet regardless of height</u> (*emphasis added*). This lower size limitation should be waived if there is a potentially significant downstream hazard.*

The management units evaluated have storage capacities of less than fifteen acre-feet. The design documentation contained in Appendix A, Document 4, shows that the elevation between the maximum water storage elevation and lowest barrier elevation (i.e., toe of the embankment) is much less than 25 feet. Further, the management units are classified as low hazard. Therefore, the management units at the Weston plant do not meet the criteria to be considered a dam.

Introduction, Summary Conclusion and Recommendations

1. Page ii, first paragraph. While the impoundment release at the TVA Kingston plant was a devastating event, reference to this event without properly describing the Weston plant results in conjecture to the reader. WPSC recommends replacing the first paragraph with the following language:

    > "On August 21, 2011, Dewberry Consultants LLC conducted an on-site assessment of the wastewater treatment basins at the Wisconsin Public Service Corporation - Weston Generating Station. The assessment was conducted as part of a national effort to assess the stability and functionality of the ash impoundments and other units and then take needed corrective measures."

2. Page ii, impoundment ratings. The ratings used to assess the management units at the Weston plant have been adopted from the New Jersey Department of Environmental Protection *Dam Safety Guidelines for the Inspection of Existing Dams, January 2008.* WPSC believes it is inappropriate to rate the management units against standards for dam safety that would otherwise not apply under any other State or Federal Program. The management units have been given a "Poor" rating, which is defined as the following:

A management unit safety deficiency is recognized for a 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.

A management unit rated as "Fair" rating is defined as:

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."

The draft report indicates a "Poor" rating is being assessed due to a lack of documentation or previous studies to assess the stability of the embankments. WPSC believes the management unit ratings for the four management units should be revised from "Poor" to "Fair" for several reasons:

a. In Wisconsin, dams are regulated pursuant to NR 333, Wisconsin Administrative Code. These basins do not meet the applicability requirements in NR 333.02 (1)(a) since their combined storage volume is less than 50 acre-feet. The management units do not meet the regulatory definition of a dam found in the 2004 Federal Guidelines for Dam Safety given their size and location. Therefore, there are no applicable dam safety regulatory criteria to evaluate the structures against.

b. The management units are permitted wastewater treatment basins designed by a qualified engineering firm and constructed in accordance with the Industrial Lagoon requirements found in NR 213, Wisconsin Administrative Code. The units are not CCR storage or disposal management units.

c. Given that the management units are not immediately adjacent to a river or stream and the ring dikes receive no surface water drainage and are not affected by river flows, hydrologic/hydraulic analyses are not required pursuant to State or Federal guidelines. The base flood elevation for the Wisconsin River near the plant for events with a 0.2 percent annual chance (500 year) flood hazard is 1153' (NAVD 1988)[1], while the lowest elevation of the toe of the embankment around the basins is approximately 1174'. The toe of the embankments is at least 500 feet from the base flood elevation mark. WPSC provided Figure 1 of this attachment as part of the August 2012 inspection depicting the location of the flood plain relative to the management units. The map shows the 100 year flood and 500 year flood plain areas near the facility.

d. Seismic stability is not a concern at the site. As described in Section 7.1.5, soils at the site have low susceptibility to liquefaction and EPA's consultant stated that liquefaction is not a concern at the site. State regulations do not require seismic stability analyses,

1 – Wisconsin Department of Natural Resources, Surface Water Data Viewer. http://dnrmaps.wi.gov/SL/Viewer.html?Viewer=SWDV

and WPSC's experience with the Federal Energy Regulatory Commission (FERC) has been that FERC also has recognized seismic loading at hydroelectric dams in Wisconsin is not a primary concern since the probability of earthquakes is so low. As additional guidance, the FERC Engineering Guidelines, Chapter IV, Section 4-6.6.5 specifically exempts Low Hazard embankments from seismic investigations.

e. Field observations concluded "The overall assessment of the dam, based on a site visit, was that it was in satisfactory condition and no significant findings were noted" (Section 5.1).

<u>Purpose and Scope</u>

1. Page *iii*, first sentence. WPSC suggests changing "Coal Combustion Surface Impoundments" to "Coal Combustion Residue Surface Management units."
2. Page *iii*, first sentence. Replace the word "dam" with "management unit."
3. Page *iii*, first paragraph, last sentence. The report states that the initiative will address management units that are classified as having one of four hazard potential rankings. Section 2.3 only describes 3 hazard classifications. WPSC recommends revising Section 2.3 to include all hazard potential rankings to be consistent with this paragraph and the information provided in the inspection check lists.
4. Page *iii*, last paragraph, first sentence. We suggest the first sentence read as follows: "The purpose of this report is to evaluate the condition and potential for CCR release from the management units at the Weston Plant and rate the units for hazard potential classification."
5. Page *iv*, limitations paragraph. Replace the word "dam" in the first and last sentences with "management unit."

<u>Conclusions</u>

1. Page 1-1, section 1.1.1. WPSC suggests adding the following statement to the beginning of the paragraph:

   "The sizes of the management units at the Weston Plant are less than the thresholds which would require State or Federal regulation under dam safety standards."

2. Page 1-1, section 1.1.1, last sentence. As stated above, WPSC suggests changing the ratings of the management units from "Poor" to "Fair".
3. Page 1-1, sections 1.1.2. WPSC suggests adding the following statement after the second sentence of the paragraph:

   "Given that the impoundments are not immediately adjacent to a river or stream and the ring dikes receive no surface water drainage, hydrologic/hydraulic analyses are not required pursuant to State or Federal guidelines."

4. Page 1-1, section 1.2.2. WPSC suggests adding the following statement after the third sentence of the paragraph:

   "In response to the overtopping events, WPSC raised the grade in low areas along the embankment and installed level meters to monitor the management units. The level meters are calibrated on an annual basis."

5. Page 1-1, sections 1.1.2, last sentence. As stated above, WPSC suggests changing the ratings of the management units from "Poor" to "Fair".

6. Page 1-1, section 1.1.3. WPSC suggests modifying this paragraph as follows:

   "The supporting technical documentation is not adequate to evaluate the structural stability of the management units against current standards for dam safety. The utility has not been able to provide a design report for the original management units (constructed in 1981, designed by Sargent and Lundy, Chicago, IL), nor did Dewberry receive any relevant analysis information on these units. At the time of construction and modification of the management units, the embankments were constructed to the design requirements found in the Wisconsin Administrative Code. Construction specifications and liner permeability related to the original design was provided by the utility. An engineering report related to embankments constructed in 2005 when a railroad loop was constructed was provided by WPSC. At the time of construction, the management units were not required to meet the design standards which they are being evaluated against in this document."

7. Page 1-2, section 1.1.8. WPSC believes the management units should be rated as "Fair" as discussed above.

<u>Recommendations</u>

1. Page 1-3, section 1.2.1. WPSC disagrees with the recommendation of a need to perform structural stability calculations under seismic conditions to show the dikes have sufficient factors of safety to prevent failure and release to the environment. The management units meet the applicable design requirements found in NR 213, Wisconsin Administrative Code. The management units are not subject to the State requirements for water retaining structures (i.e., dams) found in NR 333, Wis. Admin. Code as the combined storage volume is less than 50 acre-feet. NR 333 only requires a stability analysis of the dam during base flow conditions and at maximum load (static) conditions. Further, Federal guidelines for dam safety do not apply to these management units as described above. WPSC agrees it is a good practice to perform a stability analysis under static conditions.

2. Page 1-3, section 1.2.2. WPSC disagrees with the recommendation to perform hydrologic and hydraulic analyses of management unit performance under flood conditions. The management units are not subject to river flows. The base flood elevation for the Wisconsin River near the plant is 1153', while the lowest elevation of the toe of the embankment around the basins is

approximately 1174'. Consequently, the only hydrologic effect that could potentially impact the basin is a rain event. Inflow of water to the basins is managed by the facility. The management units are not collection basins for control of stormwater runoff. The 100 year, 24-hour rainfall event for Marathon County, WI is approximately 5.83"[2]. The basins are operated with a freeboard of 19"; therefore there is adequate capacity to handle a significant precipitation event without overtopping.

3. Page 1-1, Section 1.1.3. WPSC believes the management units should be rated as "Fair" as discussed above.

<u>Participants and Acknowledgements</u>

1. There is a typo in the name of a participant. Please revise the spelling for Dave Molzahn.

<u>Description of the Coal Combustion Residue Management Unit(s)</u>

1. Note there are two pages labeled 2-2.
2. Please revise the labels for Tables 2.1a through 2.1d from "dam" to "management unit".
3. The management unit identifiers in Tables 2.1a and 2.1b need to be switched. The data in 2.1a is for the Northeastern management unit, and the data in Table 2.1b is for the Northwestern management unit.
4. Table 2.1b. The length of the Northwestern Secondary Ash Pond is listed as 405 feet. Based on an interpretation of drawing S3002 in Drawing 13, the length of the basin (distance between embankment crest in the middle of the management unit) is approximately 275 feet.
5. Table 2.1d. The length of the Southwestern Secondary Ash Pond is listed as 325 feet. Based on an interpretation of drawing S3002 in Drawing 13, the length of the basin (distance between embankment crest in the middle of the management unit) is approximately 150 feet.
6. Page 2-5, Section 2.3. It should be noted that the management units at the Weston Generating Station, while classified as small for the purpose of the evaluation, are well below the minimum size classification listed in Table 2.2a.
7. Page 2-6, Tables 2.3a and 2.3b. The names of the ponds need to be corrected. The capacities listed in Table 2.3a are the capacities for the Northwest Secondary Pond, while the capacities listed in Table 2.3b are for the Northeastern Secondary Pond.
8. Page 2-7, section 2.5.1. To clarify, please revise the beginning of the fourth paragraph to the following:

   "The facility was originally designed with two secondary storage basins. In 2005, the railroad loop was constructed which essentially split the existing basins into four secondary basins.

---

2 - NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES.
http://hdsc.nws.noaa.gov/hdsc/pfds/

New Embankments were constructed with an underground conduit to allow the north and south secondary basins to operate as one hydraulically connected pond."

Summary of Relevant Reports, Permits, and Incidents

1. Page 3-2, last sentence. WPSC suggest modifying the sentence as follows:

   "In response to these events in 2008, WPSC raised the grade of the area on the embankment where the overtopping occurred and installed level meters on the basins to monitor water elevation to prevent any future overflow of the secondary or tertiary basins."

Summary of History of Construction and Operation

1. Page 4-1, section 4.1.1, last paragraph. This sentence should state "Next, a protective sand and rock layer was installed."

2. Page 4-1, section 4.1.2. We suggest the following language to clarify the modification:

   "In 2005, the secondary treatment basins were modified for the installation of a railroad loop track at the site. As a result, new embankments were constructed, effectively separating the existing secondary basins. New embankments were constructed parallel to the railroad track using the same materials and configuration as the existing embankments. The eastern and western basins are connected via a culvert underneath the railroad track, oriented perpendicular to the track. There is one culvert connecting the northern basins and one culvert connecting the southern basins."

Field Observations

1. Page 5-1, Section 5.1, third paragraph. Please replace "dam" with "management unit".

2. Page 5-12, Photo 5.5.4a. Note the pump in the photo is used to transfer water to the truck washing station on the temporary CCR storage pad adjacent to the management units.

Hydrologic/Hydraulic Safety

1. Page 6-1, section 6.1.1, Flood of Record. WPSC provided Figure 1 of this attachment as part of the August 2012 inspection depicting the location of the flood plain relative to the management units. The map shows the 100 year flood and 500 year flood plain areas near the facility[3].

2. Page 6-1, section 6.1.2 Inflow Design Flood. This is not applicable as the management units are not subject to river flows and inflow to the management units is controlled by the facility. Consequently, the only hydrologic effect that could potentially impact the basin is a rain event. As provided above, the basins are operated with sufficient freeboard to contain rainfall from a 100 year rain event.

---

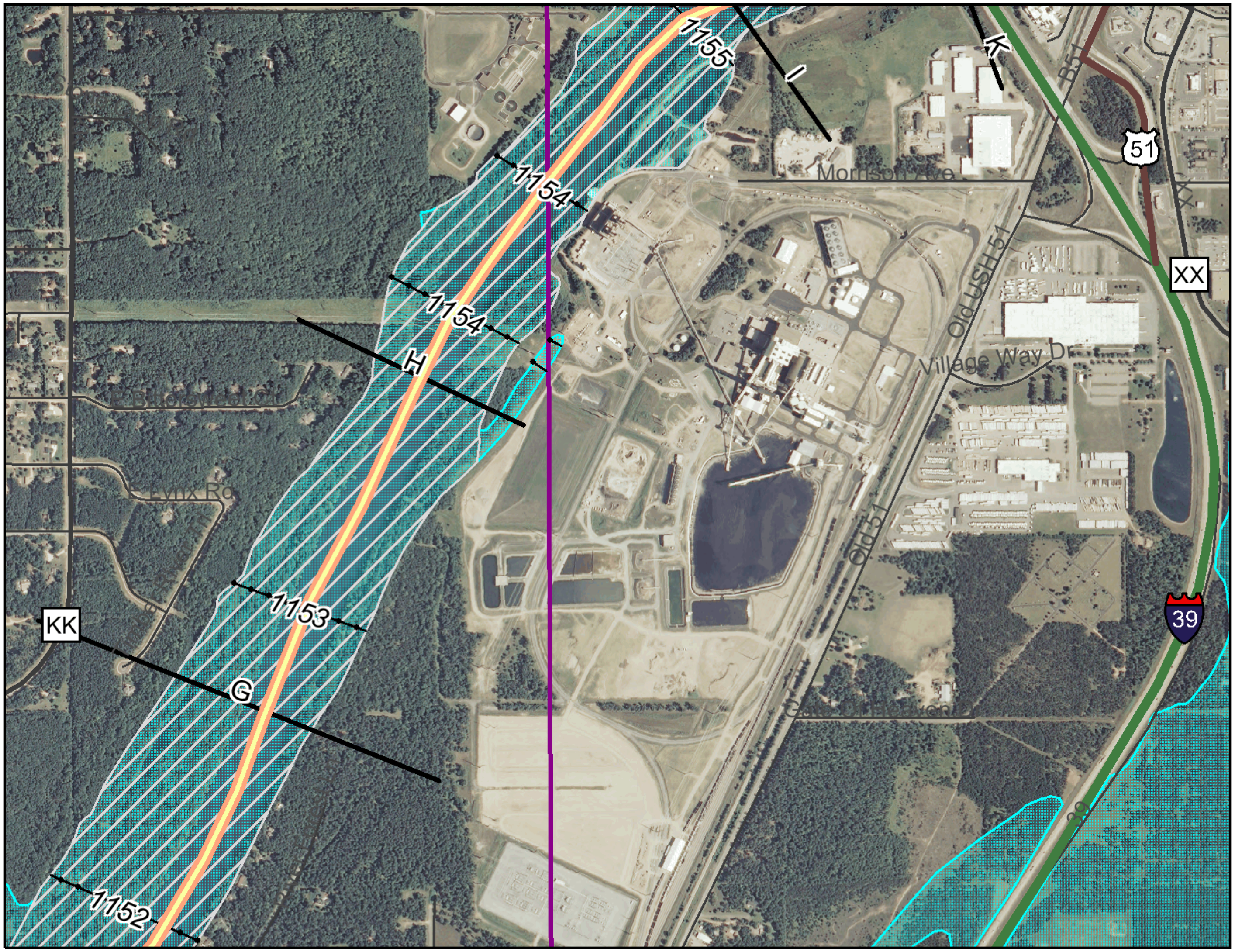
3 – Wisconsin Department of Natural Resources, Surface Water Data Viewer. http://dnrmaps.wi.gov/SL/Viewer.html?Viewer=SWDV

Structural Stability

1. Page 7-1, Section 7.1.1. As described in Section 7.1.5, liquefaction is not considered to be a concern at the site given the very low probability of a seismic event and the soil types present beneath the units are not susceptible to liquefaction. Therefore a seismic stability analysis is not warranted. WPSC recommends revising section 7.1.1 to the following:

   "Structural stability cannot be assessed without the design report and a static stability analysis. Seismic stability is not considered a concern for this site as described in 7.1.5."

Flood Zone / Inundation Map - Weston Generating Station



0 1500 3000 4500 ft.

Map created on Aug 28, 2012

Legend

Analysis Points
- Flood Insurance Study
- Letter of Map Revision
- Case By Case Analysis
- Bridge
- OTHER

Analysis Lines
- Flood Insurance Study
- Letter of Map Revision
- Case By Case Analysis
- Bridge
- OTHER

Base Flood Elevations

Digital Cross Sections

FEMA Map Panel Index

Major Highways
- Interstate
- State Highway
- U.S. Highways

County Roads

Local Roads

Digital Flood Boundaries
- 100 Year Floodplain
- 500 Year Floodplain
- Floodway

N

Scale: 1:15,094

Wisconsin Wetland Inventory (WWI) maps show graphic representations of the type, size and location of wetlands in Wisconsin. These maps have been prepared from the analysis of high altitude imagery in conjunction with soil surveys, topographic maps, previous wetland inventories and field work. State statutes define a wetland as "an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions." The principal focus of the WWI is to produce wetland maps that are graphic representations of the type, size and location of wetlands in Wisconsin. Within this context, the objective of the WWI is to produce reconnaissance level information on the location, type, size of these habitats such that they are accurate at the nominal scale of the 1:24,000 (1 inch = 2000 feet) base map. The DNR recognizes the limitations of using remotely sensed information as the primary data source. They are to be used as a guide for planning purposes. There is no attempt, in either the design or products of this inventory, to define the limits of jurisdiction of any Federal, State, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State, or local agencies concerning specified agency regulatory programs and jurisdictions that may affect such activities. The most accurate method of determining the legal extent of a wetland for federal or state regulations is a field delineation of the wetland boundary by a professional trained in wetland delineation techniques.

APPENDIX D

Document 22

Geotechnical Stability Analysis, Secondary Bottom Ash Basins, Weston Generating Station, May 22, 2014

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Geotechnical Stability Analysis

Secondary Bottom Ash Basins

Weston Generating Station, Rothschild, Wisconsin

Submitted to:
Integrys Business Support LLC
700 North Adams Street
Green Bay, Wisconsin 54301

Submitted by:
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May 22, 2014

Project 1404880

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Senior Consultant

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Executive Summary

The Wisconsin Public Service Corporation (WPSC) owns and operates the Weston Generating Station located at 2501 Morrison Avenue in Rothschild, Wisconsin. The facility is a base load, coal fired, electrical power station having four coal fired boilers used for the production of electricity. Units 1-4 have capacities of 60, 75, 325, and 595 MW. The units were commissioned in 1954, 1960, 1981, and 2008, respectively. WPSC burns sub-bituminous coal from the Powder River Basin as the primary fuel source in the boilers. As a result, coal combustion residual products (fly ash, bottom ash, and FGD ash) are generated.

The United States Environmental Protection Agency (US EPA) retained Dewberry Consultants LLC, (Dewberry) from Fairfax, Virginia as their contract engineer to perform an assessment of the Weston Generating Station bottom ash treatment basins for Weston Unit 3. These basins are referred to as "management units" in EPA's draft assessment. Based on their site visit conducted on Tuesday, August 21, 2012, and information provided by WPSC to support the assessment, the basins have been given an initial rating of POOR due to a lack of sufficient engineering and structural stability data. WPSC has retained GEI to assist in providing technical documentation regarding the geotechnical structural stability of the basins.

After reviewing construction documentation and subsurface exploration data from the permanent operating record of the site, GEI performed a very conservative geotechnical stability analysis of the secondary bottom ash basins. The result of the geotechnical stability analysis shows that the secondary bottom ash basins have adequate factor of safety under the normal pool, maximum pool, rapid draw down, and seismic conditions modeled. The calculated factor of safety values exceed generally accepted minimum factor of safety criteria and no further exploration or investigation is necessary at this time.

1. Introduction

The Wisconsin Public Service Corporation (WPSC) owns and operates the Weston Generating Station located at 2501 Morrison Avenue in Rothschild, Wisconsin. The facility is a base load, coal fired, electrical power station having four coal fired boilers used for the production of electricity. Units 1-4 have capacities of 60, 75, 325, and 595 MW. The units were commissioned in 1954, 1960, 1981, and 2008, respectively. WPSC burns sub-bituminous coal from the Powder River Basin as the primary fuel source in the boilers. As a result, coal combustion residual (CCR) products (fly ash, bottom ash, and FGD ash) are generated.

Fly ash is dry handled from Units 1-3. Fly ash is removed from the flue gas stream of Units 1&2 using electrostatic precipitators. Fly ash is removed from the flue gas of Unit 3 using a bag house. The fly ash is collected in hoppers and transferred to dry storage silos. The fly ash is transferred to vendors for beneficial use as a cement replacement in concrete or the fly ash is moisture conditioned using a rotary mixer, then transported to a temporary ash storage pad where it is stockpiled for beneficial reuse projects as structural fill.

Unit 4 has a dry flue gas desulfurization (FGD) air emission control system to remove sulfur dioxide. The FGD waste is removed by a bag house, collected in hoppers, and is eventually transferred to a dry storage building. FGD waste from Unit 4 is moisture conditioned using a rotary mixer and transported to a temporary ash storage pad where it is stockpiled for beneficial reuse projects as structural fill.

Bottom ash from Unit 3 is collected from the boiler and sluiced to a series of redundant treatment basins (i.e., the management units). The coal combustion residuals are sluiced to one of two primary settling basins where the CCR quickly settles out and the sluice water quickly flows to the secondary basin. Dewatered bottom ash is removed from the primary basins on a weekly basis using a front-end loader and transported via dump truck to the ash storage pad for future beneficial use. Weston produces about 80,000 to 85,000 tons per year of bottom ash.

Bottom ash from Weston Unit 4, along with pulverizer rejects and economizer ash, is conveyed via the submerged flight conveyor and mostly de-watered prior to being dumped into a dump truck and taken to a temporary ash storage pad.

The secondary bottom ash basins are designed to provide residence time for the CCR fines to settle out from the sluice water. To improve residence time and assist in settling the fines, silt curtains are used in the secondary bottom ash basins. In 2005, to increase the rail car capacity of the plant, the secondary bottom ash basins were bisected to facilitate the construction of a rail line. So rather than having north and south secondary bottom ash basins, Weston has Northeastern, Northwestern, Southeastern, and Southwestern secondary bottom ash basins. Equalizing underground conduits were installed beneath the rail lines to maintain the water levels of the Northeastern and Northwestern bottom ash basins and the Southeastern and Southwestern bottom ash basins. Water from the secondary bottom ash basins is treated for pH and suspended solids, as needed, and pumped to a Tertiary Basin where the water is either reused as carriage water for sluicing bottom ash in a close-loop system or discharged to the Wisconsin River under WPDES Permit No. WI-0042756-07-0. Figure 1: Site Location Diagram, shows the site and the location of the basins.

The United States Environmental Protection Agency (US EPA) retained Dewberry Consultants LLC, (Dewberry) from Fairfax, Virginia as their engineer contractor to perform the assessment of the Weston Generating Station bottom ash basins. The purpose of the assessment was to evaluate the condition of and potential for residue release from management units and determine a hazard potential classification rating for the units. Based on their site visit conducted on August 21, 2012, Dewberry considered the Unit 3 secondary bottom ash basins as being management units with a potential hazard. The Primary basins were not considered a hazard because of the berm height and size. WPSC submitted information indicating it does not consider the Tertiary basin to be a basin that contains CCR. Based on plant operations and visual assessment Dewberry concurred and did not assess the Tertiary basin.

According to the United States Army Corp of Engineers ER-1110-2-106 Guidelines for Safety Inspections of Dams the secondary bottom ash basin size classification is SMALL (all height are less than 25 feet and less than 1,000 acre-feet of water storage) and according to Federal Emergency Management Administration FEMA 93 – Federal Guidelines for Dam Safety the hazard classification is LOW in the event of failure (no loss of life expected and low economic loss and generally limited to the owner). However, Dewberry and the US EPA concluded that the secondary bottom ash basins should be rated as POOR due to a lack of sufficient engineering and structural stability data.

WPSC has retained GEI to assist in providing technical documentation regarding the geotechnical structural stability of the basins and to provide the additional engineering and structural stability documentation to support a SATIFACTORY rating of the basins.

Our work was performed in accordance with GEI proposal dated April 16, 2014. Integrys issued Purchase Order No. 1200139229 dated April 18, 2014 as authorization to proceed. Our scope of work included the following:

- Site visit and project meeting with basin operation staff,

- Review of existing documentation regarding the design and construction of the secondary bottom ash basins including historic soil boring information, operating records, and groundwater monitoring data from nearby wells,

- Geotechnical stability analysis of a critical cross-section of the secondary bottom ash basins, and

- Preparation of a report to present results of our geotechnical stability analysis.

This report presents the results of the above scope of work and includes the following sections:

Section 1	Introduction
Section 2	Documents Reviewed and Relied Upon
Section 3	Site Conditions
Section 4	Stability Analysis
Section 5	Conclusions and Recommendations
Section 6	General Qualifications

2. Documents Reviewed and Relied Upon

GEI reviewed and relied upon the following documents in evaluating the structural stability of the Secondary Bottom Ash Basins:

Design and Documentation Drawings

Black & Veatch, (2004) Drawing S3001, Grading & Drainage, Site Area 1 Plan. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Black & Veatch, (2004) Drawing S3002, Grading & Drainage, Site Area 2 Plan. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Black & Veatch, (2004) Drawing S3007, Grading & Drainage, Site Area 7 Plan. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Black & Veatch, (2004) Drawing S3050, Grading & Drainage, Site Typical Sections. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Black & Veatch, (2004) Drawing S3051, Grading & Drainage, Site Typical Sections & Details. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Black & Veatch, (2004) Drawing S3000, Grading & Drainage, Site Key Plan, General Notes & Legend. Weston Generating Station, Unit 4. Wisconsin Public Service Corporation. September 15, 2004

Sargent & Lundy, (1978) Drawing No. C-20, Grading, Roadwork, and Drainage Plan, Sheet 10. Weston Generating Station, Unit 3. Wisconsin Public Service Corporation, Wausau, WI. 1978.

Sargent & Lundy, (1978) Drawing No. C-21, Grading, Roadwork, and Drainage Plan, Sheet 11. Weston Generating Station, Unit 3. Wisconsin Public Service Corporation, Wausau, WI. 1978.

Sargent & Lundy, (1978) Drawing No. C-42, Miscellaneous Sections and Details, Sheet 1. Weston Generating Station, Unit 3. Wisconsin Public Service Corporation, Wausau, WI. 1978.

Sargent & Lundy, (1978) Drawing No. C-43, Miscellaneous Sections and Details, Sheet 1. Weston Generating Station, Unit 3. Wisconsin Public Service Corporation, Wausau, WI. 1978.

Sargent & Lundy, (1978) Drawing No. C-44, Miscellaneous Sections and Details, Sheet 3. Weston Generating Station, Unit 3. Wisconsin Public Service Corporation, Wausau, WI. 1978.

Engineering Reports

Black & Veatch Corporation (2004). Wisconsin Public Service Corporation Weston North Unit 4 Rothschild, WI. Geotechnical Report Revision 0. January 14, 2004.

Dewberry Consultants LLC (2014). Coal Combustion Residue Impoundment Round12 – Dam Assessment Report. Weston Generating Station (Site 26) Northeastern, Northwestern, Southeastern and Southwestern Secondary Bottom Ash Treatment Ponds. Wisconsin Public Service Rothschild, WI. February 2014.

STS Consultants, Inc. (1980). Merrill Gravel & Construction Company Laboratory Test Results. Proposed Soil-Bentonite Liner. Wisconsin Public Service, Weston Unit 3 Plant Expansion Weston, WI. July 16, 1980.

Groundwater Monitoring Well Data

Wisconsin Department of Natural Resources, Groundwater and Environmental Monitoring System (GEMS) Database, http://dnr.wi.gov/topic/Landfills/gems.html, Wisconsin Public Service Corporation, Weston #3 Landfill, WDNR License No. 2879.

References

Gueddouda, M.K., Lamara, MD, Aboubaker, N., Taibi, S. (2008), "Hydraulic Conductivity and Shear Strength of Dune Sand-Bentonite Mixtures," International Conference on Construction and Building Technology, ICCBT 2008-E-(12), June 2008, Kuala Lumpur, Malaysia, pp 139-150.

U.S. Army Corp of Engineers, (1979), "Recommended Guidelines for Safety Inspection of Dams," *ER 1110-2-106*. Washington D.C., September 1979.

U.S. Army Corp of Engineers, (2003), "Slope Stability," *EM 1110-2-1902*. Washington D.C., October 2003.

U.S. Department of Homeland Security, Federal Emergency Management Agency, (2004) Federal Guidelines for Dam Safety, *FEMA 93*, Denver: Bureau of Reclamation, U.S. Department of Interior.

3. Site Conditions

3.1 Secondary Bottom Ash Basins

The secondary bottom ash basins are designed to provide residence time for settling bottom ash fines from the sluice water. The basins were designed as two parallel basins where one basin could be taken off line for cleaning while the other remained in service. The basins were designed and constructed with 3 horizontal to 1 vertical (3H:1V) interior and exterior slopes and a minimum crest width of the exteriors berms of 10 feet. An interior dike bisects the secondary basins. The interior dike was constructed with 3H:1V slopes and a minimum crest width of 6 feet. The crest elevation of the secondary basins was designed by Sargent & Lundy to be constructed at elevation +1,182.5 feet. The interior of each basin is lined with a 1-foot thick compacted sand-bentonite liner system, 1-foot soil protection layer, and 2 feet of crushed stone.

In 2005, as part of the Weston Unit 4 construction project, the secondary basins were bisected by a loop railroad line to serve the needs of the plant. Underground conduits installed below the rail lines equalize water elevation in each basin and connect the Northeastern and Northwestern Basins and the Southeastern and Southwestern Basins, respectively. The design and construction of the rail line and secondary basin modifications were completed by Black & Veatch. Figure 2: Plan View, is a topographic map showing the basins, boring locations, and adjacent groundwater monitoring wells.

The dikes were constructed from on-site soil that was placed and compacted. GEI conservatively estimated the dike soils to be fine to medium sand based on borings BV-03, BV-04, BV-07, BV-08, and BV-09 and the soil recommendations from the WPSC Weston North Unit 4 Geotechnical Report by Black & Veatch Corporation dated January 14, 2004. The moist unit weight recommendation for on-site fine to medium sand (SW) is 120 pcf with a conservative friction angle of 28 degrees.

The sand-bentonite liner properties are estimated based on the Maximum Technologies Report of Soil Analysis dated March 24, 2005 and Gueddouda et, al, (2008). For our analyses we modeled the sand-bentonite layer with a saturated unit weight of 130 pcf, drained friction angle of 22 degrees, and undrained shear strength of 1,000 psf.

3.2 Subsurface Soil Conditions

Geotechnical Report – Wisconsin Public Service Corporation Weston North Unit 4, Rothschild, Wisconsin dated January 14, 2004 contains soil borings advanced near the secondary bottom ash basin. Black & Veatch advanced the soil borings using hollow stem augers to the water level, and then switched to rotary wash drilling below the water table. Soil samples were reportedly obtained using a split barrel sampler while performing standard penetration tests (SPT). Soil borings BV-03, BV-04, BV-07, BV-08, and BV-09 were advanced near the secondary basins in support of the basin modifications and were used by GEI to define the subsurface soil conditions. In general these borings encountered fill near the surface, underlain by natural granular sandy soils. Based on the geotechnical borings near the secondary bottom ash basins GEI estimated a moist unit weight of 120 pcf with a conservative friction angle of 30 degrees for the medium dense natural sands (SP-SW).

3.3 Groundwater Conditions

The Wisconsin River is located west of the secondary bottom ash basins and flows north-south. Based on FEMA Map Number 55073C0631F dated July 22, 2010, the 100-year flood elevation of the Wisconsin River near the secondary ash basins is elevation +1,153.5 feet (NAVD88). The normal pool elevation is estimated to be +1,140.0 feet.

GEI obtained groundwater monitoring well data from the Wisconsin Department of Natural Resources (WDNR), Groundwater and Environmental Monitoring System (GEMS) Database for the WPSC Weston Landfill #3. Groundwater monitoring wells adjacent to the secondary ash basins are OW-38, OW-43A, OW 43B. Monitoring wells located north of the basins include OW28AR, OW28BR, OW-30A, OW30B, OW 40A, and OW 40B. The location of these wells is shown on Figure 2: Plan View.

To estimate groundwater conditions around the basin we selected the second quarter monitoring date of June 10, 2013. Table 1 – Groundwater Monitoring Well Data presents the monitoring data from adjacent wells from the second quarter of 2013.

Table 1 – Weston Groundwater Monitoring Well Data 2Q 2013

Monitoring Well	Groundwater Elevation (ft)
OW-28AR	+1,145.26
OW-28BR	+1,145.30
OW-30A	+1,144.87
OW-30B	+1,144.84
OW-38	+1,144.73
OW-40A	+1,145.99
OW-40B	+1,147.03
OW-43A	+1,145.08
OW-43B	+1,145.09

Figure 3: Weston Generating Station Secondary Ash Basin Ground and Surface Water Conditions shows the Normal Pool and 100 year Flood Elevation of the Wisconsin River, the normal operating level and maximum pool elevation of the Secondary Bottom Ash Basins, and the recorded groundwater elevations for the adjacent groundwater monitoring wells. For purposes of our analyses, we used a phreatic surface elevation of +1,145 feet in the natural sand soils underlying the basins.

4. Analyses

Based on the geometry and design of the secondary basin, GEI selected one cross-section for analysis - Section A-A'. This section corresponds to detail Section 43 from Drawing C-42, Miscellaneous Sections & Details, Sheet 1, as shown on Drawing C-20 Grading Roadwork, & Drainage Plan – Sheet 10, Weston Generating Station Unit 3, Wisconsin Public Service Corporation. Figure 2: Plan View, shows the location of Section A-A'.

The perimeter dike is a controlled compacted fill embankment with 3 horizontal to 1 vertical (3H:1V) side slopes and a 10-foot-wide crest width. The dike was constructed to elevation +1182.5 feet and has a vertical height ranging from 4 to 11 feet.

The basin dike was evaluated using two sets of time-dependent soil strength parameters. Both effective stress analysis and total stress analysis were conducted to evaluate the basin dikes. Effective stress analysis parameters were used to model drained, long-term, steady-state loading conditions where excess pore water pressures have had time to dissipate. Total stress analysis parameters were used to model undrained, short-term loading conditions such as drawdown and seismic events, where excess pore water pressures could develop in fine-grained soils and have not had time to dissipate. Table 2 summarizes the effective and total stress soil strength parameters for each of the soil layers used in the analysis.

Table 2: Soil Parameters Used For the Geotechnical Stability Analysis

Soil Description	Unit Weight (pcf)	Effective Stress Strength Parameters		Total Stress Strength Parameters	
		c' (psf)	ϕ'	c' (psf)	ϕ
Compacted Dike Fill Soils (SW)	120	0	28	0	28
Natural Sands Medium Dense (SP-SW)	120	0	30	0	30
Bentonite-Sand Liner	130	0	22	1,000	0
Soil Cover (SW)	120	0	28	0	28
Crushed Stone (GP)	110	0	32	0	32

The basins were not designed for CCR storage, disposal, or operating levels above the perimeter dike. Therefore, the CCR within the basin was assigned no strength parameters as a conservative approach to the analysis. The ash was modeled as water so that it applied weight and pressure but did not contribute any stabilizing resistance.

Four loading scenarios were evaluated for the secondary basins. The loading conditions modeled are referred to as the normal pool condition (water level at +1,180.75 feet), the maximum pool condition (water level at +1,182.5 feet), a drawdown condition, and the seismic condition. Groundwater levels modeled are based on the design pond levels and the groundwater levels in the adjacent monitoring wells. The cross-section was analyzed for the effective stress and total stress conditions. Total stress conditions would be representative of the expected undrained soil strengths immediately after filling of the basin is completed, under a drawdown where the basin would be dewatered for cleaning, and under seismic conditions. The effective stress condition is a representation of the drained, long-term strengths that can be expected over time. This would be the normal steady-state operating condition of the basin. The drawdown case is representative of the condition when the basin is drained and the sand-bentonite liner could remain saturated. Based on the basin design and ground and surface water conditions it is not a typical "rapid drawdown condition" where water pressures can be difficult to predict due to the rapid nature of the loading and drainage that occurs. In our drawdown case we assumed total stress conditions with the sand bentonite liner saturated and the basin empty. An analysis was performed to determine what effect an earthquake would have on the stability of the basin. GEI chose a maximum probable earthquake for Weston Generating Station based on the 2008 United States Geological Survey National Seismic Hazard Maps, Peterson et.al (2008). The maximum probable earthquake has a peak ground acceleration of 0.02 g with a 2 percent Probability of Exceedance in 50 years.

Appropriate factors of safety are required to ensure adequate performance of slopes throughout their design lives. Two of the most important considerations that determine appropriate magnitudes for factor of safety are uncertainties in the conditions being analyzed, including shear strengths and consequences of failure or unacceptable performance.

What is considered an acceptable factor of safety should reflect the differences between new slopes, where stability must be forecast, and existing slopes, where information regarding past slope performance is available. In the case of secondary basins at Weston, there is a 33-year history of satisfactory performance and no instability issues. A history which is free of signs of slope movements provides solid evidence that a slope has been stable under the conditions it has experienced. Therefore, values of factors of safety lower than those required for new slopes can be justified for the existing slopes, if necessary.

Geotechnical engineers have relied upon judgment, precedent, experience, and regulations to select suitable factors of safety for slopes. For design and construction of earth and rock-fill dams, required factors of safety continue to be based on experience and guidance from the United States Army Corp of Engineers. Factors of safety recommended by the United States Army Corp of Engineers for various types of slopes and analysis conditions are summarized in Table 4. These are the minimum required factors of safety for new embankments at dams. They are advisory for existing dams and other types of slopes.

Table 4 - Minimum Required Factor of Safety for New Earth and Rock Filled Dams from USCOE EM1110-2-1902 Slope Stability

Analysis Condition[1]	Required Factor of Safety	Slope
End of Construction[2]	1.3	Upstream and Downstream
Long-Term (Steady-state seepage, maximum surcharge pool, spill way crest or top of gates)	1.5	Downstream
Maximum surcharge pool[3]	1.4	Downstream
Rapid drawdown	1.1-1.3 [4,5]	Upstream

[1] For earthquake loading, see ER 1110-2-1806 for guidance. An Engineer Circular, “Dynamic Analysis of Embankment Dams,” is still in preparation.
[2] For embankments over 50 feet high on soft foundations and for embankments that will be subjected to pool loading during construction, a higher minimum end-of-construction factor of safety may be appropriate.
[3] Pool thrust from maximum surcharge level. Pore pressures are usually taken as those developed under steady-state seepage at maximum storage pool. However, for pervious foundations with no positive cutoff steady-state seepage may develop under maximum surcharge pool.
[4] Factor of safety (FS) to be used with improved method of analysis described in Appendix G of EM 1110-2-1902 Slope Stability
[5] FS = 1.1 applies to drawdown from maximum surcharge pool; FS = 1.3 applies to drawdown from maximum storage pool.
For dams used in pump storage schemes or similar applications where rapid drawdown is a routine operating condition, higher factors of safety, e.g., 1.4-1.5, are appropriate. If consequences of an upstream failure are great, such as blockage of the outlet works resulting in a potential catastrophic failure, higher factors of safety should be considered.

The desired factors of safety are based on the loading condition and normal engineering practice. For the steady-state loading condition (Scenarios I and II), a safety factor of 1.5 or greater would generally be considered acceptable; for the rapid drawdown condition (Scenario III), a factor of safety of 1.1 or greater would generally be considered acceptable; and for the seismic event (Scenario IV), a safety factor of 1.2 or greater is generally considered acceptable. However, after any significant seismic or flooding event, a comprehensive inspection should be performed to evaluate the dikes and any necessary repairs implemented. Table 5 – Slope Stability Analysis Results summarizes the analyses that were completed and the resulting computed factors of safety. The computer outputs for each case analyzed are included in the Appendix.

Table 5 - Slope Stability Analyses Results

Design Scenario, Pond and Loading Condition			Effective Stress Analysis		Total Stress Analysis	
			Block	Circular	Block	Circular
Scenario I	Normal Pool/Static	Downstream	1.9	1.8	1.9	1.8
Scenario II	Maximum Pool/Static	Downstream	1.9	1.8	1.9	1.8
Scenario III	Drawdown/ Static	Upstream	1.5	1.4	2.0	1.8
Scenario IV	Normal Pool/Seismic	Downstream	1.7	1.7	1.7	1.7

5. Conclusions and Recommendations

The WPSC Weston Generating Station Secondary Bottom Ash Basins were constructed in 1981 in conjunction with Unit 3 of the generating station. The basins were constructed by excavating and compacting on-site alluvial soils, lining the basin with a soil-bentonite liner, placing and compacting a protective soil layer, and installing a protective crushed stone. The basins were modified as part of the Unit 4 construction in 2005 to accommodate a loop railroad track. The modifications resulted in the dual secondary basins being bisected by the track, resulting in four secondary bottom ash basins. An underground conduit connects the Northeast and Northwest secondary bottom ash basins and a similar conduit connects the Southeast and Southwest secondary bottom ash basins. The basins were designed by a qualified engineering firm and constructed in accordance with the Industrial Lagoon requirements found in NR 213, Wisconsin Administrative Code. The basins are permitted by the WDNR under the authority of Chapter 283 of the Wisconsin Statutes and are operated under WPDES Permit No. WI-0042765-07-0. The US EPA performed an assessment on the status of the ash basin at the Weston Generating Station and recommended that a geotechnical stability analysis of the secondary bottom ash basins be performed to address short-term and long-term stability of the basins.

After reviewing construction documentation and subsurface exploration data from the permanent operating record of the site, GEI performed a very conservative geotechnical stability analysis of the secondary bottom ash basins. The result of the geotechnical stability analysis shows that the basins have an adequate factor of safety under the normal pool, maximum pool, rapid draw down, and seismic conditions modeled. The calculated factor of safety values exceed generally accepted minimum factor of safety and no further exploration or investigation is necessary at this time.

6. General Qualifications

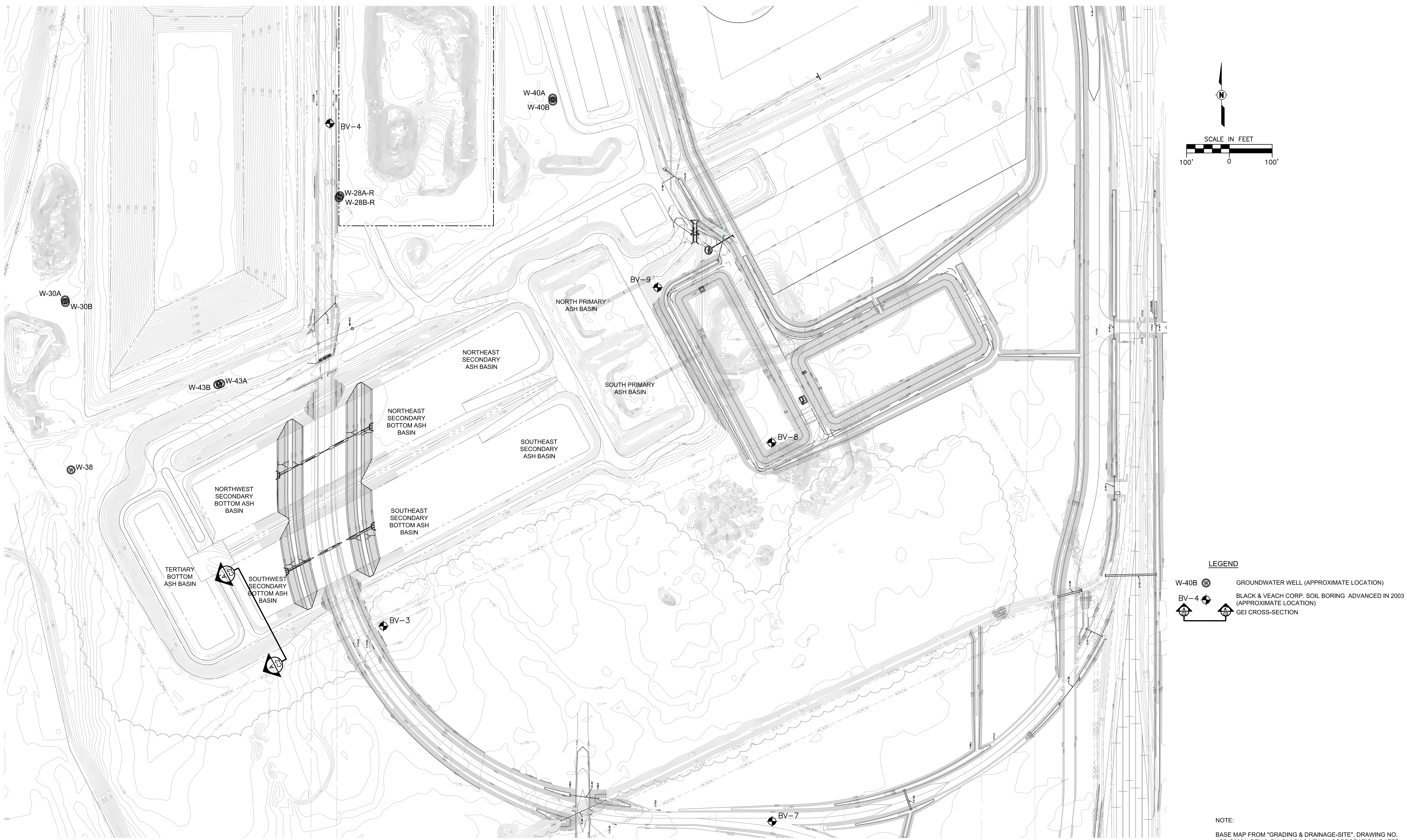
This report has been prepared in accordance with normally accepted geotechnical engineering practices to aid in the evaluation of this site for our Client. We have prepared this report for the purpose intended by our Client, and reliance on its contents by anyone other than our Client is done at the sole risk of the user. No other warranty, either expressed or implied, is made. The scope is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects relevant to the geotechnical characteristics. In the event that any changes in the design or location of the facilities as outlined in the report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified, as necessary, in writing by the professional engineer of GEI that sign this report.

The analysis and recommendations submitted in this report are based on the data obtained from the available soil borings provided by our client. In a subsurface exploration, specific information is obtained at specific locations at a specific time. This report does not reflect any variations which may occur between the boring obtained from the Client. It is a well-known fact that variation in soil and rock conditions exist on most sites between boring locations and that seasonal and annual fluctuations in groundwater levels will occur.

Figures

1. Site Location Diagram
2. Plan View
3. Weston Generating Station Secondary Ash Basin Ground and Surface Water Conditions

Units 3 and 4 Ash Basins Weston Generating Station	GEI Consultants	SITE LOCATION DIAGRAM
Wisconsin Public Service Corporation Rothschild, Wisconsin	Project 1404880	Figure 1



NOTE:

BASE MAP FROM "GRADING & DRAINAGE-SITE", DRAWING NO. 4SD-S3001, REV 2, BY BLACK & VEACH CORPORATION, DATED 9/15/2004.

Attention:

0 1"

If this scale bar does not measure 1" then drawing is not original scale.

NO.	DATE	ISSUE/REVISION	APP
0	X	X	X

Designed: JXT
Checked: JXT
Drawn: JLC

Submittal Date: 5/14/2014

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WISCONSIN PUBLIC SERVICE CORP.
WESTON GENERATING STATION

GEI Project 1404880

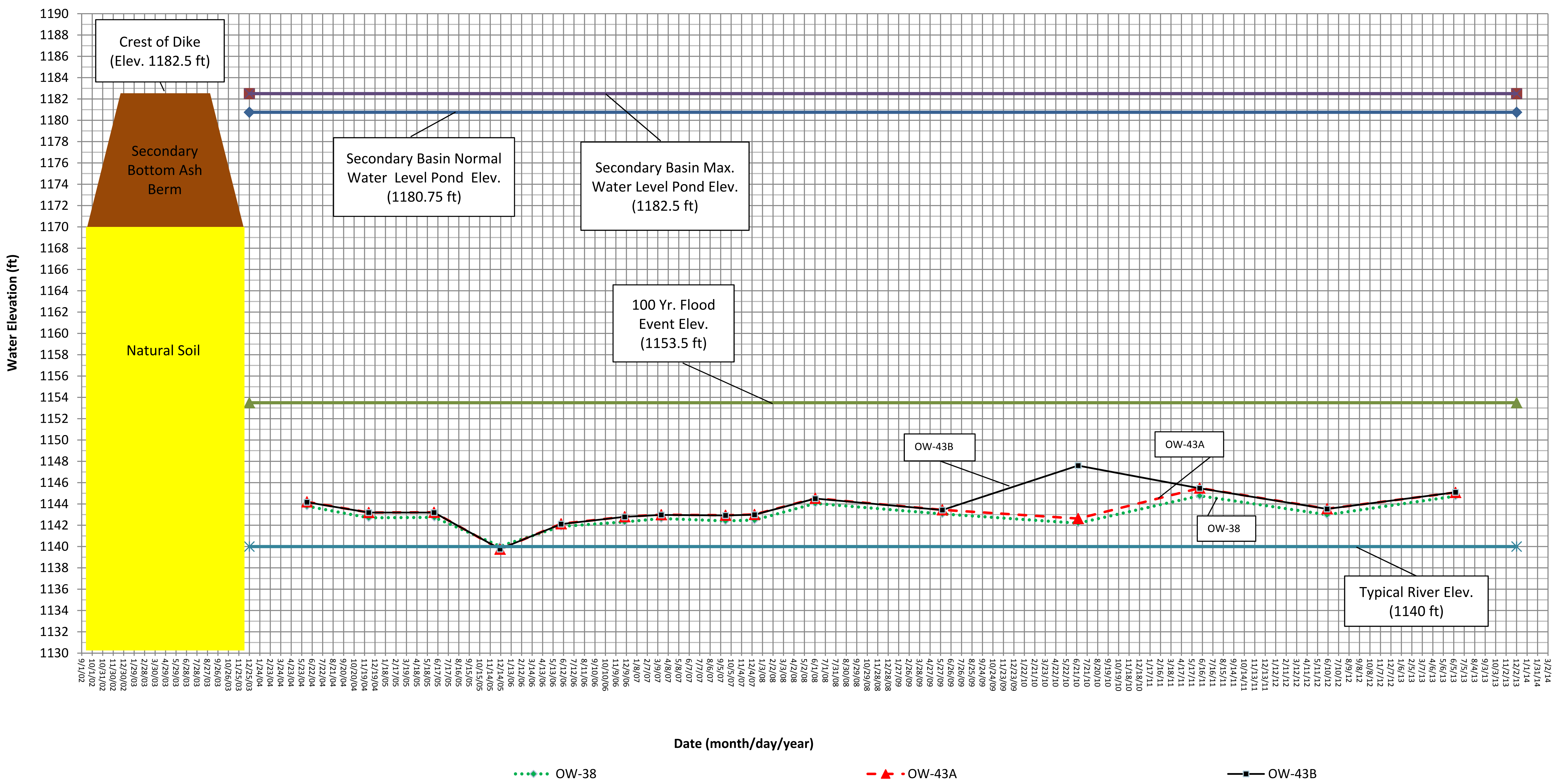
WESTON ASH POND
GEOTECHNICAL EVALUATION

PLAN VIEW

FIGURE 2

Filename: J:\2014\1404880 - INTERGRYS WESTON PP\1404880001.DWG Last saved by: JCALAWAY Last Plotted: 2014-05-14

FIGURE 3: Weston Generating Station Secondary Ash Basin Ground and Surface Water Conditions



Appendix

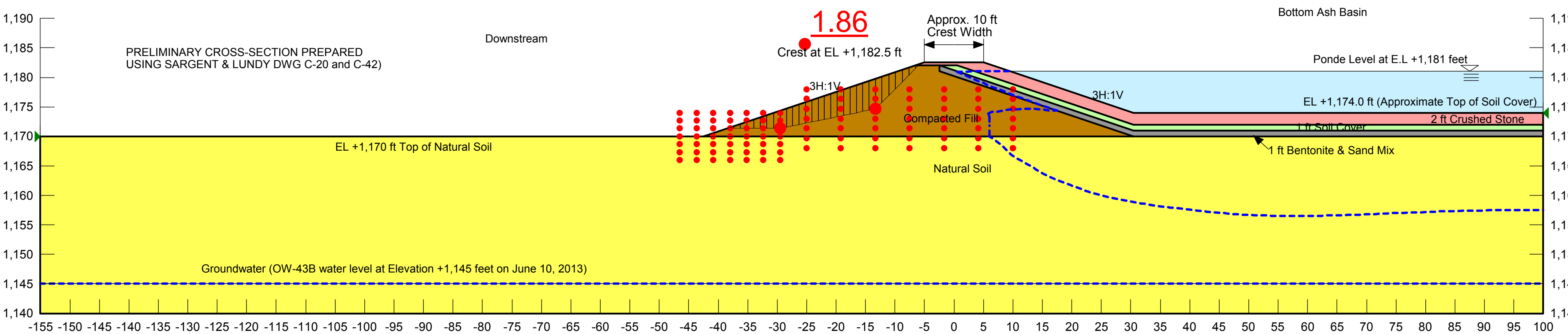
Stability Analyses

Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 ° Phi-B: 0 °
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °



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Date: 5/14/2014

Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
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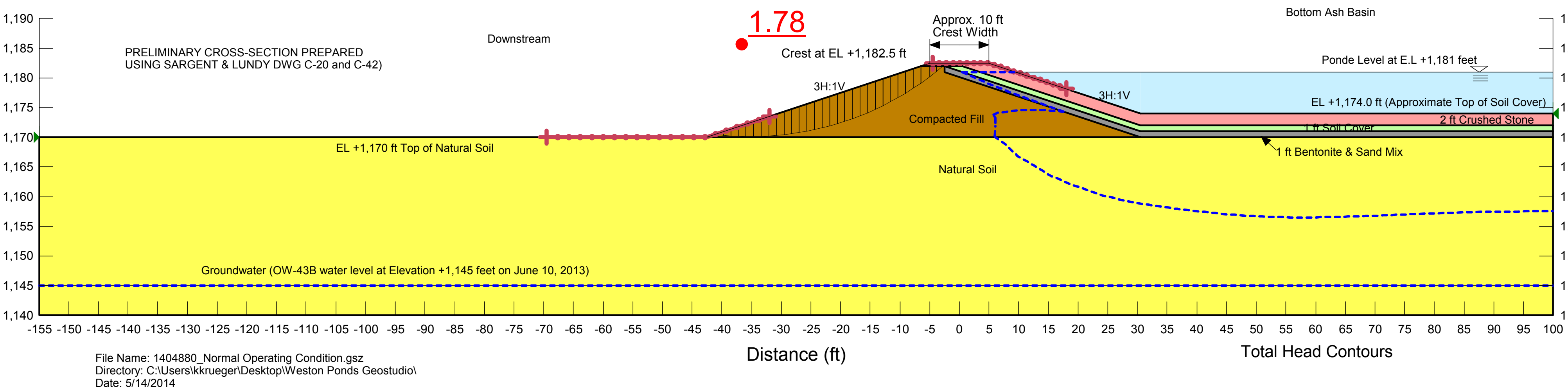
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °

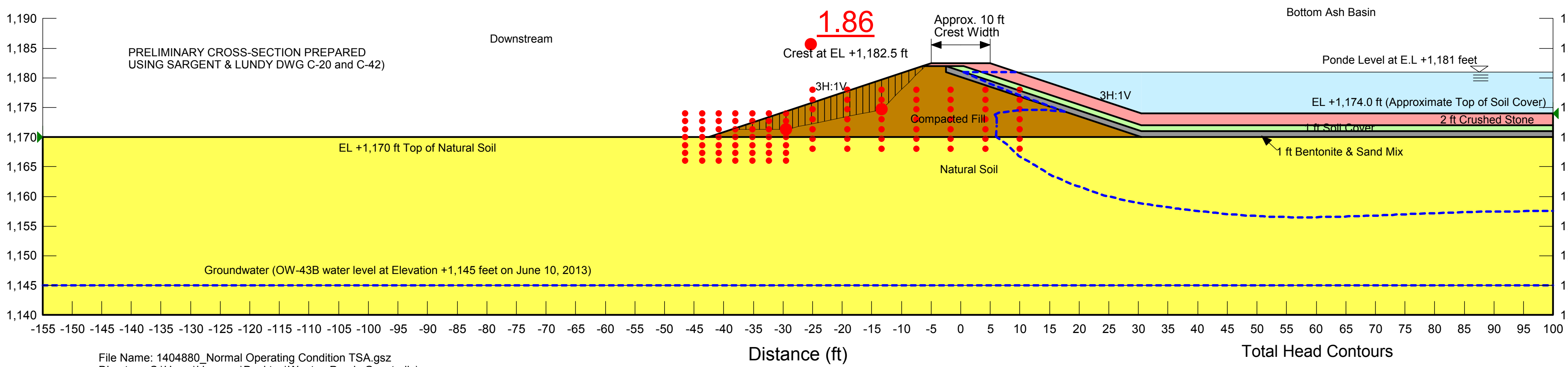


Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions

TSA

Name: Natural Soil Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Compacted Fill Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Bentonite and Sand Mix Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Soil Cover Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Crushed Stone Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 °



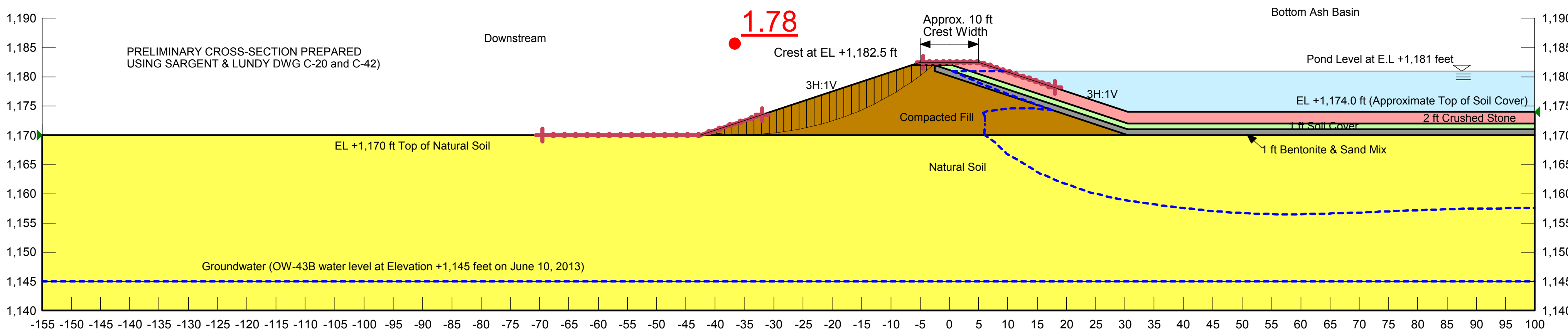
File Name: 1404880_Normal Operating Condition TSA.gsz
Directory: C:\Users\kkrueger\Desktop\Weston Ponds Geostudio\
Date: 5/14/2014

Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions

TSA

Name: Natural Soil   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 30 °
Name: Compacted Fill   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Bentonite and Sand Mix   Unit Weight: 130 pcf   Cohesion': 1,000 psf   Phi': 0 °
Name: Soil Cover   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Crushed Stone   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 32 °



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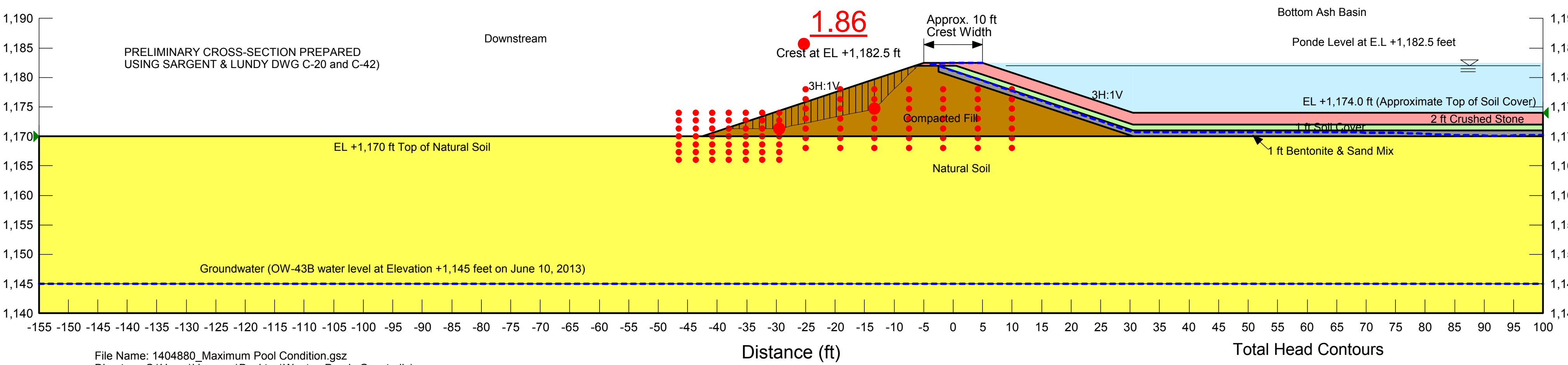
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Maximum Pool Operating Conditions

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 ° Phi-B: 0 °
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °



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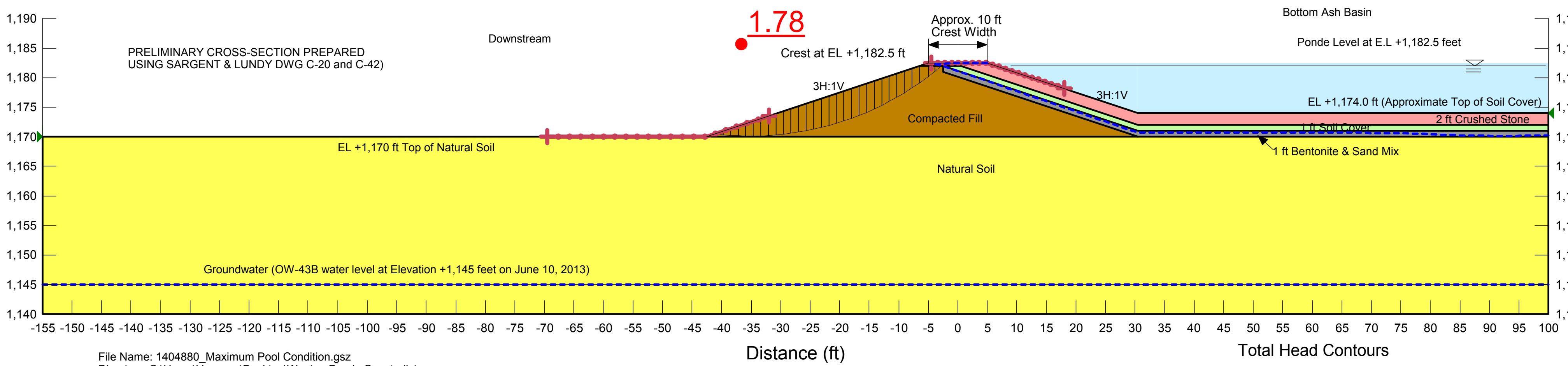
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Maximum Pool Operating Conditions

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 ° Phi-B: 0 °
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °



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Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Maximum Pool Operating Conditions

TSA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
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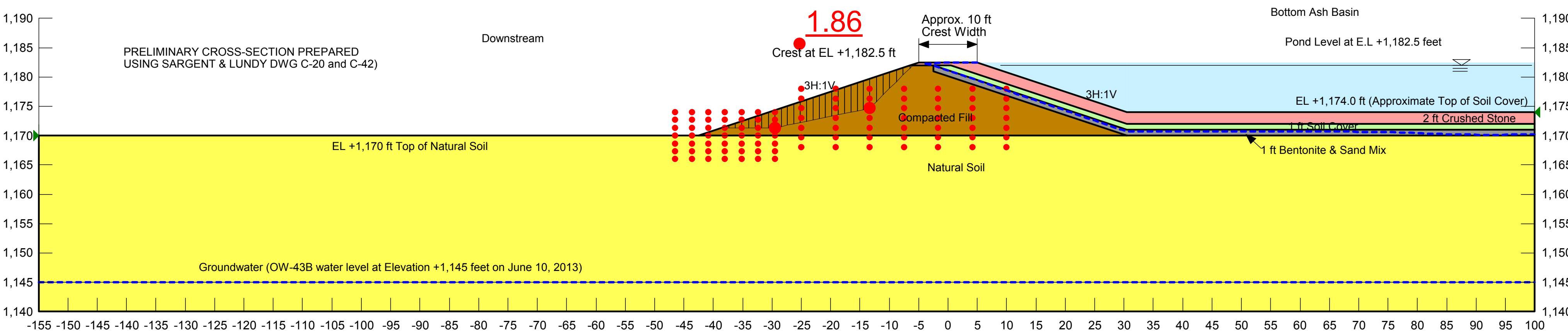
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °



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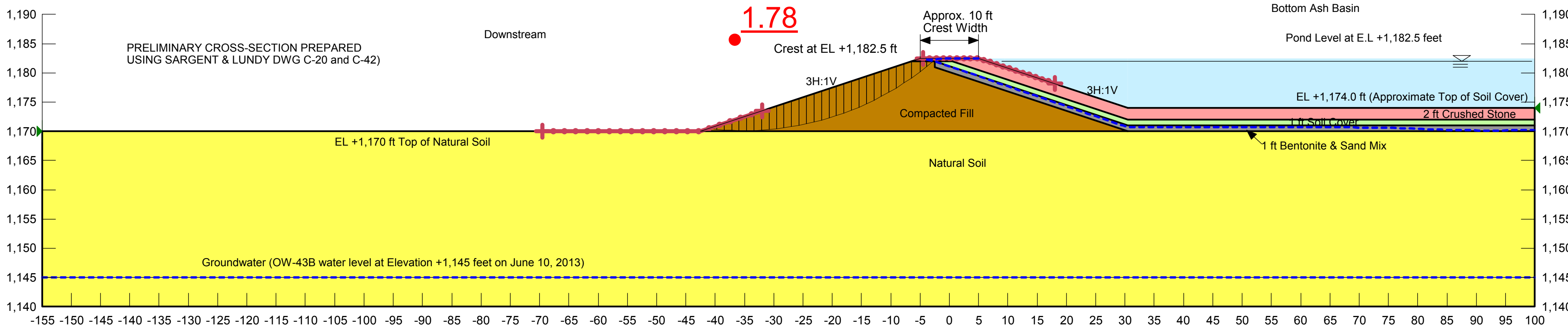
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Maximum Pool Operating Conditions

TSA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 °
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 0 ° Phi-B: 0 °
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 °
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 °



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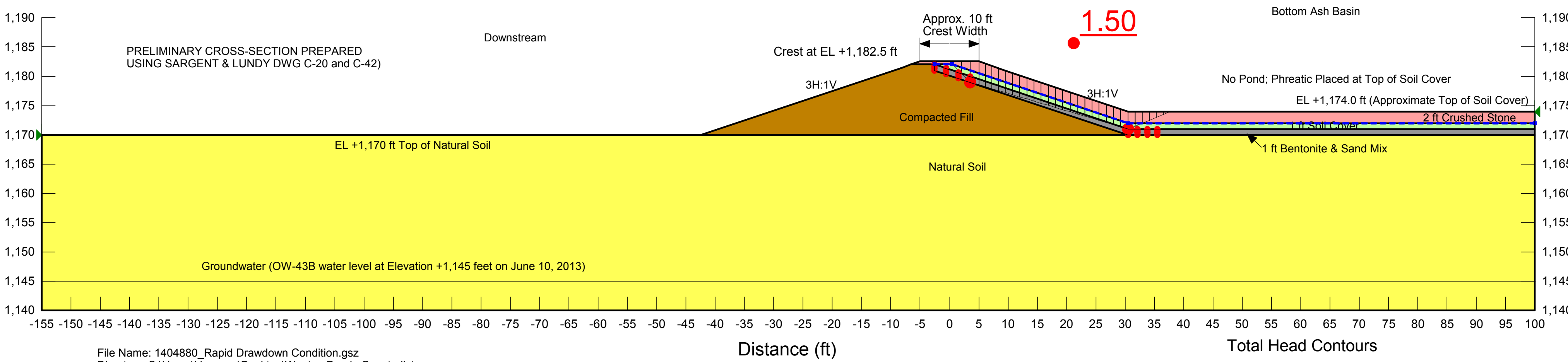
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Drawdown

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Piezometric Line: 1
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 ° Phi-B: 0 ° Piezometric Line: 1
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



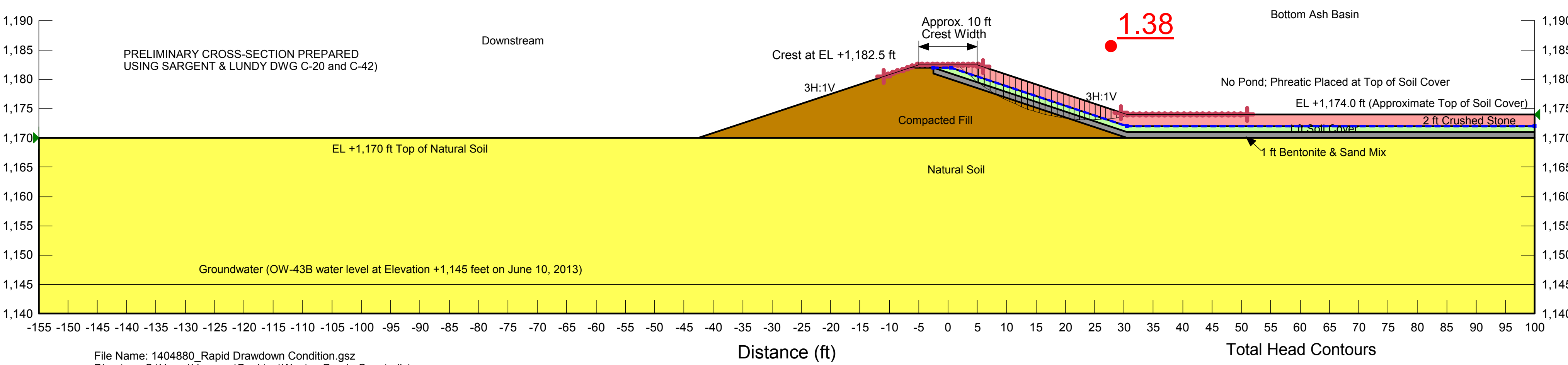
File Name: 1404880_Rapid Drawdown Condition.gsz
Directory: C:\Users\kkrueger\Desktop\Weston Ponds Geostudio\
Date: 5/14/2014

Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Drawdown

ESA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Piezometric Line: 1
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 ° Phi-B: 0 ° Piezometric Line: 1
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



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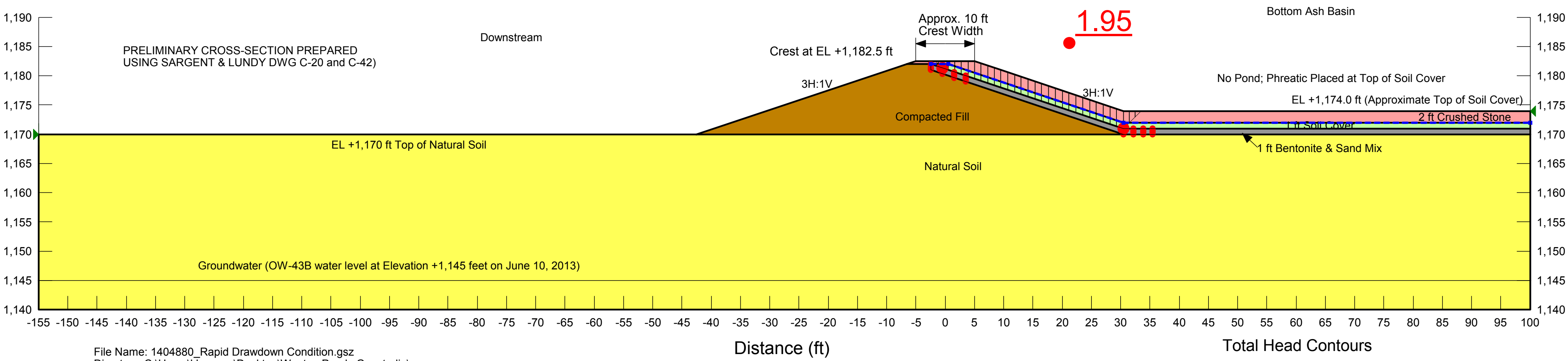
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Drawdown

TSA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Piezometric Line: 1
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 0 ° Phi-B: 0 ° Piezometric Line: 1
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



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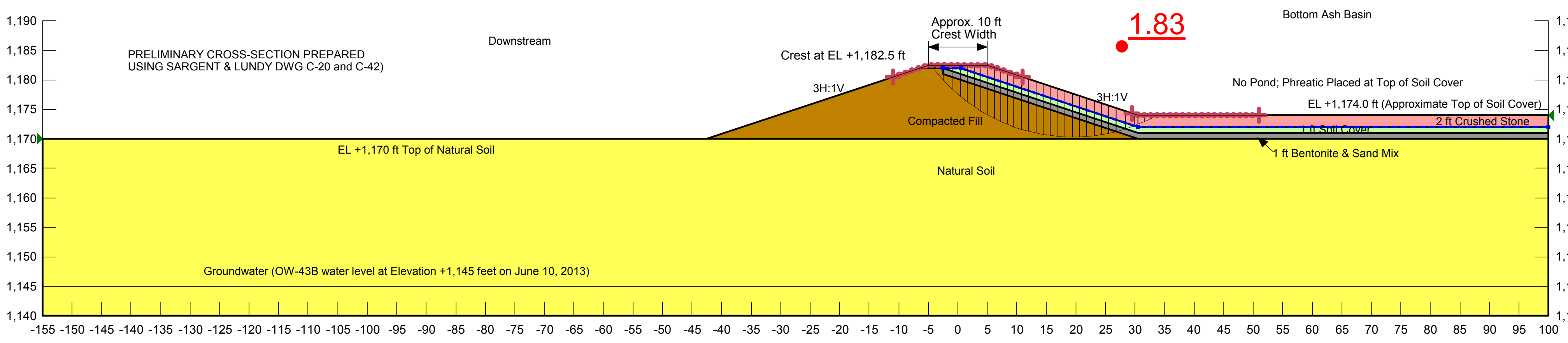
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Drawdown

TSA

Name: Natural Soil Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Piezometric Line: 1
Name: Compacted Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Bentonite and Sand Mix Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 0 ° Phi-B: 0 ° Piezometric Line: 1
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Crushed Stone Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



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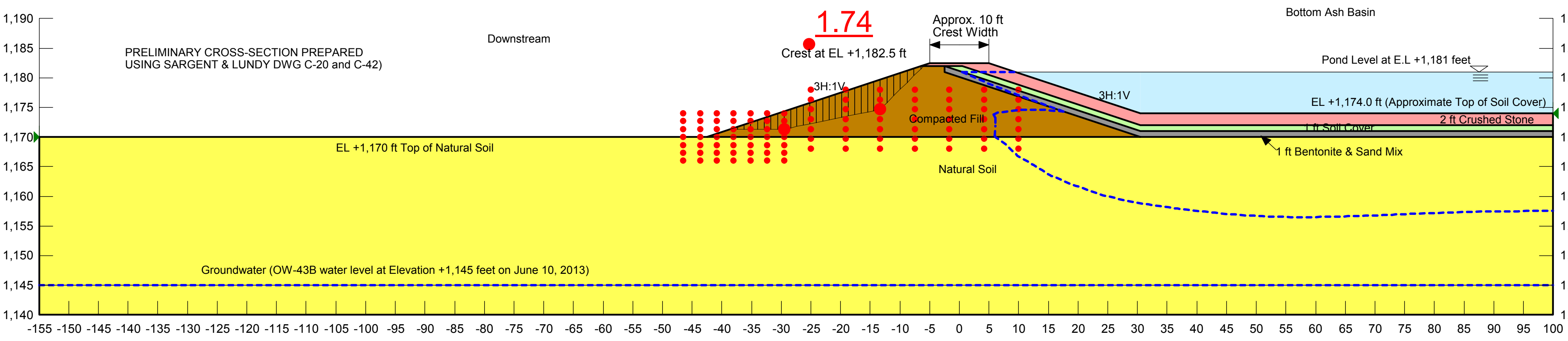
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions - Seismic Loading 0.02g

ESA

Name: Natural Soil Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Compacted Fill Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Bentonite and Sand Mix Unit Weight: 130 pcf Cohesion': 0 psf Phi': 22 °
Name: Soil Cover Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Crushed Stone Unit Weight: 110 pcf Cohesion': 0 psf Phi': 32 °



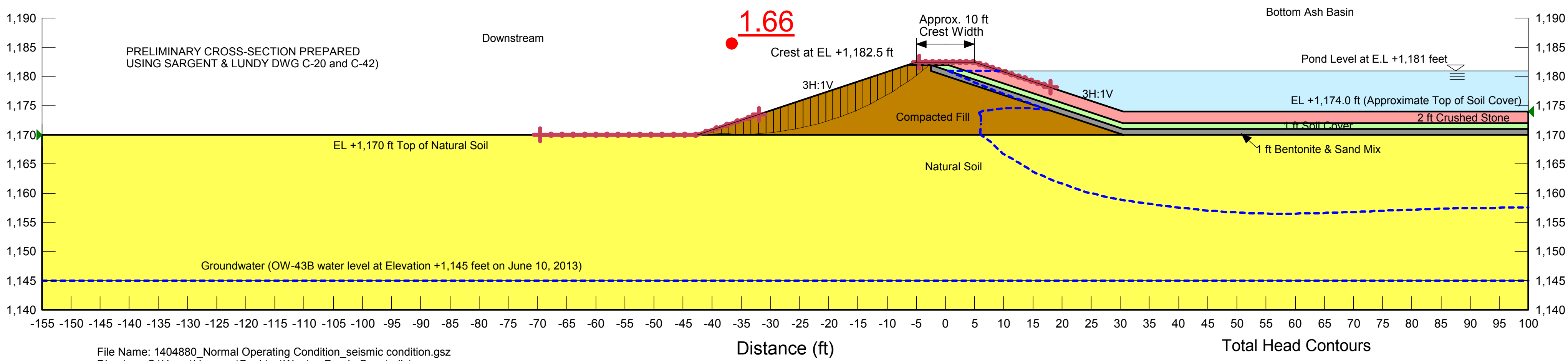
File Name: 1404880_Normal Operating Condition_seismic condition.gsz
Directory: C:\Users\kkrueger\Desktop\Weston Ponds Geostudio\
Date: 5/14/2014

Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions - Seismic Loading 0.02g

ESA

Name: Natural Soil   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 30 °
Name: Compacted Fill   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Bentonite and Sand Mix   Unit Weight: 130 pcf   Cohesion': 0 psf   Phi': 22 °
Name: Soil Cover   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Crushed Stone   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 32 °



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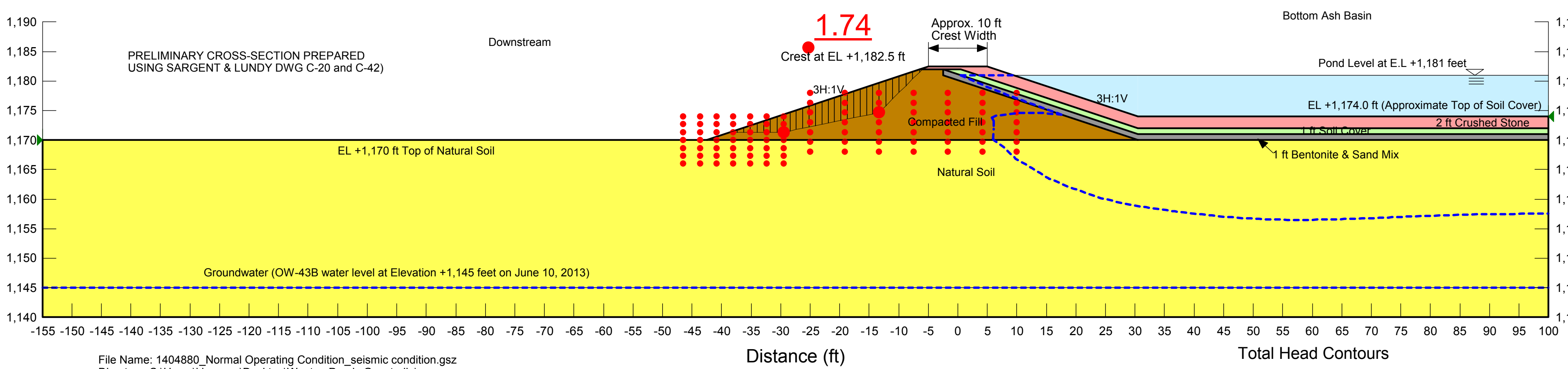
Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions - Seismic Loading 0.02g

TSA

Name: Natural Soil   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 30 °
Name: Compacted Fill   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Bentonite and Sand Mix   Unit Weight: 130 pcf   Cohesion': 1,000 psf   Phi': 0 °
Name: Soil Cover   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 28 °
Name: Crushed Stone   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 32 °



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Wisconsin Public Service Corp
Weston Generating Station Unit 4

Slope Stability Analysis : Normal Operating Conditions - Seismic Loading 0.02g

TSA

Name: Natural Soil Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Compacted Fill Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
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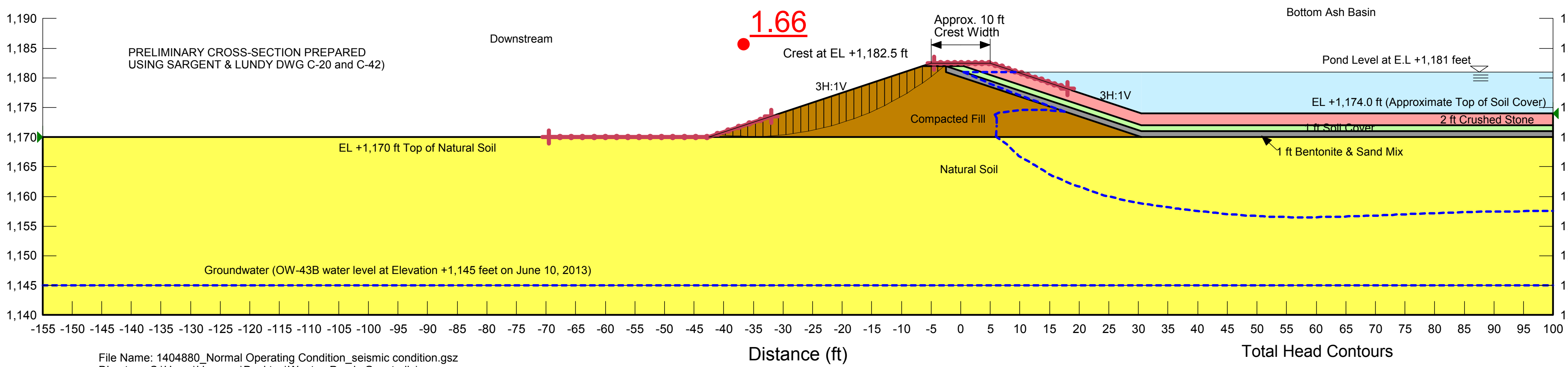

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