ANNUAL REPORT

ANNUAL INSPECTION REPORT

GREAT RIVER ENERGY – STANTON STATION

Bottom Ash Surface Impoundment

Submitted to: Great River Energy
Stanton Station
4001 Highway 200A
Stanton, North Dakota 58571

Submitted by: Golder Associates Inc.
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January 2017 **1649580**

Golder Associates

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1.0 INTRODUCTION

As part of 40 CFR Part 257 of the Subtitle D solid waste provisions under the Resource Conservation and Recovery Act (RCRA), utilities are required to complete annual inspections for surface impoundments and landfills containing Coal Combustion Residuals (CCR). This report has been prepared by Golder Associates Inc. (Golder) for Great River Energy (GRE) to satisfy the annual inspection requirements for CCR surface impoundments under Part 257.83.

Stanton Station is located in Mercer County, approximately three miles south of Stanton, North Dakota (Figure 1). There are two facilities located at Stanton Station that fall under the CCR rule requirements. These facilities include the Bottom Ash CCR Landfill (Bottom Ash Landfill) and the Bottom Ash CCR Surface Impoundment (Bottom Ash Impoundment) which is currently used to dewater bottom ash. This report presents a review of available facility information and findings of the inspection of the Bottom Ash Impoundment performed October 24, 2016.

2.0 REVIEW OF EXISTING INFORMATION

2.1 Geological Conditions

Stanton Station is located in the Missouri Slope district of the glaciated Missouri Plateau of the Great Plains physiographic province (NDDH 2005). The Bottom Ash Impoundment is constructed in Missouri River alluvial deposits. The alluvial deposits have two distinct subunits: upper and lower. The upper subunit consists of a silty sand and clay and the lower subunit is an outwash sand and gravel (Barr 2010).

2.2 Site History and Liner Systems

Stanton Station is located in Section 16 and 21, Township 144N and Range 84W of Mercer County, three miles south of Stanton, North Dakota (see Figure 1). The Bottom Ash Impoundment is divided into three cells, named the north, center, and south cells (see Figure 2). The north and south cells are active cells used for dewatering bottom ash and the center cell functions as a retention cell. Bottom ash is placed into one of the active cells until the cell reaches capacity. Once capacity is reached bottom ash deposition is directed to the other active cell and the filled cell is dewatered. Bottom ash remaining in the dewatered active cell is excavated and hauled to the adjacent Bottom Ash Landfill for containment. Each active cell is sized to hold at least two years of plant bottom ash production (Stone & Webster 1994c).

Stanton Station originally burned North Dakota lignite before being converted in November 2004 to use fuel from the Powder River Basin in Wyoming. All ash was originally wet sluiced into a series of ash ponds (Ponds A, B, and C) (Stone & Webster 1994b). In the mid-1990s, Stanton Station converted to a dry fly ash handling system, and the historic CCR management units were reconfigured.

CCRs from the 1970s ash disposal area and Pond A were excavated and hauled to Pond B and C for disposal. Ponds B and C were further consolidated and closed. Pond A was reconfigured to include a composite-lined surface impoundment with three cells and the Bottom Ash Landfill. The Bottom Ash Impoundment cells have floor liners consisting of two feet of protective cover, a 60-mil high density polyethylene (HDPE) geomembrane, and two feet of compacted clay fill (top to bottom). The liner along the side slopes consists of a 60-mil HDPE geomembrane and approximately 3.2 feet of compacted clay (10-feet horizontal width). Selected construction drawings are included in Appendix A.

2.3 Site Geometry

The berm surrounding the Bottom Ash Impoundment and two interior berms have a top elevation of 1720 feet. The bottom elevation of the cells varies between 1700 and 1704 feet according to original construction drawings. The perimeter berm along the north, east, and south sides of the impoundment complex consists of a historic embankment to elevation 1715 with a berm extension to 1720 feet. The west perimeter berm and two interior berms were completely new construction. The berm extension and new berms were constructed in 1994 and 1995. The interior and exterior slopes of the berm are 3:1. The

crest is a gravel surfaced roadway supporting both light passenger vehicles and some heavy construction equipment, such as 30-ton haul trucks.

2.4 Changes in Geometry

No significant recent changes to geometry were noted.

2.5 Storage Capacity and Volumes

Stanton Station produces approximately 10,600 cubic yards (CY) of bottom ash and economizer ash (herein referred to as bottom ash) per year that is sluiced to the surface impoundment with water pumped from the Missouri River, demineralizer reject water, boiler blowdown water, water from the plant stormwater retention pond, the coal unloading pit sump, and from miscellaneous plant drains. The capacity of the Bottom Ash Impoundment cells to elevation 1720 feet are:

- North Cell – 67,400 CY
- Center Cell – 59,400 CY
- South Cell – 75,600 CY

The north and center cells did not contain significant amounts of CCR at the time of the inspection. The north cell was cleaned out in 2014. Bottom ash was actively being placed in the south cell in 2016. The south cell contained approximately 4 years (42,400 CY) of bottom ash at the time of the inspection. Approximately 67,400 CY of bottom ash capacity remains in the north cell and 33,200 CY of capacity remains in the south cell. As previously discussed, the center cell does not typically receive CCRs and is not considered in the capacity calculations at this time.

2.6 Impounded Water

Water levels in the Bottom Ash Impoundment cells are controlled by stop logs at the inlet and outlet structures between the cells and at the discharge location. The water level in the north cell was at an elevation of approximately 1714 feet, the water level in the center cell was at an elevation of approximately 1714 feet, and the water level in the south cell was at an elevation of approximately 1716 feet. The depths and volumes of impounded water for each cell during 2016 are shown in Table 1.

Table 1: Depth and Volume of Impounded Water at the Bottom Ash Impoundment.

Cell Description	Minimum Depth of Water in 2016	Maximum Depth of Water in 2016	Depth of Water at Time of Inspection	Volume of Water at Time of Inspection	
	feet	feet	feet	gallons	Acre-feet
North Cell	4	8	8	7,000,000	21.5
Center Cell	8	11	8	6,100,000	18.7
South Cell	10	11	10	1,600,000	4.9

2.7 Permits

The Bottom Ash Impoundment is currently permitted with the North Dakota Department of Health (NDDH) under Permit Number 0043. The most recent permit renewal was submitted in February 2015 (GRE 2015).

2.8 Summary of 2016 Weekly Inspections

Routine weekly inspections of the Bottom Ash Impoundment were completed by GRE throughout 2016 as a part of the final CCR Rule. Based on a review of the available inspection forms, the following items were noted:

- Generally good site maintenance.
- No signs of significant seepage, settlement, or cracking of the exterior slopes.
- Small animal burrows were noted.

2.9 Summary of Previous Inspections

A previous inspection of the Bottom Ash Impoundment was performed by Golder in April of 2015 (Golder 2016) and a summary of the observations of that inspection are as follows:

- Generally good vegetation and site maintenance of downstream slopes:
  - Minor erosion and/or lack of robust grass vegetation
  - Animal burrows
- Upstream slopes were in generally fair condition due to minor movement of soils underlying the geomembrane liner. Between 2012 and 2015, GRE performed repairs to the geomembrane and clay liner systems.
- Generally good condition of embankment crests, including the access roads.
- No signs of significant seepage, settlement, or cracking of the exterior slopes.

A previous “Coal Ash Impoundment Site Assessment Report” performed by Kleinfelder in 2011 (Kleinfelder 2012) under contract with the United States Environmental Protection Agency (USEPA) assigned the facility a “Less than Low” hazard rating and had similar observations with respect to facility stability.

3.0 2016 ANNUAL INSPECTION

On October 24, 2016, Craig Schuettpelz, Erin Hunter, and Ryan Shedivy of Golder performed an inspection of the Bottom Ash Impoundment per USEPA Regulation 40 CFR Part 257.83(b) requirements. The inspection consisted of visual observations while walking around the crest of the facility combined with traversing up and down exterior slopes. An annual inspection checklist used during the inspection is presented in Appendix B. Photographs were taken and are presented in Appendix C. The following presents a summary of the observations made during the 2016 annual inspection.

3.1 Hydraulic Structures

North Cell

Inflow to the North Cell includes the bottom ash discharge pipes, the retention pond inlet pipe, and the coal pit sump inlet pipe. The bottom ash pipes discharge into the impoundment over previously deposited bottom ash and were in fair condition with minor corrosion and wear of the pipe. The bottom ash pipes, retention pond inlet, and coal pit sump inlet pipes discharge into the impoundment onto a sacrificial HDPE wear-liner and were in good condition with no indications of wear or penetration of the liner or cracking of the inlet pipes.

Outflow from the North Cell is through the concrete outflow structure located on the south upstream slope. The structure was in good condition with no signs of blockage, corrosion, erosion, or cracking. Stop logs were placed in the outfall structure to control the cell water elevation.

Center Cell

Inflow to the Center Cell is through the outflow structures from the North Cell and the South Cell located on the north and south upstream slopes respectively. These structures were in good condition with no signs of blockage, corrosion, erosion, or cracking.

Outflow from the Center Cell is through the outfall structure located on the east upstream slope. The structure was in good condition with no signs of blockage, corrosion, erosion, or cracking. Stop logs in the outfall structure were situated to maintain the cell water surface at approximately elevation 1714 feet during the inspection.

South Cell

Inflow to the South Cell includes the bottom ash discharge pipes, the retention pond inlet pipe, and the coal pit sump inlet pipe. The bottom ash pipes discharge into the impoundment over previously deposited bottom ash and were in fair condition with minor corrosion and wear of the pipe. The bottom ash pipes, retention pond inlet, and coal pit sump inlet pipes discharge into the impoundment onto a sacrificial HDPE wear-liner. The retention pond inlet and coal pit sump inlet pipes appeared to be in good condition.

Outflow from the South Cell is through the concrete outflow structure located on the north upstream slope. The structure was in good condition with no signs of blockage, corrosion, erosion, or cracking. Stop logs were placed in the outfall structure to control the cell water elevation.

3.2 Upstream Slope

North Cell

The upstream slopes above the water level were evaluated. The upstream slopes appeared to match the design slopes of 3:1 to about 6 feet down (approximate elevation 1714 feet) with no observed sections of significant slope difference. The geomembrane liner is exposed on the slopes with no protective cover. There were no signs of vegetation or animal burrows on the upstream slopes. The North Cell upstream slopes appear to be in fair condition.

Center Cell

The upstream slopes above the water level were evaluated. The slopes appeared to match the design slopes of 3:1 to about 4 feet down (approximate elevation 1716 feet) at which point the slopes curved inward to a steeper concave shape. This displacement of the lower slope is likely due to “pumping” of saturated soils beneath the geomembrane due to wave action and the lack of confining pressure from overlying protective cover. Geomembrane repairs were performed in the fall of 2015 to patch defects in the geomembrane liner. The Center Cell upstream slopes appear to be in fair condition.

South Cell

The upstream slopes above the water level and not covered with bottom ash were evaluated. The slopes appeared to match the design slopes of 3:1 with minor sections of slope difference where the slopes curved inward to a steeper concave shape. This displacement of the lower slope is likely due to “pumping” of saturated soils beneath the geomembrane due to wave action and the lack of confining pressure from overlying protective cover layer. The South Cell upstream slopes appear to be in fair condition.

3.3 Crest

The berm crest around the Bottom Ash Impoundment is surfaced with gravel at a constant elevation of 1720 feet. The crest roadway is primarily used for light vehicle traffic, but is exposed to heavy construction equipment when the North and South Cells are cleaned out. The crest appears to be in good condition with no vegetation, animal burrows, or settlement, and appears to be well maintained. There was minor rutting along the crest road between the North and Center cells. The rutting is limited to a small area of the road and most likely caused from light vehicle traffic during wet conditions.

3.4 Downstream Slope

North Cell

The downstream slopes on the north and east sides are approximately 20 feet high and the downstream slope on the west side is approximately 5 feet high. The slopes are graded at approximately 3:1 and are mostly well vegetated with grass, with a few small areas of bare ground along the east side of the impoundment and the north side of the North Cell that are susceptible to erosion. One small sapling was starting to grow on the east downstream slope and should be removed. Small animal burrows were observed on the downstream slopes. The downstream slopes are generally in good condition.

Center Cell

The downstream slope on the east side is approximately 20 feet high and the downstream slope on the west side is approximately 5 feet high. The slopes are graded at approximately 3:1 and are well vegetated with grass, with a few small areas of bare ground along the east side of the impoundment that are susceptible to erosion. Small animal burrows were observed on the downstream slopes. The downstream slopes are generally in good condition.

South Cell

The downstream slope on the east and south side is approximately 20 feet high and the downstream slope on the west side is approximately 5 feet high. The slopes are graded at approximately 3:1 and are well vegetated with grass, with a few small areas of bare ground along the east and south sides of the impoundment that are susceptible to erosion. Several small (2-inch diameter) animal burrows were observed on the east downstream slopes and several large-sized (10-inch diameter) animal burrows were observed on the south downstream slopes. The downstream slopes are generally in fair condition due to the large number and size of animal burrows noted during the inspection.

3.5 Toe

North Cell

The toe of the west berm is in the bottom ash deposition area and has no observed seepage, standing water, animal burrows, settlement, or excessive vegetation. The toes of the north and east berms have no observed seepage, standing water, animal burrows, settlement, or excessive vegetation. The toe of the berms around the North Cell is in good condition.

Center Cell

The toe of the west berm is in the bottom ash deposition area and has no observed seepage, standing water, animal burrows, settlement, or excessive vegetation. The toe of the east berm is in a low area that has some marshy vegetation, but no standing water. There were no observed indications of seepage, animal burrows, settlement, or excessive vegetation. The toe of the berms around the Center Cell is in good condition.

South Cell

The toe of the west berm is in the bottom ash deposition area and has no observed seepage, standing water, animal burrows, settlement, or excessive vegetation. The toe of the east berm is in a low area that has some marshy vegetation, but no standing water. There were no observed indications of seepage, animal burrows, settlement, or excessive vegetation, but a portion of the slope does support mossy vegetation, likely from receiving minimal sunlight during the afternoon. The toe of the south berm is in a surface water drainage ditch that has some marshy vegetation and minor amounts of standing water. There were no observed indications of seepage, animal burrows, settlement, or excessive vegetation.

3.6 Instrumentation

The Bottom Ash Impoundment currently has two piezometers (P-1 and P-2) on the downstream slope on the east side of the Center Cell (Figure 2). Water elevations observed in piezometers P-1 and P-2 were measured monthly between January and November of 2016. Water elevations in both piezometers varied by less than approximately one foot over the course of the year and had average elevations of approximately 1692.7 feet in P-1 and 1692.4 feet in P-2.

3.7 Signs of Structural Weakness or Other Observations that Could Affect Stability

No signs of structural weakness or other observations that could affect the stability of the Bottom Ash Impoundment were observed during the site inspection in October 2016.

4.0 SUMMARY AND CONCLUSIONS

An annual inspection was performed for the Bottom Ash Impoundment at Stanton Station on October 24, 2016. The inspection met the requirements for CCR surface impoundments under 40 CFR Part 257.83. Golder observed good vegetation and site maintenance and did not identify significant deficiencies such as seepage, excessive erosion or settlement, or cracking during visual observations.

In addition to annual inspections by the Professional Engineer, trained and qualified site personnel will continue to perform the required weekly facility inspections to look for signs of potential structural weaknesses.

Minor maintenance items that may need to be continually addressed include repairing large animal burrows as they appear, monitoring vegetative success of downstream slopes, and removal of any woody vegetation growing on the exterior slopes. In addition, the inflow and outflow piping and hydraulic structures should be monitored regularly to ensure proper conveyance of water through the impoundment system.

GOLDER ASSOCIATES INC.

Todd Stong, P.E.
Associate/Senior Engineer

Craig Schuettpelz, P.E.
Senior Project Engineer

5.0 REFERENCES

Barr, 2010. 2010 Annual Groundwater Monitoring Report, Stanton Station Ash Disposal Facility, NDDH Solid Waste Permit # SP043. Prepared for Great River Energy, February 2011.

Golder Associates Inc. Golder 2016. Annual Inspection Report – Great River Energy – Stanton Station – Bottom Ash Surface Impoundment. January 2016.

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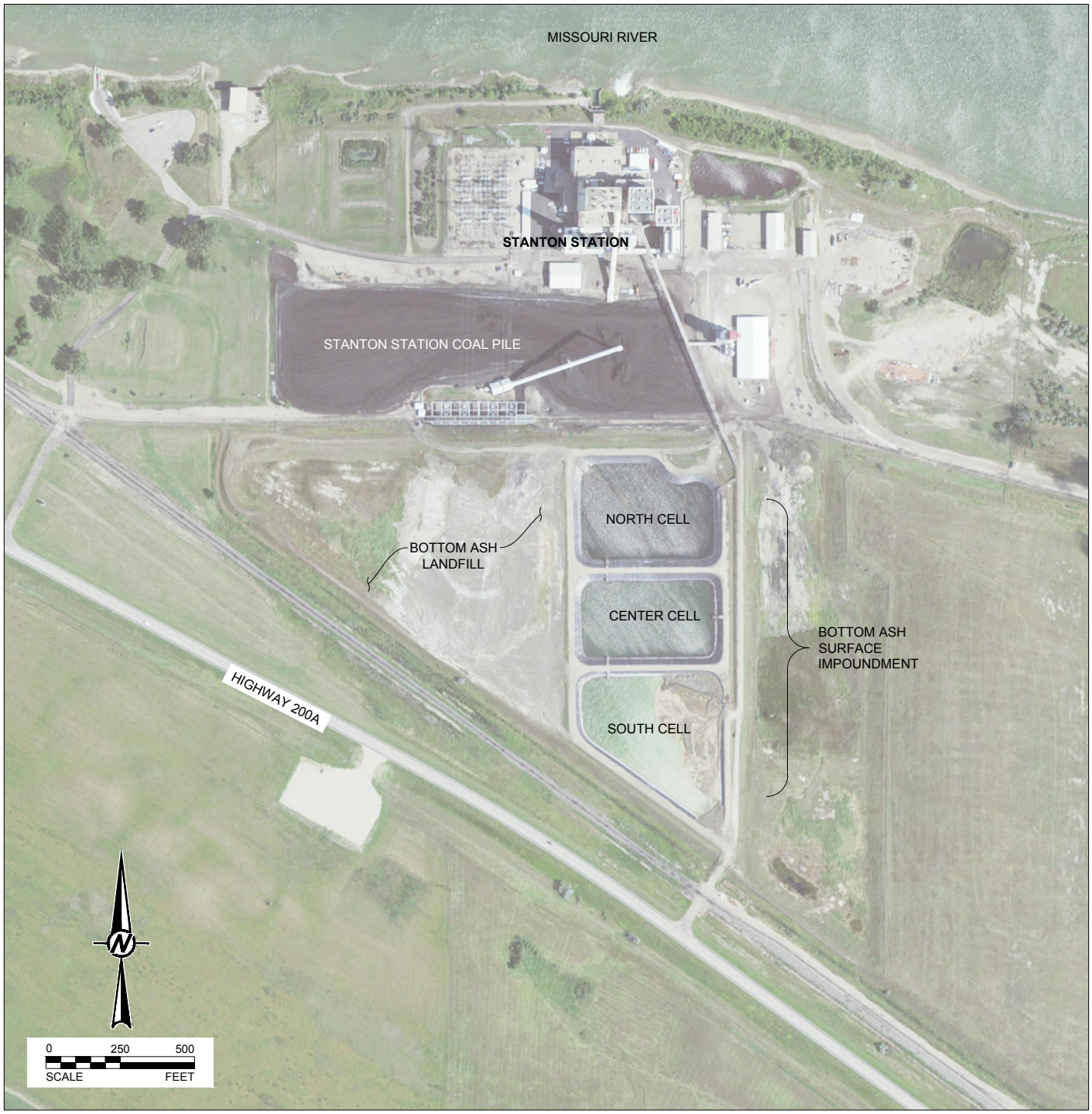
Stone & Webster, 1994a. Design Report Stanton Station Ash Pond Modifications. Prepared for United Power Association, Project No. 4177. April 25, 1994.

Stone & Webster, 1994b. Stanton Station Ash Pond Modifications, Project No. 4177 Design Drawings Rev. 2. Prepared for United Power Association, June 1994.

Stone & Webster, 1994c. Plan of Operations Stanton Station Bottom Ash Surface Impoundment and Bottom Ash Landfill. Prepared for United Power Association, Project No. 4177. June 1994.

FIGURES



REFERENCES

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED SEPTEMBER 9, 2016.

CLIENT
GREAT RIVER ENERGY
STANTON STATION
STANTON, NORTH DAKOTA

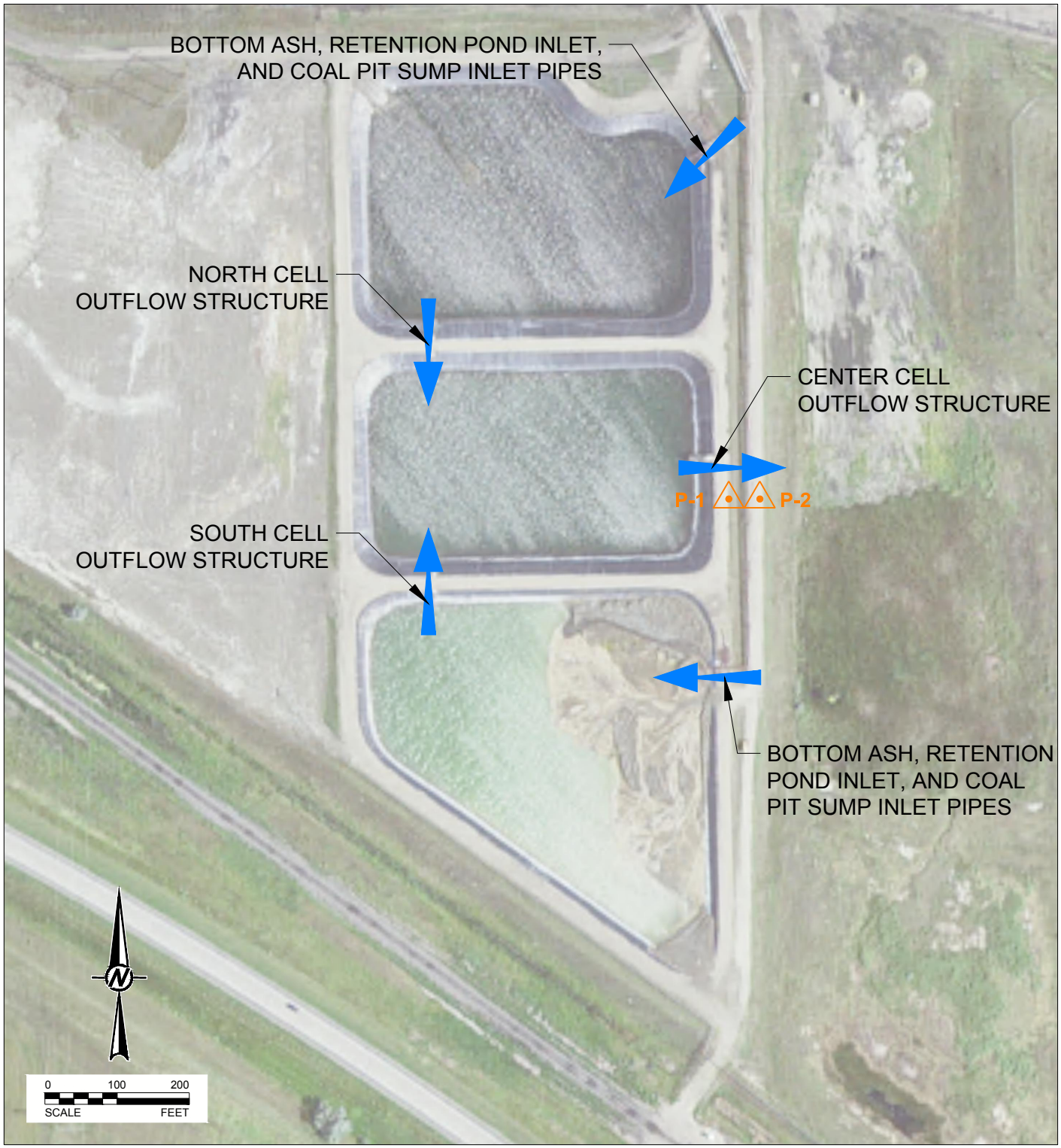
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-01-13
DESIGNED	RFS
PREPARED	RFS
REVIEWED	CCS
APPROVED	TJS

PROJECT
2016 ANNUAL INSPECTION REPORT

TITLE
STANTON STATION SITE OVERVIEW

PROJECT NO. 1649580 | REV. B | FIGURE 1



LEGEND

P-1 PIEZOMETER

REFERENCES

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED SEPTEMBER 9, 2016.

CLIENT
GREAT RIVER ENERGY
STANTON STATION
STANTON, NORTH DAKOTA

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-01-13
DESIGNED	RFS
PREPARED	RFS
REVIEWED	CCS
APPROVED	TJS

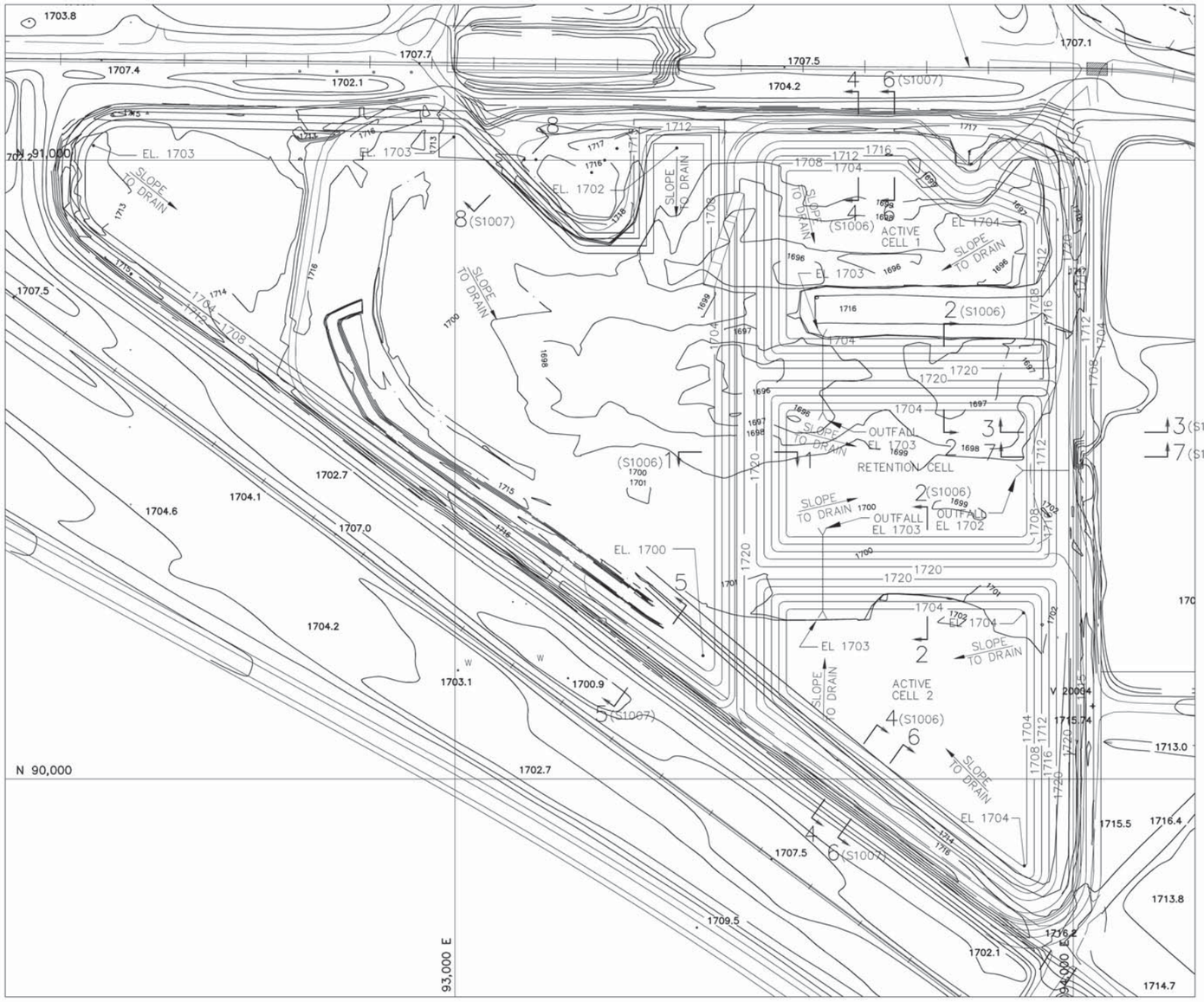
PROJECT
2016 ANNUAL INSPECTION REPORT

TITLE
BOTTOM ASH IMPOUNDMENT OVERVIEW

PROJECT NO.	REV.	FIGURE
1649580	B	2

APPENDIX A

SELECTED CONSTRUCTION DRAWINGS AND PERMIT DRAWINGS



N

SCALE 1" = 100'

100 50 0 100 200 300

LEGEND:

——— EXISTING GROUND ELEVATION CONTOUR

——— NEW GROUND ELEVATION CONTOUR

NOTES:

1. SEE GENERAL NOTES, DRAWING S1002.
2. ELEVATIONS SHOWN AT THE BOTTOM OF IMPOUNDMENT CELLS ARE OF THE TOP OF THE CLAY FILL.

REFERENCE DRAWINGS:

S1002	FACILITIES SITE PLAN
S1006	POND A SECTIONS & DETAILS – SH. 1
S1007	POND A SECTIONS & DETAILS – SH. 2
S1008	POND A SECTIONS & DETAILS – SH. 3
S1009	OUTFALL STRUCTURES OUTLINE – PLAN & SECTIONS
S1010	OUTFALL STRUCTURES – REINFORCEMENT SH. 1
S1011	OUTFALL STRUCTURES – REINFORCEMENT SH. 2

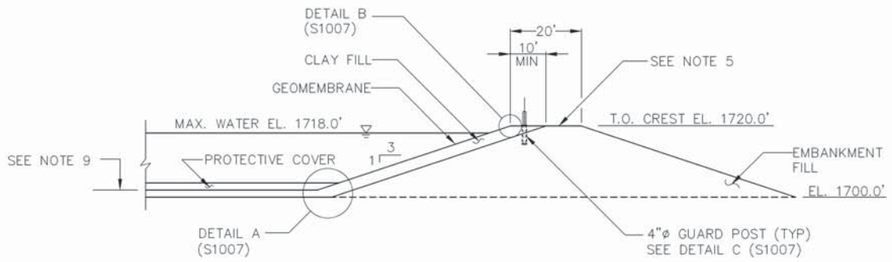
ISSUE

HALF-SIZE APP. CARD

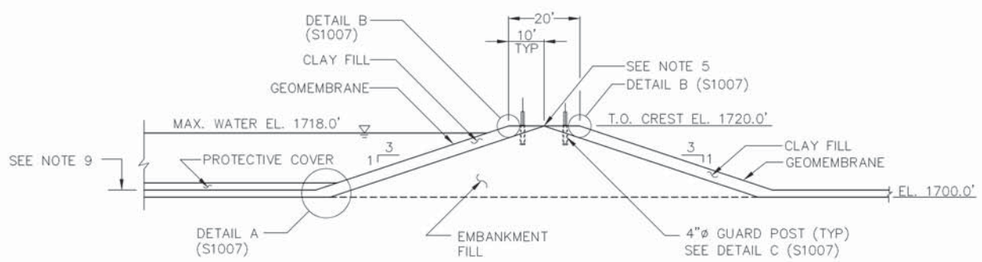
CAD FILE UPAS1005.DWG

ISSUE	DESCRIPTION	CHKD	CORRECT	APPR. DATE
3				
2				
1	FOR CONSTRUCTION			
0	ORIGINAL ISSUE FOR UPA REVIEW	WLZ	SGG KWC 4-13-94	

UPA PROJECT 4177	UNITED POWER ASSOCIATION STANTON STATION ASH POND MODIFICATIONS	DRAWING NO. S1005 REV 1
	POND A CONVERSION PLAN	
	STONE & WEBSTER ENGINEERING CORPORATION DENVER, CO.	



1–1
(S1005)



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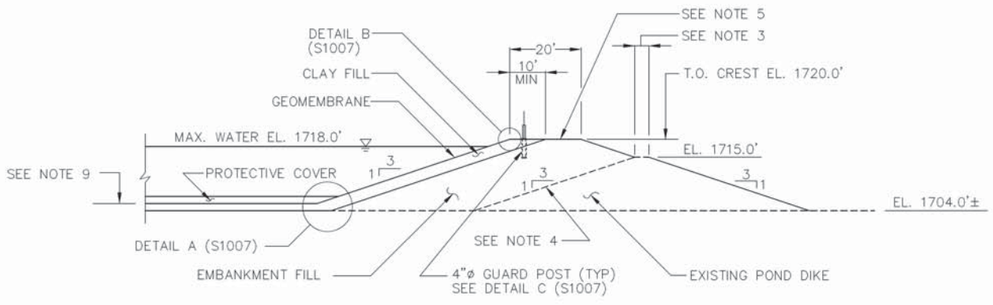

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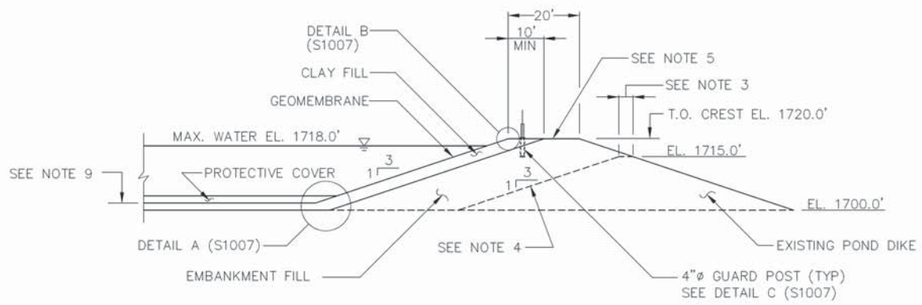


4–4
(S1005)

NOTES:

1. SCALE: 1" = 20' UNLESS NOTED.
2. SEE GENERAL NOTES, DRAWING S1002.
3. THE EXISTING POND DIKES WERE REPORTEDLY CONSTRUCTED TO HAVE 4 FOOT WIDE CRESTS AT ELEVATION 1715 FEET, AND 3:1 (HORIZONTAL VERTICAL) SIDE SLOPES. ACTUAL POND DIKE WIDTHS, ELEVATIONS AND SLOPES MAY VARY.
4. ASH, PVC LININGS AND OTHER NON–SOIL MATERIALS FOUND ALONG THE INSIDE OF EXISTING POND A DIKES SHALL BE REMOVED TO EXPOSE THE EXISTING DIKE SOIL FILL. EMBANKMENT FILL SHALL BE PLACED, AS NEEDED, TO FILL AREAS WHERE EXCAVATIONS TO REMOVE THE ASH, LININGS AND OTHER NON–SOIL MATERIALS EXTEND BEYOND THE LINE SHOWN.
5. THE TOP OF THE EMBANKMENT FILL OF THE SURFACE IMPOUNDMENT EMBANKMENTS SHALL BE GRADED TO BE AT ELEVATION 1720'–3" AT THE CENTERLINE AND TO SLOPE TO ELEVATION 1720'–0" AT 6 FEET EITHER SIDE OF THE CENTERLINE, AND SHALL BE COVERED WITH 6 INCHES OF COMPACTED BASE COURSE.
6. AN ANCHOR GUARD POST FOR THE SAFETY CABLE SHALL BE LOCATED AT EACH CORNER OF EACH IMPOUNDMENT CELL. LINE GUARD POSTS SHALL BE SPACED AT INTERVALS NO WIDER THAN 50 FEET BETWEEN THE CORNER ANCHOR POSTS. ANCHOR GUARD POSTS SHALL ALSO BE PLACED TO PROVIDE A 20 FOOT WIDE OPENING ALONG THE EAST SIDE OF ACTIVE CELLS 1 AND 2, AND A 10 FOOT WIDE OPENING AT EACH OUTFALL LOCATION, AS DIRECTED BY THE OWNER. THE WIRE ROPE SHALL BE INSTALLED TO BE A MINIMUM OF 3 FEET ABOVE THE GROUND SURFACE.
7. A ONE INCH DIAMETER, POLYPROPYLENE, TWISTED ROPE SHALL BE FASTENED TO THE BOTTOM OF EACH GUARD POST. THE ROPE SHALL BE FASTENED TO THE POSTS USING CABLE CLAMPS OR AN EQUIVALENT FITTING APPROVED BY THE OWNER. THE BOTTOM OF THE ROPE SHALL BE SECURELY ATTACHED TO A HEAVY DUTY POLYPROPYLENE BAG FILLED WITH A MINIMUM OF 50 LBS. OF CLEAN SAND, AND SHALL EXTEND TO WITHIN 3 FEET OF THE BOTTOM OF THE ADJACENT IMPOUNDMENT CELL.
8. IF ASH EXTENDS TO WITHIN 10 FEET OF EXISTING POWER POLES, THE POLES SHALL BE TEMPORARILY SUPPORTED WHILE THE ASH IS REMOVED AND THE EXCAVATION IS REFILLED WITH EMBANKMENT FILL.
9. SEE DRAWING S1005 FOR COMPLETED GRADE ELEVATIONS.

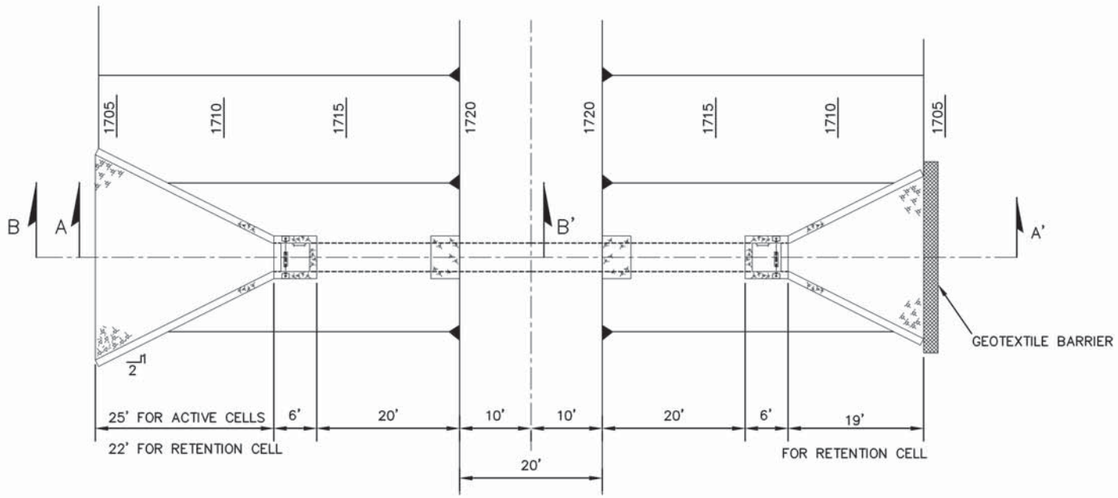
REFERENCE DRAWINGS:

S1002	FACILITIES SITE PLAN
S1005	POND A CONVERSION PLAN
S1007	POND A SECTIONS & DETAILS – SH.2
S1008	POND A SECTIONS & DETAILS – SH.3

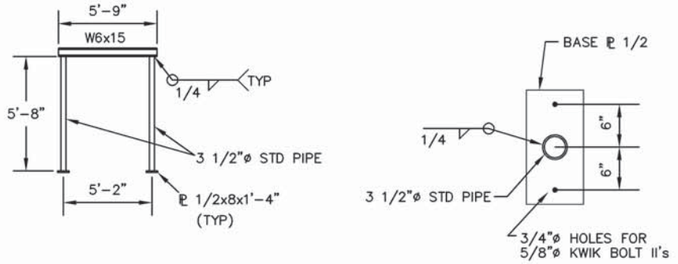
ISSUE	DESCRIPTION	CHKD	CORRECT	APPR—DATE
3				
2				
1	FOR CONSTRUCTION			
0	ORIGINAL ISSUE — FOR UPA REVIEW — WLZ — SGG — KWC 4-13-94			

UPA PROJECT 4177	UNITED POWER ASSOCIATION STANTON STATION ASH POND MODIFICATIONS POND A SECTIONS & DETAILS – SH. 1	DRAWING NO. S1006 REV 1
	STONE & WEBSTER ENGINEERING CORPORATION DENVER, CO.	

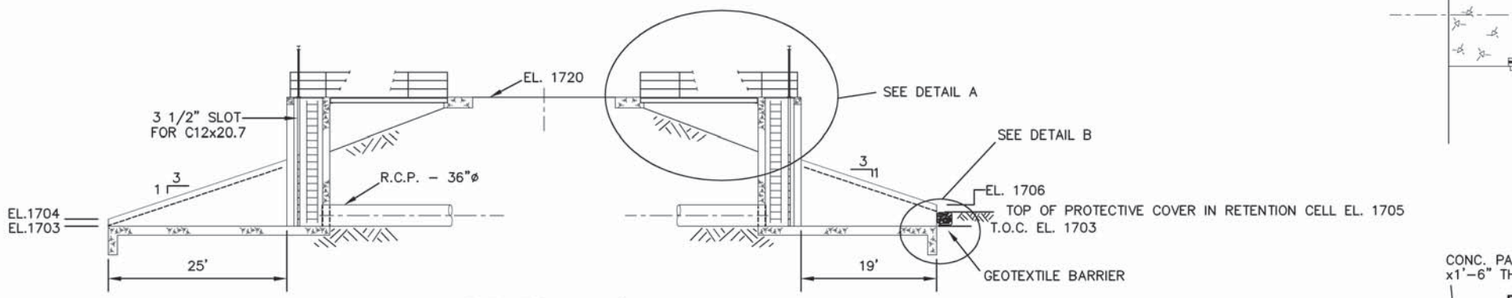
ISSUE | HALF–SIZE | APPR. CARD | CAD FILE UPAS1006.DWG



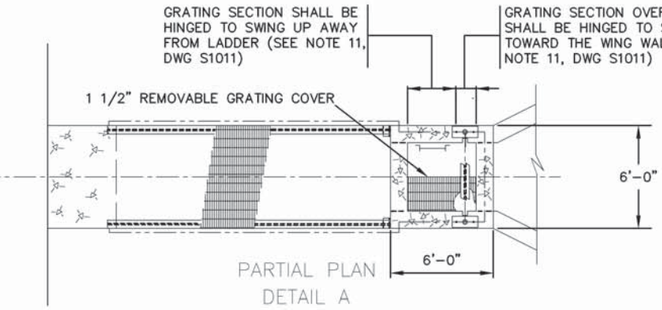
GENERAL PLAN
1"=10'



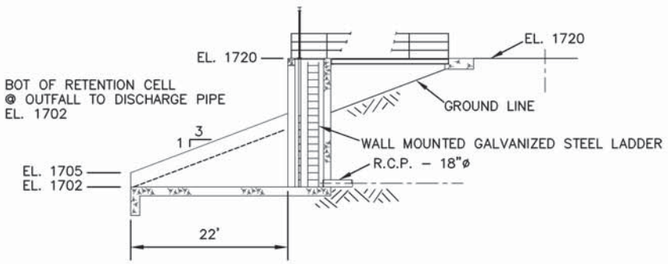
STOPLOG LIFTING FRAME
(5 - REQ'D)
N.T.S.



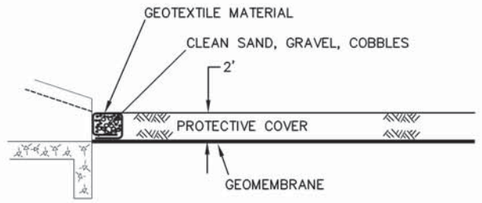
ELEVATION A-A'
ACTIVE CELL & RETENTION CELL
1"=10'



PARTIAL PLAN
DETAIL A
N.T.S.

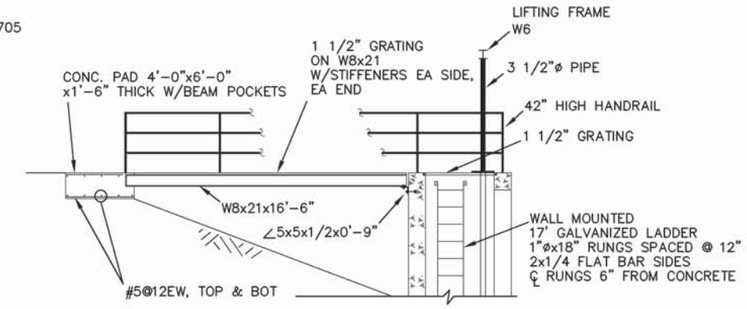


ELEVATION B-B'
OUTFALL OF RETENTION CELL
1"=10'



NOTE: THE GEOTEXTILE BARRIER SHALL EXTEND 2 FEET BEYOND THE RETENTION CELL OUTFALL WINGWALLS.

PARTIAL ELEV.
DETAIL B
N.T.S.



PARTIAL ELEV.
DETAIL A
N.T.S.

NOTES:

1. SCALE: AS NOTED
2. FOR ADDITIONAL NOTES, SEE DRAWING S1011

REFERENCE DRAWINGS:

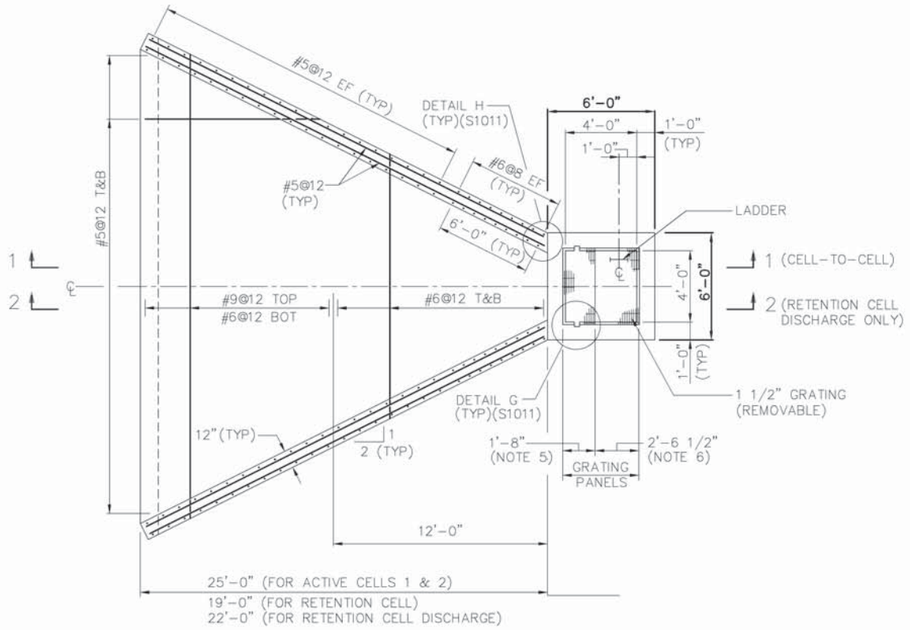
S1011 OUTFALL STRUCTURES REINFORCEMENT, SHEET 2

ISSUE	DESCRIPTION	CHKD	CORRECT	APPR—DATE
3				
2	FOR CONSTRUCTION REVISED PER ADDENDUM 1			
1	FOR CONSTRUCTION	WLZ	MEB KWC/WLZ 5-8-94	
0	ORIGINAL ISSUE FOR UPA REVIEW	RLP	MEB KWC 4-19-94	

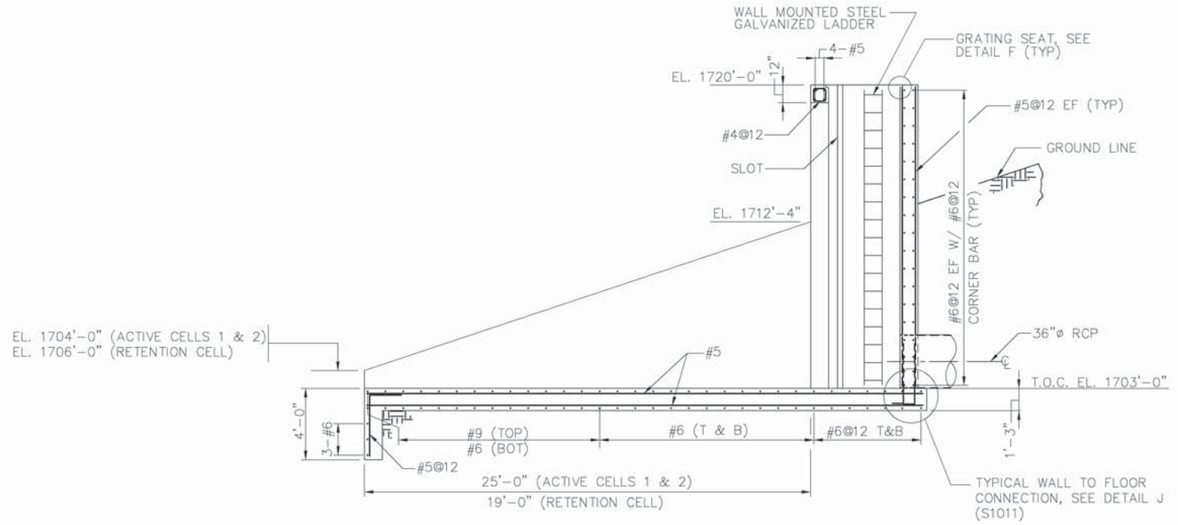
UPA PROJECT		DRAWING NO.	REV
4177	UNITED POWER ASSOCIATION STANTON STATION ASH POND MODIFICATIONS OUTFALL STRUCTURES OUTLINE PLAN AND SECTIONS	S1009	2

STONE & WEBSTER ENGINEERING CORPORATION
DENVER, CO.

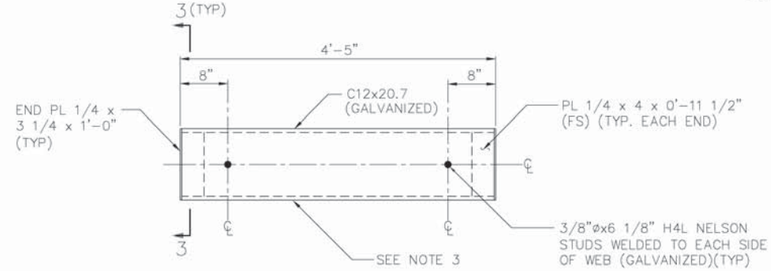
ISSUE
HALF-SIZE
APP. CARD
CAD FILE UPAS1009.DWG



OUTFALL STRUCTURES – PLAN
SCALE: 1/4" = 1'-0"



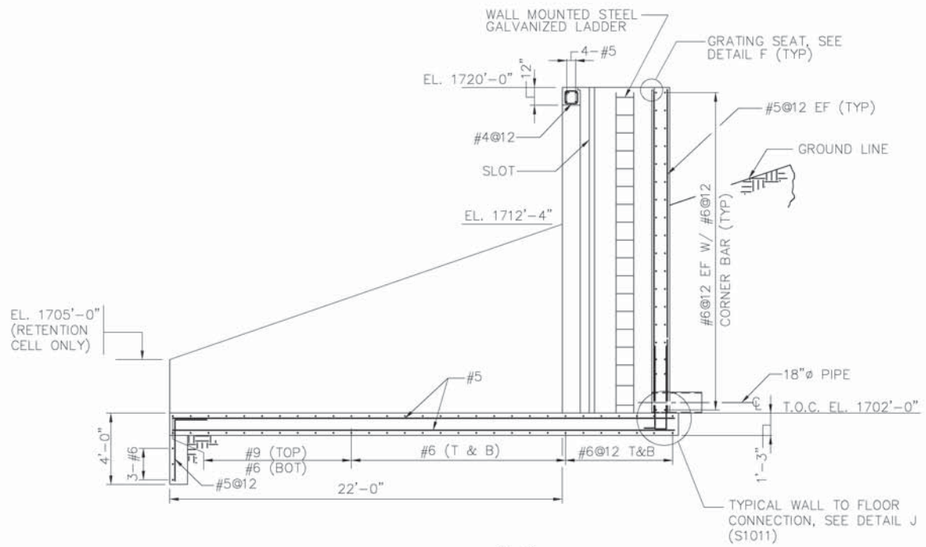
1-1
SCALE: 1/4" = 1'-0"



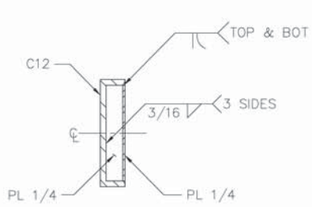
TYPICAL STOP LOG DETAIL
(76 REQUIRED)
SCALE: 1 " = 1'-0"

NOTES:

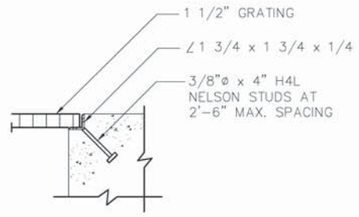
1. SCALE: AS NOTED
2. FOR ADDITIONAL NOTES, SEE DRAWING S1011.
3. PLACE 40 MIL x 2 1/2" STRIP PVC ON TOP AND BOTTOM OF C12 WITH WATER RESISTANT ADHESIVE.
4. THE FABRICATOR SHALL VERIFY AND CONNECT, AS REQUIRED, THE SWEEP OF THE CHANNEL STOP LOGS TO WITHIN 3/16", AND THE CAMBER TO WITHIN 1/16". THE VARIATION OF OUT OF SQUARE OF THE FLANGES SHALL BE VERIFIED TO BE LESS THAN THE 1/32" THAT IS PERMISSIBLE BY STANDARD MILL PRACTICE.
5. THE GRATING SECTION OVER THE SLOT SHALL BE HINGED TO SWING TOWARD THE WING WALLS.
6. THE GRATING SECTION SHALL BE HINGED TO SWING UP AWAY FROM THE LADDER.



2-2
SCALE: 1/4" = 1'-0"



3-3
SCALE: 1 1/2" = 1'-0"



DETAIL F
SCALE: 1 1/2" = 1'-0"

REFERENCE DRAWINGS:

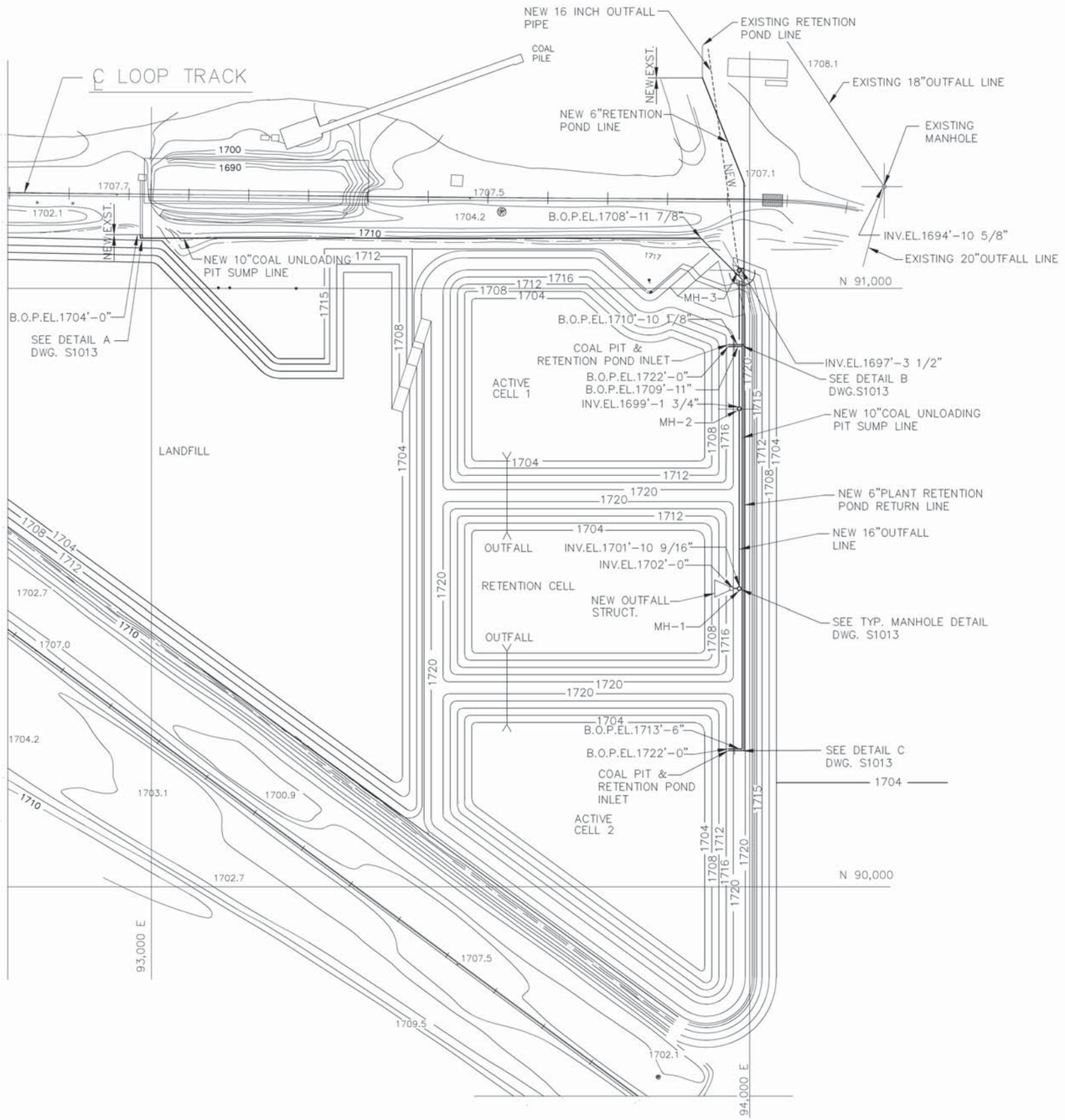
S1009	OUTFALL STRUCTURES OUTLINE PLANS AND SECTIONS
S1011	OUTFALL STRUCTURES REINFORCEMENT, SHEET 2

ISSUE	DESCRIPTION	CHKD	CORRECT	APPR. DATE
3				
2	FOR CONSTRUCTION REVISED PER ADDENDUM 1			
1	FOR CONSTRUCTION	WLZ	SGG KWC/WLZ 6-8-94	
0	ORIGINAL ISSUE FOR UPA REVIEW	RLP	SGG KWC 4-19-94	

ISSUE | HALF-SIZE | APPR. CARD
CAD FILE UPAS1010.DWG

UPA PROJECT	UNITED POWER ASSOCIATION STANTON STATION ASH POND MODIFICATIONS	DRAWING NO.	REV
4177	OUTFALL STRUCTURES REINFORCEMENT – SH. 1	S1010	2

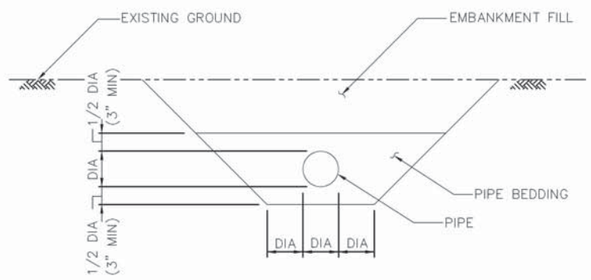
STONE & WEBSTER ENGINEERING CORPORATION
DENVER, CO.



SCALE 1" = 100'

100 50 0 100 200 300

N



PIPE AND CULVERT TRENCH DETAIL
NTS

NOTE: PIPES AND/OR CULVERTS IN A SINGLE TRENCH SHALL HAVE A MINIMUM SPACING OF 12 INCHES (WALL-TO-WALL) BETWEEN ADJACENT PIPES.

NOTES:
1.FOR GENERAL NOTES, SEE DRAWING S1002.

REFERENCE DRAWINGS:
S1002 FACILITIES SITE PLAN
S1013 PIPING DETAILS
S1027 BOTTOM ASH SURFACE IMPOUNDMENT OUTFALL PIPING PLAN

ISSUE	DESCRIPTION	CHKD	CORRECT	APPR. & DATE
3				
2	FOR CONSTRUCTION REVISED PER ADDENDUM 1			
1	FOR CONSTRUCTION	WLZ	KWC/WLZ 6-9-94	
0	ORIGINAL ISSUE FOR UPA REVIEW	KWC	KWC 4-19-94	

UPA PROJECT 4177	UNITED POWER ASSOCIATION STANTON STATION ASH POND MODIFICATIONS	DRAWING NO. SI012	REV 2
	POND A PIPING PLAN		
	STONE & WEBSTER ENGINEERING CORPORATION DENVER, CO.		

ISSUE | HALF-SIZE | APP. CARD

CAD FILE UPAS1012.DWG

APPENDIX B
VISUAL OBSERVATIONS CHECKLIST

IMPOUNDMENT INSPECTION CHECKLIST

Facility Name: **Bottom Ash Impoundment**

Owner and Address: Great River Energy – Stanton Station

Purpose of Facility: CCR Dewatering and process water storage clarification

Legal: Section 21 ***Township:*** 144N ***Range:*** 84W

County: Mercer

Inspected By: Craig Schuettpelz ***Inspection Date:*** October 24, 2016

Weather: 40°F, Sunny

ITEM		Y	N	N/A	REMARKS
1.	General Conditions				
a.	Alterations		X		
b.	Development of downstream plain		X		
c.	Grass cover	X			
d.	Settlement/misalignment/cracks		X		
e.	High water mark			X	El: N/A
f.	Current water level	X			El: North: 1714 ft, Center = 1714 ft, South = 1716 ft
g.	Sudden drops in water level?		X		
2.	Inflow Structure				
a.	Settlement		X		
b.	Cracking		X		
c.	Corrosion	X			
d.	Obstacles in inlet		X		
e.	Riprap/erosion control			X	Geomembrane rub sheet at inlet pipe locations
3.	Outflow Structure				
a.	Settlement		X		
b.	Cracking		X		
c.	Corrosion		X		
d.	Obstacles in outlet		X		
e.	Riprap/erosion control			X	
4.	Upstream slope				
a.	Erosion – liner exposed?	X			Liner is exposed on side slopes
b.	Rodent burrows		X		
c.	Vegetation		X		
d.	Cracks/settlement	X			Lower parts of slopes displaced in some locations
e.	Riprap/other erosion protection			X	
5.	Crest				
a.	Soil condition	X			Gravel road, no significant settlement/cracking
b.	Comparable to design width	X			
c.	Vegetation		X		
d.	Rodent burrows		X		
e.	Exposed to heavy traffic	X			Large equipment during cleanout
f.	Damage from vehicles/machinery	X			Minor rutting between north and center cell road
6.	Downstream slope				
a.	Erosion	X			Minor erosion
b.	Vegetation	X			Grass, few bare spots
c.	Rodent burrows	X			
d.	Cracks/settlement/scarps		X		Minor erosion rills
e.	Drain conditions			X	
f.	Seepage		X		
7.	Toe				
a.	Vegetation	X			Grass
b.	Rodent burrows	X			
c.	Settlement		X		
d.	Drainage conditions	X			Surface water drainages/ponding areas
e.	Seepage		X		

General Remarks: Lower half of upstream slopes displaced due to pumping of soil underlying geomembrane liner, but no signs of pumping causing stability issues. Ongoing maintenance to control/repair rodent burrows and eroded/bare spots.

Name of Engineer: Craig Schuettpelz

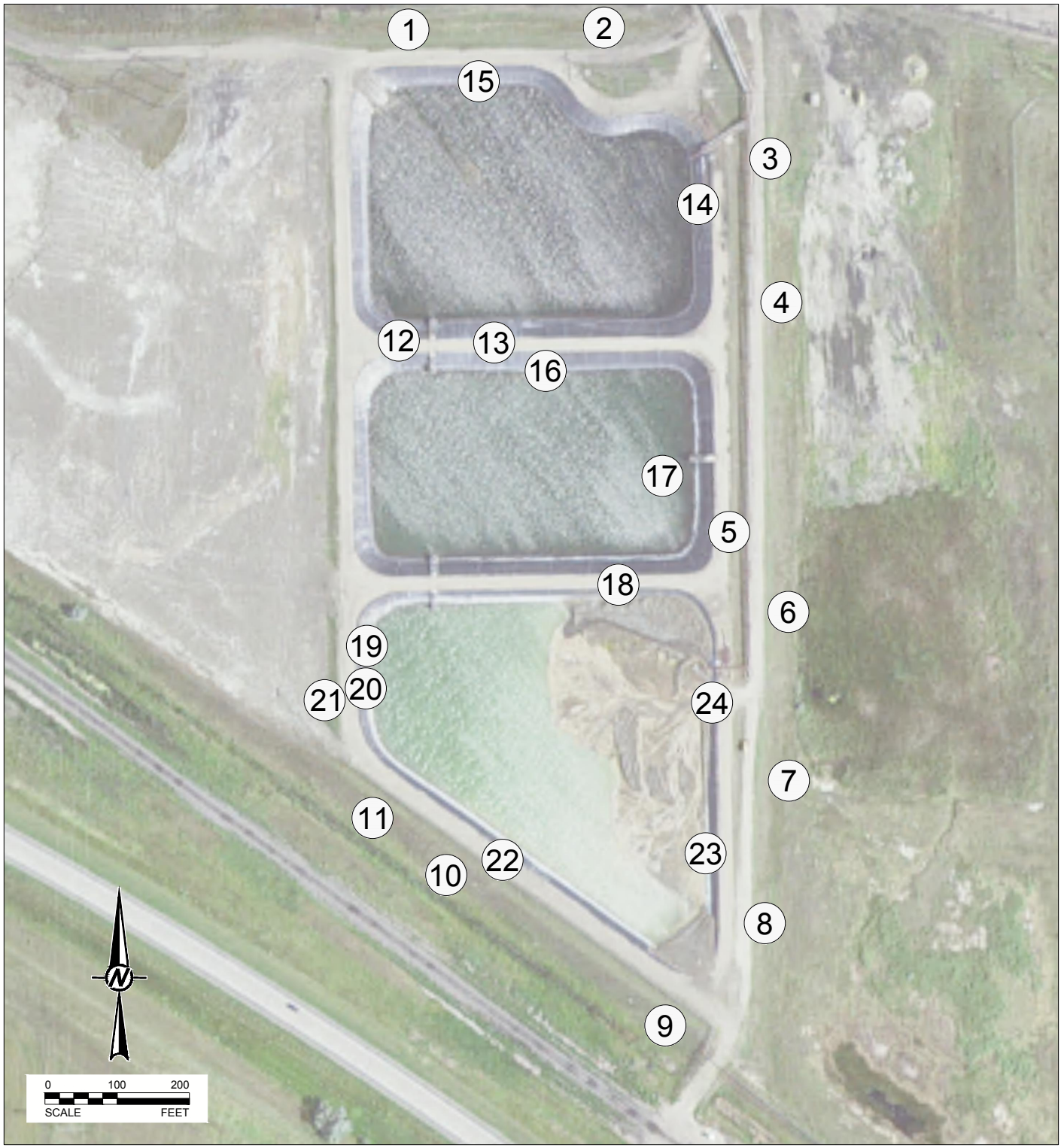
Date: 10/24/16

Engineering Firm: Golder Associates Inc.

Signature:

PROFESSIONAL ENGINEER SEAL

APPENDIX C
PHOTOGRAPHS



LEGEND

1 PHOTOGRAPH LOCATION

REFERENCES

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED SEPTEMBER 9, 2016.

CLIENT
GREAT RIVER ENERGY
STANTON STATION
STANTON, NORTH DAKOTA

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-01-13
DESIGNED	RFS
PREPARED	RFS
REVIEWED	CCS
APPROVED	TJS

PROJECT
2016 ANNUAL INSPECTION REPORT

TITLE
BOTTOM ASH IMPOUNDMENT PHOTOGRAPH LOCATIONS

PROJECT NO.	REV.	FIGURE
1649580	B	1

Path: \\Denver.golder.gds\projects\16JOBS\1649580 GRE SSA\Annual Inspections\Bottom Ash Impoundments\ | File Name: AnnualInspectionFigures - Jan2017.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

Bottom Ash Impoundment

Photograph 1 (North Cell)
Animal burrows on north downstream slope (DSCN0790.JPG)

Photograph 2 (North Cell)
Grass vegetation on north downstream slope (DSCN0789.JPG)

Bottom Ash Impoundment

Photograph 3 (North Cell)
Minor erosion on east downstream slope near the intermediate crest roadway (DSCN0788.JPG)

Photograph 4 (North Cell)
Sapling on east downstream slope (DSCN0787.JPG)

Bottom Ash Impoundment

Photograph 5 (Center Cell)
Piezometer on the east side of the Center Cell (DSCN0784.JPG)

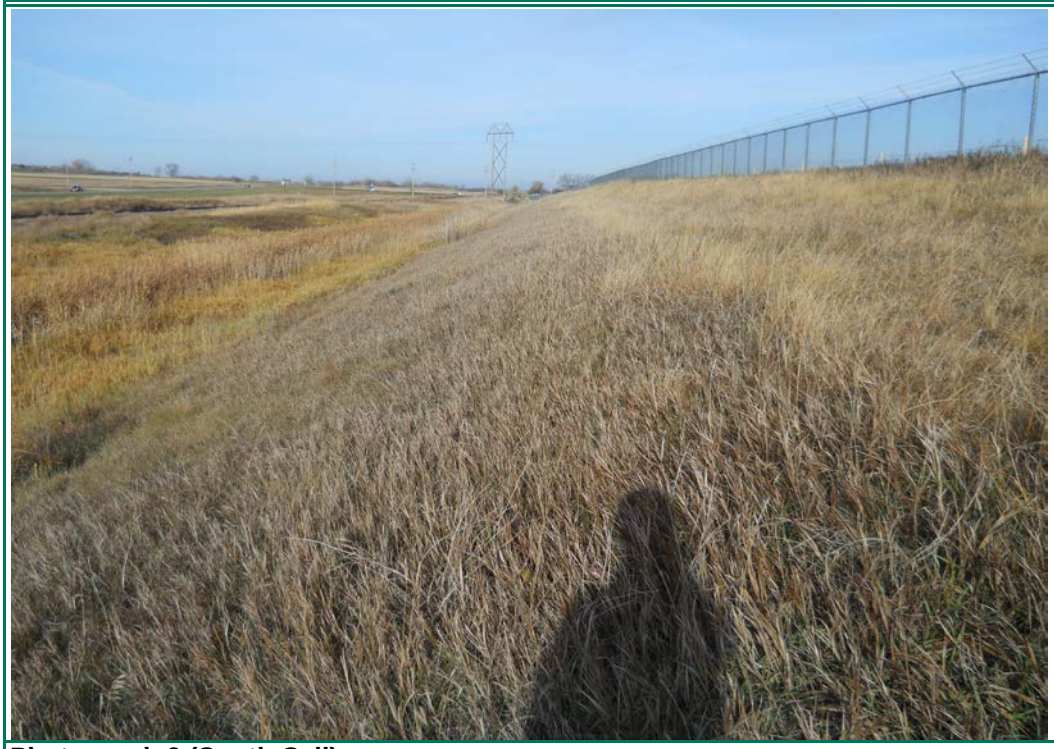
Photograph 6 (South Cell)
Erosion and barren spot on the east downstream slope (DSCN0781.JPG)

Bottom Ash Impoundment

Photograph 7 (South Cell)
East toe of slope (DSCN0780.JPG)

Photograph 8 (South Cell)
Moss on east downstream slope (DSCN0775.JPG)

Bottom Ash Impoundment



Photograph 9 (South Cell)
Vegetation on downstream slope (DSCN0802.JPG)

Photograph 10 (South Cell)
Large animal burrow on south downstream slope (DSCN0803.JPG)

Bottom Ash Impoundment

Photograph 11 (South Cell)
Large animal burrow on south downstream slope (DSCN0806.JPG)

Photograph 12 (North Cell)
North outlet hydraulic structure and geomembrane attachment to concrete (DSCN0792.JPG)

Bottom Ash Impoundment

Photograph 13 (North Cell and Center Cell)
Minor rutting of gravel access road between North Cell and Center Cell (DSCN0794.JPG)

Photograph 14 (North Cell)
Bottom ash inlet piping and trestle entering North Cell (DSCN0796.JPG)

Bottom Ash Impoundment

Photograph 15 (North Cell)
Upstream slope of North Cell and gravel access road (DSCN0798.JPG)

Photograph 16 (Center Cell)
Upstream slope of north side of Center Cell (DSCN0799.JPG)

Bottom Ash Impoundment

Photograph 17 (Center Cell)
Upstream slope of east side of Center Cell (DSCN0801.JPG)

Photograph 18 (South Cell and Center Cell)
Gravel access road between the South Cell and Center Cell (P1030385.JPG)

Bottom Ash Impoundment

Photograph 19 (South Cell)
Upstream slope of the northwest corner of the South Cell (P1030375.JPG)

Photograph 20 (South Cell)
Upstream slope on the south side of the South Cell (P1030376.JPG)

Bottom Ash Impoundment

Photograph 21 (South Cell)
Gravel access road on the southeast side of the South Cell (P1030377.JPG)

Photograph 22 (South Cell)
Upstream slope on the south side of the South Cell (P1030381.JPG)

Bottom Ash Impoundment

Photograph 23 (South Cell)
Bottom ash deposition on the east side of of the South Cell (P1030383.JPG)

Photograph 24 (South Cell)
Bottom ash conveyance water and geomembrane rub sheet on the east side of the South Cell (P1030384.JPG)