REPORT

Annual Inspection

Coal Creek Station - Southeast Section 16 CCR Landfill

Submitted to:

Great River Energy

2875 Third Street SW, Underwood, North Dakota 57576

Submitted by:

Golder Associates Inc.

44 Union Boulevard, Suite 300, Lakewood, Colorado 80228

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1893823

January 2019

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APPENDICES

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 landfills under 40 CFR Part 257.84.

Coal Creek Station (CCS) is located in McLean County, approximately 10 miles northwest of Washburn, North Dakota. There are four facilities located at CCS that fall under the CCR rule requirements (Figure 1):

- Drains Pond System CCR Surface Impoundment (Drains Pond System)
- Upstream Raise 91 CCR Surface Impoundment (Upstream Raise 91)
- Upstream Raise 92 CCR Surface Impoundment (Upstream Raise 92)
- Southeast Section 16 CCR Landfill (Southeast 16)

Upstream Raise 91 and Upstream Raise 92 both operate as impoundments and will be closed with CCR in-place. The Drains Pond System is currently being used to dewater bottom ash and as a process water impoundment to return conveyance water back to the plant. The Southeast 16 landfill operates as a landfill and is used as a storage/disposal facility for CCRs that do not contain free liquid. This report presents a review of available facility information and findings of the inspection of Southeast 16 at CCS performed September 18, 2018.

2.0 REVIEW OF EXISTING INFORMATION

2.1 Geological Conditions

Southeast 16 is generally constructed over a glacial till layer consisting of sandy and silty-clay soils. Glacial till varies in thickness from 20 feet to several hundred feet in the area of Coal Creek Station. Silty-sand and sand lenses are present throughout the glacial till formation, which is underlain by poorly consolidated siltstone/sandstone bedrock (Barr Engineering 1982; CPA and UPA 1989).

2.2 Site History and Liner Systems

Southeast 16 (Figure 2) is located in Section 16, Township 145N, Range 82W and covers approximately 71 acres. The facility is used as a storage/disposal facility for CCRs including fly ash, bottom ash, economizer ash, and flue gas desulfurization (FGD) material as required. Moisture conditioned CCRs are hauled to Southeast 16 using haul trucks. The material is placed using a dozer and compacted by routing the haul traffic across placed CCR. There is also a small construction and demolition (C&D) disposal area located within Southeast 16 that receives C&D material from CCS. Contact water at Southeast 16 is routed to the north side of the facility to a contact water collection area and sump. As required, contact water is pumped from the sump to Upstream Raise 92, Upstream Raise 91, or the Drains Pond System. Southeast 16 is adjacent to hay fields and wetland areas to the north and east, Upstream Raise 92 to the west, and is approximately 100 feet north of rail lines.

Southeast 16 was originally part of the East Ash Pond. In 1989, the facility was reclassified as a solid waste disposal area and any CCRs disposed at Southeast 16 were excavated and placed in the Southwest Section 16 Landfill that is now below Upstream Raise 92. After being cleaned out, Southeast 16 was re-graded with berms along the east, south, and west sides. The footprint was re-lined in 1994 with a composite liner consisting of 2 feet of compacted clay, a 60-mil geomembrane liner, a non-woven geotextile cushion, and fly ash protective cover. In

2001, an embankment berm was constructed along the north side with a composite liner consisting of a geosynthetic clay liner (GCL) and a 60-mil geomembrane liner. In 2015 the contact water collection area along the north side of the facility was expanded by approximately 4.5 acres. The contact water collection area expansion liner consists of a GCL and 60-mil geomembrane overlain with fly ash and bottom ash protective cover.

Selected construction drawings from the 1994, 2001, and 2015 work and current permit drawings are included in Appendix A.

2.3 Site Geometry

The design top of embankment surrounding Southeast 16 has an approximate elevation of 1904 feet above mean sea level (amsl) along the south and east sides, and between 1887 and 1892 feet amsl along the north side. The original berm along the west side was at elevation 1901 feet amsl, but CCR storage/disposal along this side extends over this berm onto Upstream Raise 92 slopes. The upstream slopes of the embankment surrounding Southeast 16 were designed with 3:1 slopes to bottom of landfill elevations between 1887 feet amsl and 1876 feet amsl. The downstream slopes from the soil embankment have 3:1 slopes. The surrounding topography has elevations varying from approximately 1882 feet amsl to 1876 feet amsl. The crest is a gravel surfaced roadway supporting light passenger vehicles. All heavy haul equipment accesses the site from the north and west sides along internal roads constructed on placed CCR material.

2.4 Changes in Geometry

No significant changes to geometry were noted other than the continued placement of CCRs and C&D debris to the design grades. Estimated disposal through 2018 included approximately 60,000 cubic yards of CCR and non-CCR material primarily deposited along the south and east sides to bring outside grades up to an approximate elevation of 1939 feet amsl.

2.5 Storage Capacity and Volumes

Based on annual placement estimates and survey placement estimates, the amount of CCR and non-CCR material contained in the facility at the end of 2018 is estimated to be approximately 3,925,000 cubic yards.

2.6 Permits

Southeast 16 is currently permitted with the North Dakota Department of Health (NDDH) under Permit Number 0033. Previous permit modification documents describe additional historical information about the design of the facility (CPA 1997, CPA and UPA 1989, GRE 2003, GRE 2012, GRE 2015).

2.7 Summary of 2018 Weekly Inspections

Routine weekly inspections of Southeast 16 were performed 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 berm downstream slopes.

2.8 Summary of Previous Inspections

The most recent annual professional engineer inspection of Southeast 16 was performed by Golder in September of 2017 (Golder 2018) and a summary of the observations of that inspection are as follows:

- Generally good vegetation and site maintenance.
- Minor erosion of downstream CCR slopes that is repaired by GRE.
- Isolated areas of poorly vegetated final cover placed on CCR downstream slopes.
- Contact water control features (sump, pump, and piping) were in good condition.
- Isolated and minor woody vegetation was growing near the toe of slopes.

3.0 2018 ANNUAL INSPECTION

On September 18, 2018, Craig Schuettpelz, Paul Schlicht and Todd Stong of Golder performed an inspection of Southeast 16 per United States Environmental Protection Agency (USEPA) Regulation 40 CFR Part 257.84(b) requirements. The inspection consisted of visual observations while walking around the facility traversing up and down the perimeter berm and CCR placement areas. 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 2018 annual inspection.

3.1 Hydraulic Structures

Contact water is collected in the contact water collection area located in the northeast corner of Southeast 16. As contact water accumulates, it can be pumped from the area to Upstream Raise 92, Upstream Raise 91, or the Drains Pond System through a high-density polyethylene (HDPE) pipe (above and below grade). The contact water collection area, pump, and pipe observed, appeared to be in good condition with no noticeable damage, significant corrosion, or significant erosion.

3.2 Perimeter Berm

3.2.1 Berm Upstream Slope

The majority of berm upstream slopes have been covered with CCR, with only the berm upstream slope along the north side being visible. The slopes appeared to match the design slopes of 3:1 with no observed cracks, sloughs, settlement, or seepage. The geomembrane liner along much of the north berm upstream slope and a minor area on the floor of the contact water collection area is exposed. Minor damage was identified on the upstream slope of the north berm. Although not covered with CCR and above the contact water level, it is recommended that the geomembrane be repaired and covered with CCR to act as protective cover. The berm upstream slopes of Southeast 16 appear to be in fair condition.

3.2.2 Berm Crest

The berm crest around the east and south sides of Southeast 16 is surfaced with gravel and used for light vehicle traffic. The berm crest along the north side is narrow and rarely used for light vehicle traffic. Heavy haul traffic bringing CCR to the site use an internal road constructed over previously placed CCR. The road on the berm crest of Southeast 16 appears to be in good condition, with no noticeable cracking or settlement, and appears to be well maintained. When wet, the road surface can become rutted and slippery. During the inspection, minor rutting was noticed on the south and east crests. Ruts that develop on the road surface should be repaired as soon as practical to maintain access.

3.2.3 Berm Downstream Slope

The berm downstream slopes on the south and east side had good vegetation. Some small animal burrows were identified along the berm downstream slope. The north berm downstream slope west of the contact water collection area was constructed of bottom ash and only minimal vegetation exists on these slopes. Golder recommends that soil be placed on these slopes to allow for growth of vegetation. Golder did not observe indications of seepage, sloughing, cracking, or excessive settlement on the berm downstream slopes. The berm downstream slopes appeared to be in fair condition.

3.2.4 Toe

The environment at the toe of the berm slope varies surrounding Southeast 16. A poorly draining area exists at the toe along the north side and surface water drainages exist along the toe on the south and east sides. Golder did not observe indications of sloughing, cracking, significant erosion, excessive settlement, or vegetation that seemed to be thriving abnormally along the toe. No signs of seepage were noted. The toe appeared to be in good condition. There were a few small trees and bushes near the toe along the east and south sides. Although these trees and bushes were not on the berm downstream slopes, Golder recommends that they be removed to keep all woody vegetation clearly off the berm downstream slopes and toe. A few larger trees downed from recent storms were identified in the surface water drainage on the south side of the facility. It is recommended that these downed trees be removed so as not to block flow through the drainage.

3.3 CCR Placement

3.3.1 CCR Downstream Slope (no Cover)

Uncovered CCR downstream slopes appeared to be in fair condition with no noticeable cracks, settlement, sloughing, seepage, or other signs of structural distress. The uncovered CCR downstream slopes appeared to match the design slopes with only minor erosion noted, particularly of fly ash along the north CCR downstream slope.

3.3.2 CCR Downstream Slope (with Cover)

Portions of CCR downstream slopes on the north, east and south sides of Southeast 16 have temporary cover installed as of late 2016. These areas had fair to poor vegetation (a combination of grassy vegetation and weeds) and minor erosion on the soil surface below. However, these CCR downstream slopes with temporary cover appeared to be in generally good condition to aid in controlling erosion of the outer fly ash “shell” and limit wind-blown fugitive dust.

The east and south CCR downstream slopes of Southeast 16 has final cover to an elevation of 1925 feet amsl with terrace channels and downchute drainage channels along the side slopes. This final cover was installed in 2015 and had fair to poor native grass vegetative growth. Golder recommends that topsoil be replaced in portions of this covered area and that it be re-seeded.

Golder did not observe indications of seepage, sloughing, cracking, settlement, or other signs of structural distress on the covered CCR downstream slopes. The covered CCR downstream slopes appeared to be in fair condition.

3.4 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 Southeast 16 were observed during the site inspection in September 2018.

4.0 SUMMARY AND CONCLUSIONS

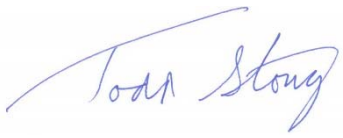
An annual inspection was performed for Southeast 16 at Coal Creek Station on September 18, 2018. The inspection met the requirements for CCR landfills under 40 CFR Part 257.84. Golder observed good vegetation and site maintenance and did not identify significant deficiencies such as seepage, excessive erosion or settlement, or cracking during visual observations of Southeast 16.

In addition to annual inspections by the Professional Engineer, trained and qualified site personnel will 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 erosion along CCR slopes, repairing rutted perimeter roads to maintain access, re-seeding poorly vegetated CCR downstream slopes where final cover has been placed, removing woody vegetation growing on the berm downstream slopes and toes, and placing CCR over exposed geomembrane liner.

Golder Associates Inc.

Craig Schuettpelz, PE
Senior Project Engineer



Todd Stong, PE
Associate and Senior Consultant

TJS/CCS/ds

5.0 REFERENCES

Barr Engineering. 1982. Coal Creek Station Hydrogeologic Study, June 3, 1982.

Cooperative Power Association. CPA 1997. Application to Renew Permit SU-033 and Combine with Permit SU-118. Eden Prairie, Minnesota, July 30, 1997.

Cooperative Power and United Power Association. CPA and UPA 1989. *Application to Renew Permit to Operate a Special Use Disposal Site, Coal Creek Station, Permit Number SU-033*. Prepared for the North Dakota State Department of Health and Consolidated Laboratories.

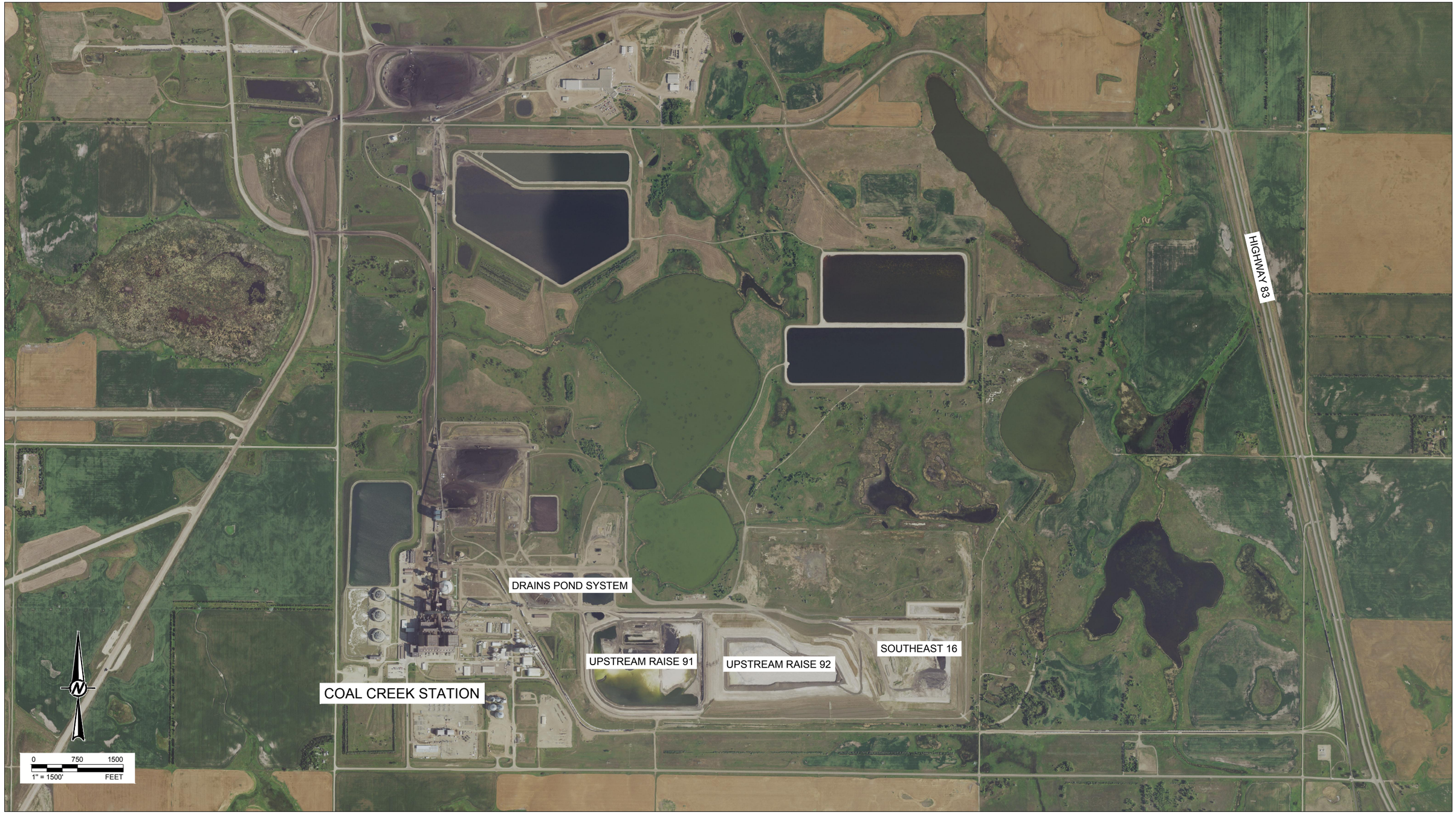
Golder Associates, Inc. Golder 2018. Annual Inspection Report – Great River Energy – Coal Creek Station – Southeast Section 16 CCR Landfill. January 2018.

Great River Energy – Coal Creek Station. GRE 2003. Permit Modification Document, Permit No. SP-033. Original Permit Modification submitted September 30, 2003. Revised Permit Modification submitted to NDDH on July 8, 2004.

Great River Energy – Coal Creek Station. GRE 2012. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated December 12, 2012.

Great River Energy – Coal Creek Station. GRE 2015. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated February, 2015.

Figures



REFERENCES

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED IN 2018.

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-03
DESIGNED	KAC
PREPARED	KAC
REVIEWED	CCS
APPROVED	TJS

PROJECT
2018 ANNUAL CCR FACILITY INSPECTION REPORT

TITLE
COAL CREEK STATION - SITE OVERVIEW

PROJECT NO.	REV.	FIGURE
1893823	B	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1 in

FACILITY BOUNDARY

AREA WITH TEMPORARY COVER (AS OF END OF YEAR 2018)

AREA WITH FINAL COVER (AS OF END OF YEAR 2018)

SOUTHEAST 16

UPSTREAM RAISE 92

N

0 125 250
1" = 250' FEET

REFERENCES

1. FOREGROUND AERIAL IMAGE FROM GREAT RIVER ENERGY PHOTOGRAPH TAKEN OCTOBER 2018.
2. BACKGROUND AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED IN 2018.

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-03
DESIGNED	KAC
PREPARED	KAC
REVIEWED	CCS
APPROVED	TJS

PROJECT
2018 ANNUAL CCR FACILITY INSPECTION REPORT

TITLE
SOUTHEAST 16
SITE OVERVIEW

PROJECT NO.	REV.	FIGURE
1893823	B	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
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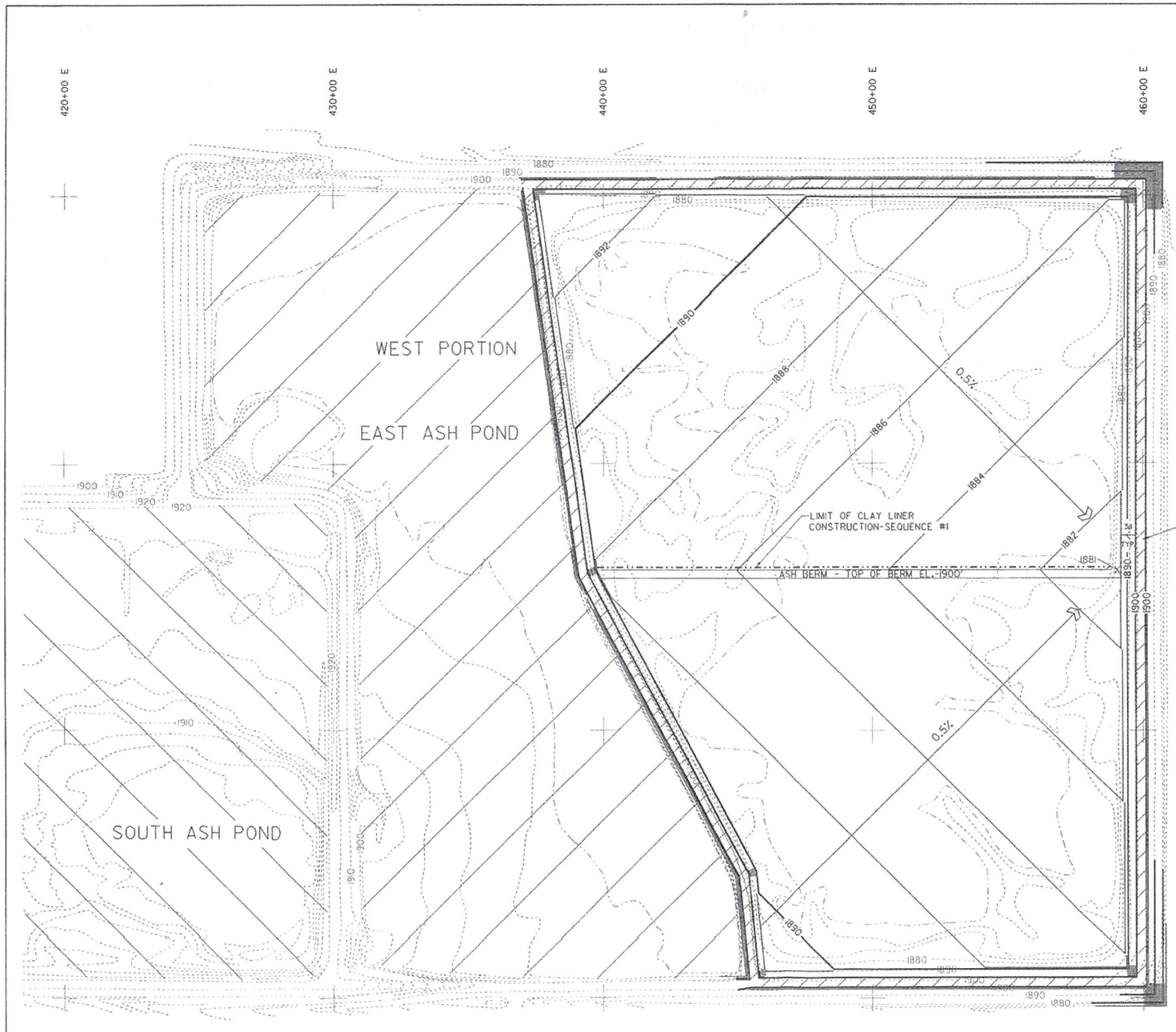
APPENDIX A

Selected Construction Drawings and Permit Drawings



N

LEGEND

- 1900 — EXISTING GROUND CONTOUR
- EXISTING EDGE OF WATER
- 1900 — PROPOSED BASE GRADE CONTOUR
- 3:1 PROPOSED SLOPE RATIO
- 4% PROPOSED SLOPE
- 1876 × PROPOSED SPOT ELEVATION
- TOP OF BERM

NOTES:

1. SITE LOCATION: SECTION 16, T45N, R82W, MC LEAN COUNTY, NORTH DAKOTA.
2. TOPOGRAPHIC MAP PREPARED FROM AERIAL SURVEY BY KBM, INC., GRAND FORKS, NORTH DAKOTA. DATE OF PHOTOGRAPHY - SEPTEMBER 30, 1987.
3. ELEVATIONS BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS TWO FEET.
4. HORIZONTAL DATUM BASED ON NORTH DAKOTA STATE PLANE COORDINATE SYSTEM AS FOLLOWS:

   SITE GRID N = N STATE PLANE COORD MINUS 150,000
   SITE GRID E = E STATE PLANE COORD MINUS 1,830,000

5. THIS DRAWING SHOWS CONTOURS DEPICTING THE BASE GRADES (TOP OF CLAY LINER).

WEST PORTION OF E.A.P

OWNER TO PLACE AN INTERIM COVER OF A MINIMUM OF 6" OF COMPACTED SELECT MATERIAL OVER EXISTING RESIDUE. OWNER TO PERIODICALLY COLLECT SURFACE WATER RUNOFF, AS REQUIRED, FOR DISPOSAL IN AN ACCEPTABLE MANNER.

SECTION MANAGER		
PROJECT COORD.		
DESIGN COORD.		
TECHNICAL COORD.		
RELEASES	BY:	DATE
ENGINEERING REVIEW		
SECTION MANAGER		
HYDRO.		
TECHNICAL COORD.		
RELEASES	BY:	DATE
HYDROGEOLOGIC REVIEW		
PROJECT REVIEW		
6		
5		
4		
3		
2		
1		
NO.	BY:	DATE
DESCRIPTION		
REVISIONS		

PLAN OF OPERATION FOR THE COAL CREEK STATION EAST ASH POND DISPOSAL AREA MC LEAN COUNTY, NORTH DAKOTA

BASE GRADES

Foth & Van Dyke
Geoscience and Environmental Management Division
P.O. Box 1902
Green Bay, WI 54307-9102
(414) 497-2500

DRAWN BY	MRS
DATE	DECEMBER, 1988
BOOK NO	
JOB NO.	87C61
FILE NO	
SURVEYED BY	
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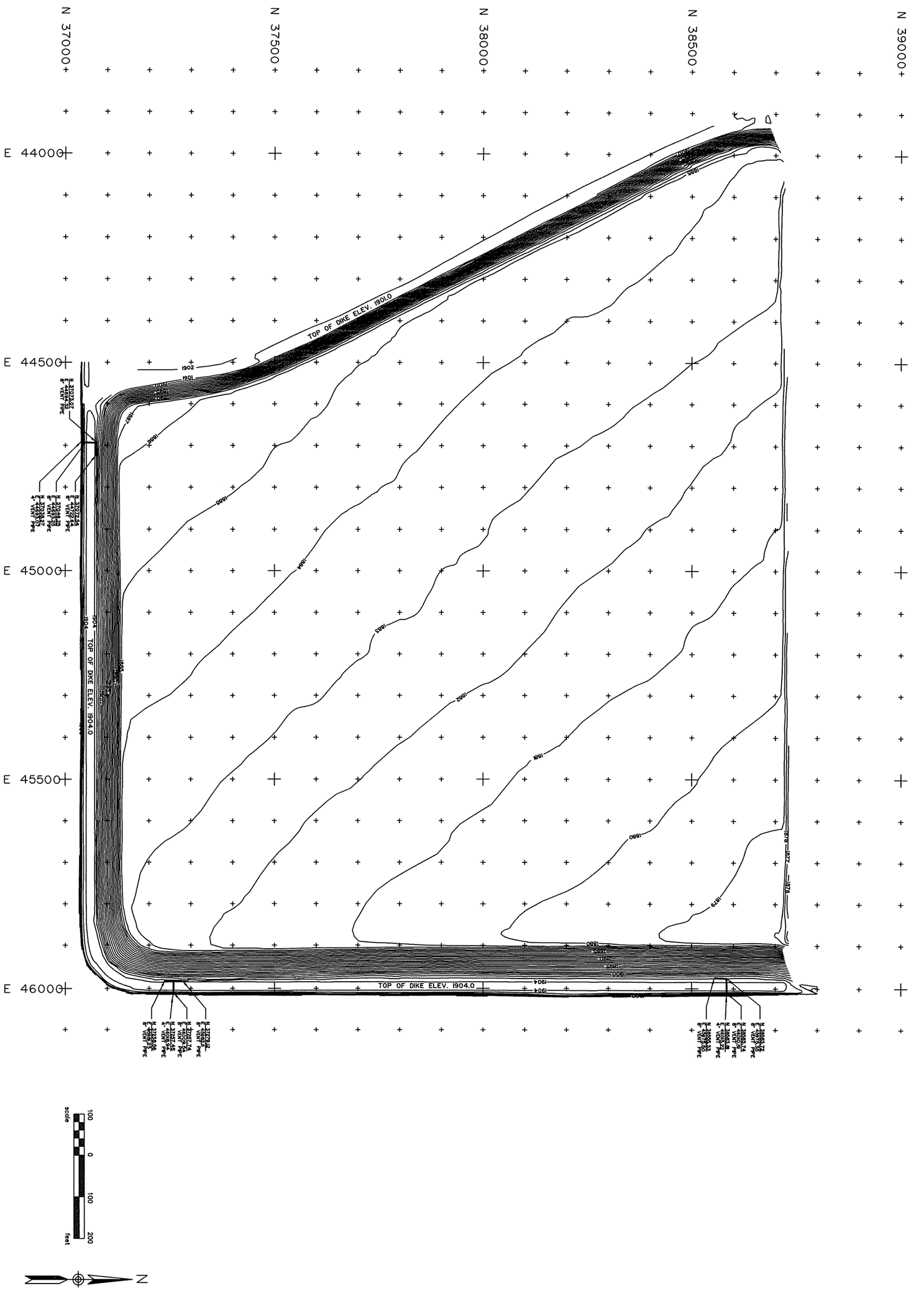
DRAWING NO.

A-4



SHEET NO. 4

interstate engineering, inc.

Engineering – Surveying – Planning

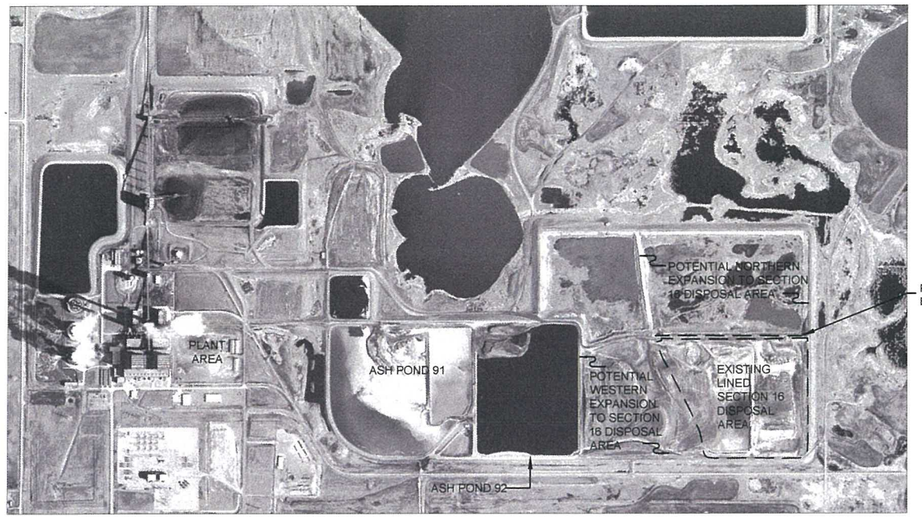
COOPERATIVE POWER ASSOCIATION
UNDERWOOD, NORTH DAKOTA

SECTION 16 FINAL CONTOURS
WITH GAS VENT PIPING
SECTION 16, T145N, R82W.

Drawn By D.JONASSON | Project No. B94-23(01)

Checked By L.H.K | Date 10/01/94

Revision No.	Date	By	Description



LOCATION PLAN

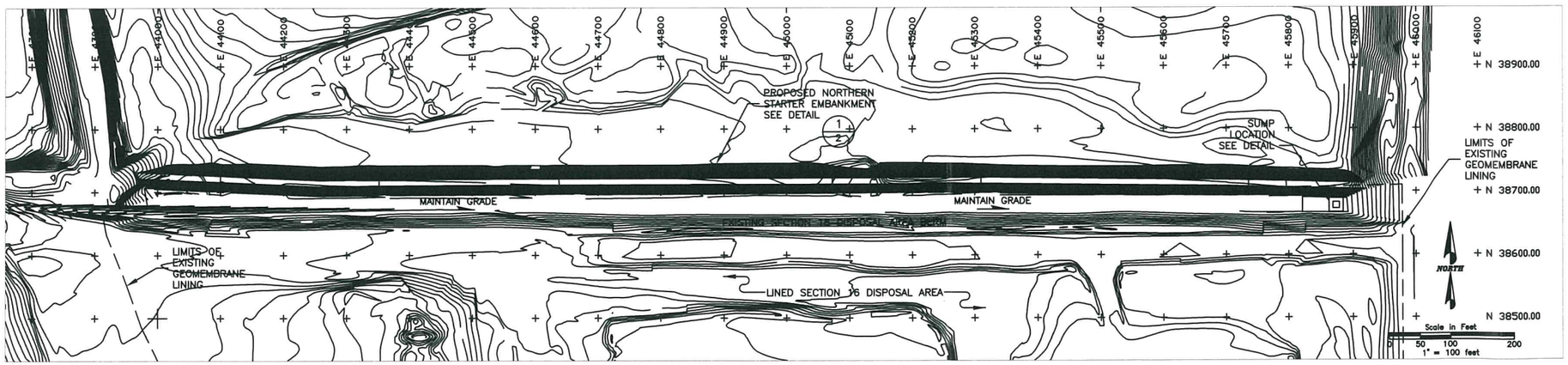
NOTES

1. TOPOGRAPHY AND AERIAL PHOTOGRAPH PROVIDED BY GREAT RIVER ENERGY (GRE) 9/2000.
2. GRE SHALL PROVIDE SOIL MATERIALS, GEOSYNTHETIC CLAY LINER (GCL), AND GEOMEMBRANE LINER.
3. EARTHWORKS CONTRACTOR RESPONSIBLE FOR BERM CONSTRUCTION, INCLUDING SOIL EXCAVATION, TRANSPORTATION, STOCKPILING AND PLACEMENT TO THE LINES AND GRADES ON THESE DRAWINGS; AND DEPLOYMENT OF GCL AND GEOMEMBRANE LINER; AND GCL SEAMING.
4. LINER SEAMING CONTRACTOR RESPONSIBLE FOR SEAMING GEOMEMBRANE PANELS.
5. GCL REQUIRED FOR CONSTRUCTION SHALL CONSIST OF A LAYER OF SODIUM BENTONITE BETWEEN WOVEN OR NON-WOVEN NEEDLE-PUNCHED GEOTEXTILES.
6. GEOMEMBRANE LINER REQUIRED FOR CONSTRUCTION SHALL BE 60-MIL SMOOTH HIGH-DENSITY POLYETHYLENE (HDPE).
7. SOIL MATERIALS USED FOR BERM CONSTRUCTION SHALL BE CLEAN, GRANULAR BOTTOM ASH FREE OF ORGANIC MATERIALS.
8. THE EXISTING LINER IN THE AREA SHOWN ON THE DRAWINGS SHALL BE CUT IF REQUIRED AND ROLLED AWAY FROM CONSTRUCTION ACTIVITIES TO PROTECT IT FROM DAMAGE.
9. NATURAL GROUND WITHIN THE LIMITS OF BERM CONSTRUCTION SHALL BE STRIPPED OF TOPSOIL, AND SCARIFIED IN PREPARATION FOR PLACEMENT OF SOIL CONSTRUCTION MATERIALS.
10. SOIL MATERIALS SHALL BE PLACED IN MAXIMUM 12-INCH THICK HORIZONTAL LIFTS AND COMPACTED USING METHODS APPROVED BY THE OWNERS REPRESENTIVE.
11. PORTIONS OF THE BERM TO BE COVERED BY GCL AND GEOMEMBRANE LINER SHALL BE SMOOTH-DRUM ROLLED TO PROVIDE A FLAT SURFACE.
12. OVERSIZED SOIL MATERIALS LOCATED WITHIN PORTIONS OF THE BERM THAT WILL BE COVERED WITH GCL AND GEOMEMBRANE SHALL BE REMOVED AS DETERMINED BY THE OWNERS REPRESENTIVE.
13. GEOSYNTHETICS SHALL BE DEPLOYED FROM EAST TO WEST TO PROVIDE OVERLAP IN THE DOWNSTREAM DIRECTION.
14. GCL SHALL BE DEPLOYED USING MANUFACTURER-RECOMMENDED METHODS, AVOIDING UNNECESSARY FOLDS OR IRREGULARITIES.
15. GCL PANEL OVERLAP SHALL BE ACCORDING TO THE MANFUCTURES RECOMMENDATIONS.
16. GEOMEMBRANE LINER SHALL BE DEPLOYED USING MANUFACTURER-RECOMMENDED METHODS, AVOIDING UNNECESSARY FOLDS OR IRREGULARITIES.
17. GEOMEMBRANE OVERLAP SHALL BE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS AND COORDINATED WITH THE SEAMING CONTRACTOR.
18. GEOMEMBRANE SHALL BE TEMPORARILY ANCHORED USING SANDBAGS FILLED WITH BOTTOM ASH.
19. THE EXISTING GEOMEMBRANE SHALL BE RE-DEPLOYED AND EDGE CLEANED (TOP AND BOTTOM) AND DRIED IN PREPARATION FOR SEAMING TO THE NEW LINER, AS DIRECTED BY THE OWNER.
20. THE GEOMEMBRANE LINER PANELS SHALL BE SEAMED USING FUSION OR EXTRUSION WELDING PROCESSES.
21. GEOMEMBRANE LINER CQA SHALL CONSIST OF DESTRUCTIVE AND NON-DESTRUCTIVE TESTING.
22. FUSION SEAMS SHALL BE TESTED USING AIR CHANNEL TESTS WITH A PRESSURE OF 30 PSI FOR 5 MINUTES. PASSING TESTS SHALL CONSTITUTE A PRESSURE DROP OF LESS THAN 3 PSI WITHIN 5 MINUTES.
23. EXTRUSION WELDS SHALL BE TESTED USING A VACUUM BOX AND AN APPLIED PRESSURE OF 5 PSI FOR 10 SECONDS.
24. DESTRUCTIVE TESTING SHALL BE CONDUCTED FOR SHEAR AND PEEL.
25. LINER CQA SHALL BE OBSERVED AND DOCUMENTED BY THE OWNER'S REPRESENTATIVE.

ESTIMATED MATERIAL QUANTITIES

MATERIAL	UNIT	QUANTITY
BOTTOM ASH*	YD^3	15,000
60mil SMOOTH GEOMEMBRANE LINER	FT^2	50,000
GEOSYNTHETIC CLAY LINER (GCL)	YD^2	6,400

* DENOTES IN-PLACE VOLUME



SECTION 16 NORTHERN STARTER EMBANKMENT PLAN

LEGEND

- EXISTING GROUND CONTOURS
- PROPOSED BERM CONTOURS
- EXISTING LIMITS OF SECTION 16 GEOMEMBRANE LINER

IF THE ABOVE BAR DOES NOT SCALE 1 INCH THE DRAWING SCALE IS ALTERED

CLIENT _____ DATE _____

ENGINEER'S STAMP

NO.	REVISION DESCRIPTION (THIS DRAWING IS NOT APPROVED UNLESS LAST REVISION IS HAND WRITTEN)	DATE	BY	CHKD	AP'VD
0	ISSUED FOR CONSTRUCTION				
A	ISSUED WITH DESIGN REPORT	10/23/00			
A	ISSUED FOR CLIENT REVIEW	10/10/00			

PRINT ISSUE RECORD

CLIENT/PROJECT
GREAT RIVER ENERGY
COAL CREEK STATION

TITLE
SECTION 16 ASH DISPOSAL FACILITY
NORTHERN STARTER EMBANKMENT PLAN

Golder Associates
Denver, Colorado

DRAWN	DBS	DATE	OCT. 2000
CHECKED	GE	SCALE	AS SHOWN
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APPROVED	RRJ	DWG. NO.	C002
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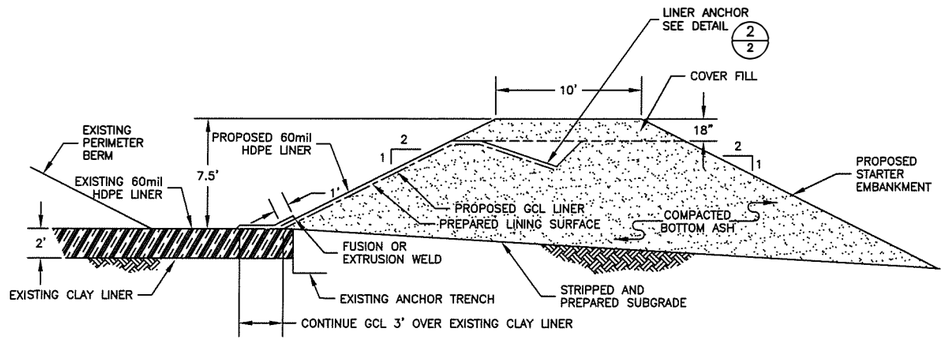

1/2 PROPOSED STARTER EMBANKMENT

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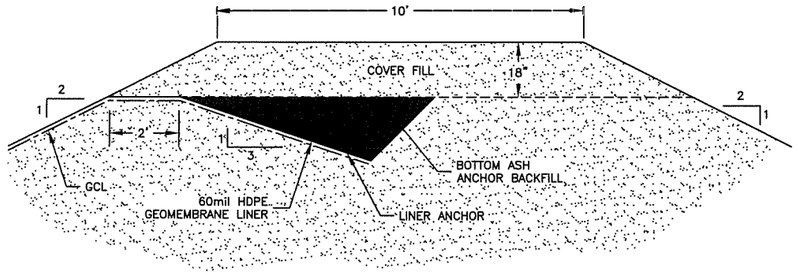
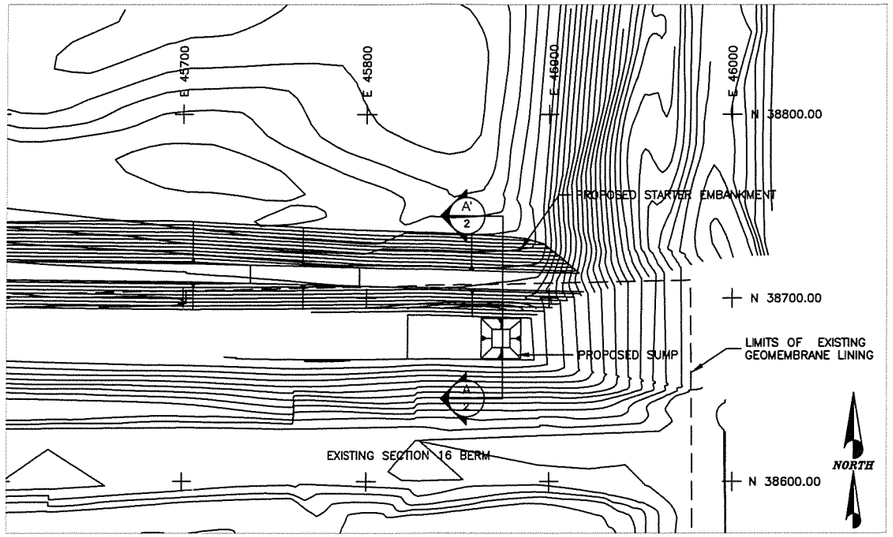
1" = 10 feet



2/2 LINER ANCHOR DETAIL
N.T.S.



SUMP PLAN

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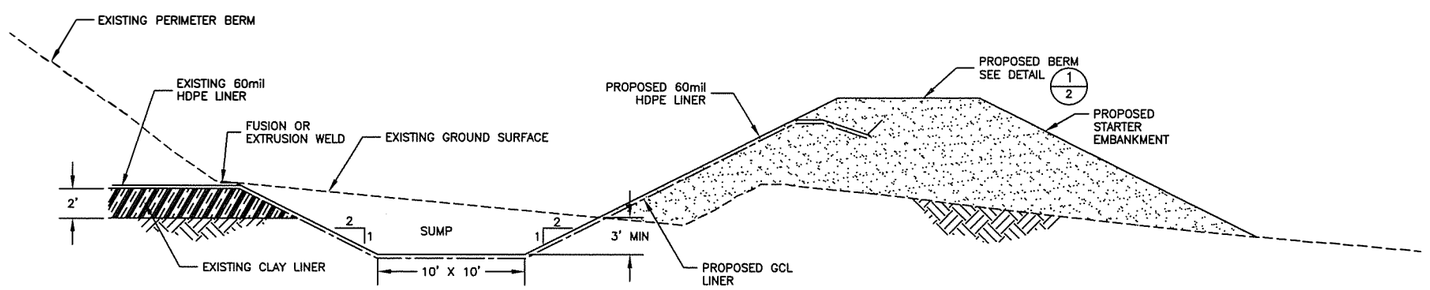


A/2 SECTION A–A'

Scale in Feet
0 2.5 5 10
1" = 5 feet

IF THE ABOVE BAR DOES NOT SCALE 1 INCH THE DRAWING SCALE IS ALTERED

CLIENT DATE

ENGINEER'S STAMP

NO.	REVISION DESCRIPTION (THIS DRAWING IS NOT APPROVED UNLESS LAST REVISION IS HAND WRITTEN)	DATE	BY	CHKD	AP'VD
6	ISSUED FOR CONSTRUCTION				
5	ISSUED WITH DESIGN REPORT	10/23/00			
4	ISSUED FOR CLIENT REVIEW	10/10/00			
3					
2					
1					

NO.	REVISION DESCRIPTION (THIS DRAWING IS NOT APPROVED UNLESS LAST REVISION IS HAND WRITTEN)	DATE	BY	CHKD	AP'VD
6					
5					
4					
3					
2					
1					

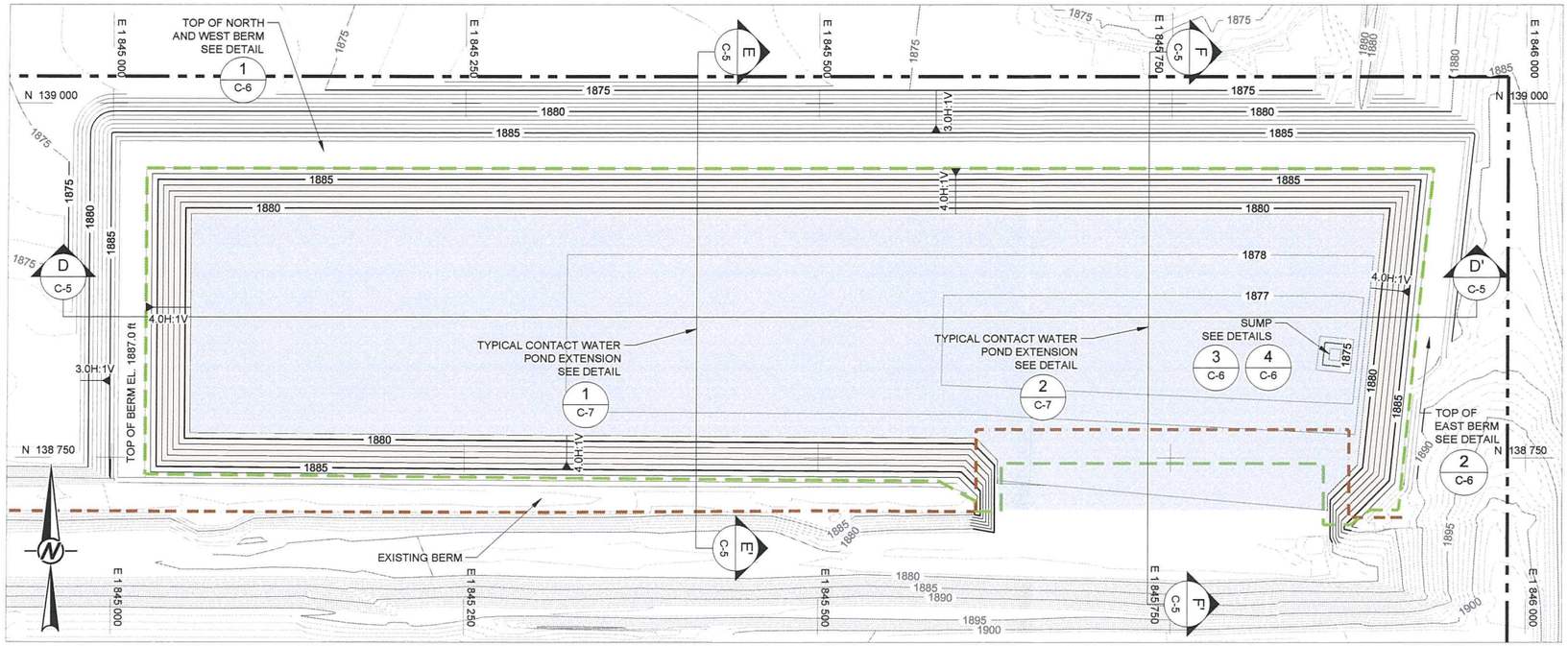
PRINT ISSUE RECORD

CLIENT/PROJECT
GREAT RIVER ENERGY
COAL CREEK STATION

TITLE
SECTION 16 ASH DISPOSAL FACILITY
NORTHERN STARTER EMBANKMENT - DETAILS

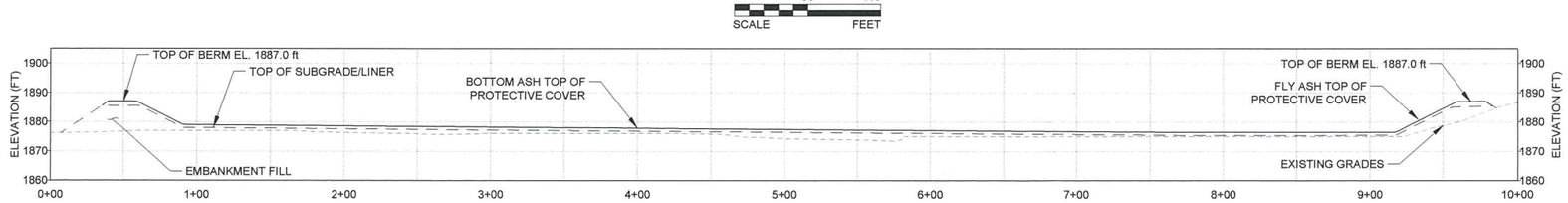
Golder Associates
Denver, Colorado

DRAWN	DBS	DATE	OCT. 2000
CHECKED	GE	SCALE	AS SHOWN
REVIEWED	RRJ	JOB NO.	003-2178
APPROVED	RRJ	DWG. NO.	C003
FILE NO.	2178C003	DRAWING	2



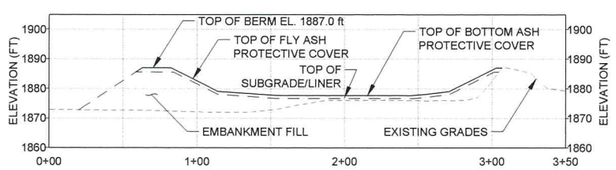
1 C-5 PLAN VIEW - TOP OF PROTECTIVE COVER

SCALE 0 50 100 FEET



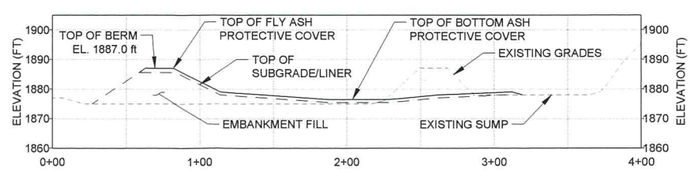
2X VERT. EXAGGERATION D C-5 SECTION D - D'

SCALE 0 50 100 FEET



2X VERT. EXAGGERATION E C-5 SECTION E - E'

SCALE 0 50 100 FEET



2X VERT. EXAGGERATION F C-5 SECTION F - F'

SCALE 0 50 100 FEET

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 2)
- TOP OF PROTECTIVE COVER OR EMBANKMENT (NOTE 2)
- FLY ASH PROTECTIVE COVER (NOTE 5)
- BOTTOM ASH PROTECTIVE COVER (NOTE 5)
- PERMITTED LIMIT OF CCR FACILITY (NOTE 1)
- APPROXIMATE EXISTING LINER BOUNDARY
- APPROXIMATE NEW LINER BOUNDARY

NOTES

1. THE PERMIT BOUNDARY IS APPROXIMATE.
2. PROPOSED GRADES REPRESENT THE TOP OF PROTECTIVE COVER AND EMBANKMENT.
3. FOUR MONITORING WELLS ARE LOCATED IN A LINE ORIENTED EAST-WEST APPROXIMATELY 200 FEET NORTH OF THE NORTH BOUNDARY OF THE WORK AREA AND A PIEZOMETER IS LOCATED APPROXIMATELY 40 FEET WEST OF THE WORK AREA. EXERCISE CAUTION WHEN WORKING AROUND OR NEAR THE MONITORING WELLS AND PIEZOMETER. CONTRACTOR IS RESPONSIBLE FOR PROTECTING THESE WELLS/PIEZOMETERS DURING CONSTRUCTION ACTIVITIES.
4. A MINIMUM OF 12 INCHES OF PROTECTIVE COVER SHALL BE PLACED OVER THE NEW AND EXISTING GEOMEMBRANE, AS DIRECTED BY OWNER'S REPRESENTATIVE.
5. BOTTOM ASH SHALL BE USED ON THE FLOOR AS PROTECTIVE COVER AND FLY ASH SHALL BE USED ON THE INTERIOR SLOPES AS PROTECTIVE COVER.

REFERENCE(S)

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS PROVIDED BY GREAT RIVER ENERGY. THE SURVEYS WERE PERFORMED BETWEEN 1996 AND 2011.
3. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
4. THE CONTOUR INTERVAL IS ONE FOOT.
5. ALL PROPERTY SHOWN ON THIS MAP IS OWNED BY GREAT RIVER ENERGY.

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
0	2015-06-24	ISSUED FOR CONSTRUCTION	AMS	AMS	RFS	TJS
A	2015-06-02	ISSUED FOR BID	AMS	AMS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 6/24/2015 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

GOLDER ASSOCIATES, INC.
44 UNION BLVD, SUITE 300
LAKEWOOD, COLORADO
USA
[+1] (303) 980-0540
www.golder.com

PROJECT
2015 COAL COMBUSION RESIDUAL FACILITY CONSTRUCTION
SCOPE OF WORK C
SOUTHEAST SECTION 16 CONTACT WATER POND

TITLE
TOP OF PROTECTIVE COVER

PROJECT No. 1523661 | Rev. 0 | C-5 of C-7 | DRAWING C-5

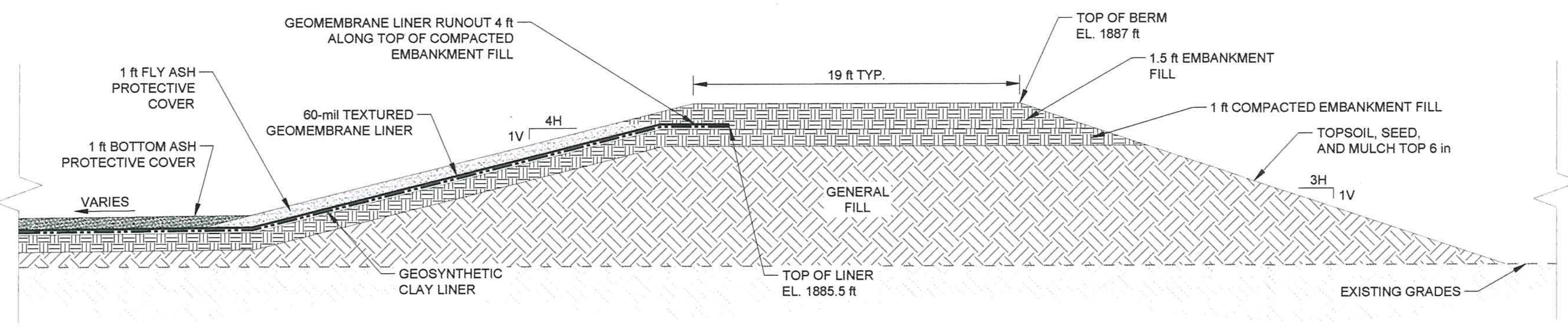
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in

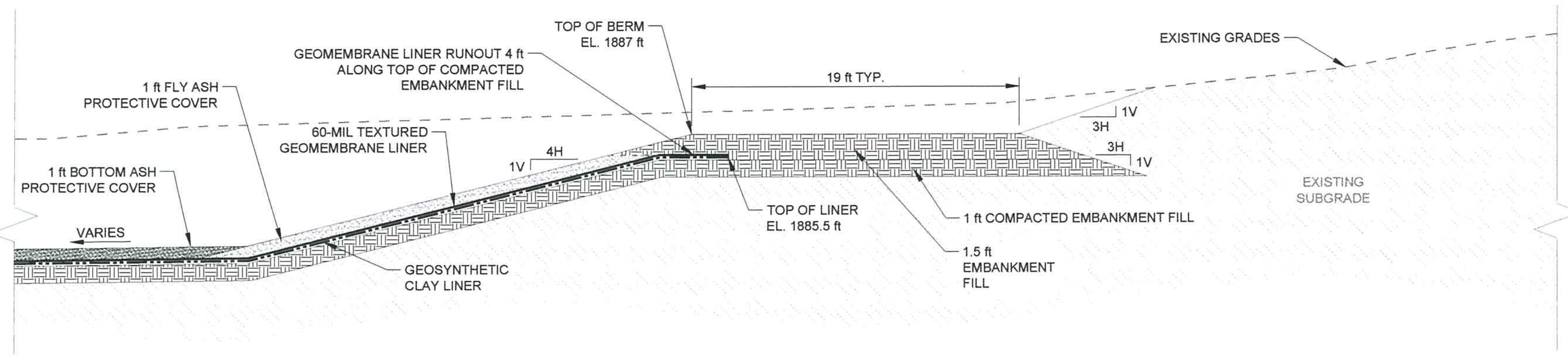
Path: \\Denver golder gda\acad15\1523661 - GRE\PRODUCTION_C - SOUTHEAST SECTION 16 CONTACT WATER POND\ | File Name: 1523661C004.dwg

NOTES

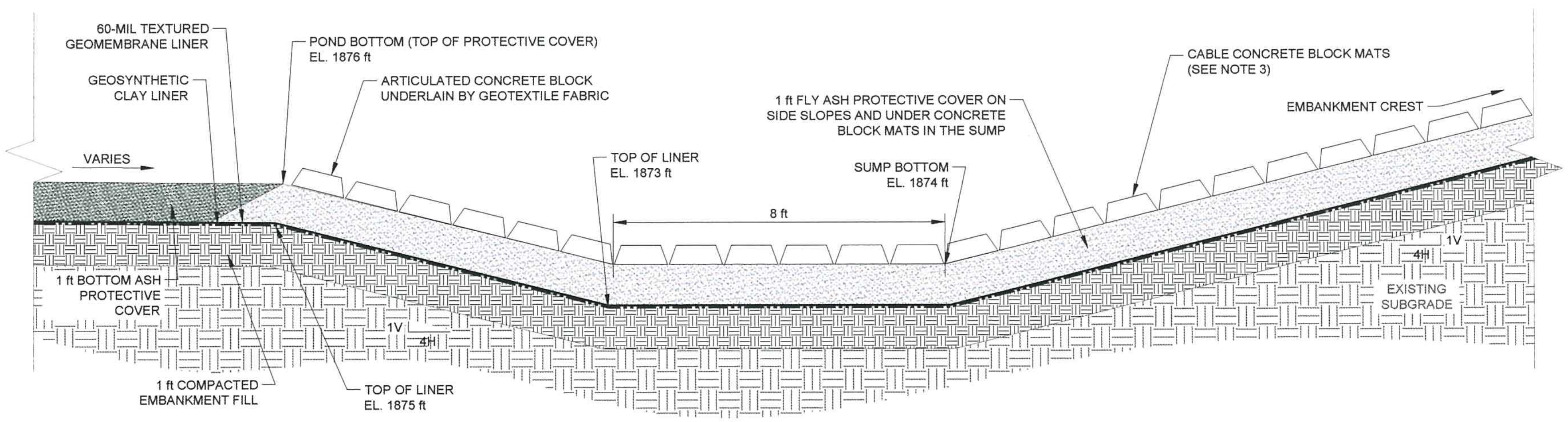
1. PRIOR TO PLACEMENT OF GENERAL FILL OR EMBANKMENT FILL, UNSUITABLE MATERIAL TO BE REMOVED AND PLACED NORTH OF THE WORK AREA. AREAS AT GRADE SHALL BE SUBCUT TO ALLOW FOR 1-FOOT OF EMBANKMENT PLACEMENT.
2. A MINIMUM OF 12 INCHES OF PROTECTIVE COVER SHALL BE PLACED OVER THE NEW AND EXISTING GEOMEMBRANE, AS DIRECTED BY OWNER'S REPRESENTATIVE.
3. CLOSED CELL CABLE CONCRETE BLOCK MATS SHALL BE PROVIDED IN 8-FOOT BY 16-FOOT SECTIONS (OR APPROVED ALTERNATIVE) TO BE PLACED IN THE POND SUMP BOTTOM AND SLOPES AND UP THE UPSTREAM SLOPE EAST OF THE SUMP TO THE BERM CREST. MATS SHALL BE UNDERLAIN BY GEOTEXTILE FABRIC, 12 INCHES OF PROTECTIVE COVER, AND THE LINER SYSTEM.



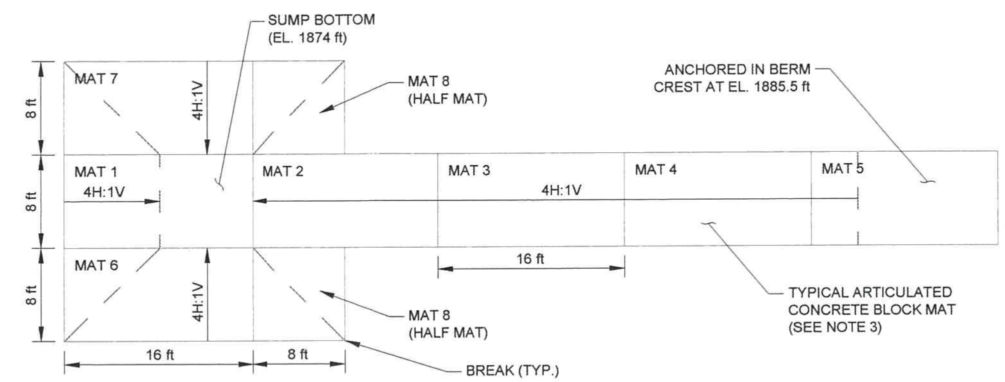
N.T.S. 1 C-6 TYPICAL BERM DETAIL (NORTH AND WEST BERMS)



N.T.S. 2 C-6 TYPICAL BERM DETAIL (EAST BERM)



N.T.S. 3 C-6 POND SUMP DETAIL (PROFILE VIEW)



N.T.S. 4 C-6 POND SUMP ACB PLACEMENT DETAIL (PLAN VIEW)

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
0	2015-06-24	ISSUED FOR CONSTRUCTION	AMS	AMS	RFS	TJS
A	2015-06-02	ISSUED FOR BID	AMS	AMS	RFS	TJS

SEAL
REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 6/21/2015
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT
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GOLDER ASSOCIATES, INC.
44 UNION BLVD, SUITE 300
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USA
[+1] (303) 980-0540
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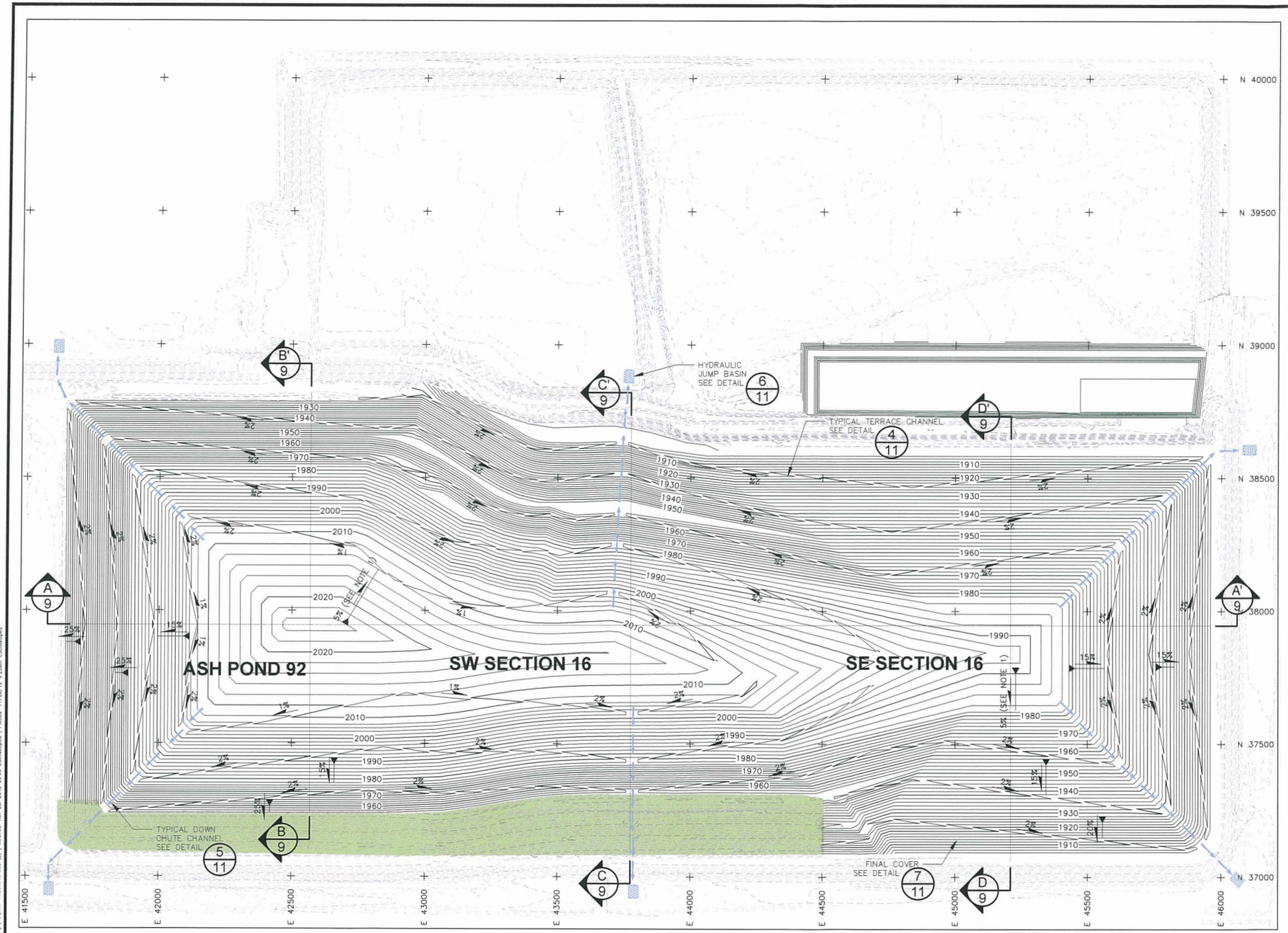
PROJECT
2015 COAL COMBUSTION RESIDUAL FACILITY CONSTRUCTION
SCOPE OF WORK C
SOUTHEAST SECTION 16 CONTACT WATER POND

TITLE
DETAILS 1 OF 2

PROJECT No	Rev.	C-6 of C-7	DRAWING
1523661	0		C-6



LEGEND

- EXISTING GROUND TOPOGRAPHY (1880)
- PROPOSED TOP OF COVER TOPOGRAPHY (1980)
- FINAL COVER PLACED
- DOWNCHUTE/OUTLET CHANNEL

NOTES

1. TOP OF COVER GRADES OF THE CROWN OF THE FACILITY ARE SHOWN AT 5%, BUT MAY BE CONSTRUCTED BETWEEN 3% AND 5%.
2. SEE THE SURFACE WATER ENGINEERING WORKSHEET FOR FURTHER DETAILS CONCERNING THE SURFACE WATER CONTROL PLAN.

REFERENCES

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY PROVIDED BY GREAT RIVER ENERGY PERFORMED BETWEEN 1996 AND 2011.
3. COORDINATES BASED ON PLANT GRID SYSTEM.
4. CONTOUR INTERVAL IS TWO FEET.
5. ALL PROPERTY SHOWN ON THIS MAP IS OWNED BY GREAT RIVER ENERGY.

200 0 200
SCALE FEET

DRAFT
FOR CLIENT REVIEW

ENGINEER'S STAMP

ORIGINAL DRAWING STAMPED BY TODD STONG, REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF NORTH DAKOTA (PE #6144), IS ON FILE AT GOLDER ASSOCIATES' LAKEWOOD, COLORADO, OFFICE.

NO.	REVISION DESCRIPTION	DATE	DESIGN	CADD	CHECK	REVIEW
B	ISSUED FOR PERMIT MODIFICATION	11/30/12	CCS	CCS	TJS	RRJ
A	ISSUED FOR CLIENT REVIEW	10/24/12	CCS	CCS	TJS	RRJ

PROJECT
GREAT RIVER ENERGY
COAL CREEK STATION
PERMIT NO. SP-033 PERMIT MODIFICATION

TITLE
FINAL COVER GRADES AND SURFACE WATER PLAN

Golder Associates

GREAT RIVER ENERGY

FILE No. 11381519A009
PROJECT No. 113-81519

8

Drawing File: N:\1\113-81519\WRK Permit Drawings\11381519A009.dwg | Layout: 11381519A008 (2) | Modified: Nov 28, 2012 09:05 CSchaettgel | Plotted: 11/28/12 9:25am CSchaettgel

APPENDIX B

Visual Observations Checklist

LANDFILL INSPECTION CHECKLIST

Facility Name: ***Southeast Section 16 Landfill***

Owner and Address: Great River Energy – Coal Creek Station

Purpose of Facility: CCR Storage and Disposal

Legal: Section: 16 ***Township:*** 145N ***Range:*** 82W

County: McLean

Inspected By: Todd Stong/Craig Schuettpelz/Paul Schlicht ***Inspection Date:*** September 18, 2018

Weather: Partly Cloudy, 60-70° F

ITEM	Y	N	N/A	REMARKS
1. Contact Water Controls				
a. Water level in contact water control area	X			Depth: 1-2 ft
b. Sump & pump in good condition	X			
c. Containment controls working	X			
d. Ponding water outside of contact water control area		X		
e. Erosion protection in contact water control area	X			Fly ash protective cover and ACB at pump suction, some erosion of bottom ash protective cover in the southeast corner exposing geomembrane
2. CCR Placement – Downstream Slope (no cover)				
a. Significant Erosion		X		Some erosion on north downstream slope in area of contact water routing
b. Cracks/settlement		X		
c. Seepage		X		
3. CCR Placement – Downstream Slope (with cover)				
a. Erosion		X		
b. Vegetation	X			Portions of final covered slopes require re-seeding continued vegetation development
c. Rodent burrows	X			Small burrows
d. Seepage/sloughing/cracking/settlement		X		
4. Perimeter Berm - Upstream slope				
a. Erosion (exposed liner)	X			Exposed liner on north berm, minor damage to geomembrane higher on slope
b. Vegetation		X		
c. Rodent Burrows		X		
d. Seepage/sloughing/cracking/settlement		X		
5. Perimeter Berm - Crest				
a. Surfacing/Soil condition	X			Gravel surfaced
b. Comparable to design width	X			
c. Vegetation		X		
d. Rodent burrows		X		
e. Exposed to heavy traffic		X		
f. Damage from vehicles/machinery	X			Minor rutting along south and east sides
6. Perimeter Berm - Downstream slope				
a. Erosion		X		
b. Vegetation	X			Good native grass
c. Rodent burrows	X			Small burrows
d. Seepage/sloughing/cracking/settlement		X		
7. Perimeter Berm - Toe				
a. Erosion		X		
b. Vegetation	X			Good native grass, some woody vegetation near toe to remove
c. Rodent burrows		X		
d. Seepage/sloughing/cracking/settlement		X		
e. Drainage conditions	X			

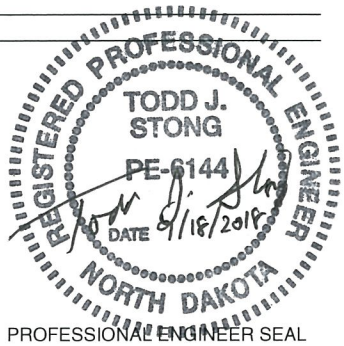
General Remarks: Good condition in general with limited maintenance required, such as filling in animal burrows, repairing interior erosion, and re-seeding areas where final cover vegetation is sparse.

Name of Engineer: Todd Stong

Date: 9/18/2018

Engineering Firm: Golder Associates Inc.

Signature: Todd Stong



PROFESSIONAL ENGINEER SEAL

APPENDIX C

Photographs

LEGEND

(#) PHOTOGRAPH NUMBER AND DIRECTION

REFERENCES

1. FOREGROUND AERIAL IMAGE FROM GREAT RIVER ENERGY DRONE PHOTOGRAPH TAKEN SEPTEMBER 2017.
2. BACKGROUND AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, PUBLISHED IN 2018.

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-03
DESIGNED	KAC
PREPARED	KAC
REVIEWED	CCS
APPROVED	TJS

PROJECT
2018 ANNUAL CCR FACILITY INSPECTION REPORT

TITLE
SOUTHEAST 16 LANDFILL
PHOTOGRAPH LOCATIONS

PROJECT NO.	REV.	FIGURE
1893823	B	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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Southeast 16

Photograph 1 (SE corner of contact water area (CWA))
Contact water collection area and seepage channel (IMGP6292.JPG)

Photograph 2 (CWA north crest)
Contact water collection area berm crest (IMGP6294.JPG)

Southeast 16

Photograph 3 (CWA north upstream slope)
Fly ash protective cover on contact water collection area upstream slope (IMGP6295.JPG)

Photograph 4 (CWA north downstream slope)
North berm downstream slope and toe (IMGP6296.JPG)

Southeast 16

Photograph 5 (CWA ditch)
Exposed geomembrane on upstream slope (IMGP6303.JPG)

Photograph 6 (CWA ditch)
Damage to exposed geomembrane on upstream slope (not in-contact with water) (IMGP6305.JPG)

Southeast 16

Photograph 7 (North CCR slope)
Temporary cover on north fly ash slope (IMGP6317.JPG)

Photograph 8 (North CCR slope)
Eroded fly ash slope due to channelized water flow (IMGP6318.JPG)

Southeast 16

Photograph 9 (C&D Area)
Haul road to construction and demolition deposition area of Southeast 16 (IMGP6320.JPG)

Photograph 10 (CCR placement)
Interior deposition of reject materials (IMGP6322.JPG)

Southeast 16

Photograph 11 (CCR placement)
Fly ash berm around rejects placement (approximately 35-40 feet wide) (IMGP6325.JPG)

Photograph 12 (Northeast downstream slope)
Sparse vegetation on east downstream slope of final cover (2ccs.JPG)

Southeast 16

Photograph 13 (East downstream slope access road)
Minor rutting of berm crest perimeter access road (4ccs.JPG)

Photograph 14 (East downstream slope separation berm)
Contact water separation berm on downstream slope (6ccs.JPG)

Southeast 16

Photograph 15 (East downstream slope)
Temporary cover (approximately 2 feet tall grass) (8ccs.JPG)

Photograph 16 (Southeast CCR crest)
Southwest Section 16 fly ash slope and contact water ditch at top of temporary cover (16ccs.JPG)

Southeast 16

Photograph 17 (Southeast corner)
Culverts partially obstructed by downed tree (19ccs.JPG)

Photograph 18 (South downstream access road)
Minor rutting of berm crest perimeter access road (25ccs.JPG)

Southeast 16

Photograph 19 (South downstream slope)
Animal burrow on downstream slope (29ccs.JPG)

Photograph 20 (South downstream slope)
Piezometer near berm crest perimeter access road and downstream slope vegetation (31ccs.JPG)

Southeast 16

Photograph 21 (C&D Area)
Construction and demolition (C&D) deposition area (37ccs.JPG)

Photograph 22 (Northeast corner)
Articulated Concrete Block (ACB) on northeast downstream slope (PDS 1 CCS SE16.JPG)

Southeast 16

Photograph 23 (East downstream slope)
Grass vegetation on downstream slope (PDS 7 CCS SE16.JPG)

Photograph 24 (East downstream toe)
Animal burrow near downstream toe (PDS 10 CCS SE16.JPG)

Southeast 16

Photograph 25 (Southeast toe)
Articulated Concrete Block (ACB) on southeast downstream slope (PDS 13 CCS SE16.JPG)

Photograph 26 (South downstream slope)
Surface water terrace channel on downstream slope (PDS 15 CCS SE16.JPG)

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